THE BACKGROUND AND USE OF THE TERM 'IDEA' BY MALEBRANCHE, LOCKE AND LEIBNIZ

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I declare that this thesis has been composed by myself, that the work of which it is a record has been done by myself, and that it has not been accepted in any previous application for a higher degree;

I was admitted as a research student under Ordinance General No. 12 in October 1971 and as a candidate for the degree of Doctor of Philosophy under this resolution on 12 May, 1972.

I hereby affirm that the conditions of the Resolution and Regulations have been fulfilled.

The general distinction between uses of the term "idea" which we draw is between occurrences in the mind and dispositions for them as opposed to concepts. Locke uses "idea" in the first way, Malebranche uses it in the second. Leibniz allows that the mind is infinite and that dispositions in the body correspond to dispositions in the mind; thus he is able to maintain that ideas are both concepts and dispositions in the mind.

We explain concepts in terms of conventional rules, for the most part linguistic and especially mathematical. We call a system of conventional rules an objective structure and, as those who took ideas to be concepts held that they are concepts of divine science, we treat God as the unique objective structure. The question in seventeenth century theories of ideas is how that body of knowledge comprising ideas and their relations is applicable to things.

In the first four chapters, we consider concepts and the Cartesian programme to reduce the description of everything but that which applies concepts to mathematical descriptions. Descartes, Malebranche, and Leibniz held that the lack of simplicity and exactness in human knowledge arises from the correspondence between microscopic activities in the body and mental occurrences. With occurrences in the body explained mechanically, it was held, the world can be described with maximum simplicity and exactness. Extended things are law-obeying configurations to which concepts are applied; thinking things are rule-following things by virtue of applying these concepts. But the parts played by convention and behaviour are left out of their accounts and, omitting these, the world cannot be shown to be anything more than a diagram, perhaps portrayed only in the mind of the investigator. In the antepenultimate chapter, we discuss two related views which led the rationalists to maintain that all rational beings naturally follow a unique objective structure: their position on the correspondence between the activity of the body and occurrences in the mind (illustrated in their theories of vision) and the view that divine science is the standard for all scientific formulations. In the penultimate chapter, we present evidence that rationalist accounts of cognition were in fact modelled on rule-governed activity. Plato's theory of knowledge and Ideas is compared with rationalist accounts and is found to have less relevance to rule-governed activity. Kant, we admit, saw the relevance of rules, but no more than the rationalists. In the ninth chapter, we discuss Malebranche's vision in God (which most clearly presents ideas as concepts), its relation to Descartes' and Leibniz's positions and its dependenc on occasionalism.

In the fifth chapter, we argue against Chomsky's innatist position and, more generally, claims in the behavioural and social sciences to explain human knowledge in terms of internalized components and covert activities. It is also maintained that Chomsky's innatism bears little resemblance to that of seventeenth century rationalism.

We discuss in the sixth through the eighth chapters the Scholastic background to the use of the term "idea" and theories of ideas. In the sixth chapter, the pervasive influence of Suarez is established, as is the prevalence of nominalism in the seventeenth century and its connection with Gassendism and eventually Locke. Suarez combined aspects of Thomism and nominalism. Thomism was concerned with so-called spiritual objects of knowledge, which roughly act as standards and are the contribution of the knower to what is known; rationalism's account of knowledge maintained these aspects of Thomism. Nominalism, on the other hand, presented what we shall call a causal or genetic account of knowledge (according to which our knowledge arises from causal relations and operations of the intellect) and was concerned with so-called material objects got from sensation (while allowing for spiritual operations). The distinction between spiritual and material objects and faculties is introduced in the sixth chapter. In the seventh chapter, we discuss the bridge between these faculties, the intellectus agens, which served as an objective structure in Thomist accounts. In the eighth chapter, we discuss uses of "spiritual", "idea", and "mind", beginning with Scholastic uses, but concentrating on the differences between Descartes and Gassendi.

Locke's causal account is discussed in the final chapter. We emphasise his divergence from Cartesianism, such as his view on the narrow compass of the understanding, his treatment of mathematical ideas as signs and his reliance on mental dispositions. Locke's position suffers from the omission of concepts.

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The term "idea" became prominent in philosophical literature largely through the writings of Descartes. Descartes' conception of ideas and their objective realities is central to his programme, which was a revolution in the account not only of our knowledge and its exercise, but also of the mathematical and medical sciences. A salient aspect of Descartes' programme is the quest for certainty and dissatisfaction with only probable knowledge. Descartes' novelty, however, does not rest on his concern with *a priori* knowledge, for Scholasticism considered a body of *a priori* truths the ideal of human knowledge. Cartesians and Scholastics shared a notion of science as a body of necessary truths, which is how we shall use "science". Descartes' novelty is in what he considered this science to be, our relation to it and, above all, its relation to things.

The Scholastics thought of logic as an art to arrive at science in beginning with our every-day observations. They thought of the exercise and inception of our knowledge as dependent on species received in sensation, which exhibit only the superficial nature of things and establish dispositions in us to be exercised in a gradual process of articulating our science. For Descartes, science is mathematics, suitably universalised and complemented by certain adjuncts. Mathematics for Descartes is perspicuous: by attending to mathematical concepts, one grasps truths as if by seeing them, without a formal arrangement of propositions or a refinement of terms. Some art or method is called for, but this is to remove the cobwebs which we have acquired since infancy through our continual concern with our biological needs and the upbringing imposed on us. Descartes not only eliminates the need for Scholastic logic, but also the need for species. Mathematics is not only the paradigm of science, but also constitutes the nature of all things but rational beings. Extended things are perspicuous; extended substances do not support accidents, but reveal mathematical properties to us with no need to refine the data of sensation. Extension is the essence of body for the

Cartesians. Likewise, the soul or mind which applies this science is perspicuous to itself, for that by which we know things - objective realities - need no refining and all that is in the mind is thought, which is its essence. These occurrences, however, are not due to the mind's grasp of science and to that extent are opaque and veil extended substances, as they relate to configurations too small to be revealed. These are due to the union of the soul with the body and include qualities we naturally attribute to bodies.

The human body itself reveals mathematical properties and can be investigated as well as the rest of the corporeal world in an endeavour to explain mechanically all extended things. By the examination of microscopic parts of the body, their relations with each other and with microscopic systems in their environment, it was thought, the dependence of our knowledge of the world and ourselves on opaque occurrences in the mind can be minimised. A large portion of Descartes' writings and much of Malebranche's magnum opus, the Recherche de la Vérité, were devoted to physiological descriptions of the minute parts of the human body, particularly the brain. Cartesianism first spread in scientific circles, especially medical circles, and Cartesian mechanical physiology was regarded as integral to the endeavour to give a perspicuous description of all things, extended and thinking.

On the Cartesian position that the essence of all things is either extension or thought, species received by rational beings from bodies were ruled out. The Cartesian account of our grasp of the natures of things was not primarily concerned with dispositions - knowledge - but with acts - cognition - whether these are inceptions or exercises of dispositions. Their major concern was with the application of our science to things. It is important to realise that much of the discussion in the seventeenth century was about cognition, rather than knowledge. The Latin "cognitio" and sometimes the French "connaissance" refer to acts. Sometimes (as with Locke) even the English "knowledge" referred to an act. "Cognoscere", for want of a better word, can be rendered as "cognise". The dominant Scholastic account in the seventeenth century, on the other hand, put more emphasis on knowledge and held that cognition which is inceptive of knowledge, as it is not the application of science, is different from that which is the exercise of knowledge. The inception of knowledge was held to be a causal relation between the thing cognised and the cogniser. Knowledge thus caused, it was held, is developed by the individual to arrive at science, which is then exercised in cognition. We shall call such accounts causal or genetic accounts. Locke's account is very much a causal account.

The major distinction we wish to draw between the uses of "idea", is as it was used for an occurrence in the mind or a disposition for such occurrences and as it was used for a concept. We shall explain concepts in terms of conventional rules. Concepts are largely the meanings of words and a science as a body of a priori truths is purely conceptual. The seventeenth century, however, did not think of science as conventional. Those who held a causal account thought of it as due to the operations of the individual on what is caused in him. Descartes identified divine science, by which things are made, with human science, which we apply in cognition. This identification is achieved in his causal proofs of the existence of God. The causal proofs rely on the objective realities of ideas, which are concepts. With the identification of divine and human science, Descartes has a guarantee that the concepts we have are all from the same conceptual structure, which is complete for any investigation we should undertake. As we interpret Descartes and Malebranche, the latter is faithful to the former on the part given to objective realities (which he calls ideas). Malebranche held that our ideas or concepts are not in the mind, but in God. We shall speak of the objective structure rather than God whenever possible, for the relevance of God in

Malebranche's account of knowledge is that He contains the science which we follow and which is revealed in things. Leibniz, although critical of the Cartesians on some points, is in agreement with them on the relation between our science and God's.

Both Malebranche and Locke characterise ideas as the immediate objects of thought. What is intended is that by which we know something and corresponds to the Scholastic objectum quo. The problem with seventeenth century theories of ideas is not that objects are placed between us and things. The question, rather, was what sorts of objects of thought or cognition must be primary to account for human science and its application to things. Malebranche calls ideas spiritual. Similarly, Leibniz calls monads spiritual automata. Spiritual, as concerned with knowledge, distinguishes what is conceptual, for what is conventional is replaced by something held to be natural.

The Scholastic distinction between material or sensitive faculties and spiritual faculties, with objects peculiar to each, was disrupted by the mechanisation of matter. Descartes, with his mechanical physiology, excluded the Scholastic sensitive faculties from the thing which thinks and held that sensation and imagination are occurrences in the mind due to its union with the body. There are no occurrences in the mind, Descartes maintained, which are indifferent to judgement. Judgement, a function of the will, is especially important for the application of science and is not to be separated from consciousness. Locke, who rejected Cartesian mechanical physiology, retains the Scholastic sensitive faculties in the mind. "Mind" has a different sense for Locke, as does "conscious" and judgement plays a minor part. Furthermore, Locke lacks any equivalent of the notion of objective reality. For him, ideas are only occurrences in the mind or dispositions for such occurrences. Locke accepted only part of the Cartesian revolution.

Chapter I

Knowledge, Cognition and Non-Descriptive Concepts.

The major distinction we wish to draw between uses of "idea" by our philosophers is between what we shall call occurrences in the mind and dispositions to have such occurrences on the one hand and concepts on the other. Concepts are best explained as that which governs our utterances of verbal tokens so that they have a use. Occurrences in the mind will be explained in analogy with utterances. Only beings governed by rules have concepts and any account of the knowledge we have which is peculiar to us as beings governed by rules and its application to things must assign a principal part to concepts. We can allow that occurrences in the mind and dispositions for them are due to our causal relations with our environment. But concepts are conventional and are imposed on us by our culture. Locke's account of our knowledge suffers from the lack of a notion of concepts, as it must, for it is a causal or genetic account. "Idea" for Locke means either an occurrence in the mind or a disposition for such occurrences. "Concept" corresponds to Descartes' "objective reality" and Malebranche's and Leibniz' "idea". The accounts these philosophers give of the application of the knowledge we have which is peculiar to us as rational beings or beings governed by rules, though attenuated and idealised, is basically sound. However, they maintain that all rational beings naturally have the same set of concepts in all stages of their history and apply them in their natural interaction with their environment. A major reason for this position is their view on the correspondence between thought and the mechanical disposition of the body and the mechanical description of all bodies in terms of a scientific ideal, which is the supposedly unique set of concepts. Another, related, reason is the view that there is one set of rules by which God evaluates our actions - including verbal behaviour and thought - and governs the course of nature.

The general problem is an account of how someone or other knows and what he knows. We begin this section by distinguishing three sorts of knowledge, each paradigmatically (but not always) associated with a grammatical form: practical knowledge, corresponding to "know how"; essential knowledge, corresponding to "know what...is"; and propositional knowledge, corresponding to "know that". To each sort of knowledge, which is dispositional, corresponds a sort of cognition, i.e., the exercise or inception of the disposition. The first three chapters are largely concerned with what is usually called _a priori_ knowledge and its application to the world; we shall construe this somewhat differently. We begin by concentrating on one of two general ways in which one can reply to "How does he know?", viz. by stating his competences. We are particularly concerned with the competence one has by virtue of following the rules of culture, which are conventional. In particular, there are certain rules one follows which do not directly depend on how the world is or what those who follow them are like. We shall call these purely conventional rules "non-descriptive rules"; they could in principle be learned by performing acts, (which we shall call "intransitive acts", as opposed to "transitive acts") whose purpose is not to pick out natural things. As rules are known in this sort of propositional knowledge, we shall say that concepts are known in the corresponding essential knowledge.

These rules and concepts largely govern our verbal behaviour, but "to know" even here is not to be conflated with "to be able to say", for we cannot always say what we know. Non-descriptive rules and concepts are most notably grammatical, logical, mathematical and moral and those governing speech acts. The totality of the non-descriptive rules and concepts of a culture we shall call the "objective structure" of that culture.

We are particularly interested here in the Cartesians (i.e. Descartes and Malebranche) and Leibniz, who maintained that there is only one objective structure, which is either an aspect of God or that which God followed in creating the world. This is contrary to the fact that an objective structure is peculiar to a culture. It is also contrary to the fact that a person comes to follow non-descriptive rules and concepts by performing acts which can be evaluated by others - "transient acts"; only once he knows the rules and concepts can he perform acts which could be evaluated only by himself - "immanent acts". (We shall say that the objective structure specifies the roles - uses - of transient and immanent acts.) But according to the Cartesian and Leibnizian position, before performing any transient act, we follow <u>the</u> objective structure, which is independent of any culture. A consequence of this is that all non-descriptive rules and concepts we should ever follow are already in force with regard to us. The Cartesians and Leibniz expressed this by saying that we know what is infinite - the objective structure (God) - before what is finite, i.e. its applications. One thing implied by this position is the view that one concept or rule is applicable to an infinite number of cases. This runs into problems because there are not always methods to evaluate whether the application of a rule or concept in a particular case is correct or incorrect; rather new rules or concepts must be agreed upon. For the same reason, an objective structure cannot be infinite in a second way, viz. given a rule or a set of rules, an infinite number of concepts are to be thereby given. We shall discuss the formation of non-descriptive rules, concepts and disciplines. We shall be particularly concerned with the criteria of simplicity and exactness, so important to the Cartesians and Leibniz, which are determined by the cultural endeavour in which one is engaged, its rules and concepts.

"Know" has a very versatile grammar. We can be said to know how to do something, know that such-and-such, know about something, know what something is, or know of something. Furthermore, "know" is often followed directly by a noun-phrase. Certain constructions are not of interest to us, ~~as~~ when we speak of knowing pain or misery, where "know" is used like "suffer", or when "to know" is used like "to be familiar with", where the familiarity in question carries some social implication (as in most cases in which we are said to know a person, town or landmark). Vendler claims that all other grammatical constructions containing "know" are reducible to constructions of the form "know that..." Consider the following.[1]

(1) Joe lost his watch.
(2) I found what he lost.
(3) I know what he lost.

Together, (1) and (2) entail that I found Joe's watch; but (1) and (3) do not entail that I know his watch. The difference is accounted for by the different functions of "what" (a purely grammatical word) in (2) and (3). "What" in (2) amounts to "that which" - a demonstrative pronoun followed by a relative pronoun introducing a relative clause.

Relative clauses always depend on noun-sharing between two ingredient sentences: e.g. "I found that (pointing to the watch), which he lost." But "what he lost" in (3) has nothing to do with a relative clause. Rather, it is a sentence nominalisation formed by replacing a noun-phrase or adverbial phrase in the original sentence. Thus (3) could be expanded as:

(4) I know what he lost, namely a watch.

Restoring the underlying sentence gives:

(5) I know what he lost, namely (I know that he lost) a watch.

So the "what" - clause after "know" derives from:

(6) that he lost a watch

Vendler suggests that the "what" clause should be called an indirect or indefinite claim, not an indirect question, under which it is usually classed by grammarians. An instance of an indirect question is:

(7) I wonder what he lost.

Restoring the underlying sentence gives:

(8) I wonder what he lost, namely (I wonder whether he lost) a watch, or a ring, or ...

So the "what" clause after "wonder" comes from an earlier nominalisation, viz.:

(9) whether he lost a watch

and not directly from a "that" clause. However, "wh.." clauses ("who...", "when...", "why...", "how...", etc.,) after the negation of "know" are proper indirect questions, coming through "whether", not "that". A similar ambiguity occurs for other "wh..." clauses: they are indefinite claims when following "know" (without a negation) and indirect questions after, e.g., "wonder".

However, although sometimes the construction "know how" can be analysed as "know" followed by an indirect claim (e.g. "He knows how the tree fell."), when it is followed by an infinitive clause it cannot. For most values of "ϕ" in "I know how to ϕ", there are any number of ways in which I can ϕ . (The most notable uses for which there is only one way are those which concern decorum.) What one knows in these cases is indefinite in a way in which "He knows how the tree fell" is not. Vendler[2] suggests that:

(10) I know how to solve the problem.

is to be analysed in the same way as:

(11) I persuaded him to go.

(12) I know where to go.

These, he maintains, are contractions of:

(13) I persuaded him that he should go.

(14) I know where I should go.

Thus (10) is held to be a contraction of:

(15) I know how I can solve the problem.

which is a contraction of:

(16) I know that I can solve the problem in this way:...

But unless "can" in (16) has the sense of "know how to" (which it must if Vendler's analysis is to work), (16) is true if and only if the following is true:

(17) I know that one can solve the problem in this way:...

Yet one could describe what someone does, could do, or the correct way of doing it without being able to do it, i.e. without knowing how to do it. "How" (it must be pointed out), when it follows "know", does not always have the sense of "in what way". It is suggested[3] that, in place of a description of ϕ in "I know how to ϕ ", one could give a demonstration of ϕ'ing. There are two reasons one would give a demonstration of ϕ'ing: to exhibit that one knows how to ϕ or (which is relevant to Vendler's position) to show another that ϕ'ing can be done in this way. In the latter case, demonstration does perform a linguistic function, but for that very reason the person who understands the statement does not necessarily know how to ϕ, although he must know what ϕ'ing is.

For some values of "ϕ", however, if one shows or tells another how one ϕ's and the person understands, then he will know how to ϕ. Such things as playing chess, adding fractions and conjugating Latin verbs can be learned in this way. We shall call them "rational activities", as there is no particular physical training involved. Knowing how to perform them may presuppose that one knows how to perform other rational activities. Still, there is no reason why one should prefer a propositional analysis of even these, for one could learn how to play chess without being able to formulate the rules.

In general we shall call the sort of knowledge we are said to have when we know how to do something "practical knowledge". Practical knowledge is to do with competences and is not always expressed by the grammatical construction "know how". We sometimes use "know" followed directly by a noun-phrase when speaking of someone's competences, as when we say that someone knows a language, skill, discipline or game. We also use "can" to express competences.

We distinguish practical knowledge from propositional knowledge (i.e. that knowledge we have when we are said to know that...) although most, if not all, cases of practical knowledge presuppose propositional knowledge and _vice versa_. From these, we distinguish a third sort of knowledge, essential knowledge, which one is said to have when one knows what (an) A is, where "A" is a noun phrase. Sometimes the construction "know what - is" can be analysed as "know" followed by an indefinite claim: e.g. in "He knows what the capital of Albania is", the "wh"-clause derives from "that the capital of

Albania is Tirana". But other times "know what - is" constructions, as "know how" constructions are indefinite in a way in which constructions in which "know" is followed by an indefinite claim are not. There is only one correct answer to the question "What is the capital of Albania?" But there are any number of answers to the questions "What is a square?", "What is a group of two things?", "What is a mongoose?" or "What is iron?" Indeed, to know what, e.g., a mongoose is, one need not be able to say what a mongoose is; it suffices that one can tell a mongoose from, e.g., a mink, that one can pick it out from a significantly large sample of other sorts of animals. Vendler,[4] to analyse the "wh" clause in "know what (an) A is" as an indefinite claim, considers samples as playing linguistic roles, supplementing language. For example, "what coffee tastes like" (i.e. "what the taste of coffee is") is taken as a contraction of "that coffee tastes like this (offering a sample)". Now a sample can be given, as an activity can be demonstrated, for different reasons: to exhibit that one has the competence to pick out the thing in question or to show someone, e.g., what coffee tastes like. In the latter case, something extra-linguistic is involved, viz. the person to whom the sample is given acquires the competence to pick out (the taste of) coffee.[5]

Still, most cases of essential knowledge can be acquired by being told about A ('s). There are two classes here, the first of which includes that essential knowledge which can be acquired because one can pick out things similar to A ('s). Here knowing what (an) A is is similar to knowing about A ('s). When one can state what one knows and one knows what (an) A is, then one can give a description of A ('s) so that an interlocutor could pick out A ('s). The second class of essential knowledge which can be acquired by being told about A ('s) is that for which what is known need not involve picking something out. We can have essential knowledge of certain geometrical figures (e.g. a chiliagon) and groups of a certain number (e.g. 1,000) without being able to pick them out from other geometrical figures (e.g. a 999-sided figure) or groups of another number (e.g. 999). This is where essential knowledge amounts in a large part to being able to say (i.e. give a definition). Yet despite the prejudice due to the importance of pedagogical cases, uttering, e.g., "nine" when the sum of four and five is demanded is not on its own a criterion that the utterer knows what (a group of) nine is. Nor is declaring, e.g., that 101 is the successor of 100 necessarily an exercise of essential knowledge of (a group of) 101. He who utters "nine" or "101" at the appropriate time must demonstrate that his utterance obeys certain restrictions,[6] i.e. that he has not just uttered something, but also said something.

Essential and propositional knowledge are not capable of degrees as is knowing about (which we can consider a grammatical variant of either essential or propositional knowledge) and practical knowledge. E.g., we can know more or less about coffee, but we either do or do not know what coffee is. However, there are not clear criteria in all cases for when someone has essential knowledge of something. Usually, but not always, pointing to a geometrical figure on being asked to pick it out counts as showing that one knows what that figure is. There is an obvious criterion for propositional knowledge, viz. saying that... But again, the utterance must obey certain restrictions. Furthermore propositional knowledge cannot always be stated. Essential, practical and propositional knowledge are intertwined. To know that a square has four sides counts to knowing what a square is, as does knowing how to construct a right angle. Involved in knowing that an angle cannot be trisected with straight-edge and compass is knowing what an angle is and knowing how to generate figures, lines and curves. The exercises of these three sorts of knowledge, which are dispositional, we shall call cognition, corresponding to the verb "cognise". All three sorts of knowledge may be involved in any one sort of cognition.

Now there are two general sorts of answers to the question "How does he know?", of which we shall initially be concerned with one, viz. stating what he knows how to do or can (when this has the sense of "know how to") do, i.e. stating his competences. There are cases of each use of "know" for which this question could be answered by stating the person's competence.[7]

When asked how someone knows how to ϕ , we reply either by stating another (either related or more general) competence or by stating how he learned how to ϕ . In the first case, if repeatedly asked how he knows how to do whatever activity is mentioned, we must eventually reply by stating how he learned how to do some activity. We can distinguish two sorts of competences, the first of which are those acquired because we must get by in our environment in ways similar to those in which certain other higher organisms do. These include such things as knowing how to swim and knowing how to climb trees. What interests us here, however, are those competences which are peculiarly human and not so closely connected with our biological functioning. By virtue of these, only _homo sapiens_ is able to control his environment as he does, engage in disinterested inquiry and form diverse sorts of societies with others of his species; by these, cultural evolution takes over from biological evolution and an individual can be inventive in a way in which an animal cannot.

These peculiarly human activities are rule-governed activities. (In particular, rules supply the restrictions whereby uttering is saying.) Rules are cultural, the conventions of a culture, and, at least initially for an individual who (we shall say) is inducted into the culture, are enforced by someone other than the individual who follows them and they can always be enforced. By these rules, the performance of an individual is evaluated for its correctness or incorrectness. We might allow that an isolated infant could become self-evaluating; but what is important is that his self-evaluation is in principle no different from his evaluation of another nor from another's evaluation of him. The rules of the culture furnish the standards of success and give a point for the individual who (we shall say) is subject to them or on whom they are imposed to act in a certain way. (This is not to say, however, that the rules themselves have no point on a biological level, for they might be conducive to the individual's success in his non-cultural environment.)

By virtue of being subject to these rules, we know how to do things which have a point only within the system of rules of the culture, i.e. we know how to follow the rules. Sometimes what is done is what we shall call "transient": something public is produced, as when we construct something, or say something. Sometimes what is done is what we shall call "immanent": nothing public is produced, as when, having essential knowledge of A ('s) (where the distinction between A ('s) and, e.g., B ('s) only has a point in the culture) one cognises (an) A. One must perform (at least initially) transient acts, which are open to the evaluation of others, before one can perform the corresponding immanent acts.

Now the utterances of some verbal tokens (e.g. "cat") pick out things; the utterances of other verbal tokens (e.g. "(a) promise", "(a) command") pick out conventional acts. Again, the utterance of certain verbal tokens (e.g. "2"), although they can apply to (but do not therefore pick out) things, still have some function when they do not apply to things, as when one intransitively counts, i.e. recites the number series without numbering things. Both utterances which apply to things and those which do not are evaluated according to rules which are not directly concerned with how the world is, and so are purely conventional. These we shall call "non-descriptive rules"; they set the limits to what can and cannot be said, constructed, diagrammed or evaluated. Utterances which must apply to things are also evaluated according to rules which are directly concerned with how the world is and our biological endowment. These rules we shall call "descriptive rules". Finally, some utterances, such as cries, babblings, etc., not being or being part of rule-governed activities, are not evaluated at all.

We draw a distinction for both transient and immanent acts between transitive and intransitive acts. Transitive acts are those which involve descriptive rules or are cognitions which involve in some essential way the history of the cognising thing in its environment. Transitive acts, when they are essential cognitions (e.g. uttering "cat" correctly) pick out things, sorts of things, properties of things, etc. which are independent of convention. When transitive acts are propositional or practical cognitions, they do not involve transitive essential cognitions. But if a person's utterance, writing or diagramming is transitive and we cognise the utterance, writing or diagramming, then our own act is transitive, picking out what the other person picks out.

Cognition can be a transient act and be evaluated. Thus one becomes subject to rules by performing both transitive and intransitive transient acts. By the latter, one becomes subject only to the non-descriptive rules of the culture, while by the former, (since non-descriptive rules are followed in making and evaluating both transitive and intransitive acts) one becomes subject to both the descriptive and the non-descriptive rules. The non-descriptive rules governing speech acts are perhaps the most important non-descriptive rules for the enforcement of the rules of a culture, and so for an individual's induction into that culture and his being subject to the rules. For example, cognising a promise leads to advantages and not cognising a command leads to inconveniences. By performing only intransitive acts, one could in principle become subject to all grammatical, logical, arithmetical and geometrical rules, which are those non-descriptive rules with which we shall be concerned.

Non-descriptive rules, as are all rules, are formulated as complete sentences; "The successor of 2 is 3" or "2+1=3", "'Red' and 'green' cannot be applied to the same spatio-temporal expanse", "'Homo', if modified by an adjective, must be modified by one which is masculine nominative singular", "From 'p' and 'If p, then q', one can infer 'q'", "From 'p·~p' one can infer anything", and "'pv p' can be inferred from anything". The statements of rules involve terms which appear in a number of rules and statements of non-descriptive rules in particular involve certain terms, call them "non-descriptive terms", which appear in a number of them. These are terms which have a use independently of the nature both of what apples them and what they are applied to.[7] Examples of such terms are : "successor of", "two", "square", "equilateral", "incompatibly applicable", "(grammatically) agree", "•", "~", "infer" and variables of different kinds.

Non-descriptive rules are for the most part followed by an individual inducted into the culture before he can formulate them. The only exceptions are mathematical rules, and even here transitive uses may in some sense be more "natural" than the intransitive uses. Indeed, formulating a rule is itself a rule-following activity, which can be correct or incorrect. Sometimes, when we ask whether someone knows that, e.g., 'homo', if modified by an adjective, must be modified by a masculine singular nominative adjective, we would not say that he does unless he could formulate the rule. This is using "know" like "can say". But sometimes, even when the person can state the rule, we would not say that he knows the rule unless he could follow the rule in other ways than formulating it; indeed parroting the formulation does not count as formulating it. This exhibits "know" as it relates to "know how (to)" or simply "can", which is the more fundamental sense than "can say"; the conflation with "can say" is due to the fact that formulating (even parroting) is a more convenient, thus more common, transient act for evaluating. The intransitive acts which are the formulations of the rules are not what is known. Rather, the rules to which one is subject are known and by being subject to these rules one can evaluate others' and one's own formulations of the rules for correctness and incorrectness - in this case truth and falsity - and one's formulations can be evaluated by another. The rules themselves, being the criteria of truth, are not themselves true.

Propositional and practical knowledge, when this concerns conventional activities, involve a number of rules. These rules, like their formulations, converge. We shall say that they converge on concepts, or their formulations converge on terms. Knowing a rule is a case of propositional knowledge; likewise knowing a concept or having a concept is a case of essential knowledge. There are non-descriptive and descriptive concepts. One knows or has a concept of (an) A when one is subject to the rules in question, i.e. when one knows what (an) A is, i.e. when one has essential knowledge of A ('s).

Non-descriptive rules and concepts intertwine: there could not be mathematical concepts and rules in isolation from one another; likewise, grammatical rules and concepts are determined by their relation to one another, as are logical rules and concepts. Furthermore, grammar applies to logical terms and logical rules apply to mathematical terms. We shall speak of the totality of non-descriptive rules and concepts which are followed in a culture (but not by any one individual, even adult, in it) as the "objective structure" of that culture. We shall take the phrase "present to" from Malebranche and say that the objective structure of a culture is present to an individual when he is inducted into that culture.

Behaving (including uttering) in a certain way (and whatever occurrence corresponds to this for immanent acts) is performing a conventional act only in so far as one's behaviour (or the corresponding occurrence) fulfils a role specified by the rules of one's culture. In particular, non-descriptive rules, or the objective structure as a whole specify certain roles by virtue of which certain sorts of behaviour (and the corresponding occurrences) are fit to apply to or pick out things. Thus the role of the utterance of a vocal token is specified by non-descriptive (viz. grammatical) rules by which the utterance is fit to pick out something. Again, the role of a mathematical diagram is specified by non-descriptive rules, whereby it could be used as a blue-print for a construction(which again - ignoring the materials - could have the same role, specified only by the non-descriptive rules), it could thereby also be used as a written work specifying which verbal tokens are to be uttered and in what order (the totality of which tokens then has the same role as the diagram); and it could thereby be fit to pick out something.

Once an individual has an objective structure present to him, the acts fulfilling roles specified by this structure need not be transient, but could be immanent. In fact, there are rules which require that one not make a transient act. This gives a hint as to what these immanent acts might be. If someone is trained to say "Five" every time someone asks "what is two plus three?" the reply is automatic. Further training is required for him to not reply "Five". Now if he has learned to recite the number series, etc., he has a handle on elementary rules and the uttering of "Five" need no longer be that which fulfils the role marked out by the concept of five; the commencement (which is not transient) of this act suffices. The commencement is perhaps a muscular reflex or an occurrence in the nervous system; we shall call it "an occurrence in the soul (or intellect or mind)" leaving this unspecified. We shall say that there are such occurrences whether the immanent act be transitive or intransitive.

"Objective" might be used in three senses. Firstly, it could be used for what is publicly observable, in which sense transient acts would be objective, immanent acts not. Secondly, it could be used for what is natural, as opposed to what is conventional. Finally, "objective" could be used to distinquish the rules or what the rules determine from the application of the rules or that to which the rules are applied. In this sense, the relations of a figure on a diagram are objective, but the paper and ink are not. "Objective" in "objective structure" is used in this sense.

The Cartesians (Descartes and Malebranche) and Leibniz alone of the philosophers we shall treat were concerned with rules. However, the rules are not thought of as conventional, but as those by which God (who becomes much like the objective structure itself) created and conserves the world. What we have called the objective structure is what Malebranche calls the divine substance as immitable by creatures and that in which we see all things; for Leibniz, God was the _regio idearum_, which, along with restrictions, is repeated in every simple substance and is known by reflection to those which are conscious; for Descartes it was the eternal truths and immutable essences which, though created, are the rules to which all things and occurrences in the world (in so far as they can represent things) conform. Each of the three considered the objective structure as involving somewhat different things. For Descartes it comprised two super-concepts: that of _res cogitans_ or of thought and that of _res extensa_ or of extension, better thought of as all mathematical rules and concepts. The concept of thought was for the most part simply that of following mathematical rules, but it included in common with that of _res extensa_, numerical concepts and certain "common notions" and in addition the concepts of two different faculties, i.e. two ways of employing rules; one is the understanding, which involves only exercises of essential knowledge. The other is the will, whose activities are willing and (in his later works) judging. Willing involves the mental equivalent of commanding, but also assenting to commands. This involves responsibility and is placed in a moral sphere. Judging takes the place of stating, but viewed as assenting, and is in fact taken as only a species of willing, involving responsibility and moral assessment. Malebranche does not admit a concept of thought, but retains the super-concept of mathematics and adds what he calls _l'ordre_, the supposedly eternal system of moral rules. Leibniz admits an equivalent of _l'ordre_ and a concept of thought (again for the most part simply that of rule following), but does not sharply distinguish between understanding and will. There is no distinction for Leibniz between the super-concepts of _res extensa_ and _res cogitans_, as non-arithmetical portions of mathematics, indeed all concepts, are held to be reducible to those of arithmetic, logic and grammar. The grammar here in question is not a discipline descriptive of the use of words in one language rather than another, which we might call particular grammar; rather it is looked on as a subject more general than logic, which is an adjoint to it. Inferences are held to be licensed not only because of the use of recognised logical words, but also because of the use of what might be called purely grammatical words, such as prepositions, conjunctions, and even case endings. Grammar regarded in this fashion we shall call universal grammar. Only if there were just one language or, perhaps, only if there were just one possible language for all possible rational beings could particular and universal grammar be identified.

All three maintained that the objective structure is infinite

This can mean that any one concept or rule is applicable to a potentially infinite number of cases. This we can allow to an extent, yet the application of a rule or concept is not something automatic, for then there could be no evaluation. Furthermore, conventions are not determined by how things are; thus conventions do not cover every foreseeable case. It suffices here to consider diagrams of geometrical figures which are intransitive and a person's transient essential cognition of them, e.g., picking them out by uttering a word e.g., "square" for "□". If one person were to pick out "□" by "square", another evaluating this act might evaluate it as incorrect. It is then up to the first person to justify his act. The only way of doing so is to invoke the rules. Now the notions of exactness and simplicity can be brought in only because a certain set of rules are followed in some conventional endeavour. The first person might reply that a square is a regular polygon with four equal sides, which, he claims, is true of the diagram. The second person in reply might put a straight-edge to the left side of the diagram and find a deviation. If they agree that this procedure evaluates whether a side is regular, then the first person, if he is to follow the rules, must agree that the diagram in question is not a square. Thus in determining the application of the concept of a square in one instance, a new rule is invoked. We shall call such invocations of new rules "coordinations of conventions". Though the outcomes of coordinations of conventions are not predetermined, they are not arbitrary, for it is presupposed that other rules are followed in common and that both are engaged in the same conventional endeavour. Thus after the coordination, both are said to know the new rule. Such coordinations are common practice in the endeavours of specialists, who ex professo follow rules and concepts peculiar to their endeavour, i.e. disciplines. One specialist could indeed coordinate conventions on his own, but he then must be able to justify the coordinations in accordance with the rules and criteria of exactness and simplicity of his discipline. We shall call one-man coordinations of non-descriptive rules and concepts "intransitive self-teaching". Coordinating of conventions is like the initial learning process, except the latter involves, not agreement, but enforcement, for the evaluation cannot be questioned by the person evaluated.

An objective structure might also be thought to be infinite in that given a rule or set of rules, an infinite number of concepts is generated. Thus it might be thought that given the concept of successor of...., of counting, or of a unit in general, the whole number series is generated. It suffices here to consider written numerals, for the only way the following of a rule can be evaluated is by transient acts. Non-descriptive rules can in fact be learned intransitively, e.g., by writing numerals. In the case of generating concepts, the concepts generated must be pinned down to something which can be picked out independently of the rule according to which they are generated; otherwise there would be no way to evaluate whether the rule is applied to a further instance. Thus there are conventions for the formation of numerals and knowing the series of counting numbers, which are concepts (taking, e.g., three as the concept of a group of three things in general) is (at least initially) knowing how to generate the series of numerals (spoken or written). In learning how to generate the series of numerals, one learns an order of conventional marks: "1, 2, 3, ..." If this were all there were to learning a series of numerals, one could never go beyond the particular numerals which one has learned in a particular order. But in fact there are other rules or conventions, by being subject to which we can generate numerals we have not used nor been presented with in an order which would be evaluated as correct. Such rules are that according to which the units are repeated in each series of ten numerals and the second digit from the right is increased in the same order as the counting numerals in the last numeral in each series of ten numerals. We then have a rule governing the construction of a number series. The situation is similar to that in which a rule is applied to, e.g., diagrams of geometrical figures, as above. Suppose someone counts "...20, 22, ...". A second person evaluates this as incorrect. In justification, the first person replies, e.g., that as "11" is after "10", so "22" is after "20", "33" after "30" etc. The second retorts by giving examples in accordance with the rule we have given above. In fact, we could get by with the rule the first person proposes. We follow the second because it agrees more nearly with the criterion of simplicity of the description of (very basic) arithmetic. Unlike the application of a concept, there is here no new rule agreed on after the concept is applied; rather, the coordination of conventions is the agreement on rules and only then are there the concepts, in this case of numbers greater than ten.

But the criterion of simplicity itself is not as evident as one would think. Why should the sequence "...10, 11, ... 20, 21,... 30, 31,... 40, 41,..." be more simple than the sequence "...10, 11,... 20, 21,... 30, 31, ...40, 42..."? One wants to say because in the first we follow the same rule. But then simplicity is dependant on what are taken to be the rules and what are taken to be the rules are dependant on the criteria of simplicity.

One can justify the rules and their simplicity by considering other operations which we can perform because we have these concepts, such as addition. But these already presuppose that some beginning has been made in coordinating conventions and thus to determining simplicity.

As a discipline becomes more developed, the original concepts do as well and further concepts are agreed upon. The criteria of simplicity and exactness and also of consistency become more defined. In mathematical disciplines, intransitive self-teaching becomes identifiable with calculating. Different operations and rules are agreed on, but they are pinned down by the same concepts. However, sometimes additional rules and operations introduce new concepts, in addition to the concepts of these operations. E.g., with subtraction, concepts of negative numbers are introduced and, with division, concepts of fractions. With the introduction of new terms and the distinctions they high -light, new concepts, in addition to those of the operations, are introduced. Such concepts are those of a negative number (in general) or of a rational number (as opposed to an irrational number). Even new disciplines, such as algebra, are developed, around which new clusters of operations, concepts or rules are centred. Yet these new operations, rules and concepts are arrived at only by coordinating the old conventions. One has the new concepts when one becomes subject to a particular rule or set of rules which gives a point to distinguishing the concept. Introducing a new term does not always introduce a new concept: one can promise and pick out others' promises without having "promise" in one's vocabulary, which adds little, if anything, to the concept.

Still, one might codify the rules governing promising to have exact, enforceable standards for settling disputes. Here the term pins down the concept, which is changed, although we should want to say that it is the same concept. On the other hand, we should want to say that new concepts are introduced with terms for numbers and their classifications.

The distinction between forming a new concept and altering (e.g. making more exact) an old is not always clear. One to some extent has a concept of the agreement of adjectives with nouns before one learns how to use "agreement"in these contexts. But there might be alternative ways of dividing the grammar, thus the fact that this term is used in this context indicates that further rules are agreed upon other than those followed in the activities to which these terms refer. Using these terms is something like describing the activities and the rules governing them; yet the rules "described" are non-descriptive and giving their"description", like using "promise", depends on following the rules involved. This "describing" can be thought of as a form of intransitive self-teaching. Similarly, in making and evaluating inferences, one examines what is to some extent the same concept as one does when speaking about inferences. Still, using a language is not engaging in the discipline of linguistics, nor is validly inferring necessarily doing logic. Once linguistic and logical terms are introduced, one can develop further concepts (e.g. of competences) which are totally foreign to the activities which furnish the initial rules of these disciplines.

Thus the objective structure present to us owes its extent, both of application and of the concepts involved, to the conventional activities in which we engage. Descartes, Malebranche and Leibniz, on the other hand , held that its extent is due to the fact that it is the divine science, using "science" in the seventeenth century sense of which any human science is a variant.

Before we quit this topic, there is one further point about the formation of concepts which we must discuss. Sometimes there are two non-descriptive disciplines such that an operation in one can be translated into the other, the operation performed and the result translated back into the first, in which it holds good. Such translations are the basis of coordinate geometry, in which the operations of geometry (i.e. the discipline about what is constructed using, e.g., a straight-edge and compass) and the rules governing them are translated into arithmetical operations and rules. The concepts are likewise translated. E.g. the geometrical concept of a circle involves the rules governing measuring and relations of measurements and their relations in general and in particular the rules governing the construction of a circle and its relation to other constructible curves and systems of curves. The algebraic notion of a circle involves the arithmetical operations, numerical relations and rules involved in the expression "$x^2+y^2= r^2$". The translations are themselves rules, but neither geometrical nor algebraic. Typically such translations rely not on doing the disciplines, but on investigating the disciplines, especially when one operates with an explicite criterion of simplicity. One looks for basic concepts (e.g. highest genera and differentia) operations (e.g. iterations of units, as in geometry and algebra) or rules (i.e. axioms) from which the others can be developed. Investigating a discipline is like describing it, but one must already follow the rules which are "described". The translation rules are "discovered", but these rules presuppose that one already knows how to follow two complex systems of rules with their criteria of simplicity, exactness, and consistency; thus these "discoveries" are coordinations of conventions for which there is little leeway in the evaluation. When there is a translation between two non-descriptive concepts, we shall say that there are in fact two concepts, but that they are intensionally identical: one could discover the translation by intransitive self-teaching alone. The two concepts, in fact, need not be from different disciplines. (Consider an algebraic formula which can be transposed by a number of operations into a formula of the form $x^2+y^2=r^2$.) When the various rules are learned as pinned to a concept, we shall say that this is the same concept, despite what rules may be involved. Whether there are two intensionally identical concepts or only one is often a matter of more-or-less. Furthermore, it is to some extent a matter of historical accident: we could imagine that someone is initially taught basic arithmetical operations as applied to geometrical figures. Finally, when there is a complete translation between one discipline and part of another, we shall say that the first is reduced to the second.

Chapter II.

The Application of Concepts and Reductionism in the Cartesian Fashion.

In this chapter we shall consider how an objective structure, comprising only non-descriptive rules and concepts, applies to things which are independent of convention. The majority of this section will be concerned with the extreme reductionism accepted by the Cartesians and Leibniz, resulting from their endeavour to describe everything and its operations with maximum simplicity and exactness, and to maximise our power to predict and to explain; only rule-following activities are excepted. One is to minimise the conventional elements in our descriptions and what is due to how the world is and what we are like. The world is to be described with maximum perspicuity, in terms which would apply to any world and by means of those rules and concepts which anyone who gives the simplest and most exact descriptions must follow. This ideal is taken to be the limit set by the objective structure which every rational being tacitly follows and in accordance with which everything, if it were made, would have been made. The catch is that this endeavour is itself a cultural endeavour. The programme relies on specifying certain purely conventional sortals - metrical units - which are the most simple and exact sortals possible, giving the most perspicuous descriptions possible. Yet one still must rely on transitive acts and something other than non-descriptive rules for determining which descriptions actually apply and giving the description is itself a very sophisticated conventional activity.

Certain sorts of behaviour and occurrences corresponding to them are fit to pick out things because they fulfill roles specified by the objective structure. Grammatical rules govern the use of all words, specifying the roles of utterances by virtue of which they are fit to pick things out. But by exercises of grammatical essential knowledge alone one understands and evaluates others' exercises of grammatical knowledge. Mathematical rules govern the use of only some words and we are apt to think that certain words, the use of which is governed only by mathematical (grammatical and logical) rules, are used for picking out configurations. Thus "three" (or "group of three") and "a circle" might be thought to pick out, respectively:

We must distinguish what we shall call "a law"[1] from a rule so that we can distinguish between the applicability of a rule to something and something obeying a law. "Law" as here taken refers to something common to the natural activities of things (hence "law" as used in the legal sense does not refer to a law in our sense, but to a rule.) Now assume that all members of a culture act in accordance with a particular formulation which is enforced, i.e. they are all subject to a certain rule. Then, if a member of this culture acts contrary to this rule on a particular occasion, the rule still applies and the person's act, if evaluated, is evaluated as incorrect. On the other hand, assume that someone presents a formulation which he claims fits all cases of, e.g., freely falling bodies. Then, if a particular case of a freely falling body does not accord with this purported law, then the purported law is rejected. Rules admit of exceptions, laws do not. In the case of conditional rules (as perhaps all rules are), if the antecedent is satisfied, the consequent might not be. In the case of conditional laws (as perhaps all laws are), if the antecedent is satisfied, the consequent must be. Transitive acts, which must consider things independent of convention, are involved in the evaluation of formulations of purported laws.

We shall say, when the term for a concept applies to a thing, that the thing instantiates the concept. Thus if we point at or otherwise indicate something and truly say "This is (an) A", then the thing indicated instantiates the concept of (an) A. Now non-descriptive rules are applied to the conventional behaviour of others; rule following instantiates concepts. We pick out, e.g.,concatenations of vocal tokens by following the same rules as he who uttered them, as is also the case with vocal tokens or concatenations of them whose roles are specified by logical rules. Some rules - those governing commands, promises, etc. and moral injunctions - are such that the instantiations of the concepts they involve occur only within conventional, rule-following activities. The instantiations of concepts involved in other rules - logical and grammatical rules - must be conventional acts, but they play a part in our relation to things outside our culture. Finally, geometrical concepts are instantiated in diagrams. Diagrams are the enduring effects of conventional acts; but things or configurations of things can be used as diagrams, the point of which is to instantiate non-descriptive concepts alone. Diagrams are not samples, which are concerned only with descriptive rules. Things used as diagrams are like enduring effects of intransitive transient acts, although the acts do not change the things, but only give them roles. In this way, natural things instantiate non-descriptive concepts.

We shall also speak of things founding non-descriptive concepts. The evaluation of statements involving descriptive essential cognition as correct or incorrect (true or false in this case) takes into account not only the things picked out by these cognitions, but also the non-descriptive concepts which specify the roles of the vocal or written tokens by virtue of which they are fit to pick out things. Some of these non-descriptive concepts are instantiated in the utterances (e.g., those of conjunction, inference, addition and certain uses of relational terms), while others (geometrical ones) are instantiated in the things. Given that the descriptive and geometrical concepts involved are instantiated in the things, there must be some relation between these and the other non-descriptive concepts, the knowledge of which is exercised in the statement when it is true. We shall generally say that these other non-descriptive concepts are founded in the system of things which is picked out by the descriptive essential cognitions. However, in the discussion here, we shall be concerned more particularly with concepts of numbers, which are most evidently founded in things. Other sorts of concepts, which are less evidently founded in things, are those of certain relations corresponding to certain relational predicates (e.g., "longer than"), or prepositions (e.g., "above") or inflections (e.g., those indicating motion towards in certain languages). When a concept is founded in things, one thing in particular is not said to be whatever the concept is of.

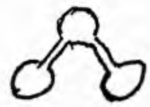
We shall say that non-descriptive concepts instantiated or founded in things are formal features instantiated or founded in those things. Thus

instantiates the formal feature of a circle and

founds the formal feature of (a group of) three and also the formal feature of a triangle. Depending on the criteria of exactness and simplicity of the endeavour in which one is engaged,

might count as instantiating the formal feature of a circle,

as founding the formal feature of a square and



as founding the formal feature of (a group of) three. Of two intensionally identical concepts, one might be a formal feature instantiated in a thing and the other a formal feature founded in the corresponding system of things, (Such is the case with the geometrical and algebraic concepts of a circle.)

We shall say that formal features are constitutive of things or of systems of things and that formal features are displayed by these things and systems. Law-obeying things or system of things display formal features because of the laws they obey. But the formal features displayed also depend on the culture of him who picks them out, the discipline in which he is engaged and what is being done within the discipline.

In fact, however, in picking out formal features, descriptive essential cognition must play the principal role if natural things are not to conflate with diagrams and transitive acts with intransitive acts. This cognition involves rules which are not purely conventional and the evaluation of it must take account of things independent of convention. Corresponding to formal features, we shall speak of material features,[2] restricted to qualities which are the same whatever their expanse or duration or the thing which is said to have them. We can have samples of material features (e.g., one could extract the chlorophyll from a leaf and present it as a sample of green), but we cannot have diagrams of them. These restrictions would include bulks (e.g., water, gold and wood) under "material feature"; but we shall restrict the term to what is picked out by only one sense, as was traditionally held to be the case for the so-called "proper sensibles". However, we shall distinguish determinables which are peculiar to one sense (e.g., colour) and refer to the determinates under them (e.g., yellow, red and green) as material features. Furthermore, a number of determinables may be peculiar to one sense (e.g., colour and intensity of light), and thus classfied under one common sensible. Finally, all material features can be picked out by adjectival phrases.

Material features involve natural aspects, but they are not independent of convention, for there are non-descriptive rules specifying the role of e.g., "green" so that it is fit to pick out things. Consider the relations of colour-words and taste-words, both among themselves and as used with each other. We imagine that someone being inducted into the culture can utter tokens of "this" "is" and "and" (all of which are purely grammatical words) and "black", "white", "colourless", "sour", "sweet" and "tasteless". By merely reciting combinations, he utters:

(1) is and yellow

which is evaluated as incorrect; but so are:

(2) This[3] is green and red.

(3) This is sour and tasteless.

He also utters:

(4) This is green

(5) This is sour.

(6) This is green and sour.

all of which are evaluated as correct. All of the evaluations in (1) - (6) are intransitive (thus we are not concerned with truth and falsity in these cases). Still, learning whatever is possible intransitively, one could not be said to know what green is; nor could one be said to be able to say what green is, other than by specifying the grammar of "green" (e.g., in the material mode, by saying that green is a colour). One would not know how to tell something green from something red.[4] Learning what green is must involve transitive learning, as when one utters "green" with the appropriate demonstrative devices. (Descriptive rules need not be learned by uttering vocal tokens; it suffices that the acts by which material features are picked out are transient and transitive.) These utterances are evaluated in accordance with descriptive rules, which specify the roles in which verbal tokens and mental occurrences corresponding to them do in fact pick out and describe things. These rules depend directly on how the world is and attach our conventional activities and our culture to the world.

We shall not say that descriptive rules form part of the objective structure; for one thing, the philosophers we treat did not consider such rules (with the exception of Leibniz, who, however, wished to analyse them into non-descriptive rules). Still, the application of the objective structure to things depends on such rules. Only by the application of these rules can figured and numbered things be treated as more than diagrams; only by their application do the criteria of simplicity, exactness and success attach to something which is non-conventional, and only by virtue of them can our transitive acts be evaluated for correctness and incorrectness. Furthermore, we could not have an objective structure present to us unless and until we are subject to descriptive rules. We cannot use diagrams unless we can pick out that on which the diagram is constructed. In fact, to learn intransitively in any way, we must pick out things - people and their behaviour, including utterances of vocal tokens.

One group of words whose use is specified in part by descriptive rules are words for sortals. Things under sortals found numerical features, for without these there could be no transitive counting. The purely grammatical term "thing" and the numerical "one" cannot be used on their own to pick out things or individuals[5]. Some sortal terms pick out conventional acts and activities (e.g., "a statement" or "an inference"). Of sortal concepts which apply to things, some could be called concepts of conventional sortals because they pick out things only as they relate to a cultural endeavour: e.g., the concepts of a table, a building, a work of art, a sacred object and a chess set. Some of these concepts - e.g., that of a chess set - are not of spatio-temporally continuous law-obeying things, but are of systems of things which need not obey any laws in particular. Some of these concepts could perhaps be included as formal features: it is conceivable that someone could learn chess and play chess verbally and at least some works of art and sacred objects are much like diagrams. Other concepts of conventional sortals could not be formal features: a blue-print does not take the place of a building and one cannot sit in a chair verbally.

We distinguish concepts of natural sortals from those of conventional sortals. Concepts of natural sortals, like concepts of material features, involve something conventional, some more, some less. (What we say of sortal terms also applies to bulk terms. Things under sortals are of particular interest because they found numerical features.) Concepts of sorts of living things might be thought to be minimally conventional. Yet the classifications of things is according to cultural activities; thus the concepts of, e.g., a weed and a totem animal contain a considerable conventional element. The conventional element is not necessarily due to the inclusion of a formal feature. Indeed, the conventional element in at least some cases is decreased when a concept of a material feature is replaced. For example, the concept of a raven might include the concept of black. There might be some purpose for this: perhaps all black birds are injurious to the main crop of the culture which has the concept or perhaps they are taken as portents of disaster. Yet ravens, on this count, gradually come to be from pink featherless animals and are similar in all other respects to a rare sort of white bird. Now there might be a point in investigating the origin of black birds of this particular sort and their relations to one another. In such a case, its history might become part of the concept of a raven and the concept of black restricted to a part of this history (with allowance for exceptions). This is still the same concept, for the concept of a raven as it was initially focuses on a recurrent sort of animal, a number of whose characteristics are known, i.e. there are descriptive rules other than that governing the use of "black" converging on this concept.

The purpose of the modification of the concept could arise from within the cultural endeavour in which the concept originally had a place. As, e.g., it is desirable (from the culture's point of view) to avert damage to one's main crop or disaster in general, it is desirable to foresee what brings these about. A prediction rests on a formulation of a purported law. Making such formulations are conventional acts and have purposes within a cultural endeavour. But they allow one to decrease the cultural element in that the predictions which are made by means of them can be tested. If the formulations are rejected, other formulations are presented and tested. Eventually, one arrives at a formulation which is successful as a guide to, e.g., averting crop damages, the criteria of success being determined by the rules of the culture. The formulation as acceptable is similar to the concept of a material feature in that it is dependent on how the world is. Accepting such tested formulations, certain unmodified concepts of sortals appear arbitrary in that they now appear to apply to stages of that to which the formulations apply or to exclude or include things in a way different from the way in which one predicts things. Thus the concepts of sortals are modified, their conventional element decreases and they come to apply to differently characterised spatio-temporally/continuous law-obeying things.

With the testing and acceptance of further formulations of purported laws, not only is the conventional element of the original concepts of natural sortals decreased, but there also come about new endeavours - disciplines - with new purposes and new concepts of natural sortals. Prediction might itself become the purpose. The desideranda of exactness and simplicity come into their own. In this case, the conventional element in the distinctions between material features under a determinable is to be decreased and there is to be some method by which the newly distinguished material features under one determinable are related to one another. Eventually, the concepts of natural sortals become secondary and natural sortals become explained in terms of sortals which have a use only within a discipline. Minimising the conventional element of our concepts is itself a conventional endeavour in which the desideranda of predictive and explanatory power operate and in which those of exactness and simplicity come into their own. The goal is to translate concepts of natural sortals into concepts which are the convergences of rules presupposing only purely conventional sortals, viz. units of measure. These purely conventional sortals are called upon to minimise the conventional element in distinctions and relations.

By iterated applications of a unit, concepts of (groups of a certain) number are founded in "things" whether or not these "things" are under some sortal concept. As the term "thing" suggests that something is already under a sortal concept, we shall (using seventeenth century terminology) say that these concepts are founded _in re_. Specifying a unit specifies a dimension: that quantity which the unit measures, such as length, weight or radial degrees. Some of these dimensions (e.g., weight) are determinables under which material features are ranked; others (e.g., length) are formal features. Although the selection of the unit is purely conventional, the dimension itself is founded _in re_, for in applying the unit, one relates something instantiating the unit according to the non-descriptive rules of the discipline. When the dimension is a determinable under which formal features are ranked (such as length), the thing instantiating the unit applied in measuring can be thought of as a diagram, applying the unit as constructing a diagram; yet the "diagram" which is constructed is founded _in re_.

Of particular interest is the dimension of length. Any particular value got by measuring length depends on the unit, and so is conventional. But the ratios of these values are relations independent of the unit (e.g., something being twice as long as something else), but not independent of the convention of relating. The same unit of length is applicable in three orthogonal dimensions. The product of the value of two orthogonal measurements gives the value of an area; that of three gives the value of a volume. We shall indiscriminately call area and volume "size". The value of the size as thus derived is conventional, but again ratios of sizes are relations independent of the unit, but dependent on the convention of relating. The rules governing the measurement of lengths specify that the unit is to be placed end to end; this specifies what is taken as straight, which in this context is what is most simple. Measuring x units in this way generates a straight line x units in length. Measuring x units of a straight line segment, then measuring x units of a straight line segment in an orthogonal direction, then x units parallel to, but in the direction opposite to the original line segment, etc. generates a square of x^2 square units. Other geometrical figures and their areas are specified by more complex operations. The values of the ratios of their sizes are independent of the unit, likewise their shapes, being relations of line segments, are independent of the unit. Thus in relating values got by applying a purely conventional sortal and applying it in accordance with conventional rules, one gets translations of formal features which are instantiated (e.g., geometrical figures) or founded (e.g., relations of lengths and sizes) <u>in re</u>.

Things display the relations they found and the values of measurements are relations. We usually distinguish between distance and length, distance being between things, length of things. But this distinction cannot be drawn when there are no sortal concepts applied <u>in re</u> previous to that of a unit of length. There are concepts of length and size previous to and presupposed by the sophisticated metrical concepts of length and size because concepts of sortals include relations in the dimension of length and hence size. When these concepts are pre-metrical, the criterion of exactness is not strict and thus we speak of a large or small horse or a tall or short man. When we speak of lengths and sizes of things without relation to other things under the same sortal term, the relation can only be to ourselves. But in the programme to reduce concepts of natural sortals to concepts arising from purely conventional sortals, the relation to ourselves drops out in minimising the conventional element. We use instruments to measure what we do not naturally pick out and the applications of units in using these are related by non-descriptive rules to the applications of units made when not using them. In this way, what is natural in relation to us is by-passed by conventional activities and rules.

Time as well is founded <u>in re</u> and a pre-metrical concept of it becomes metrical with the addition of further non-descriptive rules. One might consider that there are initially two concepts of time which became fused as one develops a metrical concept. On the one hand, there is the concept of time pinned to counting the recurrence of natural states which offer natural units. On the other hand, there is the concept of time allied to the concept of motion, which itself is pre-metrical and can be metricised.

Suppose, in accordance with the endeavour to maximise simplicity, exactness and predictive and explanatory power, all our concepts of things under sortals were reduced to or replaced by concepts arising from concepts of units and the non-descriptive rules governing their application. A description of a spatio-temporal expanse could in principle be given in purely numerical terms by specifying the values of certain variables at different times and places. But the measurements by which one arrives at these values and spatio-temporal positions must involve descriptive rules and the dimensions themselves are refinements of pre-metrical concepts. Furthermore, one can have these pre-metrical concepts only because one follows descriptive rules in picking out things.

Part of the programme to maximise the simplicity and exactness of our descriptions and our predictive and explanatory power is the translation of concepts of material features into concepts involving formal features. This involves minimising what is due to convention in the distinction between material features and eventually the elimination of descriptive rules. It also involves minimising what is due to how the world is and what we are like. The translation of concepts of material features into concepts involving formal features is part of the goal of Cartesian mechanical physiology. This translation (unlike the translation of the geometrical concept of a circle into the algebraic concept of a circle) cannot even in principle be arrived at by intransitive self-teaching; we shall say that such concepts are "extensionally identical" - they apply to the same things, features, etc. Essential knowledge of material features depends on how the world is and what we are like. Concepts of material features are not just instantiated in things, for they are in part due to things. Still, they are in part conventional: e.g., there is more than one way to divide the colour chart.

The programme is to minimise the conventional element in the distinction between material features under any one determinable by formulating and testing purported laws. As the criteria of exactness and simplicity are furnished by non-descriptive rules and concepts, the programme includes the correlation of concepts of material features with non-descriptive concepts; this again is done by specifying a metric unit, a purely conventional sortal. Ratios of pitches are correlated with ratios of lengths and tensions of the vibrating source, which also shows how heterogeneous pitches can be analysed into homogeneous pitches. Colours are correlated with their relative positions in the spectrum, thereby showing how hetergeneous colours can be analysed. Both of these ranges of features are transmitted, i.e. they are sensed somewhere other than where they are produced or located. Other ranges of material features (smells and tastes - we leave feelings to the side as a special case) are not transmitted. (The smell is said to be where it is smelled; things give off smells.) These can be analysed into homogeneous features by isolating bulks until we have those which can be combined in various amounts to produce the desired smell or taste; a unit of weight is then the metric unit and the combinations are expressible numerically.

Having metrics for material features, and a method for analysing them into homogeneous features so they can be serially arranged under a determinable, the next thing desired is an explanation of their production. In the case of pitches, each homogeneous pitch is correlated with the macroscopic values of the tension and length of the source. We do not pick out tensions; rather, tension can be correlated with a weight producing that tension and weight is metricised by, e.g., the number of unit weights which balance a given weight equidistant from the centre of a balance. The point is to eventually correlate the ranges of material features with concepts arising from metric formal features which are displayed to us. Colours, smells and tastes are microscopically produced and instruments are required to display metric formal features. (Consider a calibrated meter.) The macroscopic display is associated with a microscopic quantity. Some macroscopic displays are discrete and are correlated with discrete microscopic quantities. In some cases, the microscopic quantity is the number of certain things under a sortal, the concept of which involves formal features which are not displayed in our natural environment.

Invoking microscopic things, we not only minimise what is conventional, but also what is biological - what is due to the way we are. Eventually, carrying through with this programme, one desires to explain even the constants by which the expressions of formal features are related. To do this, it is sometimes necessary to take into account systems of such size that instruments are required for their measurement; indeed, the whole universe might have to be considered. In this we go beyond what the world is like to what any world must be like, to any world which could in principle be diagrammed. The concepts involved could be learned intransitively and one could describe any number of such worlds. Still, as measuring is an application to things _in re_, determining which description is in fact founded involves transitive acts; there must be something which obeys laws and does not simply display formal features.

Even when one has eliminated the conventional aspect in the distinction between material features under a variable, material features still depend not only on what the world is like, but also what we are like. To explain what material features are, then, one must take into account the biological elements. To do this, the same programme is applied to the human body as it is applied to other things. The procedure is most evident for pitches. Pitch is correlated with vibrations per second or frequency. Take two strings, a and b, of the same material, length and tension. When struck, they produce waves in the air of the same frequency. When they are sufficiently close and a is struck,it produces a wave which is received by b, which then vibrates at the same frequency. In the physiological explanation of pitch, the first string is taken as that which produces the pitch, which is transmitted and received by a fibre in the ear, which plays the part of [redacted] the second string. For colours, the state of that which produces (emits) the feature is like the state of that which receives (absorbs) the feature, although there are no similar states in the transmission.[6] Smells and tastes are not transmitted; their production and reception are explained by the chemical interaction of what produces and what receives the features. The parts of the body sensitive to these features can be analysed to give a ratio of bulks (i.e. chemical substances) which interact with the bulks in that which produces the feature. We shall in future identify the material feature with some part or all of what is described by the mechanical description of the production, transmission and reception.

Not all changes on the periphery of the body count as receiving material features, for there must be a connection between the reception and the rest of the organism and what it can do, at least a connection with its motor activity. To explain material features in this programme, one must give a mechanical description of the production, transmission and reception of the physical activity and also the neural impulses arising from its reception and any resultant motor activity. Only material features need be explained in this programme, for we have essential knowledge of formal features simply from the fact that we follow the non-descriptive rules which give a point to this endeavour (although why a formal feature is founded at a certain time and place needs explanation). Now the material feature might be held to be extensionally identical with the concept of what is mechanically described; but what is explained by this concept involves something much more extensive spatially than what is picked out.

Chapter III.

Dualism and Monads

In this chapter we shall be concerned with dualism, which postulates that there are two sorts of physical existents: what is physically _in re_ and occurrences in the mind (which we shall say are physically in the mind). We begin by identifying the input and output in the physiological explanation of the reception of material features. These correspond to occurrences in the mind and are already in roles. As material features, we shall say they are founded in the mind and projected onto what is outside the body. So occurrences in the mind correspond to occurrences _in re_, both in the body and (because mechanical activity is transmitted) beyond the body. We shall divide the objective structure into two, not mutually exclusive, concepts: that of _res cogitans_, founded in what is physically in the mind, and that of _res extensa_, founded in what is physically _in re_. This is Cartesian dualism, although we shall here eschew talk of substance as much as possible for "substance" was used in a number of ways in the seventeenth century and always as a technical term. There were different degrees of physiological reductionism in the seventeenth century, of which the Cartesian form was the most extreme, and there were different sorts of dualism. The Cartesians speak of two substances, but have cognitive dispositions secured in the body. The Scholastics held that a person is a single substance. Yet they accepted a form of dualism in distinguishing a sensitive soul, said to be "material" and largely open to physiological investigation (but not of the mechanical sort), and a rational soul or intellect, said to be "spiritual" and unextended; both sorts of souls were held to secure dispositions. For Locke, dispositions are secured in the soul, a substance distinct from the body. The sort of dualism accepted reflected the relation between the roles of occurrences in the mind and things _in re_. For the Cartesians, the roles of occurrences in the mind or soul are specified by the objective structure, which comprises concepts displayed _in re_. For the Scholastics and Locke, the roles of occurrences in the mind or soul are specified by what _in re_ causes them or dispositions to have them; furthermore, they hold that we are not subject to rules until we have formulated them. All three positions suffer from the problems of holding that occurrences naturally have roles, ignoring the fact that convention is responsible for these roles. The Scholastic and Lockean positions have the further complication that occurrences in the mind or intellect are in roles specified by what _in re_ causes them. Now any form of dualism introduces problems regarding the relation between the two basics which it distinguishes. Leibniz, who accepted Cartesian reductionism, introduced monads to overcome these problems. Each monad is held to instantiate the concept of _res cogitans_ and aggregates of monads found concepts comprised in the concept of _res extensa_. Further, all the concepts comprised in that of _res extensa_ are held to be analysable into concepts comprised in the concept of _res cogitans_. Thus (it is held) only what is physically in the mind physically exists. In addition to exhibiting its own problems, the theory of monads exhibits what is inherently wrong with looking for one or two basic sorts of physical existents. It also exhibits the problems inherent in locating cognition in something unextended, for the part played by behaviour in cognition is excluded.

Making an utterance is a sort of motor activity. An utterance picks out a formal feature by fulfilling a role specified by the same rules as those which specify the role of a diagram; an utterance picks out a material feature by fulfilling roles specified by not only non-descriptive rules, but also by descriptive rules. But the programme minimises what is due to convention in picking out material features, hence, within the programme, descriptive rules drop out and their place is taken by non-descriptive rules and mechanical descriptions. We can distinguish two parts to the mechanical description: the input, from the production of the material feature to the neural impulse, and the output, which is natural (including acquired) motor behaviour. Both the input and the output can fulfil conventional roles: the input, as when we pick out a formal feature, and the output, as when an utterance is made in a role. Within the programme we are now considering, the aspect of descriptive rules not taken over by non-descriptive rules is described by a mechanical description - what is thus described is law-obeying, not rule-following. Thus if an utterance picks out a material feature, it is because it is the output of a law-obeying, mechanical process.

A mechanical description of some system can be given only by applying purely conventional units in accordance with non-descriptive rules. Thus the input already occurs in a role, in particular, in that which places it in the range of material features under a metricised determinable. Likewise, if there were a natural output, it would be in the same role.

In this picture, the natural utterances of only certain sentient beings - persons - occur in roles because only persons are rule-following and are evaluated. For instance, an hallucinating person's claim to pick out certain features is evaluated as incorrect. But he need not claim this; he could state what he was led to claim (i.e. how things appeared to him), which is an exercise of his knowledge of the concepts which would be exercised in picking out things if things were as he hallucinated. The statement can be evaluated intransitively and, in principle, physiologically in so far as the same physiological occurrences take place when we are led to claim something as when we do in fact pick out something <u>in re</u>.

The Cartesians consider a person under a double description: as something physiological and law-obeying and as something which performs conventional acts, follows rules and evaluates. For them, the input in its roles is like a provisional statement with which one is presented. As the shadows of utterances are held to be occurrences in the mind, so there are held to be occurrences in the mind corresponding to the physiological input. Both these occur in the same roles. But, further, the Cartesians maintain they are the same occurrences, for the utterence is held to be an optional transient act and parts of the brain are held to supply the input corresponding to all occurrences in the mind, whether or not the input originates beyond the body. We shall say that these occurrences are physically in the mind; they correspond to what we shall say is physically <u>in re</u>, which founds or instantiates the formal features of mechanical descriptions and includes not only what is beyond the body, but also what is in the body. Material features according to the Cartesians are in the mind. As the mind cannot be said to be, e.g., red, we shall say that material features are founded, not instantiated, in what is physically in the mind. We shall not say that the material feature is displayed by that which originates the activity which is transmitted; rather, we shall say that the material feature is projected onto it.

This analysis supposes a mature adult who has been so well trained that he is immediately led to utter, e.g., different names for all the discernable compositions of heterogeneous light. In fact, almost universally in the seventeenth century these features were held not to be concepts at all because (it was held) we do not know what they are in the way that we could generate them; projecting material features, unlike having formal features displayed to one, does not involve knowing how to do something. They were treated as natural rather than conventional and descriptive rules drop out. Occurrences in the mind (it was held) are needed for picking out anything in re; thus (as descriptive essential cognition) these occurrences were held to be necessary for the application of non-descriptive concepts.

Descartes in fact maintained only in his later works (published during his lifetime) that material features are founded in the mind. In the Regulae, the input and output are not held to correspond to an occurrence in the mind; rather, occurrences in the brain - which, it was thought, included faculties responsible for imagination and memory - were held to suffice for the application of non-descriptive rules to things and their imagined and remembered applications. In this account, which is shared with certain other moderns (such as Hobbes and Gassendi, who later severely criticised his account in the Meditations), the mechanical description is not complete, for material features are founded in what is law-obeying and not rule-following. The mechanical description is even less developed in the general Scholastic account of the seventeenth century: the transmitted activity was held to found the material feature - e.g., red - throughout the input course, from the thing in which it is produced, to its conservation and exercise in those parts of the brain held to be responsible for imagination and memory, and its exercise was held to lead us to call what produces it "red". Material features are for the Scholastics, among other things, occurrences in a soul, viz. the sensitive soul, which was held to include the faculties of external sense, imagination, memory, etc. But only for some Scholastics are they occurrences in the rational soul, which corresponds to the Cartesian mind.[1]

A distinction was drawn in the seventeenth century between those sorts of things which know and those sorts of things which are only known. The distinction is not always sharp for those who maintain that there are different sorts of souls or that animals think; but the important distinction is between that which knows and is not extended and that which is only known and is extended. These were sometimes styled two different sorts of substances. "Substance", however, was a technical term and we shall not be concerned with it here. We have distinguished two descriptions under which the Cartesians consider a person: as something physiological and law-obeying and as something which performs conventional acts, follows rules and evaluates. We have also distinguished what is physically _in re_, which occurs in all things, from what is physically in the mind, which occurs only in rule-following things. We now distinguish two parts of the objective structure: that containing concepts instantiated in law-obeying things (i.e. _in re_) and that containing concepts instantiated in rule-governed acts (i.e. in the mind).

Now some concepts of sortals are instantiated in rule-governed utterances and, we shall say, they are constitutive of them. They are not, it is to be noted, instantiated in the persons who make these utterances. The same rules are followed by him who makes these utterances as by him who picks out the concept instantiated in the utterances. These are concepts of speech acts and of what we have called rational operations, including grammatical operations (e.g., predicating), logical operations (e.g., inferring) and mathematical operations (e.g., adding). Not all concepts of rational operations, however, are instantiated in utterances, for geometrical operations (e.g., bisecting angles) are instantiated in diagrams or things. Generally, restricting ourselves to mathematical operations, concepts of arithmetical operations are instantiated in utterances and arithmetical formal features are founded in utterances (since there are sortal concepts instantiated in utterances); concepts of geometrical operations are founded in things and geometrical formal features are instantiated in things. Now if numerical features are founded in things, concepts of numerical operations are as well. If the diagram

twice founds the concept of (a group of) three, it also founds the concept of (a group of) six. It could also be said to found the rule that three plus three equals six and so this particular addition, and hence the concept of addition. (One might say that diagrams display rules; making diagrams, after all, is an intransitive act, like writing or saying.)

That portion of the objective structure comprising concepts instantiated in utterances we shall call the concept of *res cogitans*. That portion comprising concepts instantiated *in re* we shall call *res extensa*. This is not to suggest that there is no overlap, for, e.g., concepts of numbers are founded equally in both. Concepts of *res extensa* are instantiated and displayed in what is physically *in re*, i.e. in what is law-obeying and mechanically or physiologically described. Concepts of *res cogitans* are instantiated in what is physically in the mind, those acts which are following rules; but when the acts founding them are immanent, they are displayed only to that rule-following thing in which they are instantiated. No geometrical concepts are instantiated in the mind, i.e. the mind is unextended, while what is physically *in re* instantiates only geometrical concepts, so everything *in re* is extended.

This distinction between *res cogitans* and *res extensa* is taken from Descartes. The distinction is somewhat different for Malebranche, who held that the objective structure is above all geometrical, although there is a translation between geometrical and arithmetical concepts. Geometry and algebra take the place of logic and grammar. The mind for Malebranche instantiates none of the objective structure, but is rather that which follows it. If one were to say that there is for Malebranche a concept of res cogitans, it would be only of that which performs geometrical operations and their arithmetical analogues.

There were few philosophers in the seventeenth century who did not hold one form or another of dualism. Dualism, by and large, but by no means always, was of the form which maintained that there are two sorts of substances, one extended and one not. Still, there are significant differences between even those positions maintaining that there are two substances. For the Cartesians, there are no dispositions in the mind. Dispositions are secured only in the body. An occurrence in the brain leaves a trace in the brain, but the corresponding occurrence in the mind does not have a trace in the mind. Rather, a second occurrence of the same type in the mind (but not associated with the reception of a material feature) is due to the exercise of the disposition in the brain. This occurrence is of the same type as that which corresponded to the first occurrence.

Seventeenth century Scholastics did not generally hold that a person is a composite of two sorts of substances. They did not accept the physiological reductionism; rather, substances (taken in a sense different from the Cartesian), they held, are composites of form, which specifies the properties, and matter, which is undifferentiated. Matter and certain forms - substantial forms - suffice for all the properties and activities of different sorts of substances. Forms are said to inform matter. If more than one form informs the same matter, there is only one substance. The composites of some substantial forms and matter are inanimate extended things. Substantial forms whose composites with matter are animate things are called souls. Plants have only vegetative souls, which account for their nutritive faculties (e.g., growth and assimilation). Animals have both vegetative souls and sensitive souls, which account for their sensitive faculties; as these inform the same matter, each animal is only one substance. Men have, in addition to vegetative and sensitive souls, rational souls, accounting for their faculties of reasoning and understanding and moral faculties (such as will). Still, each man is a single substance (although, for religious reasons, it was held that the rational soul could be conserved supernaturally on its own).

Even though the Scholastics[2] held that man is a single substance, they held that different dispositions are secured in different souls. The exercises of those dispositions (cognitions) occur in the soul in which the dispositions are secured. As the Scholastics did not reduce everything which is not rule-following to instantiations of mechanical descriptions, the Scholastics admitted that animals cognise; in particular, animals have essential cognitions of material features and their configurations. Thus, as men as well as animals have sensitive souls, cognitions and dispositions for cognitions of material features were held to be functions of the sensitive soul. Still, neither animals nor the sensitive souls of men were held to be "spiritual", which we take here to mean that their activities are not spatial. Accordingly, for something to be or occur in the sensitive soul is for it to occur in the brain or the organs of sense. On the other hand, the rational soul was held to be spiritual, its activities non-spatial. In addition, dispositions for these occurrences including non-descriptive essential and proposition knowledge - are in the rational soul. There are thus two levels of knowledge and cognition. The sensitive level is natural, not involving non-descriptive rules; the rules of occurrences in the sensitive soul are determined by things *in re* which produce material features. The rational level involves among other things non-descriptive rules and concepts, but not descriptive rules concerning material features. Thus descriptive rules concerning material features drop out in Scholasticism as well as in Cartesianism.

Locke maintained a form of dualism: a person is a composite of a spiritual substance - a soul - and material substance. Cognitive dispositions are secured in the soul, characterized by being called "spiritual". There is an implicit distinction in Locke between soul and mind. Like the Cartesians, he was concerned with occurrences in the mind, which we can evaluate, i.e. of which we are conscious. What is in the mind, not the soul, is important in his account of what we know. But "in the mind" is taken in a dispositional sense: that is in the mind which occurs in it or which again (independently of what occurs *in re*, including the body) could occur in it. And the relation between what is in the mind and the soul is only that the latter secures the dispositions. (Locke, unlike the Cartesians, admitted that animals think and he had doubts about the value of physiological explanations; but there is no indication that he considered that there are sensitive as opposed to rational souls, for souls are said to be spiritual.) Since cognitive dispositions are secured in the soul, not the body, not only the application of non-descriptive rules and concepts to things *in re*, but also the relation between occurrences in the mind and occurrences *in re* (whether in or beyond the body) is not clear. Locke's answer is to specify, but not explain, this relation as causality: the initial occurrence in the mind of one type is caused by an occurrence *in re* of a corresponding type; the occurrence in the mind establishes a disposition which is exercised in other occurrences in the mind of the same type, whether or not there is something corresponding *in re*. These occurrences are in roles and, in so far as we are subject to non-descriptive rules according to Locke, we are so subject because of the dispositions established by these occurrences and their relations.

On the Cartesian position, we could not be subject to non-descriptive rules and concepts because there are occurrences in the mind, for the roles of these occurrences are specified by non-descriptive rules. Even though there are no dispositions in the mind according to the Cartesians, there are concepts instantiated or founded in the mind. In addition to the concepts we have mentioned above which are instantiated in the mind, geometrical concepts in particular could be said to be founded in occurrences in the mind. There is a translation between geometrical and arithmetical concepts and <u>res cogitans</u> and <u>res extensa</u> as parts of the objective structure are not mutually exclusive. Again, the Cartesians could maintain that occurrences in the mind are projected into what is physically <u>in re</u> only because they held that these occurrences are already in roles specified by geometrical rules, i.e. we or, rather, our minds already know how to perform geometrical operations, even though we cannot perform the operations <u>in re</u> nor formulate any of the rules.

The Cartesian position reverses Suarez's position. The rational soul is responsible not only for reasoning, but also for understanding, i.e. essential cognition not dependent on material features, which is not just of mathematical features, for it is the cognition of forms in general independent of particular conditions imposed on them by their information of matter. When one has essential knowledge of a form, the form is said to inform the intellect, the faculty of the rational soul responsible for understanding, judging and reasoning. Since the intellect is non-material, the forms in it are independent of the conditions imposed on them by their information of matter. Essential cognition of these sorts of forms is not initially dependent on our following rules; rather, they are extracted from their material conditions, in a sense caused by the things <u>in re</u> which are cognised. (We shall later discuss how this extraction ("abstraction") is meant to take place). Forms extracted in this way; it was held, found rational (including non-descriptive) concepts and rules, which are made explicit by the intellect reasoning on the forms. We are not subject to these rules and concepts, it was held, until they are made explicit, a process which must be done by or for each individual.

Locke is just as removed from Cartesianism on this point. The important distinction is between simple and complex ideas, both of which can be either occurrences or dispositions for occurrences. The former are caused in roles and the latter are founded in them in the sense that they are formed from them, their roles being specified by those of the ideas from which they are formed. Some simple ideas are of mathematical features and some are acquired by 'reflecting on' the operations (taking 'operation' broadly, to include exercises of attitudes) of our minds. Other simple ideas are of material features. From the point of view we have presented, this is a confusion between that which specifies the roles of occurrences and the occurrences themselves. But on Locke's position the roles of the occurrences do not need to be specified by anything other than what causes them and we are not subject to the rules, which are founded on ideas, until we have formulated them. Both Suarez's position and Locke's position, like the Cartesian position, suffer from the problems of holding that occurrences naturally have roles, ignoring the fact that convention is responsible for these roles. Suarez's and Locke's positions have the further complication that occurrences in the mind or intellect are in roles specified by what <u>in re</u> causes them or that from which they are formed.

Leibniz was one philosopher who did not hold a dualist position; rather, he maintained that what is real (and we shall see what the force of "real" is) is unextended founding concepts comprised in _res extensa_. The Scholastics also maintained that man is but one substance, but Leibniz's position develops from the Cartesian position by identifying what is physically _in re_ with what is physically in some unextending soul or some equivalent thereof and by analysing the super-concept of _res extensa_ (i.e. geometry) into that of _res cogitans_ (i.e. arithmetic, logic and grammar).

Res cogitans on the Cartesian position is instantiated by what is physically in the mind. There is a correspondance (which Descartes usually, but not always, Malebranche never, took to be a causal correspondance) between this and what is physically _in re_, the latter instantiating the concept of _res extensa_. But this correspondance is arbitrary in that only certain occurrences physically _in re_ correspond to what is physically in the mind. From this it might be thought that only what is physically _in re_ is needed, for the postulation of two sorts of physical existents is arbitrary to the extent that their distinction relies on the concepts they instantiate. Whether one or two physical existents are admitted, since the concepts of _res cogitans_ and _res extensa_ are features, they do not individuate things; furthermore, what physically exists is not individuated, as it is held not to be a sortal.

Leibniz asserted that only by introducing monads could these Spinozistic tendencies of Cartesianism be averted. Only one sort of physical existent is admitted. These correspond to the Cartesian occurrences in the mind, but are held to occur even in non-sentient beings. Leibniz maintained that all geometrical features and operations can be analysed in terms of algebraic or arithmetical, logical and grammatical features and operations. Thus geometrical features, he held, are founded in features of unextended things - simple unities, simple substances, or monads. Geometrical features are picked out by simple substances because they perform the operations and exercise the concepts which are the translations of geometrical operations and concepts.

The individuation of things is guaranteed (he held) because each monad instantiates the whole super-concept of res cogitans. But each instantiates it in a different way for two reasons. First, each monad is related to others in a different way. The relational concept can be analysed. But simply because monads are related, they not only instantiate the objective structure, but also a restriction of the objective structure for each relation. These restrictions can be thought of in terms of the infinitely iterated application of a unit for some dimension. The objective structure is meant to contain the resultant series, which can be restricted to a finite segment by specifying two values as end points. What is called an individual concept comprises the objective structure plus these restrictions peculiar to each monad. Still, the individual concept itself must be instantiated.

The second reason each monad instantiates the objective structure in its own way is due to the nature of what physically exists - primitive forces, which instantiate individual concepts. Each primitive force is held to act on its own, though in a way corresponding to all others. Primitive forces, as they uniquely instantiate individual concepts, are individuated by these concepts. "Monad", "simple substance" or "simple units" is applied indifferently to either the individuated primitive force or to the instantiated individual concept. Indeed, these are not distinguished. The primitive force is sometimes viewed as the serial performance of rational activities, which is the concept instantiated serially. The movement from one state in the series to another is identified with a conatus or appetition, corresponding to what in the unanalysed spatial display is described according to the desideranda of simplicity and exactness by $\frac{1}{2}mv^2$.

Given that all which physically exists is held to instantiate only res cogitans, spatial features (relations) are held to be founded on monads. Material features are treated as formal features, and hence are held to be founded on monads. There is no need to introduce some further rule-following sort of thing as a locus for one of two sorts of physical occurrences and there is no need for occurrences in the mind distinct from the analysis in non-spatial terms of the physiological description. The purpose of some of these monads, one could say, is only to found spatial features, while other monads instantiate certain concepts which (so it is held, wrongly, which is important, as we shall see) are non-spatial, such as pain and others to which we make reference in describing natural and conventional behaviour. Although instantiated in something unextended, these features are picked out in operations which are extended. The operations are instantiated in a monad which "dominates" an aggregate of monads which do not perform the operations, but found the spatial display. (In picking out some displays, one is not picking out concepts instantiated in a single monad; these are merely aggregates, without a dominant monad.[4]) The dominant monad - called "the (sensitive) soul" - is said to express the display - called "the body" - which is founded in the monads which it dominates.

The description of the spatial display is a mechanical description of the world. Thus regarded, the universe could be given a mechanical description and nothing be left out. In particular, those displays corresponding to dominant monads would be given what we have styled a physiological description. Because of conservation laws, particularly the conservation of energy ($\frac{1}{2}mv^2$ and potential energy), dispositions are included. As Leibniz holds that there are no perfectly closed systems, the dynamical states of all things in the mechanical display are related to each other to a greater or less degree. At any one time, different dynamical configurations are related to one another the closer they are spatially. One dynamical state of the universe develops from previous ones, which are more similar to it as they are closer in time to it; likewise, a given mechanical state of the universe develops into later states, which are more similar to it as they are closer to it in time. One could say that the present state of the universe is a consequence of its past states and is pregnant with its future states.

Corresponding to the description of the universe as a mechanical display is a description of the universe in terms of what physically exists - instantiated concepts or monads, which found the mechanical display. These do not interact mechanically; in fact, they do not interact at all, being primitive forces. As the mechanical displays are related to each other, more or less, according to their distance, the monads which found them mirror each other from their own "point of view", more or less, as the displays they found do; indeed, each monad mirrors the universe from its own point of view. As states of the mechanical display of the universe are consequences of one another, the present state of a monad is a consequence of its past states and is pregnant with its future states. Since all states of the universe to some extent are founded in part in any one monad, every monad is infinitely complex, as it must be if it instantiates the concept of *res cogitans*. Every monad expresses an infinitely complex display, which must be founded in other monads, which in turn express infinitely complex displays; so any portion of space is infinitely divisible. Since all that physically exists instantiates _res cogitans_ - cum - restrictions and only souls dominate other monads and so express displays, there is said to be life throughout. The restrictions are analyses of the spatial limits of the display as it is generated through time.

Certain monads instantiating behaviour - dependent concepts also instantiate rational operations in a way in which others do not: some of their operations or acts are evaluated, either by themselves or by something else which performs acts which can be evaluated or are evaluations themselves. These acts are said to be conscious acts and the monads in question are said to be minds. The acts which are evaluated are held to be resultants from those which are not. Thus there is a perfect correspondance between the mind and the display founded by those monads which it dominates, i.e. the body. Like any other monad, the present state of a mind is a consequence of its past states and is pregnant with its future states. Thus dispositions are secured in the mind itself, but only by virtue of its performance of operations of which it is not conscious (i.e. which it itself cannot evaluate) and which correspond to physiological operations which are not properly behavioural. The behaviour-related acts of minds and not those of other sensitive souls can be evaluated because their complexity on the level of what is behaviour-related instantiates rules of the objective structure, i.e. minds reflect _res cogitans_, which they also instantiate.

It is to be noted that, on the outlines of this account, one monad could, e.g., see another: the states of the one, displayed by what is founded on the monads it dominates, correspond from its point of view to the states of the other from its point of view. The colours and formal features displayed correspond to an analysis in both monads. Furthermore, one mind can pick out and evaluate the conventional acts of another if it, e.g., hears with sufficient clarity the rule-governed utterance of another. When the display or body as well as the dominant monad is referred to, Leibniz prefers to refer to the two together, which are only one substance, as an animal (when only sensing is involved) or as a person (when the dominant monad is a mind).

The displays are called "phenomena" by Leibniz. This is misleading to twentieth-century readers because it seems to imply that they are imaginary or are to be by-passed in an account of how we know. Nothing could be further from the truth. Yet Leibniz calls only minds real. The furniture of the universe is divided in an odd way; or, rather, the furniture of the universe is split apart in a way which rests on subtle - and fallacious - moves. Phenomena are the public half, but are treated as relational and founded on monads dominated by the monads which express the phenomena and alone are held to be "real", i.e. physically existent.

The problem with Leibniz's position is not that relations are not admitted. (He expressly includes relational inferences among those inferences which cannot be reduced to other forms.) Rather, every relation is held to be founded on what physically exists in unextended substances. Leibniz maintained that all natural qualities of things are analysable in terms of mensurable, hence tacitly relational qualities, thus needing a foundation. All, even conventional relations, he maintained, need a foundation in what physically exists. He once wrote that if a man's wife dies in India, then there must be a physical change in him.

Following a rule and obeying a law are conflated by Leibniz. Simple substances, even those which do not sense, are held to count; e.g., when the phenomena expressed by a monad receives an audible vibration, the monad 'counts' the peaks and 'divides' by the time elapsed. But this counting is law-obeying, for all monads, including minds, are said to be spiritual automata. To allow for the fact that certain acts of persons are evaluated, Leibniz has recourse to mathematical methods: evaluated (i.e. free) acts are said to be inclined, but not necessitated by the series of those which are not evaluated. The series of the latter is said to be infinite, but does not include the former; rather, the series of acts, one necessitating the other, is said to approach a necessitating condition of a free act as an asymptote approaches a limit. An analysis of responsibility, rational knowledge and operations and related notions in terms of the conventions to which one is subject is eschewed in this way.

Following a rule and obeying a law are conflated because one looks for one or two ultimate kinds which are independent of convention. But all that is independent of convention has been given a conventional role because of the concepts involved in the cultural endeavour to explain everything with maximum simplicity and exactness. What by means of this endeavour is found by minimising the conventional element is identified with what performs rational, hence conventional, operations. And the practical knowledge exercised in these operations is not held to be acquired by one's induction into a culture.

We have already criticised the approach which assumes that what is physically in the mind naturally occurs in roles. In particular, we mention here that the part played by behaviour is ignored. We distinguish two sorts (or, perhaps better, aspects) of behaviour: natural and conventional or role fulfilling behaviour. The point of the latter (including vocal) is determined by the culture whose rules specify the roles. If we are to allow immanent acts of any kind, their roles are determined by the roles of the transient acts of which they are shadows, for only behaviour can be evaluated by another.

But why should one look for simple substances which found spatial displays? In addition to simple substances, Leibniz also held that there are simple concepts. What is not conceived by itself, he argues, must be conceived by means of others. But nothing could be conceived by means of others unless something were conceived by itself. Conception is what we have called rational essential cognition, an exercise of knowledge of non-descriptive concepts. But these concepts are determined by their position in the objective structure; knowing them involves knowing some of the propositions involved, which involves knowing other concepts. The dichotomy between conceived by itself and conceived by means of others most be rejected; rather, all concepts are conceived in relation to others.[5] The status of simple substances is comparable. We pick out things with diverse spatial parts, which Leibniz takes to be aggregates. To do so, we must (but not consciously) pick out simple substances. These substances, it is maintained, must be without parts, i.e. unextended, because extension is infinitely divisible. But if each simple substance's part in founding an aggregate is written into it, how are the simple substances more simple than the supposed aggregates?[6]

The position we have considered maintains that the behaviour of sentient beings can be analysed in arithmetical, logical and grammatical terms. This applies not just to conventional behaviour, but also to natural behaviour because picking out the roles presupposes picking out what fulfils the roles. Thus, to maintain that behaviour can be analysed into concepts instantiated in something unextended, one must maintain, as a first step, that behaviour can be completely described mechanically. Now in picking out behaviour of sentient beings, as in picking out material features, descriptive rules are involved. For knowing certain behavioural features, non-descriptive rules might be necessary for knowing the constitutive formal features. These features most notably include modes of locomotion. E.g., if one has learned geometrical rules and concepts including those involving a temporal development, one might develop a concept which is instantiated in a horse galloping. These sorts of concepts are those which are the best candidates for reduction to arithmetical, etc. concepts. However, simply because such concepts are assimilated to formal features, they are not properly behavioural features.

Chapter IV.

Empirical Knowledge,

Behaviour and Feeling.

In this chapter we shall produce a model which will allow us to speak intelligibly about (while keeping in mind the problems with) cognition of material features as occurrences in the mind. We shall be concerned with the second way "How does he know?" can be answered, i.e. by stating the position he is or was in. This determines, according to our philosophers, what occurs in the mind, if not the roles it occurs in, for the material features we receive depend on the position we are in. As the authors with whom we are concerned largely ignored descriptive rules, in their accounts one easily segregates that knowledge we have by being subject to non-descriptive rules - which we shall call rational knowledge - from that knowledge which we have by virtue of being or having been in a certain position - which we shall call empirical knowledge. We begin this section with a discussion of what is displayed in behaviour, including cognition. We are particularly concerned with pain-displaying behaviour since we could be said to have a natural concept of pain. We shall manufacture an artificial material feature in the sense of what is received to be the object of pain-displaying behaviour. To correspond to natural pain-displaying behaviour, we shall imagine that we naturally utter tokens corresponding to features received. As pain is felt, we shall also say these features are felt and identify the feeling with the occurrence in the mind. 'Cognise', when it is used for the inception of empirical knowledge, corresponds to certain English verbs - some uses of 'see','hear', etc. - which we shall distinguish by a grammatical criterion.

We must distinguish two ways we use "behaviour". First, we speak of, e.g., the behaviour of a particle in a field. In this sense, any motion counts as behaviour. Secondly, which presupposes the first, we usually restrict "behaviour" to sentient beings. Distinctions between sorts of behaviour in the second sense are not determined by distinctions between sorts of behaviour in the first sense: an animal going through the same motions might or might not be correctly describable as fleeing. For some sorts of behaviour in the second sense, unlike any sorts of behaviour in the first sense, one can ask for a point, knowing which depends on knowing the sort of animal which behaves in this way. But some concepts of behaviour are independent of a point, most typically those which are expressions of emotions or feelings and are referred to by what they express, such as fear, pain or pride.

As emotions and feelings are exhibited only by the behaviour which expresses them, to learn concepts of emotions or feelings, one must perform transient acts which are evaluated. These transient acts may be transitive, as when we pick out the fear-expressing behaviour of an animal. However, unlike concepts of material features, concepts of emotions or feelings may be learned by the evaluation of our intransitive acts by others. When these acts are performed, the evaluation is made with reference both to the act and the behaviour of the person performing the act, which need not be distinct.

A natural sort of behaviour-expressing-a-feeling is that which expresses pain: cries, writhing, etc. To those who have learned how to use "pain" to pick out pain-behaviour, hence pain, this behaviour displays pain, even in animals (atleast in those whose normal behaviour we know something about). But the response to pain is natural, not requiring that we have a concept of pain. It is important that the use of "pain", which is conventional, should reflect this. Now pain-behaviour is holistic. One of the elements can be a natural utterance (e.g., a cry) or utterances which fulfil conventional roles (e.g., "I am in pain" or "It hurts"). Having learned the rules governing the use of "I am in pain", one can substitute the utterance of this in the place of a cry in pain-displaying behaviour. This intransitive use can be evaluated by its agreement with the rest of the behaviour of which it forms a part.

Now for someone who can be supposed to know how to use the words he in fact utters, statements of emotions and feelings are criteria for the occurrence of the emotions and feelings involved. I.e. the stating displays the emotion or feeling involved. (Consider, e.g., statements of affection.) Still, they can be evaluated, for, as stating is a rule-governed activity, statements of emotions and feelings can be used wrongly - i.e. be inappropriate - and can be used for other purposes (e.g., to mislead when insincere, but also neither to mislead nor to display, as in drama). Similarly, other sorts of behaviour can be wrongly employed or employed for purposes other than the standard. Nevertheless, these presuppose that one has learned the rules for displaying the emotion or feeling.

Most, but not all, feelings and emotions are displayed and evaluated in conventional roles and are evaluated accordingly. E.g., a claim that one is offended or offence-displaying behaviour is evaluated as appropriate or inappropriate according to what counts as an offence in one's culture. Evaluations of these displays also depend on one's cultural relations, e.g., the "position" one bears to the purportedly offending "object", and they may depend on one's evaluation of one's own behaviour (as with pride) and other things which are not part of the behaviour displaying the emotion or feeling. These feelings and emotions may also be displayed to someone in a certain culture by a sentient being, man or beast, not in the culture; e.g., a rooster may display pride.

Some natural behaviour - such as fear-displaying behaviour - is apparently evaluated as appropriate or inappropriate with regard to its object. E.g., an animal's fear of a tiger is apparently inappropriate when the tiger is behind bars. However, fear, whether displayed conventionally or naturally, has a biological point when the object fulfils no conventional role (at least as far as the fear is concerned). The fear of something which a sentient being displays under normal conditions involves avoidance behaviour. "Under normal conditions" here has the force of a conceptual "must", for if such behaviour is not involved, one looks for an explanation of why it is not.[1] Evasion or protection is similarly connected with fear when the object (perhaps a state of affairs) fulfils a conventional role.

Now displays of pain, though they could be insincere or made in an uncalled-for fashion, are not appropriate or inappropriate nor do they have a point; in fact, natural displays of pain are not evaluated at all. "Pain" has a use because there is a family of reactions which have an important biological function. Any higher animal which displays certain abnormal behaviour - e.g., contortions - displays pain to us. The display of pain is like a sign, important socially, for any culture and signalling an abnormal physiological change. In particular, when the physiological change is due to the position an animal is in, a display of pain signals that the position is detrimental to other organisms more or less like it. (Thus the first step in checking the sincerity of a person's display of pain is to investigate his contact with his environment.) A display of fear is like a sign that the animal's own pain is displayed to it in the object feared. A display of fear for another is like a sign that the other's pain is displayed in the object of the fear to the one displaying the fear.

The concept of pain could be called a natural concept since "I am in pain" replaces cries. It thus approximates Cartesian occurrences in the mind which take over the parts played by concepts of material features and are projected onto things in re. We shall take feeling pain as a model of Cartesian cognition (i.e. perception)of material features. Both are due to our interaction with our environment.

The question "How does he know?" can be answered in two general ways. One way, which we have already treated, is by stating the intellectual competences a person has, due to being subject to conventional rules. The other way is by stating the position a person or animal is or was in. These two ways of answering the question "How does he know?" correspond to two different sorts of knowledge. We shall call the first "rational knowledge" and the second "empirical knowledge". Empirical knowledge as well can be essential, propositional and practical and the exercises of it are also called "cognition". Rational knowledge is not independent of the positions one has been in, for one must be in positions to learn; nor is empirical knowledge independent of one's intellectual competences, which give one a greater facility with one's environment. This division, however, was followed by the Cartesians since the objective structure was taken to specify the roles in which all occurrences in the mind take place and descriptive rules, the learning of which is particularly tied to our positions in our environment, drop out. This division, making allowances for the differences indicated above, holds for the other authors with whom we are concerned.

Unlike rational knowledge, which depends on conventional rules, empirical knowledge is had by animals. Thus, with regard to empirical knowledge, only in some cases can we say what we know. The Cartesians, who deny that animals think, allow that animals and men are similar with respect to the physiological occurrences which correspond to occurrences in the mind, dispositions for these, and interactions with the environment which bring them about. Animals are not held to have occurrences in the mind only because they are not rule-following.

However, there are differences between sensitive cognition and feeling pain. One's display of pain is related to the position one is in. But cognition, like fear, involves an object and cognition is different from fear in that it is a success, i.e. there would be no cognition without the object cognised, whereas one can fear X and be mistaken in holding that X exists, is in one's vicinity, etc.

The criterion of success for rule-governed behaviour is furnished by the rules, but what we want is a criterion of success for natural behaviour. What behaviour displays to us the cognition of something by a sentient being depends on our familiarity with that sort of being and particularly its usual relations to different sorts of things in its environment. A display of pain is an indication of failure, although we should want to say that some pain is unavoidable. We can think of the pain - fear mechanism as a disapproval or evaluation. (Indeed, enforcement of conventional rules relies heavily on this initially.) This is learning by experience, using "experience" in the sense of acquiring a facility. The facility is a disposition to succeed in certain circumstances, and cognition is the exercise of this disposition. Facilities can be for more or less general things. With enough facility in something general, a more particular disposition might be acquired with a single cognition. Having a disposition or facility to cognise is knowing. Its exercise, when one emphasises that the present cognition is facilitated by this disposition, is remembering in the occurrence sense. When something has the disposition and we wish to emphasise that it was previously established, we say the thing remembers, here in the dispositional sense. Memory, whether as an occurrence or as a disposition can be essential, propositional or practical. Propositional, essential and practical knowledge and cognition are inter-related, but essential cognition (e.g., of a cat) is particularly related to the sort of thing or feature cognised and propositional cognition (e.g., that the cat is on the mat) is particularly related to the particular situation, although there is general propositional empirical knowledge (e.g., that all house cats are wont to sleep on mats). Knowing what practical cognition is wont to be displayed by a sort of animal is that in particular which contributes to our familiarity with the behaviour of that sort of animal.

What the thing is said to cognise is dependent on the concepts of him who picks out the cognising thing and what it is said to cognise. Animals can display conventional emotions or feelings to us; likewise, what is said to be displayed to an animal can be a descriptive or non-descriptive concept. It is perhaps most natural to say that sentient beings cognise things under sortals or perhaps bulks. However, in the seventeenth century some sort of physiological explanation was looked for, if not as extreme as the Cartesian.

Thus material features as received are obvious candidates for what is cognised in empirical cognition. We have suggested taking pain as the model of a material feature, but encountered the objections that feeling pain is not related to an object nor is it a success. Nevertheless, we shall manufacture an artificial feature as the object for which feeling pain is a success. Call this feature "painfulness". A thing is painful or has painfulness if, when it is in contact with a higher animal, the animal displays pain.[2] We could think of certain chemicals as having painfulness and of painfulness as being cognised only when the particular bulk comes in contact with the periphery of the body, as one might say that the tastes of things are cognised when the bulk which is said to have them comes in contact with parts of the mouth.

To correspond to natural pain displaying behaviour, we shall imagine that we naturally utter, e.g., "yellow" (not in a role) when our eyes are focused on something yellow. Thus here, as before, we shall consider material features, not as descriptive concepts, but as what is produced in a thing and transmitted to the periphery of a sentient being. Conflating feeling pain with picking out features, we shall consider the features, when received, to be felt and the cognition by an observer of the natural expressions to be the picking out of the sentient being's cognition of the material feature. As pain-displaying behaviour is a sign that the position the animal is in is detrimental to similar animals, we suppose that cognition-displaying behaviour is a sign of the cognised material feature (including painfulness) to him who picks it out. This sort of physical account again is conducive to taking that which cognises as unextended, or, at least,that which is rule-following. On the part of the thing which cognises, the display of the cognition of painfulness is a display of pain, expressing pain, which is a feeling. On the same count, other features received on the periphery of the body should correspond to other sorts of natural feelings. Again, practical and propositional empirical knowledge, which depended on how the world is, become dependent on the transmission of features.

Whether or not these feelings are held to be physically in the mind or intellect, the important point is that in the seventeenth century one did not take account of the behaviour displayed, which is replaced with a private occurrence. The Scholastics did in fact distinguish between the reception or feeling of received features (i.e. intensional species) and feeling pain, which they considered to depend on this reception. "Feeling", as in the reception of the species, is a gerund. But for the Cartesians, feelings ("sentiment") in both cases is an occurrence in the mind and "feeling" is to be taken as a noun.

These cognitions, the Cartesians hold, are displayed by man and beast alike and in both cases are for the good of the body. But men have means to evaluate their own cognitions as they have an objective structure present to them and perform rational acts, such as judging. We judge automatically and as a matter of course, they maintain, about the things in our environment according to what is conducive or detrimental to the body, i.e. we are led by prejudice of the senses. Malebranche introduces the Recherche with an account of how our use of the senses was perverted by the Fall. This account is like that of the Coimbrians whose commentaries on Aristotle were known to Descartes at la Flèche and were perhaps as widely known in the seventeenth century as Suarez's works. According to this account, there were not different occurrences in the mind; rather, since the Fall these occurrences lead us to judge precipitously for the good of the body. The goal of following a method in the endeavour to describe things with maximal simplicity and exactness and hence to correct the judgements one is naturally led to make is thus put into a moral setting by Malebranche. The tale itself is not of interest to us; rather, the responsibility men are placed under in their cognition of the relations of material features differentiates human natural cognition from animal and supports the view that these feelings are occurrences physically in the mind.

"Cognise", at least in English, is an artificial verb for the inception and exercise of knowledge. There are a number of verbs in English which do the job of "cognise" when the cognition in question is inceptive. There are a number of ways we are affected physiologically by material features, some depending on particular organs in which the features are received. These material features are determinates under determinables associated with a common sensible. For example, pitches and audible amplitudes are associated with the common sensible of sound and are said to be heard, the organ of hearing being the ears. We shall call those verbs which are associated with the reception of features "sense verbs". Some uses of "see", "hear", "taste" and "smell" count as sense verbs, corresponding to the proper sensibles of colour, sound, taste and smell respectively. The presentation we give here of these verbs is attenuated, for we use them only for the inception of essential empirical cognition of material features.

It is a peculiarity of these verbs and a few others that a statement containing the verb alone has much the same force as a statement formed from it by introducing the appropriate grammatical form of 'can' immediately before the verb, which is inflected accordingly. Thus

(1) He sees the building.

and

(2) He hears the car.

and used to convey much the same information as

(1^1) He can see the building.

and

(2^1) He can hear the car.

The same is true for "smell" and "taste" and for other persons, numbers and tenses of these verbs.

When a verb has uses other than as a sense verb, this grammatical property distinguishes its use as a sense verb. For example, "see" is sometimes used as an equivalent to "read", but when, as it were, the narrative is read out or otherwise presented. Accordingly, we read a novel and see the film version, read the script, but see the production. "Can" operates differently for this use of "see", for:

(3) He sees the film.

and

(3^i) He can see the film

do not convey the same information - (3) is in the habitual present tense and (3^i) carries a conversational implication that he has not seen and is not seeing the film. Indeed, in some cases the primary usage of a verb followed by a "that" - clause, when it is a sense verb, is when it is preceded by "can". For example:

(4) He feels that the building is shaking.

usually indicates that he believes that the building is shaking, while

(4^i) He can feel that the building is shaking.

is to do with sensing. The difference between 'hear that...' and 'can hear that...' is to be noted as well.

Prefixing "can" to sense verbs results in something like a continuous tense, otherwise generally lacking for these verbs because of their success nature. Thus we do not say

(1^{ii}) He was seeing the building for five minutes.

and

(1^{iii}) He could see the building for five minutes.

is preferred over

(1^{iv}) He saw the building for five minutes.

where the use of "saw" is similar to "looked at" or "watched". "Can" is not used here for a competence (e.g., 'He can add fractions'), faculty (e.g., 'He can see') or power (e.g., 'He can lift the chair'). Rather, it is related to the positions one is in. We say of someone that he can hear the train if he concentrates because he is appropriately situated; we also say, e.g., that someone could have heard the train if he had been on the platform. The fact that prefixing 'can' results in something like a continuous tense is associated with the fact that in these contexts its use is related to the position one is in.

Features are received because of the position one is in and a claim to know which concerns empirical knowledge is justified by stating the position one is or was in. But more is required than being in a position, for from the fact that one is in a position, e.g., to see the train, it does not follow that one does see the train. There must be some cognition-behaviour displayed or a shadow of it. As the philosophers with whom we are concerned considered cognition to be an occurrence in the mind, we shall say that the thing which cognises a feature must be 'alive to' that feature, i.e. it feels the material feature. If there were a material feature corresponding to pain, it would be felt as material features which are seen, heard, tasted or smelled are held to be felt.

We shall thus take 'feel' as a general sense verb. One of the traditional five senses is the sense of touch, but 'touch' is not properly a sense verb: two bodies touch one another whether or not they are animate. 'Feel', however, is not associated with a proper sensible: we feel weights, motions which are transmitted (such as the shaking of a building), heat and cold and textures as well as pain. It is the general nature of what is felt which makes 'feel' particularly apt as a general sense verb. However, there are uses of 'feel' in which it is not a sense verb. Emotions and feelings which one can have only because one has been inducted into a culture are felt; but they do not depend on the position one is in (unless one takes 'position' in a social sense). 'Feel' is also used in the sense of 'believe' and for an activity, most commonly associated with one's hands.

With these qualifications, we shall take feeling a feature to be cognising that feature. We shall take 'to be alive to' more generally than 'to feel', allowing that one can be alive to things which produce features.

This account, which is modelled on the Cartesian account, but applies with minor variations to the other accounts we shall consider, is very restricted. For one thing, it does not recognise the conceptual connection between various sense verbs and the faculties and organs of sense. For example, the grammar of 'see' is such that one is said to see only with one's eyes. Nor does this account consider what is peculiar to rule-following beings, for the rule-following aspect is minimised. If we consider the behaviour which displays cognition of material features as natural utterances expressing these feelings, the conventional element, though minimised, is not eliminated. Natural utterances could be classified into groups: "yellow", "blue", etc., "sweet", "sour", etc., and so on. These already exhibit a grammar, as is shown by what we have already said about the mutual incompatibility of material features under one determinable and the co-instantiability of material features under different determinables. Finally, the part played in empirical cognition by acquired facilities is largely ignored. Indeed, modelling this on feeling, the account one gives best fits a lower form of life, lacking distinguished organs of sense.

There are two more verbs which we must mention before completing this discussion of empirical cognition. Empirical essential cognition occurs not only in the inception of empirical essential knowledge, but also in its exercise. One verb which we have already mentioned in this context is "remember", as used in the occurrence sense. 'Remember', however, is not a sense verb. We do say that someone <u>can</u> remember something, but 'can' here indicates a faculty.

Another verb which one might think has a place here is 'imagine';

but this, unlike 'remember', is generally not a success verb. Still, we say that one can imagine something and in the seventeenth century the ability to imagine something was taken to depend on prior cognition. We could think of imagining as the exercise of a number of dispositions to remember. But for imagining, unlike remembering, there is nothing which obviously counts as a display. One might consider as imagining the repetition of an habitual form of behaviour, but in an unwarranted situation.

Chapter V

Chomsky

Recently, Noam Chomsky has maintained that the facts of language acquisition can be accounted for only by assuming that an important component of this competence is innate. He suggests that this, though an empirical position, supports the theory of mind presented by seventeenth century rationalism. Furthermore, Chomsky's notion of a (grammatical) rule is central to his position. And he attempts to mathematically analyse behaviour; this is in the spirit of seventeenth century rationalism, but is differently conceived and gives different results.

Chomsky extends his innatist position generally to cover what he calls complex behaviour; it is this general psychological position which is of greatest interest. To give a description of complex behaviour, Chomsky calls upon mathematical theories which generally ignore metric properties (such as length, time and angular measure). In this respect, Chomsky's work is one aspect of mathematics' colonization of new subjects, especially in the social and behavioural sciences, which has been a significant feature of mathematics this century. But much of the activity and structure postulated by the mathematical theory is not apparent in gross, overt behaviour. So these are postulated as theoretical entities (or, more exactly, unobservable activities and structures), in a way similar to the way in which the physical sciences refer to unobservable entities whose properties explain observable properties. These activities and structures must be instantiated in something; the obvious candidate is the central nervous system - hereafter referred to as the CNS.

Now verbal behaviour is rule governed. Indeed, a look at a grammar for any natural language will convince one that there are a large number of rules admitting of few exceptions; and these exceptions can largely be accounted for by increasing the number of rules. Rules - both formation rules and rules of inference - are explicitly presented for artificial languages. For all artificial languages of any interest, we could specify a machine which could generate only well-formed strings formed from the vocabulary according to the formation rules. This suggests the project of specifying natural languages by explicitly listing all the rules and identifying grammaticalness with well-formedness. This would give automat on models of users of natural languages. This - and the accompanying application of explicit systems of rules to natural languages - is Chomsky's contribution to mathematics' colonisation of the behavioural sciences (including linguistics).

Such models are far removed from our ordinary concept of a person. And, since cognitive concepts depend on the concept of what instantiates them, this involves a considerable change in - or, perhaps, addition to - our ordinary concepts of human knowledge, cognition, etc. Theories of complex behaviour which characterise it in terms of systems of explicit rules intend to get behind gross behaviour and explain it in terms of internal activities and structures; "competence" is held to be internal and to result in "performance". On an innatist position, some rules or other aspects of competence are held to be "internalized"; but a component of competence is held to be internal from birth (or through development). These notions of internal and internalization are similar in many ways to seventeenth century notions of ideas, especially Locke's. And these notions are more fundamental than that of innate competence.

It is difficult in Chomsky's theory to draw a significant distinction between what is mechanical, what is biological (in the sense of displaying gross behaviour appropriate or inappropriate to its circumstances described in ways relevant to the behaviour), and what is cultural. This is surprising, given that Chomsky makes such a point of the creative aspect of human language, which he contrasts with mechanical activity. But the truth is that this is a contrast between two sorts of "behaviour" corresponding to two sorts of automata. Chomsky's sense of "creative" is odd; his notion of a rule is from the study of artificial languages; and a competence for Chomsky is less like practical knowledge than it is like a programme in a computer. A child's supposed innate linguistic competence is sometimes characterised in terms of hypotheses - Chomsky calls them beliefs - weighted according to an innate metric. In general, belief and internal cognitive structures take over from practical knowledge.

However, there is a general way of arguing against internal structures, objects, etc. which are posited to explain cognition[1]. For we can always ask how we know or know how to use the internal structures, objects, etc. If we can answer this without introducing further internal structures, objects, etc., then we could have just as well answered how we, e.g., can pick out a physical object or know how to use words without appealing to internal structures, objects, etc. If we cannot answer how we know or know how to use the internal structures, objects, etc. without appealing to further structures, objects, etc., then we are involved in an infinite regress. We shall use arguments of this sort frequently in the sequel.

Chomsky and others neglect persons and their gross behaviour. This is hardly surprising, given their automaton models and the part they give to the CNS. Their notion of what a rule is cuts out consideration of behaviour in a proper sense, allows nothing to be said about the application of rules and concepts, and makes a mystery of the fact that we make decisions.

Our alternative involves considering the rules as cultural. Following a rule is not performing a well-defined procedure, but involves picking out relevant aspects and sometimes deciding. The rules are always capable of further specification. Persons and <u>their</u> behaviour are subject to rules. Our internal machinery is not the locus of cognition, but rather is exploited in cognition. Chomsky makes a great deal out of the fact that tacit knowledge must be attributed to language users. This is meant to be evidence for internal rules which have never been explicitly presented to the language user. But tacit knowledge is at least as easily accounted for by the fact that a language user is subject to an objective structure, any rules of which cannot be stated or understood without supposing other rules of the same structure.

The positions we shall criticise take their theoretical terms and models too seriously. They ape the methods of the physical sciences; cognition, however, is not the sort of activity which can be explained in terms of dimensions, limiting cases, or distributions giving rise to observable properties. Chomsky in particular applies a sophisticated discipline with its own criteria of simplicity and exactness to the whole range of language use. He is able to formulate specific hypotheses within this discipline as four-dimensional diagrams - automata functioning to accept or generate well-formed strings in an artificial language. The formal features of the diagram are held to be instantiated in the most important physiological part of the person.

Chomsky supports his position against three competitors, all of which are held to be instances of the empiricist hypothesis (opposed to Chomsky's innatism). Firstly, Claude Shannon's cybernetic interpretation of linguistic competence in terms of probabilities calculated from received strings is shown to be untenable. Chomsky interprets Shannon's suggestion in terms of an automaton model using a particular sort of language; his alternative is another such model. We shall spend some time considering the alternative automata and grammars, in the course of which we shall present the generative grammar Chomsky accepts. Transformations have probably received the most general acclaim, but in many respects the generative component is more basic. Secondly, Chomsky showed that Skinner's behaviourism with its operational definitions was insufficient for human languages. Operationalism is also the feature of the third competitor - inspecifically referred to as structuralist linguistics - which Chomsky finds objectionable. Rejecting operational definitions leads Chomsky to posit theoretical entities.

We shall move beyond Chomsky's own work to discuss points which are presented in more detail by others. The weak component of transformational grammar is semantics. Semantics is called upon at least to account for valid inferences and has allowed transformational grammar to be incorporated in attempts to systematise the logic of natural languages. If transformational grammar adds anything to this project, I argue, then there is reason to deny Chomsky's innatist hypothesis. We shall then consider positions developed by D. M. Armstrong and J. A. Fodor which set in relief the neglect of ordinary concepts of persons and their cognition, the position of the CNS as the locus of cognitive dispositions causing overt behaviour, and the reliance on belief at the expense of practical knowledge. Then we concentrate on internalization as instanced in our ability to negotiate towns. A consequence of Chomsky's notion that linguistic competence is a species-specific - i.e. biological - trait is that there could be possible fields of knowledge inaccessible to us; I shall argue against this. Finally, since we shift the emphasis to cultural aspects, we shall show what is wrong with the part assigned to internalization in sociology.

I spend some time showing the extent to which Chomsky's historical claims are false. The grammatical tradition Chomsky finds of interest derives from pre-Cartesian sources and was ignored by Descartes; in the eighteenth century it sought a foundation in Locke. Another tradition, making use of generative notions, culminated in work by Leibniz; but this is ignored by Chomsky, as is Leibniz's theory of monads, described as spiritual automata. The rationalists held onto shreds of our concept of a person and his behaviour; Chomsky leaves this concept behind. Chomsky's own position, being empirical and seeking biological foundation, is poles apart from the conceptual position of the rationalists. Indeed, biological faculties were ousted from the mind as the first step in Descartes' exorcism of the evil demon, who still haunts Chomsky's biological/mechanical man.

In Chomsky's view, the problem the child has in acquiring the rules of its first language is similar to the problem the linguist faces in determining the rules which specify the competence of the native speaker of a given language[2]. Both are presented with a comparatively small corpus, or set of sentences, grammatical or otherwise, of the language. Both must come to select those rules which not only discriminate what is grammatical from what is ungrammatical in the corpus, but also allow the formulation of any number of grammatical sentences not given in the corpus[3]. An additional requirement, which requires special consideration, is that both the child and the linguist must acquire the ability to grasp the grammatical structure of sentences in the given language.

Neither the child nor the linguist confronts the corpus without some principles of arrangement. In the case of the linguist, this is quite clear, for he will always have some methodological standards, not to mention tacitly held assumptions and even his own linguistic competence (albeit in a different language). It might at first be thought that there are hypotheses about the child's development as due to its exposure to the corpus which suppose no principles on the part of the child; rather, the child simply associates verbal types because of the co-occurrence of their tokens in various parts of the corpus. But even this - which Chomsky takes to be the empiricist hypothesis - supposes a principle of arrangement - viz. a principle of association[4].

Chomsky insists that internal states should be considered in the study of behaviour[5], for psychology in general (and linguistics in particular) must be concerned with internal mechanisms which, when the organism is in certain stimulus conditions, give rise to certain sorts of behaviour. He states[6] that it is hopeless to study the purported mechanism which "determines what the organism does (perhaps probabilistically) given its past experience and its present stimulus conditions". This can be represented as

(1) Experience $\longrightarrow$ $\boxed{}$ $\longrightarrow$ Behaviour
Stimulus conditions $\longrightarrow$

What is needed is a characterisation of the competence of the organism, O, how it is gained from experience, and how, given certain stimulus conditions, it gives rise to behaviour. What is missing in (1) is the relevant cognitive state. Chomsky's position is that behaviour cannot be properly studied as the output of a black box, whose input is a set of stimuli; he proposes to describe the internal states. Yet in some respects O is still treated as a black box, for it remains for physiology to locate the states (under a different description) which are postulated by psychology.

What he suggests[7] as a reasonable task is the joint investigation of a mechanism called a learning theory (LT) which "relates experience to cognitive states"

(2) Experience $\longrightarrow$ $\boxed{\text{LT}}$ $\longrightarrow$ Cognitive state (CS)

and a mechanism which "relates stimulus conditions to behaviour, given the cognitive state CS"

(3) Stimulus conditions → $\boxed{\text{CS}}$ → Behaviour.

The situation depicted in (3) must be analysed further to account for the discrepancy between performance and competence or cognitive state; e.g., in the linguistic case, we produce false starts, interrupted fragments, and inappropriate or simply ungrammatical sentences, which do not reflect our competence[8]. Hence Chomsky introduces a perceptual (or performance) model, represented in the linguistic case as[9]

(4) Signal → $\boxed{\text{PM}}$ → Syntactic representation
→ Semantic representation
→ Phonetic representation

where the representations are due to the incorporated competence model. This represents the device accepting signals; when it generates signals, the input and output labels are reversed. (4), the corresponding generating situation, plus the competence or cognitive state incorporated in PM together represent the situation depicted in (3).

The learning theory, LT, in (2) is a theoretical construct. In general, for each (sort of) organism O in each of its cognitive domains D (e.g. language), there will be a different LT (D,O). Each is "a system of principles, a mechanism, a function", having as input (domain) an analysis of the data of D by O and as output (range) an internally represented cognitive structure, one element of the cognitive state attained by O[10]. This construct involves two theoretical assumptions: that O and other members of its species "are essentially identical with respect to their ability to learn over the domain D"[11]; and that learning is instantaneous[12]. The study of a given LT(O,D) involves, among other steps[13], the determination of "what is learned by O in the domain D". This step, he adds[14], "is missing in many formulations of psychological theory, much to their detriment". For there is little plausibility in the contention of "the odd variant of empiricism known as 'behaviourism'", that, for disparate domains D_i and D_j, $LT(O,D_i)$ is similar to $LT(O,D_j)$ in an interesting way[15].

An LT(O,D) is innate competence which O brings to bear on the data in domain D and which gives rise to its competence in D. When D is language, the data is the linguistic corpus with which the child is presented and the competence is the internalized grammar. So, as a special case of (2), we have[16]

(5) $$\text{Corpus} \longrightarrow \boxed{\quad I \quad} \longrightarrow \text{Grammar}$$

The mechanism represented by "I" is characterised in a number of ways, other than as a learning theory. It is said to be "the property of the mind" enabling a child "to acquire the grammar of the language spoken under" the abstraction from observed variety within given societies to a uniform speech community[17]. It is also said to be something biological, a "specific adaption" to acquire a grammar, and is compared to the adaption to walk[18]. More fundamentally, with the child in the position of the linguist, it is called the "innate linguistic theory that provides the basis for language learning"[19].

The way this innate mechanism is specified is indicated by Chomsky in <u>Aspects</u>. He here thinks of

> the theorist as given an empirical pairing of collections of primary linguistic data (i.e. a corpus) associated with grammars that are constructed by (a hypothetical language-acquisition device) on the basis of such data. ... the theorist has the problem of determining the intrinsic properties of a device capable of mediating this input-output relation[20].

Chomsky lists conditions on the "explanatory adequacy" of a linguistic theory[21]. We shall later discuss the notion of the explanatory adequacy of a theory; suffice it here to say that this is attributed to a theory if that theory has that power and only that power required to formulate - or explain - any known grammar. He gives a corresponding list of what must be attributed to a child for him to be capable of language learning.[22] He then adds[23] that a "language-acquisition device" meeting these conditions can select, from the hypothetical grammars possible under these requirements, grammars that are compatible with these conditions; one grammar in particular can be selected because the device is held to have an "evaluation measure". We shall return to this evaluation measure of "simplicity metric" later. Suffice it to note that, in accordance with the child taken as a linguist, there are two aspects to the simplicity metric. Firstly, it is the most basic innate component, corresponding to "universal grammar" in that any possible grammar must conform with it. Secondly, among formulated theories attributed with explanatory adequacy, the simplicity metric favours that which, very roughly, "says the most with the fewest expressions". (Note that it presupposes that the general features of the class of possible grammars has already been determined.)

Given all this, the alternative between innatism ("rationalism") and empiricism is clearly formulated and purportedly empirically decidable. The empiricist hypothesis, he holds,

> assumes that the device has certain analytical data-processing mechanisms or inductive principles of a very elementary sort, for example, certain principles of association, weak principles of "generalization" ..., or, in our case, taxanomic principles of segmentation and classification ... [24]

The rationalist hypothesis, on the other hand,

> holds that ... there are innate ideas and principles of various kinds that determine the form of the acquired knowledge in what may be a rather restricted and highly organized way.[25]

To decide between these hypotheses (and others), what is sought is a device which can "use" langugaes similar to natural languages in the relevant respects. In fact, to take account of both performance and competence, two devices are sought, and can be represented as follows, combining (4), the corresponding generating situation, (5), and other considerations.

(6) Input signal → | PM | → Representations or interpretations → | Grammar or competence: Internalized rules | Innate structure |
Output signal ← | PM | ← Representations or interpretations ← | Grammar or competence |

The performance or perceptual model is said to be "a system of information processing"[26] which "operates under constraints of memory, time, and organization of perceptual strategies that are not matters of grammar".[27] Its outputs "converge on those predicted in terms of the grammar" only when "given time and computation space under contrived experimental conditions".[28]

Verbal behaviour is only one case in which an LT(O,D) can be sought. Something similar to (6) could be sought for many different D's. In each case, a supposedly biologically determined form of behaviour would be explicated in terms of automata. Chomsky holds[29] that psychology will study the performance mechanisms and, regarding competence, he states that

> ... psychology is that part of human biology that is concerned at its deepest level with the second-order capacity to construct cognitive structures that enter into first-order capacities to act and to interpret experience.[30]

G.A. Miller, one of Chomsky's collaborators, has succinctly defended the validity of the biological application of automaton models.[31] Miller feels that there is no objection to considering the class of all possible systems, mechanical or biological, that might perform functions biological systems are known to perform. This would bring the procedure of biology, so far concerned with actual organisms, into line with that of physics. It would involve concentrating on one function at the expense of others. The ideal would be to establish that, if any device performs a certain function, then it must be limited by a certain set of principles which apply to any possible device performing that function.[32] Chomsky's characterization of human linguistic competence is a perfect example of this mechanical taxonomy. Note, however, that the functions, and not the organisms, are classified.

What makes language peculiarly suitable for such an investigation is not only the fact that the input and output in (6) are from the same family of phenomena, but also that they can be described with a great deal of precision in terms of items and rules which are not unmanageably large in number. This gives a precise way of determining what competence must be attributed to the native speaker. Syntax is ideal for such a study, for not only are the largest and most easily analysed structural units syntactic, but also syntax (unlike semantics) need make no reference beyond the components described in (6).

The approach used to determine the innate structure in (6) is to find an upper and a lower bound on the sorts of automata which could take as input or give as output sentences having a syntactic structure similar to those of natural languages; Chomsky then proceeds to move the upper and lower bounds together by finding what adaptations must be made at the two bounds to extend or restrict the sorts of languages which could be "used" by the automata.[33] "Linguistic universals", common to all natural languages, are of interest in an empirical inquiry only if we can show what a language not conforming to them would be like. We want automata which function according to principles other than those of innate human linguistic competence. Chomsky satisfies this requirement by considering artificial languages which an automaton could be instructed to accept or generate.

It is essential to get some notion of the nature of these languages. Their rules are explicit and a useful criterion of explicitness is whether a rule can be followed by an automaton; this will do as a definition of "algorithm". The rules in the automaton model relate to states of the automaton and to the symbols of the vocabulary of the language. One imagines that the symbols are written on consecutive squares of a tape which is fed through the device. The rules apply to "situations" - i.e. a symbol and a state of the machine - and specify subsequent situations. Certain strings of symbols can pass square-by-square through a given automaton only if the automaton has the states and the instructions (or rules) which allow the passage from one symbol-state to another. In such a case, the string is said to be accepted by the device.[34] The same formal relations hold for generating a string; only the temporal relations need be changed.

These are quite a number of considerations to keep in mind; so let us get clear on what is of primary importance. Neither the states of the machine nor the vocabulary are essential to the sort of machine or the sort of language it can use. What is important is their relation to each other as specified by the rules. But, again, particular rules can be substituted one for another without affecting the sort of automaton or the sort of language it uses. What this depends on, rather, is the sort of rules or instructions: whether they can specify movement of the tape in both or only one direction, whether they can specify that a symbol be replaced by another, whetherthey allow the machine to use the whole tape or only the part occupied by the string of symbols, etc. Conversely, of course, we could say that different sorts of automata specify different forms of rules or instructions. Different sorts of automata and instructions in turn use, i.e., specify different sorts of languages; and, given a sort of language, one is restricted to a certain sort of automaton or set of rules. What is meant by different sorts of languages are languages that differ in some systematically describable structural - that is, syntactic - property.

For example, languages whose well-formed strings are of the form $a^n b^n$ [35] differ in an important syntactic way from those whose strings are of the form $(ab)^n$, even though the string ab is in both languages.

Chomsky has reported that his first work of acclaim, Syntactic Structures (1957), was "a rather watered-down version of earlier work (at the time unpublished)".[36] The enduring value of Chomsky's work has been seen in "the mathematical rigour and precision with which he formalized the properties of alternative systems of grammatical description".[37] This concerns syntax. In the work in which he most thoroughly presents his automata models, he mentions two departures he makes from Saussure's distinction between langue - competence - and parole - performance.[38] Firstly, he says nothing about the semantic side of langue. Secondly, Saussure regarded langue as a storehouse of signs and their grammatical properties and had no way to deal with sentence structure; this led to what Chomsky describes as the "bizarre consequence" that parole, not langue, is involved in the formation of sentences.[39] Linguists have reported that Structures made such an impact because it justified intuitions on such matters as the relation between active andpassive forms (which are unrelated in phrase structure analysis, leaving the intuition unaccounted for by the immediate-constituent phrase-structure-grammar of the day); and, further, a technical treatment would have made the results inaccessible to most linguists.[40] But Chomsky's treatment of syntax depended in the first place on making explicit the way in which syntactic structures are due to explicit rulesand their application, which is the essence of the technical treatment.

To see this, let us return to the notions of a machine generating a string of symbols and of rules as algorithms. Specifying a set of rules and a vocabulary specifies a "grammar"; it also, given the states of an automaton, specifies an automaton. As the automaton is said to generate (or accept) a language, so the grammar is said to generate a language - in a completely explicit way, i.e. there is an effective procedure for generating any sentence in a language, given a grammar for it.

Notice that "generate" refers to a formally defined relation between a grammar and a set of sentences. There is no suggestion of a temporal process. In the same sense, the set of natural numbers, considered in terms of their relations with regard to the operation of addition, is said to be generated by the set {1}.

A grammar generates a language in a special way. To see this, consider how {1} generates the set of natural numbers by addition, viz. one is added to one (giving two), then added to this sum (giving three), etc. That is, the unique non-null element of the set {1} is recursively applied (added). Similarly, when the set of generators are syntactic rules, these are applied recursively to generate syntactic structures. Any given rule can be applied as often as needed. (Of course, when there is more than one generator in the set, it might make a difference in what order they are applied.)

Chomsky holds[41] that "langue must be represented as a generative process based on recursive rules". The insight that "infinite sets with certain types of internal structure ... can be characterised by a finite recursive generative process" was not available to Saussure, and it allows Chomsky to avoid the "bizarre consequence" that sentence formation is a matter of parole.

The rules of grammars corresponding to automata are "rewriting rules" and the grammars are "rewriting grammars". To take an example, let the grammar contain the vocabulary {a,b} and the rules

Rule 1. $S \rightarrow aSb$

Rule 2. $S \rightarrow aA$

Rule 3. $A \rightarrow a$

A "derivation" is a sequence of strings, each of which is formed from the preceding one by applying some rules of the grammar, e.g.

S	
aSb	by Rule 1
aaSbb	by Rule 1
aaaAbb	by Rule 2
aaaabb	by Rule 3

In general, this grammar generates the language whose sentences are of the form $a^{n+2}b^{n}$. The capital letters are "auxiliary" or "nonterminal symbols" and correspond to the states of the automaton. In many cases, the instructions of the automaton must be rewritten to include rules which allow for changes of state without changes of the input tape to correspond to rules generating languages like natural lnaguages. But the divergence is only notational: it remains true that a set of rules or instructions for an automaton specifies a set of rules of a rewriting grammar and vice versa. Furthermore, as restrictions are added to the automata to approach a device which represents a native speaker's competence, so restrictions are added to grammars to approach those which generate natural languages.

However, it is not sufficient that the grammar merely generate strings corresponding to sentences in a natural language. Consider the sentence "They are flying planes". The ambiguity of this sentence can be shown with parentheses: "They (are (flying planes))" and "They ((are flying) planes)". What is called the weak generative capacity of an automaton or grammar concerns the set of strings that it generates. Its strong generative capacity refers to the structural descriptions it assigns to strings. It turns out that only one class of rewriting grammars allows us to consistently assign structural descriptions to sentences. The grammars are "phrase structure grammars" and the structure is represented by a "phrase-marker" or "P-marker".

Consider the example above. The two interpretations can be generated by the rules:

Rule 1. S → Pro VP

Rule 2. VP → V NP

Rule 3. VP → V N

Rule 4. NP → Adj N

Rule 5. Pro → they

Rule 6. V → are

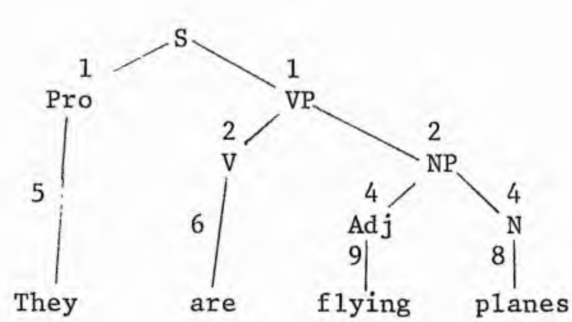
Rule 7. V → are flying

Rule 8. N → planes

Rule 9. Adj → flying,

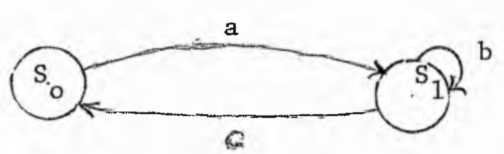
where the following abbreviations for the auxiliary symbols are used: "S" for "sentence", "Pro" for "pronoun", "VP" for "verb phrase", "V" for "verb", "NP" for "noun phrase", "N" for "noun", and "Adj" for "adjective". Rules 1-4 are subcategorization rules and introduce nonterminal symbols; the corresponding instructions for an automaton specify a change of state without a change of the input tape. Rules 5-9 are lexical insertion rules and correspond to instructions changing the input tape. Roughly, the subcategorization rules are responsible for syntactic structure; the lexical insertion rules, for the symbols in the string.

The P-marker for the first interpretation is derived by applying the rules in the order: 1, 5, 2, 6, 4, 9, 8.[42] This gives (where the edges between X and Y and X and Z are labelled with the number of the rule X → Y(Z))



A different order gives the P-marker for the second interpretation.[43]

P-markers are an instance of tree graphs. Graph theory in general is one of the major forces in mathematics' colonization of new disciplines. The "nodes" or "vertices" (here occupied by symbols) are connected by "edges" (here labelled with the numbers of rules). A graph, G, is specified by giving its set of vertices, V(G), and the set of pairs of vertices connected by edges, E(G). The distinguishing mark of a tree graph is that none of the series of edges or "paths" connecting edges forms a "circuit", i.e. a path in which all the vertices are distinct but the first and the last, which are identical - the path is "closed". A major factor in the wide application of graph theory is the fact that graphs need not involve any metric properties. Further, the vertices can represent any sort of "thing" and the edges any relation between them. Yet graph theory is a rigorous mathematical theory with a number of important results. One of the early applications of graph theory was Cayley's use of tree graphs to determine the number of non-isomorphic stuctural formulae corresponding to each (empirical) chemical formula of the form C_nH_{2n+2}. Tree graphs can also represent power structures in societies. In fact, Leibniz's description of the hierarchy of monads describes a tree structure. The relation between states of automata such as we have been discussing can be represented by Eulerian graphs, i.e. graphs in which there is a closed path including each edge. Here, however, one must give a direction to the edges (now called arcs), i.e. these are "digraphs" known as state descriptions in automaton theory. The following is a very simple example.

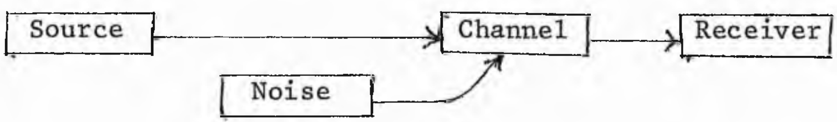


Here the vertices represent states and the edges are labelled with the symbol accepted at each state transition permitted by a particular instruction. This automaton accepts strings of the form ab^nc.[44] Another application of digraphs is in computer flow-charts, representing the order in which tasks are performed. Again, digraphs represent the communication of information, however "information" might be interpreted.

Now on Chomsky's position, the P-marker - the tree graph representing syntactic structure - must represent something within the language user. For the language user is held to syntactically interpret phonetic signals by matching them with structural descriptions generated by the grammar it internalizes.[45] One could, equivalently, think of the interpretation of syntactic structure in terms of the application of the rules of grammar to the phonetic strings. The characterizations are equivalent because the P-marker portrays the application of the rules in particular cases.[46]

The first sort of automata considered as models of human linguistic competence are finite automata; these turn out to give a lower bound. In showing that these cannot be models of linguistic competence, Chomsky also shows that linguistic competence cannot be represented in terms of information (or communication) theory, or cybernetics, alone. In the late 1940's and early 1950's, when cybernetics was a new field, a number of American linguists not unnaturally sought to explicate natural languages with concepts derived from the mathematical theory of communication.[47] Chomsky sometimes gives the impression that in rejecting information theory as a model of linguistic competence, he rejects all artificial devices as such models.[48] But, in fact, information theory, as embodied in finite automata, is construed as one among a number of hypotheses about innate human linguistic competence. The finite-automaton hypothesis, postulating the least syntactic structure in language, so the least innate structure in the user, is taken as the empiricist hypothesis. There is no particular initial plausibility to this hypothesis, for, as the alternatives are presented here, there would be no more reason to assume that this hypohtesis is true than to assume that an untested die will land ace-up.

There are two different, yet equivalent, presentations of information theory. They are best considered in terms of the components postulated by this theory

(7) 

Information is sent across the communication channel. This imposes restrictions - channel capacity - on the amount of information. Indeed, information theory is concerned with the amount of information; it says nothing at all about what information is or the meaning of the symbols or events making up the signal. The unit is called a bit.[49] Each bit corresponds to a yes-no decision - a decision between two alternatives. If the number of the alternatives is, e.g., eight, the decision at each "epoch" can be thought of as involving a decision between two sets of four alternatives, then a decision between two sets of two alternatives, and finally a decision between two alternatives; thus there are three $= \log_2 8$ bits of information at each epoch.[50] Notice that this relates to channel capacity; the significant unit is bits per epoch. Often one wishes to characterise the amount of information in the signal independently of the channel. Then one must consider overall properties of the signal or the set of signals to which it belongs.[51]

The fact that the amount of information at any one epoch is determined by the number of alternatives allows the alternatives to be construed as linguistic items. The fundamental structuralist insight is that linguistic items are determined by their mutual differences, and so form a self-contained system; this characteristic can be referred to as linguistic holism. At each position in the formation of a sentence, one can choose from a set of alternatives. In fact, however, one does not choose from the whole set, since the set of items which can occur in a given position - those which are in "paradigmatic opposition" - is restricted by those items which form its context - those items which are in "syntagmatic opposition" with the items in question. There are different levels at which one can distinguish items.[52] A clear example is furnished by phonemes, roughly corresponding to speech sounds, although more abstract.[53] Phonemes are functional units - they are in paradigmatic opposition to one another - and differ from language to language; and their realization often depends on syntagmatic oppositions. At the level of speech sounds proper, one talks of distinctive (phonetic) features, any particular sound being specified by whether it has or lacks certain distinctive features. (Note that each distinctive feature corresponds to a yes-no decision.) These form a holistic system for human languages in general; not all distinctive features need occur in any one language. Within individual languages, the various holistic systems (phonemes, morphemes, etc.) can be construed in cybernetic terms.

The second interpretation of the amount of information concerns more directly the components of the communication system in addition to the channel. A channel will randomly introduce items from the set of alternatives from which we choose in forming a message; that is, a channel has some degree of noise. The noise will almost certainly be in a very probable distribution of the items. We can usurp the thermodynamic term "entropy" and say that the channel, in so far as it contains only noise, has very high entropy. We want some indication that what is received is a message and not simply noise.

The "authenticity factor" does this; it is the negative of entropy or "negentropy" and is set equal to the amount of information in a received sequence.[54]

The authenticity factor relates the source with the receiver. Now the amount of information the source can transmit or the receiver receive depends on the number of alternatives there are to choose from in the vocabulary V. But if these items are chosen at random, the information (negentropy) will be almost zero. The amount of information in the source (analogous comments apply to the receiver) is taken to be the difference between the maximum entropy possible with the items of V (viz. when they are chosen at random) and the entropy of messages actually transmitted by the source. If the maximum entropy is taken to be zero, then the amount of information in the source is again negentropy.

For the receiver, this information can be thought of as a priori or internal information about messages received in the language. For the source, it would supply constraints on the formation of messages. "A priori" is used here in the sense of a priori probability - the probability assigned to events before the trial(s) in question. From another point of view, the information shared by the source and the receiver can be thought of as a posteriori information, and the state of maximum entropy - when all symbols are equiprobable - can be thought of as the a priori information. Thus a child begins life with no information about the frequency of words in its mother language, but gradually acquires internal information from the messages it receives.

On the vew sketched here,[55] redundancy[56] is the statistical structure of a message which is beyond our choice in the selection of the message. It does the job of syntax in an odd sort of way.

Information theory has furnished a new tool for cognitive psychology.[56] The general approach is to find the channel capacity of the human observer by correlating the information in the stimuli with the information in the responses. This has an advantage over previous attempts at quantitative data about the observer, which purportedly measure the strength of sensations, in that it is expressly concerned with the correlation between two observable phenomena. The man-as-communication-channel view is also suggestive of new experiments and techniques.[57]

There is no doubt that the findings of such experiments are empirically significant. But a great deal of care must be taken in how they are interpreted. The term "information" suggests that what receives or communicates it cognises something. But information theory is a mathematical theory of very wide application. The application of the statistical thermodynamic concept of entropy is restricted to systems in which one can already say something about the distribution of a certain sort of thing and its states - e.g. molecules and their energy states or electrons and their energy levels. But any such restrictions are indirect for the application of the concept of negentropy. Essentially the same cybernetic system could be realized with any number of materials by exploiting any number of physical laws. In the end, the only restrictions on the application of information theory are those of human ingenuity, both in technical realizations and in discovering how to exploit physical systems which are already given.

In the experimental examples referred to, the language-dependent skills of the experimenter are involved at both ends of the human channel. They are involved at the input end because he designs the experiment and manipulates the stimuli to different values along the dimension. They are involved at the output end because he communicates with the subject or, failing this, interprets the subject's behaviour in his own terms.

Experiments on channel capacity, since they relate to the maximum number of discernable features, might indicate the foundations for linguistic holism in certain dimensions - colour is the most obvious candidate. But any such foundation must be exploited to be linguistic.[58]

In the early years of information theory, there was much talk about the CNS and the sensory systems as cybernetic systems accounting for human cognition.[59] But, as mentioned above, almost any system could be a communication channel. It even seems that one physical structure of nerve and various other tissues could be two different sorts of cybernetic systems, depending on how it is used. For example, if physiology and communication technology were sufficiently advanced, we might be able to incorporate the visual system into an audiocommunication network.

We must keep in mind whose information and whose concepts are involved; and also whose behaviour is the acting on the information received. I am not criticising the application of information theory. Rather, I am criticising taking "information" seriously, attributing knowledge to components, and circumventing accounts of why someone Ø'd when he found out that p by tracing physiological pathways. There is a certain appeal to "explain" knowledge and cognition in the way one would explain the size of a crystal by stating the average distance between atoms and the number of atoms. But cognition is not a joint affair.

The effect of arranging tasks and presenting information in different ways[60] suggests that Gestalt effects[61] must be considered. Gestalt theory suggests that the hypothesis of minimum innate competence is false, at least concerning perception, and that statistical experimentation and explanation must begin by taking the structures it finds into account. Chomsky's position on language is similar to the Gestalt position on perception. Indeed, the perception of phonetic sequences is an example of a Gestalt effect, as is evident from intonation patterns.[61]

Now for Chomsky information theory is embodied in finite automata as the empiricist, minimum-structure hypothesis of innate linguistic competence. These automata correspond to regular languages,[62] which can be generated by recursive rewriting rules of the form $S \rightarrow aS$, with terminal rules of the form $S \rightarrow a$. The instructions or rules for a finite automaton allow for the tape to move in only one direction (to the right, say) and do not allow for the machine to print symbols on the tape. The most plausible sort of finite automaton is a particular sort of what is called a k-limited automaton suggested by Shannon.[63] The states of such automata are determined by the last k symbols accepted on the tape. In terms of rewriting rules, this means that the applicability of a rule depends on the last k symbols to the left of the auxiliary symbol to which the rule applies. The particular sort of k-limited automata are probabilistic ones. Associated with each state of a probabilistic k-limited automaton are probabilities for each of the D symbols of the vocabulary. Each of these gives the probability that the next transition will be into a state determined by the last k symbols on the string followed by the symbol with which the probability is associated. Equivalently, each value gives the probability that, given the string of k symbols determining the state, the next symbol on the tape will be the symbol associated with the probability value. A probabilistic k-limited automaton has D^k different states.[64]

There are thus D^k different probabilities to be calculated: one for each state transition, or one for each concatenation of a symbol to each possible string of k symbols. The transition probabilities can be estimated by counting the (k+1)-letter (or -word) strings of each type; these probabilities can be used to produce "(k+1)-order approximations" of the corpus. As k increases, the strings take on a more familiar look. An example of a fifth-order word approximation is

> Road in the country was insane especially in dreary rooms where they have some books to buy for studying Greek.[65]

However, such devices cannot represent linguistic competence or even allow for language acquisition. Chomsky gives three reasons why they cannot. Firstly,[66] there are many grammatical sentences which have never been uttered and so could not be represented in any estimation of transitional probabilities. Secondly,[67] by the time k and D have grown large enough to give a reasonable fit to ordinary usage, the number of probabilities to be calculated is astronomical. On the most conservative estimates of k and D the child would be called upon to learn 10^9 parameters in a childhood lasting 10^8 seconds.

Chomsky refers to these two reasons throughout his less technical writings as reasons the empiricist hypothesis cannot account for language acquisition. The first reason is restated as the fact that languages have finite means (phonemes, lexical entries, rules, etc.), yet there are an infinite number of grammatical sentences in every natural language.[69] The second is restated as the purported fact that a child could not internalize the grammar of a natural language, given a minimum of innate structure and the poverty of the corpus with which he is presented.[70]

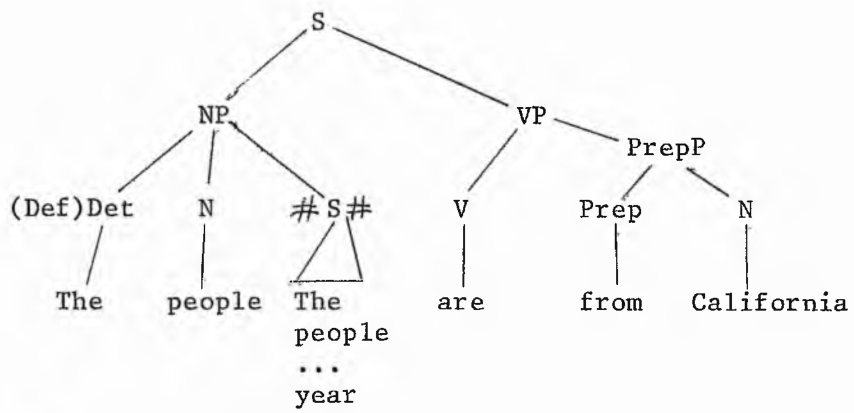
The third reason Chomsky gives why a probabilistic k-limited automaton cannot represent linguistic competence applies generally to all finite automata. Furthermore, it is a syntactic reason, so applies more directly to the supposedly innate component of linguistic competence. The reason basically is that natural languages are not regular languages.[71] Consider the following sentence

(8) The people who called and wanted to rent your house when you go away next year are from California.

The clause from "who" to "year" is a relative clause and is derived by a grammatical transformation called Relitivization from the sentence

(9) The people called and wanted to rent your house when you go away next year.

Sentence (9) occurs in "deep" (as opposed to "surface") structure. The P-marker in deep structure "underlying" thesurface structure P-marker for (8) is



The symbol "#" flanking "S" indicates that the sentence dominated by this node must undergo a transformation for the whole sentence to be grammatical. What is significant for us is not that transformations are involved, but that an instance of a grammatical categoy occurs within the context of another occurrence of the same category. Languages with constructions of the sort XYZ, where both the string as a whole and Y are instances of the same grammatical category, are "self-embedding" languages. The automaton which accepts (generates) sentences with self-embedding must interrupt its accepting of the principal sentence, accept the embedded sentence, then continue accepting the principal sentence.[72] We can think of the nodes and their relations in the P-marker acting as memory. This can be so because the instructions determining the automaton can be stated in such a way that they refer to a state previously entered and specify a change of state without a change of symbol scanned on the input tape. The instructions can be so because the rules of the grammar generating the language have certain sorts of subcategorization rules and lexical insertion rules. A finite automaton, corresponding to rules of the form $S \to aS$, lacks the required sort of memory: a symbol is scanned with each change of state.

The lower bound, finite automata, embodying the empiricist hypothesis, is thus eliminated as a model of linguistic competence. An upper bound is given by Turing machines in general. A Turing machine differs from a finite automaton in that

a) the tape can move in either direction

b) the machine can print on the tape as well as scan it, and

c) the whole tape (thought of as infinite in extent) is available.

Now a language generated by a set of recursive rules is "recursively enumerable" - any string in it results from a definite number of applications of the rules. Given a language L whose strings are formed from members of the vocabulary V, the complement of L, L_c, is defined as the set of strings formed from the members of V which are not strings of L. L_c might or might not be recursively enumerable when L is. If both L and L_c are recursively enumerable, L (and L_c) is "decidable": given any string formed from members of V, one can determine in a definite number of steps whether or not this string is a member of L (or L_c). Now if L is undecidable (even if it is recursively enumerable), then a speaker of L would have no way of knowing that a given string is not in his language. This is sufficient reason to reject the automaton corresponding to L as a model of linguistic competence.

Turing machines can represent any formal system. More explicitly, an unrestricted rewriting system or grammar is any grammar with rules of the form $\phi \rightarrow \psi$, where ϕ and ψ are strings formed from members of the vocabulary. All these can be directly represented by Turing machines and vice versa. But some languages generated by unrestricted rewriting grammars or Turing machines are undecidable. Therefore, this sort of grammar or automaton cannot represent human linguistic competence. Furthermore, these grammars or automata are too unstructured; one need only consider the lack of constraints on the memory, that is, the print-out of Turing machines to see this. In particular, they give no uniform assignment of P-markers.

We now have an upper bound, and we can move this down by adding conditions to unrestricted rewriting grammars.

Condition I:[73] If $\phi \rightarrow \psi$ is a rule of the grammar, then ψ is not shorter than ϕ.

Since each line of the deivation must be at least as long as the preceding line, languages generated by grammars satisfying this condition are decidable. But this condition is not strong enough to allow uniform assignment of P-markers.

Condition II:[74] Each rule $\phi \rightarrow \psi$ must be of the form $\chi_1 A \chi_2 \rightarrow \chi_1 \omega \chi_2$; i.e. A can be rewritten ω when in the context $\chi_1 - \chi_2$ (where χ_1 and χ_2 may be null).

Grammars meeting Conditions I and II are called context sensitive grammars. Again, these grammars do not allow the uniform assignment of P-markers.[75] This suggests:

Condition III:[76] No symbol can be rewritten as a single nonterminal symbol in any context.

Exceptions are made in natural languages for lexcial insertion rules. By moving the upper bound down, we are now very close to grammars which will assign P-markers to natural languages in a natural way, and so are close to the automata which are acceptable models of linguistic competence.

We can also move the lower bound up. We can modify a finite automaton by allowing the tape to move in either direction;[77] but it still accepts (generates) only regular languages. We can modify it further by allowing the machine to print symbols on the tape as it changes state.[78] This defines a linear-bound automaton. To simplify matters, we can think of such automata as having two infinite tapes, one solely for input and one solely for output. If the output tape (generally referred to as the storage tape) can move in both directions, it can be thought of as memory. Usually such automata use two vocabularies, one $-V_I$ - for the input tape and one - V_s - for the storage tape. Requiring that the storage tape move in only one direction determines a transducer.[79] The storage tape is then an output tape and the automaton effects a mapping - a transduction - of the input language into the output language.[80] Transducers cannot represent human linguistic competence, for their storage tape acts simply as a counter and not as memory, which would put constraints on the strings accepted or generated.

But if we allow the storage tape ofthe linear-bound automaton to move in either direction, we have a pushdown storage automaton[81] and such automata do represent, according to Chomsky, human linguistic competence. The storage tape acts as memory allowing the automaton to remember how "deep" it is in the P-marker.[82] The languages accepted (generated) by pushdown storage automata are generated by grammars which satisfy Conditions I-II plus

Condition IV:[83] A certain nonterminal symbol can be rewritten as a string of symbols, irrespective of the context in which it occurs.

Such grammars are called context-free grammars. In practice, this class of grammars is usually restricted by adding condition III. Also, lexical items are subject to co-occurrence constraints (e.g. "water" cannot be preceded by an indefinite article); this reintroduces contextual constraints while avoiding the undesirable results of context-sensitive grammars. These grammars are the phrase-structure grammars referred to above.

We now have a model of human linguistic competence corresponding to the component on the right in (6); we thereby have an outline of what learning theory or innate structure must be posited. It remains to find a performance or perceptual model, indicated on the left of (6), which relates performance to the competence model. Now utterances are strings of sounds; there is no interruption between grammatical dependencies while a nested component is accepted or generated. The performance of the speaker or hearer is thus represented by some sort of finite automaton. To relate the string of symbols to competence, we need some way of mapping a structural description, or P-marker, into the string.[84] This is done by introducing a bracketed notation in which the left-hand bracket is labelled with the label of the node which it and its corresponding right-hand bracket represent. Included between the brackets are all the brackets and terminal symbols corresponding to the nodes dominated by the node represented by the pair of brackets in question. Thus (10) corresponds to

$\left[_S \left[_{NP} \left[_{(Def)Det} \text{The}\right] \left[_N \text{people}\right] \# \left[_S \text{The people ... year}\right] \#\right] \left[_{VP} \left[_V \text{are}\right] \left[_{PrepP} \left[_{Prep} \text{from}\right] \left[_N \text{California}\right]\right]\right]\right]$

It is easily seen that this contains all the grammatical information contained in (10).

Now for any context-free rewriting grammar, G, there is a mechanical procedure for constructing a transducer whose V_I is the terminal vocabulary of G and whose V_S in addition contains a pair of labelled brackets for every member of the nonterminal vocabulary of G.[85] Such a transducer is the perceptual model on the left of (6); it assigns to arbitrary sentences their structural description with respect to G. By increasing its memory, it can relabel self-embedded symbols up to any bounded degree of self-embedding.[86]

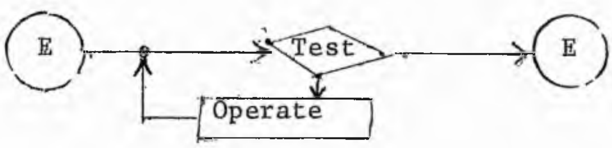
Chomsky has to account for the discrepancy between context-free grammars or pushdown storage automata as descriptions of human linguistic competence and linguistic performance as actually observed. The transduction is part of the account, but calls for further comment. Within competence, he introduces transformation rules. The P-markers of a large proportion of sentences of any natural language cannot be derived from any one context-free grammar. Transformation rules account for this. A transformation is defined by stating a grammatical structure to which it applies, the grammatical structure which it produces, and the relative positions of the items in the initial ("deep") and resulting ("surface") structures. We have already mentioned Relativization. Other familiar examples are those which transform active into passive sentences and declaratives into questions. The lexical insertion and subcategorization rules together make up the base component of the grammar. The base and transformational components make up the syntactic, i.e. (usually) the generative component, the component which generally figures in discussions of competence and performance. However, the "interpretive" components - the phonological and (usually) semantic components - are closely connected with the syntactic component in their functioning.

Transformation rules help to bring competence into line with performance, for the surface structures are more easily accepted by the transducer.[87] A large discrepancy remains, however. Chomsky suggests[88] that the transducer generates an internal signal to match the input signal; if this guess does not match, further guesses are made (now having the additional information from the mismatch) until the match is accepted or the input is dismissed as unintelligible. He also identifies the transducer with short-term memory, which transmits the imperfect structural description of the surface structure to the long-term memory, which embodies the grammar and gives a structural description of the deep structure.[89]

In any case, there remains a great number - in fact, an infinite number - of grammatical sentences which the transducer, and so the human device cannot accept. To account for this, Chomsky drew a distinction in Aspects[90] between acceptability and grammaticality. Some have rejected this distinction and have pointed out that sentences with degree of embedding greater than one are largely unintelligible to humans without calculating aids.[91] But Chomsky's proof that finite automata cannot represent linguistic competence requires examples of self-embedding to any arbitrary depth. It has been suggested instead that this competence can be represented by a finite device protrayed (roughly) by a graph having a number of circuits with one or more common vertices.[92]

It is difficult to see how discrepancies, perhaps very serious ones, such as this can fail to arise with the sort of idealizations which portray human competences by automata. Furthermore, a practical distinction between short-term and long-term memory is magnified into a distinction between components. Recently, Chomsky has denied that the deep-surface distinction implies anything superficial about the latter; he has dropped "deep" in favour of "initial".[93] Yet a good deal of the activity involved in language use can no longer be described as behaviour and Chomsky is essentially in the same position as those cognitive psychologists who theorise about sensations and other mental events which are in principle unobservable.

Chomsky has proposed his treatment of language as a model for other forms of behaviour.[94] He refers to the model of complicated behaviour in terms of "tote" ("test-operate-test-exit") units presented by Miller, Galanter, and Pribram.[95] These units comprise two parts: a test to determine whether some situation matches an internally generated criterion; and an operation reducing the difference between the external situation and the internal criterion either by revising the criterion in the light of thenew evidence or by changing the organism's internal and/or external environment. These parts are linked by a feedback loop permitting iterated adjustments until the criterion is reached



Carrying out the operation may involve further tests. In that case, the box labelled "Operate" is analysed into a sequence of tote units, creating a self-embedding hierarchy.[96] In programming language, this hierarchy is called a plan and its postponed parts are called its intentions. As plans are closely analogous to P-markers, Chomsky suggests[97] that transformational grammars indicate how plans could be combined and rearranged. As a grammar is the source of a P-marker and a programming language is the source of a particular programme, Chomsky adds that there might be many diverse sets of rules as sources of plans in diverse enterprises.

Ulrich Neisser has recently presented a theory of perception incorp-orating structures similar to tote units and which are said to be emdedded in units of the same sort. (Neisser is perhaps the most influential contemporary cognitive psychologist and his Cognitive Psychology (1967)[98] was influential, though cautious, in publicising computer models.) These cognitive structures, or "schemata", are said[99] to prepare the perceiver to accept certain kinds of information rather than others and so control the activity of, e.g., looking.[100] Neisser uses the term "cognitive map", which has come to be used in all disciplines concerned with spatial orientation.[101] Cognitive maps are often thought of as mental pictures; but Neisser refers to them as orienting schemata, which (like other schemata) accept information and direct action.[102] Cognitive psychologists have assumed that there are successive stages or levels of information processing from the specific to the general. But, e.g., a person's object schema accepting information about a lamp in his office is (according to Neisser[103]) embedded in his cognitive map of his office. The orienting schema and the schema for the lamp are simultaneously active and support one another.

> Actions are hierarchically embedded in more extensive actions and are motivated by anticipated consequences at various levels of schematic organization.[104]

Neisser compares cognitive maps with what Miller, Galanter, and Pribram called "plans for speaking".[105] Embedded shcemata, like syntactic subunits in P-markers to which transformations are applied, can be detached from the cognitive map in which they occur.[106]

The general influence of automaton models in psychology and the emphasis on the organism's competence owes a great deal to Chomsky's review article (1959) of B.F. Skinner's Verbal Behavior, an attempt to introduce well formulated behaviourist principles into the study of language. Behaviourism explicitly seeks to make psychology scientific by eliminating from its vocabulary terms such as "sensation", "will", etc. which refer to no directly testable parameters. The general form of this dogma - "operationalism" - was once widely supported in the philosophy of science and characteristically maintains, in the words of the physicist P.W. Bridgman, that "the concept is synonymous with the corresponding set of operations".[107] Stated another way, operationalism holds that the meaning of every scientific term must be specified by a definite testing operation thatprovides a criterion for its application; such operations are "operational definitions".[108]

The point of such definitions is to insure objective testability for all scientific statements. Operational tests, whether or not they are linked with the ontological austerity of behaviourism, have been widely used in psychology.[109] Bridgman had to maintain that, when we find that two measuring operations give the same results in their range of applicability, it is not safe to regard them as determining the same concept, for their concurrence gives only an empirical generalisation. It is obvious, then, that the theoretical requirement of operationalism has substantive implications.

Skinner's basic vocabulary is operationally defined.[110] But, as Chomsky points out,[111] if Skinner maintains (as he does in his earlier works (e.g. Behavior of Organisms (1938)) that only those physical events to which the organism in fact reacts are stimuli and only those parts of its behaviour which are connected with stimuli in lawful ways are responses, then behaviour is lawful by definition.

We can think of the stimulus-response correlation, as previously, in terms of the animal as a communication channel. Those things that are classed as stimuli and the behaviour classed as responses are picked out in the experimenter's own language. The referring expressions of the experimental language, to meet the theoretical requirements, must all be operationally defined. Apparently intelligent tasks which animals are taught to perform (e.g. fetching newspapers) are accounted for as linguamorphic, i.e. they derive from the language-dependent abilities of the trainer. Organisms in stimulus response experiments essentially perform linguamorphic tasks; even when the stimuli occur naturally, they could always have been the result of manipulation.

At the level of operants, the subject must be thought of, not as a communication channel, but as a source. Skinner's position in Verbal Behavior and elsewhere is that the contribution of the organism is trivial; interesting recurrent behaviour is to be accounted for in terms of environmental factors. Furthermore, the basic dependent variable in learning processes, response strength, is defined as "probability of emission" and Skinner writes: "our evidence for the contribution of each variable (to response strength) is based on observation of frequencies alone".[112] So a model of an organism on this count would be a probabilistic finite automaton. The refutation of Skinner now ties in with the refutation of Shannon and both constitute a refutation of the empiricist hypothesis on innate structure. Further, Skinner's position on language complements Shannon's cybernetic model, for Skinner states[113] that the relation of reference for a given term in the vocabulary of the speaker is "simply the probability that the speaker will emit a response of a given form in the presence of a stimulus having specified properties". That is, Skinner is concerned with semantics.

Of course, the terms of English or any other natural language are not operationally defined. So Skinner cannot give the semantics of English. Instead, he illicitly extends the terms in which his theory is stated so that a so-called stimulus is referred to by a technical translation of the English term which is the response to be explained. A similar move is made for syntax, where the so-called stimuli are tokens of English morphemes having (roughly) a descriptive function.

This is essentially Chomsky's criticism. He states[114] that the experimental psychologist is faced with a dilemma. Either he accepts the narrow definition of "stimulus" and "response", making behaviour lawful by definition; or he counts any physical event to which the organism can react as a stimulus and any part of its behaviour as a response, in which case his theoretical claims are not borne out. In Verbal Behavior, neither course is consistently followed.[115] As Chomsky writes

> He utilizes the experimental results as evidence for the scientific character of his system of behavior, and analogical guessses (formulated in terms of a metaphoric extension of the technical vocabulary of the laboratory) as evidence for its scope.[116]

Skinner states that responses are "under the control of extremely subtle properties" of thephysical object or event as stimulus.[117] Chomsky points out that the word "control" is merely a misleading paraphrase for the traditional "denote" or "refer".[118] Skinner, for example, claims that "This is war" may be a response to a "confusing international situation".[119] In general, nouns are evoked by objects, verbs by actions, etc. Similarly, -s in "the boy's gain" is said to be under the control of the "relational aspect of the situation".[120]

Other implausible accounts are given when Skinner ventures to treat certain "autoclitics" which cover Chomsky's home ground, syntax. This class includes the operants involved in assertion, negation, quantification, qualification of response (e.g. "I imagine ..."), construction of sentences (e.g. order and inflection), such units as "let x equal ...", etc. - i.e. all morphemes other than nouns, verbs, and adjectives, as well as grammatical order and arrangement.[121] Sentence construction is explained as an internal process of composition, in which the nouns, verbs, and adjectives are chosen first and then arranged, qualified, etc. by autoclitic responses to these internal activities.[122] (Notice that Skinner must now rely on internal responses.) But, since the grammar accounts for well-formedness we should expect it to contain information about admissable contexts for the lexical items; that is, it should state "selectional restrictions" for these items. Thus lexical items are represented in generative grammar by complex sybmols which not only list phonological features, but also indicate the syntactic context in which the item can occur.[123] It is the fact that lexical items must contain some information relevant to their admissible contexts which makes suggestions such as Skinner's so implausible.

Finally, a central notion for any "empiricist" theory of language acquisition is that of generalization: the range of stimuli which "control" various verbal operants is extended as the child's acquisition of the language progresses. The insufficiency of such an account is a recurrent theme in Chomsky's wiritngs.[124] The linguistic fact which generalization cannot account for is the ability of the language user to utter and understand sentences which are not similar in any simple, physical sense to any he has uttered or heard before. This is largely a syntactic fact, but, in his review of Skinner, Chomsky suggests that generalization conceals complexities in semantics as well.[125] Analogy has been suggested as a mechanism to explain generalization, but Chomsky rightly insists that such a suggestion is far too vague to shoulder any explanatory weight.

The inadequacy of Skinner's analysis of language acuiqistion and use follows from the fact that terms in natural lnaguages, unlike those in behavioural psychology, are not operationally defined. Chomsky shows thoroughly how Skinner smuggles in our ordinary concepts to prop up the extensions of his terminology in his account of language. Chomsky rightly maintains[126] that we must first understand the structure of grammar before we investigate the speaker's performance, the listener's performance, and the child's "construction" of the grammar.[127] This follows from the general point, not mentioned by Chomsky, that to pick out successful performance or adjustment one must know the standard of success. This point should be a truism, but is regularly ignored.

From the inadequacies of Skinner's operationalism and Shannon's probabilistic interpretation of competence, Chomsky derives the very important truth that language is "underdetermined by any fixed association of utterances to external stimuli or physiological states (identifiable in any non-circular fashion)."[128] This is the essential point behind the theme which, together with his nativism, dominates his work that has gained philosophical attention (beginning with Cartesian Linguistics) - viz. the creative use of language.[129]

It is imperative to keep in mind that Chomsky has his own hypothesis, presented as a hypothesis in the empirical sciences in competition with other hypotheses. This range of hypotheses is embodied in a range of language-accepting devices. But one could consider these hypotheses as all subsumed under a more general hypotheses - viz. that human linguistic competence can be represented by an automaton. This is simply assumed by Chomsky; yet the assumption involves a very inadequate notion of rule in a natural language. When he refers to physiological states in the passage quoted in the last paragraph, what he has in mind are physiological states that correlate with strings of formatives and which store received information. Though underdetermined by environmental factors, language use for Chomsky is to a large extent determined by what he calls the contributions of the organism.[130] Chomsky is looking for functions shared by organisms and automata. After rejecting generalization, he suggests that the brain is adapted to produce the rules of a particular language, given as input sentences generated by that grammar.[131] Concluding his review of Skinner, he suggests that a properly formulated grammar will indicate the integrated processes and patterns "imposed on the specific acts that constitute an utterance", and so will "be of independent interest for psychology and neurology".[132]

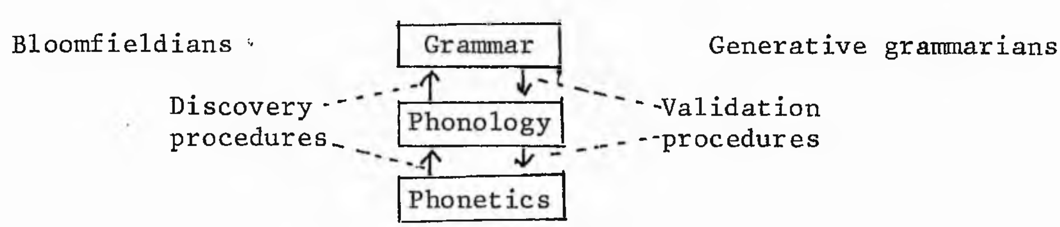
Neurology is acting as a middle-man between what must be granted to have peculiar cultural significance and the operations of an automaton. Recently, Chomsky has distinguished two kinds of issues in the study of language and mind. There are "problems" - those issues "that appear to be within the reach of appraoches and concepts that are moderately well understood", such as arise when "we deal with cognitive structures". Secondly, there are "mysteries" - those issues "that remain as obscure to us today as when they were originally formulated". We are faced with mysteries, he adds, "when we ask how humans make use of these cognitive structures, how and why they make choices and behave as they do". "The creative aspect of language use" is classed as a mystery.[133] It is inevitable that such aspects should appear mysterious, for what is not determined by the contributions of the device are the variabilities of use, which are of minor importance for generative grammar. Since, in one interpretation, these devices - automata - are cultural products, we can think of the linguist's task as an attempt to translate all of natural language into a small part of itself which has an exaggerated formal structure. A language-accepting automaton is a four-dimensional diagram exhibiting certain series of applications of the rules of a rewriting grammar in much the same way that a two-dimensional Cartesian coordinate system drawn on a blackboard can be used to exhibit the functional relationship between two algebraic variables. This suggests, as has been suggested by others,[134] that generative grammarians take their theoretical terms too seriously.

The best illustration of this is in the domain of phonology.[135] As phonology is the least abstract grammatical component, we can expect any real referants of theoretical terms to show up here. Phonology is a step nearer the data than is syntax. Still, it does not deal directly with observables - this is done by phonetics. But linguistics usually accepts a condition of bi-uniqueness: the phonemic make-up of a word (the subject of phonology) uniquely determines its phonetic form and vice versa. Now it is a well-established fact that what we intuitively take to be a single sort of sound, roughly corresponding to a letter of the alphabet, varies considerably according to its position in different utterance forms and from speaker to speaker. This gives the theorist leeway in what is to count as a phoneme, which must relate both to paradigmatic oppositions and to the physical sounds.

Chomsky often attacks the method of "segmentation and classification" attributed to structuralist linguistics.[136] His target is actually the indigenous American species of structuralist linguistics derived from L. Bloomfield (1887-1949).[137] Bloomfield was an extreme behaviouralist (at least for his day[138]) and insisted on operational definitions of phonemes, which means segmentation of utterances into minimum sound units and the classification of these according to their differentiation of meaning. But not all structuralists advance operational definitions of phonemes.[139] "Abstract" views, under which generative grammar is sometimes classed, generally rely on non-phonetic criteria for defining phonemes.[140]

The Copenhagen School, which maintained an abstract view, appealed to the practices of physics in its rejection of operationalism and held a psychologically real theory of speech production. Operationalism has been attacked in physics for the unmanageable multiplication of concepts it introduces. This unhappy consequence is obvious once one considers the number of ways we can measure distance: with a unit-length rod, by triangulation, by reflecting radio waves off a distant object and recording the time between emission and reception, etc. Most importantly, finding two or more operational tests for the same concept establishes empirically significant generalizations and, conversely, empirical laws allow new measurements - e.g. Charles' law allows one to measure the temperature of a gas in terms of its pressure, given a constant volume. Bridgman argues that linking operational definitions in this way is unsafe. But boldness is a virtue in a scientific theory, for it is correlated with its empirical content. The procedure of the physical sciences is to formulate hypotheses and (given the requisite initial conditions) deduce predictions which are tested.

Chomsky and his followers repeatedly endorse the hypothetico-deductive method in linguistics.[141] Bloomfieldian linguistics, on the other hand, followed so-called discovery procedures in formulating a grammar. In the early 1950s a number thought it was only a matter of time before an effective procedure would be found.[142] But Chomsky maintains that the corpus is intelligible only once the grammar is given; this is conjectured, then tested against an extended version of the corpus. The opposition can be depicted as follows, where phonology, the least abstract component of the grammar, is depicted as distinct from the rest.



Similarly, generative grammarians hold that the child must be born with means to form hypotheses about the grammar of its speech community.

Chomsky is concerned above all else with syntactic structures. Thus he has attacked even the methods of the Copenhagen School because they involve the segmentation of a sentence into smaller units.[143] He puts further requirements on a grammer. A "descriptively adequate" grammar, in addition to generating the correct strings, assigns the correct syntactic structural descriptions to sentences of the language; it thereby captures "the linguistic intuitions of the native speaker".[144] Furthermore, the linguist - or (in Chomsky's view) the child - formulates a grammar within a theory. And this theory should be applicable to any natural language, resulting in a descriptively adequate grammar for that language. Such a linguistic theory is attributed with "explanatory adequacy".[145] Since such a theory should be able to account for the intuitions of the native speaker of any natural language, a linguistic theory satisfying the conditions of explanatory adequacy is held to be a hypothesis about the child's innate linguistic competence.[146] This is held to be an empirical hypothesis, for generalizations are to be abstracted from particular descriptively adequate grammars and incorporated into the linguistic theory meeting the conditions of explanatory adequacy.[147]

The term "linguistically significant generalization" is frequently used by generative grammarians. The best known of such generalizations are transformations. If two sentences of different surface sturcture are paraphrases of each other, then we look for a transformation or set of transformations which would allow the two sentences to be assigned the same P-marker. Notice that transformations allow not only for an economy of particular P-markers, but also for an economy in the rules generating P-markers, and thus also in the symbols by which these rules are expressed. Again, transformations allow us to economise in stating co-occurrence relations between lexical items.[148] In general, a principle of economy is in force throughout a linguistic theory.

Here again we can think of a lower bound - a linguistic theory which does not capture the relevant linguistic data - and an upper bound - a linguistic theory which presents as two different linguistic facts what in another theory could be presented as a single linguistically significant generalization.[149] The more generalizations of this sort a theory contains, the more it discriminates between acceptable and unacceptable forms. Again, these generalizations, although they reduce the number of symbols in the grammar, allow more information to be given in complex symbols for lexical items.

The connection between linguistically significant generalizations and the simplicity of the theory gives Chomsky a method of evaluating theories.[150] His suggestion is that alternative theories be evaluated by a "simplicity (or evaluation) metric" which gives greater value to a theory as that theory requires fewer symbols (while still accounting for descriptively adequate grammars).[151]

Chomsky's clearest presentation of a simplicity metric is in phonology.[152] But he also holds

> that syntactic interpretation of an utterance may be a prerequisite to "hearing" its phonetic representation in detail, (and) rejects the assumption that speech perception requires a full analysis of phonetic form followed by a dull analysis of syntactic structure followed by a semantic interpretation, as well as the assumption that perceived phonetic form is an accurate point-by-point representation of the signal.[153]

This makes manifest the extent to which Chomsky's phonology is abstract.

A simplicity metric is supposed to be an empirical hypothesis about the constraints on any possible human language[154] - i.e. it concerns linguistic universals. So it formulates the competence of the child.[155] It supplies restrictions weighting the hypotheses the child presents about the language of its community.

However, the criteria of explanatory adequacy which go under the label "simplicity metric" involve the assumptions which were made to show the inadequacy of the cybernetic model of linguistic competence, i.e. that human linguistic competence can be portrayed by some sort of automaton and captured by some sort of rewriting grammar (augmented with other formal components). When competing hypotheses are formulated in these terms, some can be falsified, and one can converge on a pushdown storage automaton as a model of linguistic competence. But the assumption itself cannot be falsified - it is a suggestion to look at human language in a particular sort of way.

Chomsky, in fact, admist that to his knowledge structuralist linguistics was never intended as a learning theory[156] (and he admits his debt to structuralism[157]). And he questions whether most behaviourist tendencies can be regarded as varieties of empiricism, since they eschew the mental and explanatory adequacy.[158] Indeed, Chomsky carries on the formal approach of the Bloomfieldians.[159] This became linked with automaton models conjectured to be instantiated in the CNS; Chomsky strengthens this link.

On Chomsky's view, there are two general sorts of restrictions on the formulation of a linguistic theory, and so on a grammar for a natural language formulated within that theory. Firstly, there is the simplicity metric and, secondly, there are the "intuitions of the native speaker" and, at a lower level, the linguistic corpus, both of which are said to be evidence which a grammar, formulated within the theory, "explains". We can get some notion of the status of the simplicity metric by considering how a generative grammar "explains" the other constraint on it, viz. the evidence.

Now a linguist, if he is to formulate a grammar for a natural language, must understand that language to the extent that his grammar captures aspects of that langauge. With the condition that the grammar be descriptively adequate and capture the intuitions of the native speaker, the demands on the linguist's competence in the language are very high indeed. But, then, in what sense are the intuitions and the supposed corpus acting as (empirical) evidence which demands explanation, or the further sentences in the language (in which the linguist is fluent) being predicted? (Generative grammarians invariably speak of the "predictions" which follow from rules they propose.)

We can compare the position of a linguist who formulates a descriptively adequate grammar with that of a mathematician who formalizes a branch of mathematics which has developed informally from the investigations of a number of other mathematicians. The mathematician in question must be competent in the field; he must be able to derive a significant number of the results for himself and he must share most of the intuitions of others working in the field. Yet we would hardly say that the results published in the field are (empirical) evidence for the formalized system; nor would we say that the results derivable from the system are predictions.

The analogy breaks down on one point. If what is derivable from the formalized mathematical system is a new result or disagrees with a previous result, the result is nonetheless of mathematical interest, for it shows what consequences there are of the axioms and rules of inference of the system. This might indicate that the system does not capture the field it was intended to capture; but, then, mathematics is creative. On the other hand, if the grammar counts as grammatical (ungrammatical) what by general use (including the linguist's) is ungrammatical (grammatical), the grammar is of little interest. But this is because the whole intent of formulating the grammar was to capture the natural language. Linguists, when concerned with natural languages, are not meant to be creative in the way mathematicians are.

The point I wish to emphasise has been made by Cavell: native, e.g., English speakers, "do not, in general, need evidence for what is said in the language; they are the source of the evidence".[160] We on occasion do need to be reminded of what we already know - Cavell makes this point in defence of the method of "Oxford philosophy". We can add that the average speaker must be taught specialist subjects (such as linguistics) to be able to use the terms of these subjects. Cavell points out the complementarity between statements and rules: what in one context is a statement conveying information about a state of affairs can be, in a context where no such information is called for, a way of showing how a word is to be used; ordinary use is normative.[161]

If the linguist goes beyond a language in which he is fluent, he is like a social scientist studying a culture or an aspect of a culture which is beyond his normal sphere of activity, and so beyond his intuitive grasp. In such a case, the linguist who is out to capture the native speaker's intuitions must develop those intuitions himself; so generative grammar remains a non-empirical endeavour. Peter Winch has argued[162] that the goal of a social science (which linguistics is in many ways) is to understand, while that of a natural science is to explain. A natural science is a cultural endeavour with its own set of rules which a practitioner comes to follow on learning the discipline. This is true of a social science as well, but, in addition, its object of study is rule-governed. The objective of a social science is achieved when and only when it has made the activity governed by this further set of rules intelligible.

Granted that the linguist formulating a descriptively adequate grammar is like the mathematician systematizing a branch of mathematics, the only constraint added by generative grammar beyond the appeal for comprehensiveness and explicitness is supplied by the simplicity metric. Because of Chomsky's abstract, syntax-oriented position on phonology, the only thing directly measured in a descriptively adequate grammar is the notational basis of the theory. The grammar translates, e.g., English into a language differing from it most notably in that it has auxiliary symbols and satisfies these artificial demands of simplicity.

Furthermore, the child and the linguist are on a par simply because the linguist translates the child's linguistic feats into his own theoretical terms. Indeed, some generative grammarians speak of the intuitions of the native speaker of linguistics.[163] In short, innatism is a methodological artifact of this approach. A reply of the sort that the psychological aspects of the thoery are testable externally, in the context of psychology,[164] is unconvincing, because the same assumptions infect the relevant areas of psychology.

Generative grammarians' talk about the hypothetico-deductive method, theoretical entities, and prediction adds the aura of the respectability of empirical science to a theory which cannot be empirical or explanatory or tell us about what is too small, large, or rapid to observe. The ridicule of operational tests is misplaced. Physics relies heavily on such tests, even though they do not define its more spectacular terms. The conventional (not conjectural) part of physics is at the level of operational tests, for the sortals involved in measurement are conventional. The equivalent sortals in generative grammar are what is measured by the simplicity metric. The methodology of physics allows the purely conventional element to be eliminated, since, e.g., ratios are independent of the unit of measurement. Generative grammar, on the other hand, seeks to capture the conventions of natural languages; it makes no sense to speak of measuring conventions, for the standards of exactness and simplicity are conventional. Generative grammar exaggerates these in translating languages into its own conventional notation.

The component of generative or transformational grammar which has caused the most difficulty within the theory is semantics. On the other hand, a generally acceptable semantics would be the most desirable result from transformational grammar. For semantics is called upon, among other things, to account for valid inferences. Furthermore, the syntactic component is closely connected with the semantic component, since the meanings of items depend on syntactic relations between their constituents and, conversely, the identification of syntactic constituents depends on semantic relations between sentences. If transformational grammar does reveal the structure of natural languages, then there is reason to think it would at least aid in revealing the logical form of natural languages. There is a further reason for considering the semantic component. This is because innatist claims are least reasonable with regard to semantics, since utterances relate to things beyond the speaker by virtue of being meaningful. Finally, a connection between transformational grammar and logic could jeopardize two important claims of the former. Firstly, if logic must rely on its own resources to capture the logical form of natural languages, then transformational grammar's claim to present the semantics and, to a large extent, syntax of natural languages would be suspect. Secondly, if there is no reason to claim that a logical analysis uncovers innate structure, then any connection transformational grammar has with it would argue against its own claims to reveal innate structure.

Quine sees logic and transformational grammar as two distinct specialist endeavours. He holds that "logical paraphrase" (avoiding the phrase "logical analysis", which gives the misleading impression "that we are exposing a logical structure that lay hidden in the sentence all along".[165]) "may go one way or the other depending on one's specific logical purpose".[166] Regarding grammars, "extensionally equivalent" ones are those which "determine, recursively, the same infinite set of well-formed (e.g.) English sentences".[167] Quine maintains that the members of two linguistic communities who learn, e.g. English, from two extensionally equivalent but different (i.e. differing in structural analyses of strings) grammars would end up sounding the same. I.e., their verbal behaviour would "fit" - conform to - both systems. Such a fit, he continues, is all the linguist can be expected to attain.[168] He suggests that linguistic universals are imposed by translation[169] and that both deep structure and logical structure "are paraphrases that we resort to for certain purposes of technical convenience"[170] and differ "in detail and purpose".[171]

Quine and Chomsky differ greatly in approach. Chomsky's strength is syntax, while Quine wishes to question semantic notions such as those of synonymy and meaning. For Quine, thefacts end with "stimulus meaning" - the circumstances evoking a characteristic utterance - while for Chomsky meaning has biological foundations. It is not apparent to me, however, how Quine could answer Chomsky's reply, pointing out that transformations are structure-dependent.[172] For, even if we disallow the notions of synonymy and meaning, entailment relations - which any logical appraoch must take into account - are preserved systematically by certain transformations in specified circumstances.

Most philosophers have not been satisfied with Quine's logical conservatism and transformational grammar was welcomed as an analytic tool to expose the logical structure of natural languages. However, transformational grammar on its own has proven incapable of capturing the semantics of natural languages, in particular, their inference patterns, hence logical form.[173] The Katz-Postal hypothesis, the "standard theory", held that deep structure (as described in Aspects) is the basis for semantic interpretation. But, for one thing, a context-free grammar is insufficient as a set of formation rules for the predicate calculus; in particular, it cannot give the required restrictions on the positioning of quantifiers. Again, the standard theory would allow the first of the following sentences to be derived from the second.

Every man voted for himself.

Every man voted for every man.

In response, the semantics has been modified in two ways. Firstly, "interpretive semantics", developed by Chomsky[174] and others, does the semantics on the surface and holds that there is no syntactic basis for rejecting meaning-changing derivations, for they do not change grammaticality. Whether deviance is attributed to syntactic or semantic apsects cannot be decided by the speaker's intuitions, this position holds; it will, rather, be determined by whatever theory is the simplest overall. The second response is "generative semantics", which takes the semantic component as generative and the syntactic component as interpretive. This leaves the theory basically unchanged, for semantic representations are labelled trees, and Chomsky claims it is imply equvalent to a grammar with a generative syntax.[175]

When transformational grammar is incorporated into a logical analysis of natural language, its semantics is replaced by or heavily supplemented by semantics developed in the tradition of Tarski for artificial languages.

Semantics or theories of truth on the Tarskian model, since they are explicitly concerned with inference or truth promulgation, on which logical form depends, assign semantic structures to sentences which are identical with their logical forms. It is maintained by Davidson [176] and others that transformation rules assign logical form or syntactic structure to each sentence, for they allow cases previously intractable because of their grammar to be rewritten in a form analysable in terms of the logic at hand. But transformation rules, Davidson continues, belong to the domain of grammar; so logic, grammar, and the theory of truth belong to a single discipline, called the logic of grammar.[177] Davidson adds[178] that a logic of natural language is verified primarily by deciding whether the arguments it declares to be valid are all and only the arguments we deem to be valid. But,[179] since a logic requires a grammar for its application and a theory of truth for its justification, we may also ask whether it satisfies intuition by using a suitable grammar and an acceptable theory of truth. That is, what must agree with intuition is a total theory of truth, logic, and grammar.[180]

Tarski felt that his theory of truth was applicable to artificial languages alone. For he held that we cannot structurally specify sentences in natural languages. Again, he held that the possibility of the consistent use of the phrase "true sentence" in natural languages is questionable, because, if anything can be said, it can be said in a natural language, which suggests that the paradoxes of self-reference would arise.[181]

The worry about self-reference was in part directed at such terms as "necessary", since "it is necessary that p" can often be paraphrased as "p is true by virtue of the meanings of its constituent terms", and "believe", since p in "A believes that p" shows much the same referential opacity as p in "A says that p". The formal objections to a semantics for modal logics are overcome by extending the designation of terms to cover possible worlds.[182]

Yet general problems about the extension of logic to capture the form of referentially opaque clauses are not thereby solved.

Now generative grammar on its own has little to say about referentially opaque clauses. Self-embedding is the principal syntactic feature for Chomsky, but all embedded clauses (relative clauses, etc.) are treated similarly, or distinguished by different grammatical functions assigned to an element which occurs outside the clause and in the base P-marker for the clause. An analysis in the spirit of Tarskian semantics in which opaque clauses are thought of as mentioned is foreign to transformational grammar. So is the following analysis in the same tradition, due to Davidson.[183] The problem in, e.g., indirect discourse is that we assign the familiar semantically significant structure, but the usual consequences do not follow. The solution is to analyse, e.g.

Galileo said that the earth is flat.

as

Galileo said that.

The earth is flat.

where "that" in the first sentence is a demonstrative referring to the second sentence. Thus the content sentence (or, better, utterance) can be assigned the usual structure because it is not contained in the sentence (utterance) whose truth counts.

A part of the logic of natural languages about which transformational grammar has nothing to say on its own concerns the reference of indexical items - e.g. demonstrative and personal pronouns - and indexical aspects - e.g. tense, which cannot be determined without knowledge of the context of use. A commonly drawn distinction is between syntax, semantics, and pragmatics, which is concerned not only with expressions and their referents, but also with the users of expressions and their possible contexts of use, and so with indexical expressions. Transformational grammar by its very nature ignores pragmatics, but the tendency within logic as adapted to natural languages has been for the border between semantics and pragmatics to break down since truth conditions often depend on considerations in pragmatics.[184]

If, in the collaboration of (Tarskian) semantics, logic, and grammar, so little of the interesting work is doen by grammar, we must ask what transformational grammar has to offer to a theory of logical form for a natural language. Harman has incorporated analyses from transformational grammar in a theory of logical form, but the interesting features are largely motivated by considerations from outside grammar.[185] Such projects indicate that transformational grammar sometimes is suggestive for or supplies a convenient notation for the analysis of the logical form of natural languages. And, further, it clarifies intuitions by giving translations from natural language into whatever analysis of logical form is justified by the version of (Tarskian) semantics one has at hand.

But the burden borne by transformational grammar is restricted in two ways. On the one hand, if the grammar is to do any work, there must be a translation of the natural language into the language of its grammar. On the other hand, we must have the semantics first to know what transformations are relevant to a logical analysis.

In opposition to Quine's logical conservatism, we can allow for a complex structural analysis of sentences of natural languages to whatever degree is deemed necessary to permit the canonical notation to encode the information relevant to which sentences a given sentence is a consequence of and which sentences it has as consequences. Still, this is a specialist discipline; it attends to only some aspects of natural language. (It would be misleading, if not straightforwardly false, to say that it considers a distinct function of the organism.) The semantics of natural language eschews psychological considerations. Davidson has argued[186] that we can have a clear notion of testing the correspondence of a theory with a speaker's intuition only if we take deep structure to be logical form; this proposal, he points out, has the advantage that internalized structures play no direct role in testing the proposed logic. Yet he seems to hold that finding a semantics for a natural language is an empirical affair. But, by the same token, systematizing a branch of mathematics would be an empirical affair. The logician is a native speaker (or near enough). The testing is not matching the consequences of the theory against waht is observed, but is like testing a mathematical generalization by applying it to specific cases. More general formulations may be shown wrong in the light of more particular cases; but this is because the latter were not taken into account, which is not like observing them. "Intuition" here has no psychological overtones.

What the semantics of natural language is concerned with in particular is what is done in or with natural languages. Phonology is not of interest to it. Rather, such things are drawing inferences, but also mentioning utterances or indicating contents and, further, speech acts in general[187] are the concern of the semantics of natural language. These are the sorts of things which physiology can tell us nothing about; rather, they are what we know how to do by virtue of the fact that we get by in a <u>cultural</u> environment, that we are subject to an objective structure. It takes a great deal of analysis - reflection, if we wish to call it that - to formulate the rules involved, which are tacitly followed. From the point of view of the language user, this is an abstraction; it does not say what goes on in him when sounds are produced or received.

Transformational grammar, on the other hand, is concerned with phonology, so (however distantly) with phonetics, with what goes on in the medium and, thence, with what transpires in the language user. It is a specialist concern different from the semantics of natural language. It attempts, however, to be all-embracing. But transformational grammar lacks the resources on its own to capture what we do which is of particular logical interest. In so far as it takes over the requisite resources and enters this domain, it is no longer concerned with biological activities, or with what might have an innate foundation.

It must now be admitted that a great deal of the most important aspects of language are located "at the surface". And here context beyond the language user (cf. especially indexical aspects) becomes critical. But Chomsky does not see this as a threat to his innatist position,[188] for everything is accounted for by some cognitive structure, presumably with an innate foundation. Modifications and idiosyncracies are presumably accounted for in terms of performance. Chomsky now considers it possible that the language faculty constructs a grammar only in conjunction with other mental faculties, so providing only an abstract framework. He considers it a reasonable hypothesis that there is an innate learning theory for common-sense understanding and that this faculty shares a common stock with the semantic component of the language faculty.[189] Although he admits that his simplifying assumption that learning is instantaneous is obviously false, he holds that the assumption is still acceptable. For, since a grammar generates an infinite system of "potential experience", the input to a learning theory at any stage of development can be considered as the grammar available at that stage.[190]

It is critical for Chomsky's position that only components which can be considered innate are involved in linguistic competence. For, once one component is allowed to depend essentially on the subject's mastery of conventional techniques, the language faculty would not simply be an abstract framework, but could be regarded as only a set of physiological initial constraints which are exploited and adapted as need be. Linguistic holism, for nativism to hold, must involve not only items of a certain component, but also all relevant components.

Vendler maintains that knowing what a word means involves mastery of the whole language.[191] And he thinks that this implies that a child must have native equipment encoding all the salient aspects of adult language - the fundamental illocutionary, syntactic, and semantic features of any possible human language.[192] Vendler considers the objection that it is sufficient for the child to have an initial crude grasp of the language which is developed by adding words. This is presented as a meaning-as-use position and Vendler sees Skinner here. Merely responding to stimuli, he replies, is not understanding. Furthermore, understanding is not acting. Finally, acting upon someone's words presupposes understanding what has been said.[193]

Now understanding is involved in non-linguistic cases; e.g., we understand how the motor works. why the crops failed, etc. If Vendler is to rely on understanding which is not overtly reflected in the use of words, then he must admit that certain faculties other than that of language are innate. More significantly, we understand people's actions, their significance, what they mean. But these actions could not properly be described without assuming certain circumstances and some relation between at least two persons. But how can the innate, e.g., speech-act forms take account of the other person? and the circumstances in which utterances are appropriate? If we grant that there is native equipment accounting for our understanding, then we must ask for the equipment which brings this equipment into play in the proper circumstances, and the equipment which brings this further equipment into play, and so on. Or we can keep understanding at the surface, as the exercise of practical knowledge which one has gained through induction into a culture.

When I understand a command to do something, I need not act. But, in thus disobeying the command, I must be able to act. Further, it is presupposed that I did act on something similar (leaving "similar" unspecific). Otherwise there would be no reason to charge me with disobedience. We would not say of someone that he understood an utterance unless we had reason to think that he could act like most people in similar (cultural) circumstances; i.e. unless we had reason to think that he had been inducted into a culture. With the vast majority of people we meet, this passes as a presumption.

Similar actions in similar circumstances suffice. A child's initial grasp of a language can be described (by adults) as crude. But it is improper to describe our progressive acquisition of a first language as the addition of words. Holism with regard to the individual's culture-dependent capacities figures from the start. A child learns how to use the same words in different sorts of circumstances and learns that the same sorts of responses are appropriate in other sorts of circumstances. He also learns to make new distinctions with new phonemic types and new syntactic forms. The acquisition of a language is a process both of expanding horizons and of drawing finer distinctions. The child's early expansions and distinctions depend on the fact that his immediate social group has the capacities in question and that his actions are evaluated as if he shares them.

We must insist on the fact that semantics involves gross, public behaviour, (overt) speech acts in particular. This makes implausible the view that semantics is biologically determined and that semantic interpretation is covert. The complex symbols for lexical items are sometimes regarded as filled out so as to specify the meaning of the item. This is supposedly accomplished by "semantic markers (features, components)" analogous to distinctive (phonetic) features. It is held that these markers form a universal stock of human concepts, only some of which are realized in any given language.[194] Such views usually concentrate on physical concepts.[195] Similarly, Vendler uses "concept" much as I have (having a concept, he holds, is potentially knowing the meaning of a word, and, in the case of nouns, knowing what a (sort of) thing is), but he adds that a concept is a lexical item with the more significant co-occurrence restrictions already written in.[196] He circumvents arguments showing that language use is tied to getting about in the world - describing, picking out, or producing things - with the counterexamples that I could not pick out molybdenum from a sample of rare metals or tell a chiliagon from a 1001-sided figure, yet I know what these things are, and so what the corresponding nouns mean.[197]

Yet some of our most important words, as I have argued, depend on picking out features of the behaviour of an organism, usually in an environment - e.g. "pain" and "fear", not to mention "smile", "cry", and other words concerned with expressing, and "hide", "search", and other words referring to animal activities. I sometimes, e.g., hide and I sometimes truly state that I hide and also that someone else hides. But what guarantees that what I and others do is captured by the semantic marker interpreting what I say? Again, what would guarentee that the semantic marker would supply the proper interpretation when I say "I feel pain"? Is the same marker involved in shrieking? writhing?

Furthermore, to refer to certain culture-dependent activities, I must be able to perform them. For example, I could hardly use "promise" unless I were capable of promising. Can I, then, promise only because I have the relevant semantic marker? Much of our moral vocabulary ("offend", "commend", "command", etc.) is similar, as is our vocabulary relating to simpler legal activities ("sue", "plea", etc.), although in these cases we may lack the esoteric knowledge (and the certificate) to carry out the activity step-by-step. Indeed, the breakdown between the ability to use the word and to perform the activity occurs when the activity is esoteric. As the esoteric activity depends on the more common activities, so the ability to use the esoteric word depends on the ability to use the common word and perform the common activity.

If, as we have argued, counting, classifying, etc. are culture-dependent activities and we could not use words referring to these basic activities unless we could perform them, then, by a parallel argument, we can understand the esorteric terms for the activities of the scientist only because we can perform these basic, culture-dependent activities. But our ability to use words referring to number and dimensions of length, time, momentum, etc., as well as members of taxonomic divisions depends, at a basic level, on our ability to perform the relevant operations. So our ability to use more esoteric words for natural things (e.g. "molybdenum") or words for more complex features (e.g. "chiliagon") or natural things depends on our ability to perform certain basic culture-dependent activities. How, conversely, could our ability to perform simple, culture-dependent activities (which may seem quite arbitrary from a more sophisticated point of view) depend on innate, biological semantic markers interpreting words in either mathematical or taxonomic sciences?

One aspect involved in language which assuredly is biological is phonetics if only because speech sounds are made with identifiable parts of the body. But this aspect is innate only in the sense that any physiological structure and its functioning - e.g. the lungs and respiration - are innate. There is no more reason to hold that the child has the same phonetic knowledge as the linguist than that the child has the same knowledge as the pediatrician. It could not be generally true that whatever is required for knowledge must be innate - otherwise we could argue from the fact that I know that Fiji is in the Pacific to the fact that Fiji and the Pacific are innate in me. The holistic character of the common stock of distinctive phonetic features, if it exhibits linguistic competence, exhibits that of the linguists who formulate and use the system. Generally, speech sounds are no more peculiarly linguistic than digital positions until we consider them as exploited.

Because of Chomsky's abstract and syntax-oriented notion of phonology, his phonology is as closely related to syntax as it is to phonetics. And the general view is that syntax mediates between phonetics and semantics - it relates sounds to meanings. What this shows, however, is that certain rules of forming comparatively long phonetic strings (including breaks) are more naturally exploited than others. (Phonological rules are like Gestalt effects: both are exploited. Chomsky's clearest examples of innate principles are those governing the application of rules of intonation and stresss.[198]) Phonetic rules in general are not held to be universal in the sense that they must be exploited in any given language. The general principles governing the applicability of phonological rules are of the same form as those governing syntactic rules. But this is hardly surprising when it is considered that the same formal apparatus is used in both phonology and syntax; similarly, both an alcohol molecule and the command structure in an army can be represented by tree graphs. In the present case, however, there is reason for using the same formal apparatus: syntax must link up with phonology. But this liaison shows how the sound structure is exploited. In addition, syntactic competence is a very small part of our knowledge in general and it seems more natural to attribute knowledge of syntax to the linguist, who formulates a simplicity metric, than to the child. Generally, ths synchronic linguistics of this century and even the diachronic linguistics of the last have concentrated on phonology and syntax and neglected semantics. This neglect is understandable, since a knowledge of semantics requires an understanding of the endeavours of thecultures which use the languages in question. Syntactic ability, on the otherhand, is relevant to knowledge only in so far as it allows natural sounds to be exploited so that semantics gets a hold.

It seems that the syntactic aspect which Chomsky relies on most - self-embedding - is so general beyond linguistic contexts that the fact that human languages exhibit it can be explained environmentally. Sampson has noted the ubiquity of self-embedding - in political structures, where there are different levels of government or administration; in organisms where semi-independent units such as cells go to make up other semi-independent units such as tissue, and so on; etc.[199] Sampson also claims that self-embedding is the only candidate for a linguistic universal which has not been questioned on empirical grounds.[200] That this sort of structure is exploited is suggested by Martinet's claim that the relative clause construction is a relatively recent development in Indoeuropean languages and is typical of cultures which witness frequent innovations. His explanation for the use of this structure is that it affords new referring expressions.[201] Davidson, in his analysis of referentially opaque clauses presented above, points out that "that" in the context in question was originally a demonstrative pronoun referring to the statement in, e.g., indirect speech which has become incorporated into the "that" clause. This move seems to have been commonly made in Indoeuropean languages and other languages, such as Finnish.

In language acquisition, an account in terms of exploitation rather than biologically grounded tacit knowledge is in place. Empirical studies show that initially not only the child, but also his elders are little sensitive to the child's syntax.[202] What is important is the speech act performed and the circumstances of its performance. Despite the predilection of generative grammarians for statements, questions and commands have the major part in the very early stages of language learning and psycholinguistics has increasingly turned in this direction. The generative grammarian's reply would be that the utterance, to count as English, would have to approximate the syntactic structure of English in a significant way, not just in a generalized way. But this is false. It is not always clear, nor need it be, that the utterance of an isolated word is an elliptical speech act or whether it is a simple linguistic exercise similar to numbering or attaching labels. One can often not say what speech act the child "intended",[203] nor need one. What is important for language acquisition is how the utterance is taken. And one need not always be able to say what larger linguistic context the utterance is placed in, which would allow the ellipsis to be expanded into a grammatical sentence.

The child is not only presented with a linguistic corpus, which, as Chomsky points out, is small by certain criteria. But - and Chomsky never mentions this - he also presents a corpus (however imperfectly formed) to his elders. The linguistic structure presupposed in language acquisition is what we have called an objective structure; it is not biological nor in the child. Further, thepresence of this structure accounts for tacit linguistic knowledge. The elders do not have the problem of determining the grammatical rules which the child follows, for the child's corpus is a part, albeit a very imperfect part, of the on-going corpus of the language as a whole.

The child's behaviour is assessed in its induction into a culture. This is evaluated largely in terms of what is done; hence the importance of the speech act and the relative unimportance of syntax initially. What we have called transitive acts of cognition - e.g. picking out things _in re_ - allow what is done linguistically to be of general importance, rather than simply a potentially elegant form of behaviour which might have aesthetic or ritual importance. Intransitive acts initially would be simply forming syntactically correct sentences, syntactically assessing those uttered by others, using the form of speech act appropriate in the linguistic context, and evaluating others' speech acts on the same grounds. If we could perform these alone, not much more could be said about what we do than could be said about, e.g., the courtship rituals of birds. Once we have learned how to do things linguistically, we can carry on with what I have called intransitive self-teaching, which covers both what Chomsky calls the intuitions of the native speaker and the formulation of a grammar by the linguist to capture these intuitions; syntactic analysis, however, is a small part of this compared with what falls under the heading "semantics". (E.g. arithmetic is applicable to all sorts of things; syntax, only to human speech.) Indeed, the syntax cannot be analysed without a grasp of the semantics, for the evidence for transformations depends on semantic relations.

This points back to the point made earlier, that linguistics, as it concerns knowledge and not sounds and the reactions they naturally elicit, cannot be an empirical science on a par with the physical sciences. For, when meaning is involved, linguistics formulates our knowledge and does not predict or empirically explain what utterances are acceptable. The point can be put more generally by saying that cognition is "explained" by giving the criterion of success, which is a cultural rule or norm shared by the members of the culture or specialist discipline. This point is of more general interest because of psychologists' claim (encouraged to a considerable extent by Chomsky's work) that automaton models analyse what the human must do; as this is not displayed in gross behaviour, it is thought that it must take place in the CNS. Yet there is in any culture a common stock of everyday knowledge and cognitive concepts applying to gross behaviour, which is ignored by such projects.

When the everyday concepts are ignored, and the translations attributing cognition to subcortical processes take over, comments such as the following by Miller result. Writing about human recoding of "information", he states that the search "for ways to map a strange, new phenomenon into simpler and more familiar ones" "is something we call 'thinking'; if we are successful, we call it 'understanding' ".[204] Other famous examples include "explaining" remembering (occurrence) as retrieving information from a memory unit. But when I remember my case, I retrieve it from the shelf, not a bit of information from my brain. My public action cannot be explained by an internal action of retrieving an internal case against which the public action is matched. For the duplication of the action asks for a further explanation.

The claim is that the automaton is a model of some aspect of an animal's behaviour and that the competence is internalized. Concerning automaton models of human cognition, a distinction is now normally drawn between the hardware, which is not shared by the man and the machine, and the software describing the actions common to both.[205] The hardware of the human is the CNS and perhaps other systems; the hardware of the automaton is the circuitry of the processing component, the memory tape of the storage component, etc. Within the software, a distinction is drawn between two further levels: the executive programme and subroutines.[206] It is claimed that, within these three levels, the functioning of the lower level does not explain the functioning of a higher level. For the executive programme could have used different subroutines to obtain the same result; and the subroutine is realized either by neural synapses or circuit activations.

But, if cognition is indeed internal, the neural synapses and the circuit activations simply are performances of the subroutines. And the execution of certain subroutines is one way of carrying out the executive programme. This account is still a story of what the hardware does, although the materials and arrangement of the hardware is not the interesting part of the story.

J.A. Fodor maintains[207] that psychologists who "characterize the etiology of behavior in terms of a series of transformations of information ... (, where) the neural event which encodes it is one of the causal determinants of the behavior of the organism" are not "committed 'to redrawing the logical geography' of our ordinary mental concepts". They are only after psychological distinctions. "The natural kinds, for purposes of theory construction, appear to include some things that the organism does, some things that happen in the nervous system of the organism, and some things that happen in its environment". It makes no difference that "the states of the organism postulated in theories of cognition would not count as states of the organism for purposes of, say, a theory of legal or moral responsibility".

It is not evident why happenings in the environment or the CNS should be thought to be constituents of cognition. They enter into an account of what is exploited in cognition, but our ordinary cognitive concepts refer to persons; we are interested in what the person does or can do. It might be replied that cognitive psychology is interested in such things as seeing, which is not a sort of action. But the same comment is in place here as was made with regard to understanding: we have no reason to hold that a person sees the thing in question unless we have reason to think that he could act appropriately, which involves a presumption that he has acted appropriately in circumstances similar in some way to the present. A rejoinder might be that we could have a law that no one is to look upon object A, but not that no one is to see A, for seeing is not something we do. This is true, but as a reply it ignores the "logical geography" of our ordinary concepts. In the case in question, we would arrest persons who have seen A. If someone looks upon A, then he has picked out, seen A, knows what A is, and has some understanding of the significance of A; otherwise we might as well arrest gnats. Ordinary cognitive concepts are not only sufficient to account for human cognition, they also are necessary for it. More esoteric concepts supplement, but do not replace them. It is indicative of the subtlety of ordinary cognitive concepts that, while they all involve the actions of a person, many make no direct reference to these actions.

As opposed to the metaphorical extension of everyday concepts to automaton functions and the projected re-application of technical terms to components of the human anatomy, factor analysis presents a less ambitious and more empirical appraoch. Factor analysis finds "significant dimensions"; its purpose "is to find a new set of variables, fewer in number than the original variables, which express that which is common among the original variables".[208] The new, independent variables, when used as experimental variables, give more significant data. In everyday life, we assume that there is one factor for each word used to refer to personal attitudes, abilities, etc. But factor analysis shows, e.g., that there are two independent dimensions covered by "group morale" and seven covered by "depression".[209]

What do such findings tell us about cognitive concepts? No new things are found; although we say that someone feels depression, this is not like feeling the chair against one's back. The fact that seven independent factors are picked out under "depression" indicates that correlations with other emotional states, activities, etc. can be grouped in seven different ways - it says something about how people act, how their actions, dispositions to act, etc. relate to one another. Furthermore, talk of the dimensions which are measured must include at least a tacit reference to people, their characteristic activities, etc.; on the other hand, one can refer to orthogonal distances independently and without any assumption about what "fills" the distance, picking out only the end points. Again, these findings do not do away with common-sense knowledge and concepts. When it is said that there are two independent factors covered by "group morale" we can ask why "group morale" covers both. Factor analysis might tell us that there is a correlation between mathematical and musical abilities, but it cannot tell us what mathematics and music are or what it is to exercise these abilities.

This points to a dilemma for the person who wishes to explain human cognition - let us call him the "psychologist", the scare quotes indicating that he might not be engaged in the academic discipline called psychology. Now the "psychologist's" investigation must be guided by the cognitive concepts we already have.[210] "Psychology" indulges little in concept formation; concept formation, on the other hand, is typical of the natural sciences, where it allows simple and powerful explanations of familiar phenomena. Psychology (more broadly) can show, e.g., what conditions are conducive to the development or exercise of knowledge or what sorts of physiological and behavioural traits are exploited by homo sapiens. But this does not tell us what knowledge is, what we in fact know, or what goes on to constitute cognition. The point can be made if we widen what Popper calls the principle of transference: "what is true in logic is true in psychology".[211] What is true in logic can be found only by doing logic; and why it is true can be explained only in logic. If a psychologist investigates, e.g., the frequency of self-contradiction, he must know what a contradiction is. Again, Popper refutes historicism as follows. A good deal of history concerns the acquisition of knowledge. We could not predict this acquisition in advance, for then we would have to know what by hypothesis is not known until later. So the general thesis that the development of history can be predicted is false. Similarly, the thesis that by knowing how underlying factors cause cognition allows us to explain cognition is false, for these factors would then already be the cognition.[212]

We can allow "psychology" and psychology to develop their own jargon and hence their own concepts applicable in a limited domain presupposing everyday concepts.[213] There are even cases of psychological concepts entering the vernacular - those of intelligence and motivation and a number of Freudian concepts. But their entrance is a gradual process and relies heavily on the previous concepts and endeavours of the community at large.

Physics can formulate new concepts and apply them in such a way as to explain familiar phenomena in unfamiliar terms and as not to prejudice the data, because it has a correspondence principle. According to this principle, a theory or law which replaces a less satisfactory or refuted theory or law in a particular domain must explain all that the replaced theory or law (apparently or almost) explained. This is often done by showing that the old theory is a limiting case of the new theory.[214] Theories such as statistical thermodynamics do not replace the nucleus of common-sense knowledge and concepts about, e.g., heat, disorder, etc., but rather give a more accurate and theoretically fruitful way of accounting for the facts. The theoretical endeavour itself is in part constrained by the common-sense knowledge and concepts it goes beyond.

The task of the natural sciences is not to replace our everyday concepts; these concepts perform a central function in human life. They are at the centre of the objective structure; the concepts of theoretical disciplines develop from this nucleus and eventually gain a large degree of independence. Everyday concepts are certified by millenia of use. Those of scientific disciplines undergo certification in an explicit and rigorous manner in a much shorter time. Everyday concepts are generally not fit for the sort of exactness and explicit theoretical fruitfulness demanded by organized scientific enquiry; yet, unlike scientific concepts which have proven unfruitful, they cannot be dropped without altering our way of life. One task of natural science is to establish what I have called extensional identities between everyday concepts and its own concepts. Positions such as Eddington's on the two tables, which maintain disparate ontological commitments for everyday and scientific concepts, have been criticized rightly for explaining away what they intend to explain. The extensional identities referred to maintain a link between our everyday activity and scientific research, between common and esoteric knowledge, and allow one part of the society to repay the support given by the society at large.

As concerns cognitive concepts, there are no dimensions relating everyday concepts and knowledge with esoteric concepts and knowledge which could be formulated in psychological research such that the first are the limiting cases of the second. People are neither small societies nor large organs. While an organ may figure in a relevant reply to the question "How do you know?", our knowledge is not allotted to various parts of our body, nor do the parts communicate information to a central store. Similarly, while we learn much of our knowledge from individuals engaged in disparate specialist disciplines, our cognition is not like the resolution of a think-tank.

Even the formulation of the problem of psychological realism is misleading. There appears to be a tacit assumption that a field of empirical inquiry, to show that it is concerned with real things, must show that it has its own objects independently of human investigation; or, failing this, that its laws are independently motivated and refer to objects which eventually admit a reduction to physical states. But our cognitive concepts are applied to animate things because of the behaviour they exhibit in certain circumstances or because there is reason to think they have come to be capable of such behaviour in such circumstances. Neither the behaviour nor the circumstances are describable in terms which could be paraphrased in the language of physics.[215] And some of the clearest cases of behaviour and the circumstances to which it is relevant are culturally determined.

Chomsky has had ample opportunity to consider objections similar to those we have levelled. His replies fall into three categories, none of them completely satisfactory. He either sees his opponent as a Skinnerian behaviourist, or re-asserts a realist position based on his autmoaton model (usually somewhat disguised), or picks a weak point in presentations of the theory of speech acts. Chomsky admits that he considers the most careful work in the theory of speech acts as a reversion to behaviourism despite very explicit denials by its adherents.[216] He even sees Wittgenstein as Skinner, but never mentions the extent to which behaviour is underdetermined by natural environmental factors for Wittgenstein; he never mentions family resemblances or cultural aspects.[217] He objects to Quine's behaviourism with more justice.

For Quine as well, verbal behaviour is underdetermined by environmental factors; this leads to his thesis of the indeterminacy of translation. Chomsky sees this (and particularly Quine's position that extensionally equivalent grammars fit verbal behaviour equally well) as unscientific: physical theories as well are underdetermined by the evidence, he states,[218] but we do not abandon realism in their case. Quine sees nothing wrong with empiricism admitting innate biases and quality spaces; Chomsky finds this position incomprehensible.[219] Against the object that the regularities the linguist observes in the subject's speech are regularities true of what the subject knows and not regularities ke knows, Chomsky asserts that the knowledge is unconscious; he assumes that tacit knowledge must be an internal structure (grammar) in accordance with the realist practices of science.[220] He considers the objection that knowing a language is a case of "knowing how" analogous to the skill of a bicycle rider. His reply is that such a framework is too "impoverished".[221] Another objection (of the pattern we rely on considerably) is that the assumption that the child can learn a language because he knows a more basic language leads either to a vicious circle or an infinite regress. Chomsky denies this consequence of assuming that in language use "the user employs an internally represented grammar. We can easily construct a model (say, a computer program) that functions in this way".[222] In all these cases, Chomsky secures his position to scientific realism.

Chomsky considers the objection that any attempt to present sentences as abstract objects produced and understood independently of their role in communication is either circular or inadequate.[223] The way out of this dilemma, the objection continues, is to identify semantic competence with the ability to perform and understand speech acts. Unfortunately, this objection is connected with the formulation that (in the words of Searle)

> making a statement to the effect that the flower is red consists in performing an action with the intention of producing in the hearer the belief that the speaker is committed to the existence of a certain state of affairs as determined by the semantic rules attaching to the sentence.[224]

Other speech-act theorists considered by Chomsky also state their positions in terms of what the speaker intends the audience to believe or to do.[225] Chomsky has a very simple and effective reply: there are cases in which language is not used for communication and this theory does not account for them.[226]

However, Chomsky cannot escape from the original insights which brought language use into focus. The question of intention comes in when we consider the performance of a speech act in the presence of an audience, but without the usual conversational implications. For intention is brought up to account for cases in which an action lacks the usual implications. Secondly, when a person utters a string of sounds without an audience, there is no reason to hold that he is not simply engaged, e.g., in ritual behaviour unless there is some presumption that he has previously engaged in communication. On the other hand, if we allow soliloquy to be primary - and there is no reason in Chomsky's theory why it could not be - then we are left with the question how the speaker ever becomes capable of communicating. The same problems beset the role given in the hearer to belief. For there is no reason to think the person has the relevant belief unless there is a presumption that he has acted appropriately before in a communicative situation. And if belief is held to be conceptually prior to action, we are left to account for how it gives rise to action.

Chomsky has not worked out the implications and details of his position as thoroughly as some of his followers. In fact, the notion of man as a biological machine is not peculiar to generative grammarians. The philosopher, D.M. Armstrong sees his work, directed to philosophers, as defending those psychologists who identify mind and brain.[227] A follower of Chomsky, the (psycho-)linguist J.A. Fodor, claims to do speculative psychology which presents a theory of mind which both extrapolates from available psychological theories andhopes to be philosophically respectable; the psychology he takes views mental processes as computational processes.[228] Both lack proper concepts of persons and their behaviour. Furthermore, on the account given by either, it is impossible to consistently draw a distinction between what is mechanical, biological, and cultural. Finally, both rely heavily on the notion of belief and on the notion that belief causes behaviour. This they share with Chomsky, who at times maintains that what is innate is a system of beliefs;[229] othertimes he compares thehypotheses formulated by the linguist to those formulated by the child, weighted by his innate competence and referred to as beliefs.[230]

Armstrong holds that, as a matter of contingent fact, mental states are identical with purely physical states of the CNS.[231] Concepts of a person and his behaviour are ignored, so much so that he holds that disembodied existence of mental states or experiences (bound together as the mind) is a conceptual possibility.[232] The CNS is a locus for cognitive dispositions.[233] Furthermore

> Dispositions are seen to be states that actually <u>stand behind</u> their manifestiations. It is simply that the states are <u>identified</u> in terms of their manifestations in suitable conditions, rather than in terms of their intrinsic nature. ... talking about the mind, we (are) committed to talking about inner states of the person. ... To admit dispositions as states lying behind, and in suitable circumstances giving rise to, behaviour is to contradict the whole programme (of behaviourism).[234]

The dispositions which are of particular interest are beliefs. Perceptual beliefs are held to account for selective behaviour[235] and perception is the continuous mapping of what goes on in our environment or boyd.[236] The distinction between cultural (linguistic in particular) and natural breaks down for beliefs.[237] So does the distinction between animate and mechanical; purposive behaviour is explicated by analogy with a homing rocket with a feedback device to correct vacissitudes in its course.[238]

Knowledge is accounted for in terms of beliefs and their causes.[239] Since perceptions are states of the CNS, there is no need for them to be conscious, so they may come in a great flood of detail, and may even be noticed only later.[240] Introspection is a "self-scanning process of the brain"[241] which may be erroneous and does not reveal all mental states.[242] Finally, since we are born with our CNS, we should expect Armstrong to hold that certain cognitive aspects are innate, as he does.[243]

With the behaviour which is usually associated with persons in their circumstances explained away, the question arises of a criterion for the application of our mental vocabulary. Armstrong claims that we could determine whether animals (or men) have beliefs or mental images by correlating our introspective reports with idiosyncratic neurophysiological processes, the occurrence of which in animals would be "compelling evidence" that they too have beliefs and mental images.[244]

I shall defer criticism, and move to Fodoer's position, which in many respects is a sophistication of Armstrong's. Armstrong to a large extent explains away even the psychology he intends to defend. His generalizations could largely be in terms of neurological or even physical states. But what we want are psychologically significant generalizations with their own vocabulary; we could then attempt to correlate physical and psychological states. Fodor rejects psychological-physical reductionism, since generalizations are captured differently by physics and psychology, so both must have their own taxonomies. What he allows instead is a "token physicalism" - i.e. any psychological occurrence is identical with some occurrence describable by terms from physics alone.[245]

Fodor wishes to explain overt behaviour in terms of belief such that an act "is the consequence of computations defined over representations of possible actions".[246] He presents a model for decision on behaviour, which, being linguistic, invovles an infinite number of distinct representations and involves semantic properties such as truth and reference.[247] The model is in terms of the beliefs the agent has of the behavioural options open to him in a particular situation and the weighting he assigns to the consequences of each option.[248]

The fact that this "langugae of thought" is innate is said to be confirmed, firstly, by considering "concept learning",[249] i.e. learning which involves hypothesis formation and confirmation. The hypotheses are weighted by a simplicity metric which takes into account the way the organism represents its hypotheses. So the organism (like the scientist postulating hypotheses in the organism to explain its observed behaviour) must, Fodor concludes, have a representational system.

The innateness of the language of thought is confirmed, secondly, from the nature of perception.[250] Fodor claims that a psychological analysis of perception must recognise that perception, too, involves hypotheses formation. But there is also "the computational problem in perception integration", for theorganism must "infer the appropriate task-relevant description of the environment from its physical description together with whatever background information about the structure of the environment it has available"; so it must choose "the best hypothesis about the distal source of proximal stimulations".[251] A typical case is the analysis of a token of a sentence (the nature of the distal source does not, apparently, matter) on acoustic, phonological, morphological, and syntactic levels.

Mappings from the output of sensory mechanisms to the language of thought over which computational routines are defined require transducers.

The visual system interpreting Gestalt effects is one such transducer.[252] People differ from machines, he claims, in that they have more sensors and they learn one of their compilers (transducers), the language they internalize.[253]

To defend the linguistic status of the language of thought, Fodor attempts to show how the relation between linguistic forms and propositional attitudes (not only believing, but also fearing, wanting, intending, learning, and perceiving that p) can be mediated by something other than public convention, viz. by nomological necessity.[254]

We shall concentrate on a few of the major assumptions shared by Fodor and Armstrong. In particular, both rest their accounts on the notion of belief as a disposition in the CNS[255] which causes overt behaviour. And both rely on a private language of the sort described by Fodor.

Fodor maintains that an organism O believes that p (formulated in the internal representational - private - language) when

i) O, in situation S, is in a computational relation to "p" corresponding to a sort of behaviour B_i, and

ii) O has chosen to perform B_i as opposed to other options in S by weighting the consequences of performing B_i and the other options in S.

One sort of behaviour is uttering "p", which is true or false as the belief that p is true or false. Since O's weighting or computations could be erroneous, it is always possible that the utterance of "p" is false; indeed, all utterances O ever makes could be false.

Fodor admits just this, but adds that it does not jeopardize the coherence of any language.

> ... even in the case of public languages, coherence doesn't require a stable relation between the way the terms are used and the way the world _is_: What it requires is a stable relation between the way the terms are used and _the way the speaker believes the world to be_.[256]

Beliefs must have something to do with events or actions which go beyond language and linguamorphic activities. If not, they are idly posited. Now, with the exception of speech acts and other acts interpreted according to norms, principles, etc., what we do cannot be inconsistent. So inconsistent beliefs are shown up when they are implemented - we know then that at least one is false. Even if we allow a neurological criterion for attributing beliefs, there is still a condition of consistency. For it is up to the neurologist to insure the consistency of his descriptions of the neurological states, which would be the manifestations of these purported beliefs.

But if all beliefs could be false, any sequence of beliefs might be inconsistent. And, since a sequence of beliefs is, when formulated, itself a belief, and any belief can be analysed as a conjunction of two or more beliefs, the beliefs themselves might be incoherent.

What Fodor does is move the problem back one step. What was a problem about the consistent use of terms, their application to situations, and the truth or falsity of tokens of sentences now becomes a problem about the consistent implementation and truth and falsity of beliefs. If there is a language of thought and it is relevant to our relation to our environment, then it as well must be used. Furthermore, if we are to talk about true and false beliefs, as is generally assumed (although we might talk about appropriate and inappropriate beliefs as we do about behaviour), then it seems we must allow that belief is linguamorphic, since truth and falsity are semantic properties.

If we must choose as to conceptual priority between (public, conventional) language and belief, it seems that we must choose the former. For the implementation of belief in general does not explain language use in general, while we can think of the silent implementation of belief as a surrogate for uttering and acting according to what is said (which has a long tradition).

Furthermore, sentences and their uttered tokens have a syntax; but the only temptation to assign syntax to beliefs is due to remote theoretical considerations.[257]

Finally, we learn how to speak and we can given an account of this; but we do not say that we learn how to believe. This linguistic fact doesnot licence the conclusions that we know how to believe from birth, for "know how to believe" is not English. We are said to know how to do something, but not to believe how to do it. This, in conjunction with what we have said about the connection between practical, essential, and propositional knowledge in Chapter I, suggests that knowing how, or practical knowledge is presupposed by belief. Indeed, purported expressions of belief concerned with a certain discipline are ignored as somehow out of place when expressed by someone with no practical knowledge in the discipline. We expect an answer to "Why do you believe ...?" (the common reply to a belief-expression, as "How do you know...?" is the common reply to a knowledge-claim) to be answered by exercising one's knowledge relevant to the endeavour in which the expression of belief occurs.

Fodor does think that the regress from natural language to the language of thought accomplishes something. We are asked to consider computers.[258] These use an input / output language to "communicate" with the environment and a distinct, internal machine language to "talk to themselves" (i.e. compute). Compilers (i.e. transducers) mediate between the two.[259]

But this says nothing at all about how belief is to do its job or even why the input to the compiler is relevant to the organism or to the environment. Furthermore, if engineering principles work as truth definitions, we could call truth definitions the principles by which a machine sorts gravel into pieces two inches or less in diameter (called true) and larger pieces (called false).

Fodor, although he holds he is exempt from Wittgenstein's private language argument because neurological events are public,[260] feels that the argument has some relevance to his position, as it most certainly has. He states that the argument is unacceptably verificationalist, for it shows at most that unless there are public procedures for telling whether a term is coherently applied, there will be no way of knowing whether it is coherently applied. But it does not follow, he adds, that there is no difference between applying the term coherently and applying it at random.[261]

But the point of Wittgenstein's private language argument is that if there is no way I could use a term incorrectly, I could not use it correctly. For example, if I attend to a sensation and pronounce "S", I have not established a connection beteeen the use of "S" and the occurrenc of the sensation. For "correctly", when applied to my subsequent utterances of "S" means "consistently with my own definition". But there is no difference between having used "S" consistently with my own defintion and seeming to have.[262] I cannot justify what seems to be a consistent use by appeal to another sensation; this would be like buying several copies of the paper to see whether what is in it is true.[263] Memory impressions cannot help, because the claim to revive the sensation in question is just as in need ofjustification.[264] But if the distinction between correct and incorrect has disappeared, so has the concept correct. So "rules" in my private language are only impressions of rules.[265] And the proof that I am following a rule must appeal to something independent of my impression that I am.

Fodor's objection relies on unsupportable distinctions between applying a term, coherently applying a term, and knowing that the term is coherently applied. He again thinks in terms of believing that the term applies and this blinds him to the connection between being able to apply the term, e.g., "A" and knowing what (an) A is. If all "applications" were incorrect or incoherent, there would be no sense in talking about applications. The criterion for the application of a term is the same as the criterion for the correct application of the term. Dropping a handful of name-tags onto a crowd at a convention does not count as randomly naming or misnaming the individuals. There can be incorrect applications of a term only if the term is used in a principled way so that certain cases would violate the princple. What a principled use requires is that some explanation can be given for its misuses - e.g. that the user was tired, that the sun got in his eyes, that he is prone to Spoonerisms, etc. We can say how a person has learned to apply a term and how he knows that the term "A" applies to a certain A. But what we cannot explain, because any "explanation" finishes where it started, is why a person, given that he is an English speaker, applies, e.g., the term "chicken" to chickens or refers to chickens as chickens.

Furthermore, applying the term "A" in a principled way is simply knowing what (an) A is. And if I know what (an) A is and can apply the term "A", then I can generally tell when someone has incorectly applied "A" or when he applies it (a number of times) incoherently. If I could not, then I could not apply "A" myself. I can also be shown when I have misapplied "A"; if there were no way of explaining to me my "misapplications", they would not be applications at all.

One sort of explanation for the incorrect application of a term refers to the beliefs of the speaker. E.g. Fred sees the apples on a tree otherwise hidden by a nearer plum tree, and, believing the apples are on the plum tree, refers to it as "the apple tree". We can give explanations of consistent misapplications of a term by bringing in false belief. E.g., Fred, convinced that apples come from the sort of tree others call a plum, henceforth applies "apple tree" to this sort of tree.

But consistent misapplications of terms presuppose that one can give an explanation. This in turn supposes that the person in question can (correctly) apply terms, that is, that some uses of his terms do not ask for an explanation. And this is to say that the person knows how to use, e.g., English. Consistent "misapplications" of the majority of terms by a society is not misapplication, but (correct) linguistic performance. Similarly, an individual's implementation of any consistent set of "beliefs" is the exercise of a competence; any other set of "beliefs" would do as well, for the question of their truth does not arise. I conclude again that knowing how is conceptually prior to believing (that).

At first glance, it is surprising that Chomsky is willing to characterize innate competence in terms of having a set of beliefs. This becomes understandable, however, when it is realized that the competence in question involves primarily propositional knowledge and only secondarily practical knowledge, and, further, that the beliefs are really hypotheses.

But, firstly, there is a difference between hypotheses or conjectures and beliefs. Chomsky thinks of the child as a linguist conjecturing a grammar for a newly discovered language. But it is perfectly intelligible to frame a hypothesis and add that you do not believe it is true. It might be the only candidate in the present circumstances, or it might be presented for the sake of argument, or framed to test a vague intuition. Furthermore, beliefs are expressed, not framed.

Secondly, the sorts of propositions or rules or structure which Chomsky postulates as innate suffer from much the same defects as Fodor's model for decision on behaviour as an explanation of human performance. For they do not explain how we know how to use language, because we must ask how the structure is used. Again, the rules function in such a way that the person said to have them cannot make an error. But then there is no reason to say he correctly follows them. In "following" these "rules" he would be like a machine incorporating principles to sort gravel into two sizes. There can be malfunctions, but not errors. Following a set of rules or having a competence is not functioning in a way determined by these rules.

Fodor asserts - and it is implied by Armstrong's position - that a convention depends on the parties having the same beliefs - a convention is a coincidence of beliefs. But this explains conventions in terms of what depends on conventions. For cultural endeavours are possible only because there are conventions, and beliefs relating to these endeavours depend on them.

We have rejected the central role given to belief by Armstrong and Fodor and also Chomsky. In these accounts, belief is something standing behind overt performance. We thus have further support for our view that an account of human cognition is primarily concerned with overt behaviour and the circumstances in which it occurs described in a way relevant to it. This also supports the view that human cognitive concepts are tied to the notion of a person.

Another aspect central to both Armstrong's and Fodor's account is the notion that internal dispositions of the CNS are cognitive and cause overt behaviour. This is seen to be inconsistent with an account of human cognition in terms of overt behaviour. Armstrong writes that he holds a realist view, according to which, if an object has a dispositional property, there must exist a "categorial basis" responsible for its manifestation of certain behaviour in certain circumstances.[266] Squires has replied to this with a regress argument:[267] since the object would have to have the dispositional property and so the categorial basis even if no manifestations occurred, what is meant is that the basis would cause the object to behave in the appropriate ways in relevant ciccumstances. So a dispositional property is attributed to the categorial basis and the analysis must be applied to this property, and so on.

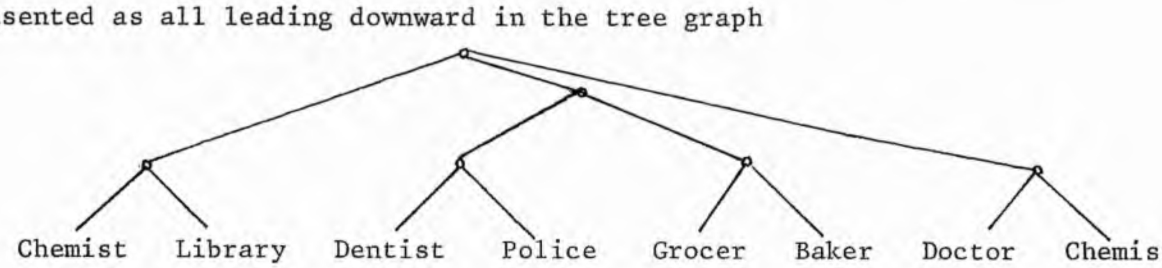
Armstrong argues that for the disposition of a rubber band to stretch one inch under force F to be attributed to it at different times, the numerical identity of the rubber band is not sufficient, for dispositions change over time; rather, one must rely on the continued existence of the categorial basis or inner state.[268] Squires replies that the correlation of this state with the relevant manifestations either gets us no further than we were with the thing itself, or itself requires a further categorial basis to account for its manifestations - and so on.[269] The acquisition of a disposition is a change, Armstrong replies in turn,[270] but dispositions are potentialities, not actualities, so some actual basis must be acquired in the change. Squires points out in reply [271] that "actual" is not opposed to "dispositional": there are actual conditional properties just as there are actual categorial properties.

With respect to persons, Squires' point is that in separating the inner from the outer, what is left is incapable of the behaviour it was postulated to explain; if there were a part of a person which accounts for his behaviour, it would be the person himself.[272] We are tempted to locate certain activities "inside" the person because they can be done without any external sign.[273] But these carry implications about overt behaviour which we are not tempted to so locate. For example, saying something under one's breath entails not saying it aloud and, if a chess player is mulling over his next move, it follows that he is not doing any number of things. Since it is not a part of someone which talks or makes moves, it is not just a part of him which mulls over or ponders.

What convinces some that there must be cognitive structures and processes standing behind overt behaviour is that we must somehow "internalize" maps, rules, instructions, etc. to account for our ability to follow these when they are no longer present. This gains plausibility from the fact that the learning involved is often not explicit. "Internalization" is a term used extensively in the biological, behavioural, and social sciences. In particular, Chomsky and his followers hold that language learning is a matter of internalizing the grammar. Furthermore, tree structures are generated by the internalized and innate rules to govern speech production and to match received signals. Indeed, innatism would be idle if there were no such internal products.

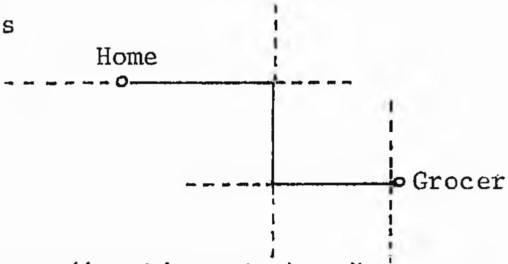
Tree graphs can also represent a number of other competences. One such is our memory for and, generally, competence in urban geography. Results from experimental work in which subjects are asked to estimate distances and angular measures of routes traversed in various parts of a town suggest that spatial relations are not remembered in terms of metric properties; rather, they are remembered in a way which could be represented by graphs, in which only topological connectedness (the order of locations and turns) is presented.[274] In a graph of a town, each vertex of degree greater than two corresponds to a road junction and each vertex of degree two corresponds to locations encoded. A subject's ability to find new paths can also be expressed in graph-theoretical terms.

It has been suggested that paths of such graphs correspond to "programmes" which guide locomotion.[275] We could think of remembering a path as having an algorithm generating it. A person's knowledge of the shortest routes from his house to various important locations in his town or district could be represented by rules (corresponding to subcategorization rules) giving all the alternatives at each intersection.[276] Suppose the destinations are all public agencies of some sort; we could have rules (corresponding to lexical insertion rules) specifying agencies at the ends of paths.[277] Since metric properties are not remembered, the paths can be represented as all leading downward in the tree graph



where each node is labelled by the sort of intersection it is. We could also imagine that there are co-occurrence rules for the agency-labels in that certain sorts of public agencies tend to be near ones of some other sort, distant from others of the same sort, etc. Given other reference points, similar trees would be generated. A child whose geographical competence is represented by such a tree could grasp the geography of another town or district. If the difference in towns or districts lies in the interchanging of the locations of two or more agencies, the difference in the child's understanding could be accommodated by one or a few transformation rules.

As a very simple example of what might be internalized, consider the path from A's home to the grocer's



This corresponds to the instructions (in this order): "Turn left outside the house". "Turn right at intersection." "Turn left at intersection." "Enter agency at T-junction."

Now it would not help to have the instructions internalized in the sense that I say them to myself, which would accomplish no more than having someone else say them to me. But perhaps the major reason we speak of internalization is to account for why someone behaves in the absence of the instructor as he did in his presence. In the instructor's absence, some modified version of his instructions echo through the person's head at the appropriate place. But the instructions might echo through one's head at any time or place; why just when it is appropriate to turn right?

Why, first of all, do we turn right when the instructor says "Turn right"? We could always do otherwise. If we say because we want to get to the grocer's, then it can be asked why we wanted to get there, and so on. And there are any number of answers to the first question which would have been appropriate, e.g. we wish not to be punished. But there is one general answer which has a special position: we understand what he says. Generally, given this reply, no further question is asked (with the exception in special cases of, e.g., "When did you learn English?" "When did you regain your hearing?, etc.); the further account is required in the case of misunderstanding. In particular, there is no need to refer to internalized rules or structures or internal processes.

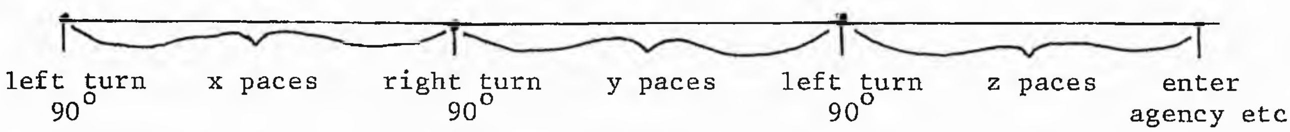
Now the phrase which echos through my head is appropriate when I reach the intersection because it describes what I do - it is no longer an imperative. In the initial case, I understand the instructor. Subsequently I could give the instructions, but this would accomplish nothing in the present case, for I know how to get to the shop. (That I know how to turn right (when so instructed) is unimportant.) I do not obey the instructions every time I go to the shop. Nor do I remember them every time I go to the shop. I perhaps do remember the instructions in another way - e.g. I can reflect on the instructor's odd accent. But this is independent of remembering how to get to the shop, which is similar to remembering where I left my case or simply remembering my case. Here again there is no need to posit something internalized or internal processes.

A fortiori an internalized graph would be of no avail: if it is not the instructions themselves in a different form, then the instructions are needed to interpret it.

But, it is objected, we are supposing prior competences, A's ability to use language, in particular. What the graphs represent, on the other hand, are very basic abilities which suppose no more general or basic abilities.

Suppose, then, we interpret the graph as specifying an automatic form of locomotion. Person A sees an empty milk bottle and automatically stands up, walks out the door, turns left, etc., and ends up at the grocer's. Suppose A responds to cues at each point where a "decision" is called for. But then we would be left with the problem why the "internalization" of comes into play just when A is presented with the cue: either the cue on its own would be a cue for A to turn right or there must be a third factor which brings the internalized node into play just when the cue occurs.

To give the general suggestion some plausibility, we must assume a situation such as the following. An empty milk bottle is a cue which triggers a complex behavioural pattern determined largely by internal factors. A sees the milk bottle, automatically walks to the first intersection X (standard) paces away, at which distance he turns right, and carries on in similar fashion. For this to work, he must have some means of recording his progress, so that, e.g., he turns right after x paces.



The diagram is no longer a graph, for metrical properties are specified.[278]

To see what "internalization" implies here, consider what would happen if the recording device fails. E.g., it does not begin to function until after the first x-n paces, so A overshoots his first turn. Has A made a mistake, got something wrong? Compare this with the case in which A sets out for the grocer's, but x-n paces before the first turn he goes blind. Desperate for milk, he carries on, but overshoots the first turn, What sort of error is this? A's error was that he did not turn right; he didn't know when he was at the turning. We might blame him for carrying on, or, allowing this, for not asking people, feeling the kerb, etc. But what we cannot blame him for is going blind.[279] This was his misfortune; although it accounts for his error, it is not his error.[280] Similarly, if the recording device malfunctions, this is A's misfortune, but not the error itself.

But, now, if the error, A's getting it wrong, is a public affair, involving his (gross) behaviour and the circumstances in which it occurs (described in a way relevant to behaviour), then getting it right must be as well. We might wish to delve beneath A's skin to find out why he made the mistake; perhaps then we could account for the error in terms of the malfunctioning of an organ. But, given that A knows how to get to the grocer's, an account of why he gets it right - either in terms of his internal machinery or in terms of his (gross) behaviour and its circumstances - simply cannot be demanded. And, further, the fact that A knows how to get to the grocer's cannot be accounted for in terms of internalized structures, for these are either idle or they beg for another explanation, viz. why they come into play when they do. All in all, internalized cognitive structures do not explain what they are postulated to explain. There are certainly internal structures, but these function or malfunction and cannot be the loci of cognition or cognitive dispositions. They function correctly in the vast majority of cases.[281] When they malfunction, activities which exploit them are liable to go wrong and the resulting errors can be accounted for in part by these malfunctions.

We may look at the wrong thing, fail to see something, and act hastily on what is only glanced at; but these are all things we do. Our eyes do not make errors, although they may fail us. "The testimony of the senses" is only a quaint phrase. In visual error (if it is in fact error, and not malfunction), the buck cannot be passed to one's "deceptive" visual apparatus. In any straightforward sense, we neither do nor do not know how to use our eyes. The locution "use your eyes" has a use in so far as it relates to looking for or at something (as opposed to acting habitually or intuitively).

Compare this with the case of using a compass. In some important ways, a compass is exploited in ways similar to the ways we exploit our natural endowment. (This point, when extended to other gadgets, is a powerful argument for realism in the natural sciences.) E.g. we judge the ship is 10^{o} off course by compass, by eye, etc. We neither say that our eyes tell us nor do we say that the compass tells us that the ship is off course; rather, we use our eyes or we use the compass to find out. A malfunction of the compass (which is not, of course, an error) can account for error.

But there are important differences. Errors occur not just when we use the compass in order to get somewhere, but also when we are simply taking compass readings. There could be no equivalent with the eyes. We learn to use a compass and we either do or do not know how to use a compass.[282]

Other, perhaps more interesting cases of urban-geographical competence involve applications to novel situations or general competence. Such cases would involve map reading and picking out courses, but also turning right when presented with the sign $\boxed{\rightarrow}$. In any case, there is no reason to suppose that internalized rules, directions, or graphs are involved. They are not involved in the particular, familiar cases, and what the general case adds are public signs - maps, directional indicators, etc. and written and verbal tokens.

This introduces competences exercised in activities other than locomotion; still, the signs must have some relevance to locomotion. If A draws a map including his present position, butdoes not know how to begin to follow any route portrayed on it, we would have good reason to say that he did not know how to use the signs; he might only have memorized an array of signs.

No matter how explicit is a map or a set of directions we give to a person, he still must apply them - select certain features as relevant and decide whether he is at a certain place. These selections and decisions are determined by neither environmental nor internal factors. In general, a person has a competence or knack in an endeavour when he can apply the rules in a discriminating and innovative way, when he can take advantage of the possibilities offered by that endeavour, and when he can engage in activities of that endeavour for purposes which go beyond it.

A person acquires a knack by experience - not experience in the sense of a stream of mental occurrences, but in the sense of trying out, learning how to do something. Errors are to be expected; eventually the person himself will be able to correct them. The activity becomes second nature. While the explicit formulation of rules is a powerful heuristic device, unless one has some competence in the field in which these rules are applied, they can be of little help in advancing one's understanding.[283] The fact that these activities become second nature explains why the rules need no longer be enforced. The agent can evaluate his own behaviour. Indeed, an individual totally isolated from the culture into which he was inducted will most probably continue to observe its conventions. This is not because they have somehow taken over his internal machinery, but simply because observing these conventions, or following these rules has become second nature. Chomsky suggests that the extension of established competences to novel sorts of situations can be accounted for in terms of an extended notion of transformation.[284] We have given an example in terms of urban-geographical competence. But such an account is not needed. The same general knack is usually sufficiently open-ended to take on new cases. If a major adjustment is called for, more trials, with inevitable errors, must occur before one acts in general by second nature.

There is a consequence of Chomsky's view that the human language faculty is a species-specific faculty of mind[285] which illustrates the results of confusing what is natural with what is conventional. The consequence is that there could be possible sciences not accessible to humans.[286] Chomsky thinks of innate competence as a set of rules or at least principles governing the application of rules. We can think of these rules as a set of independent axioms generating a system. Any number of rules could be taken away, any number of consistent rules added; we could even replace the set of rules with a set completely disjoint from it. For the system generated by the rules is the sole constraint on what are taken as axioms, and there is no claim that the system is complete. It so happens that we have the competences we have; it is a matter of biology.

Chomsky allows that there are human innate cognitive faculties other than that for language, e.g. "common-sense understanding", "a system of beliefs (sic), expectations (sic), and knowledge concerning the nature and behaviour of objects, their place in a system of 'natural kinds'..."[287] He also suggests faculties to account for various Gestalt effects, numerical and spatial intuition in mathematics, and the recognition of faces.[288] One need only imagine a device with one or more other faculties (we could not, of course, say what these are) to see what Chomsky is on about when he claims that there could be possible fields of knowledge which are not accessible to us.

There are indeed certain biological constraints on humans; e.g. humans can endure only a certain acceleration. But these are not (directly, at any rate) constraints on what we know. Again, consider the following pairs of statements:

I	II
We do not know how to travel faster than c.	I know how to drive this car faster than 50 mph.
We do not know how to produce a perpetual motion machine.	I know how to make a pinwheel which will continue to spin indefinitely, given the slightest breeze
We do not know how to cross a pine with an oak.	I know how to cross a pumpkin with a squash.

Furthermore, the statements in column I state what we could not know how to do. The statements in column II look like those in column I. Perhaps, we are tempted to think, our technology has not yet come up with a solution to the problems of flight at speeds greater than c as it has for supersonic flight; or perhaps one thinks there is some secret to travel at speeds greater than c which will always remain inaccessible to human knowledge as some maintain certain psychic phenomena are beyond the scope of our knowledge. But, in fact, the statements in column I are circumlocutions for statements of general laws. They thus state something we do know, and not in the trivial sense that we can say of someone that he knows that, e.g., he does not know the capital of Albania.

There are more inviting analogies to Chomsky's claim. E.g. we could not know the answer to certain (unsolvable) mathematical problems. But knowing this is knowing something about the mathematical discipline in question. Again, we cannot know the position of a particle in one dimension and, simultaneously, its momentum in that dimension beyond an accuracy of by $\Delta x \Delta p_x \geq \hbar/2$. But knowing this is again knowledge of physics (even on the interpretation that particles have definite positions and momenta smaller than specified by this formula). Chomsky's position, on the other hand, is that there could be possible fields of knowledge inaccessible to us.

Now humans are not biologically equipped to fly. Yet it is odd to say of a person that he does not know how to fly unless we mean that he cannot handle an aeroplane. (In some contexts it might be acceptable, but this is when the species is personified, as in children's stories, where representatives from different species portray human character types.) Again, it is odd to say of a person with a permanently damaged larynx that he does not know how to speak; rather, the fact that his vocal equipment does not function accounts for the fact that he does not speak.

Chomsky is not principally concerned with the opposition between the faculty of language and, e.g., that of flight. Rather, he sees the faculty of language on a par with, e.g., our ability to do mathematics. Further, if some other species had a faculty for a field of knowledge inaccessible to us, we could never know this. Chomsky would bring in the point used against Skinner: we must be able to specify the competence before we can say what has it, how it is acquired, etc.

But this shows that there could be no biological evidence for or against this thesis. There is a communality to knowledge which allows us to say that fields of knowledge developed by a culture are accessible to its members.

Chomsky would have this communality depend on biological factors; so, e.g., tensor calculus would have been accessible in some way to the Babylonians.

However, certain disciplines - e.g. mathematics - develop to the point where they are indpendent of biological factors. What one does in stating an arithmetical formula is not properly described by giving distinctive features matrices or any other aspect connected with out biological equipment. Rather, it must be described in mathematical terms, which requires understanding a portion of mathematics. Admittedly, there is a link between our mathematical concepts and the signs we use. But any signs will do, as long as they are consistently used and the requisite relations can be established, which is a matter of use.

It might be objected that if Martians have developed a science, there would be a good chance that they could not communicate it to us. Indeed, there would be a good chance that Martians (if there were such things) could not communicate with us at all.

This is perfectly intelligible. The reasons would be biological, but not because a Martian's speech organs or whatever and CNS or its equivalent are wired differently from ours - this would present a technical problem in decoding. Rather, there might not be any way for either of us to get a handle on the other's basic vocabulary which is used in conjunction with typical forms of behaviour. If a Martian's "behaviour" is totally different from ours, how could we teach it to use expressions such as "I have pain" or "I am afraid"? And how could he apply "pain" and "fear" to us? Furthermore, the words for basic actions would be without a context for the Martian, and so without a use. Many of our cultural institutions such as legal systems, and so their vocabulary, might presuppose behaviour of a sort indicating nothing to a Martian. The acquisition of the rest of our vocabulary depends on having these basic terms.

If we and the Martians could share our basic terms, there is no reason to think that esoteric terms could not be shared. Martians might be so equipped that, e.g., group theory appears more natural to them than basic geometry or they might add one three-digit number per microsecond. Still, although we and Martians might have different developmental histories, there is no reason to think that, once the basic vocabularies are translated, we could not eventually learn any field of Martian knowledge which does not directly require the equivalent of a behavioural context. Chomsky, on the other hand, thinks more in terms of the esoteric fields being excluded.[289]

This suggests why we apply "know" and other cognitive terms to animals, even though we have emphasised the cultural aspect of knowledge. It is because animals share forms of behaviour with us. (Here again practical knowledge is basic.) This does not suggest that cognitive terms might be applicable to inanimate objects which move about, change shape, etc. in response to environmental changes. Much of the environmental response of an animal's body or a human's does not count as behaviour, so cannot count as the display of cognition.[290] We do not generally say of an animal that it knows how to do what it can do from birth.[291] E.g., we do not say of fish that they know how to swim or of humans that they know how to breathe. Some development is needed.

Chomsky sometimes characterizes his position, not in terms of innateness, but in terms of maturation, with cognitive structures arising from the interaction of the organism with its environment.[292] The development of cognitive structures is likened to the development of the leg.

But such development does not give rise to knowing; basic sorts of practical knowledge, rather, arise from learning. And learning, in these basic cases, involves trying, particularly trial and error. Trying need not involve intending, nor need there be a point to trying. What is tried depends on the criterion of success, and this is given in the case of animals (where convention is not involved) largely by what the adult is normally able to do.

If something tries to do something, it is conceptually necessary that it could fail. Trial allows of error; only if we could get it wrong can we be said to get it right. When the success has come to be taken for granted, the ability is often not counted as knowledge. For example, a fledgling flapping its wings in the appropriate fashion is said to be trying to fly, because the adults normally have the ability to fly; yet the adults are generally not said to know how to fly. Practical knowledge as well must allow of error; this distinguishes "know how" from other paraphrases of "can".

The trials and errors are manifest in (overt) behaviour and relate to the circumstances of the behaviour. The criterion of success must be external, for "know" is used in such a way that if something knows something, it thereby has an advantage.[293]

We have relied a great deal on cultural rules. Such things are the explicit subject of sociology. Yet internalization figures large in this subject. Furthermore, the notion of functional (systems) inegration, taken with that of internalization, results in a view of the "compartmentalization of the self" reminiscent of automaton models incorporating transducers. Finally, sociology has come to use graphs; when such structures are internalized, they are remarkably like P-markers. To maintain my position against this attack on the flank, then, I shall investigate and argue against these points.

The term "sociology" covers a great range of academic styles. We shall be concerned with the sort which analyses social structures with an eye both to the systematic relation of the components and the activities of the members of the societies. As such a discipline, sociology has been colonized by mathematics in a number of ways in the last thirty years or so.[294] In this respect, sociology can be thought of as generalizing certain methods of economics, the most successful social science. Some of the units of economic theory - monetary units, persons, institutions, fiscal periods, etc. - are so obvious that to some extent theory has grown up with practice. Concerning the applications of mathematics, of particular interest is an analytic tool for micro-economics known as game theory: one can determine certain "equilibria", in which it is not possible that anyone involved would have been better off if he alone had acted differently and all the rest had acted just as they did. The situations in which the sociological notion of unintended consequences is involved are structurally similar to the situations to which game theory is applied. Game theory and the notion of unintended consequences are in some ways restricted versions of Wittgenstein's notion of a language game.[294'] The significant value of these approaches is that they focus on the prerequisites for the use of items which require social relations, and they do not directly concern themselves with tangential natural properties and relations.

Much of the better work in this direction was syntehsized by the American sociologist Talcott Parsons, who has had considerable influence in the English-speaking world. Parsons analysed society as a system of functionally inter-related variables.[295] Functional analysis is a genuine part (but only a part) of social theory; it points to feedback in the causal processes of social life by creating a number of abstract models of certain features of a society.[295'] These are then treated as totalities - Parsons' "boundary maintaining systems". After these models have been analysed, they can be used to give a true causal explanation of social problems.

We can imagine any number of social relations - whether between individuals or between groups - which could be represented by graphs or digraphs. We take[296] V(G), the vertex-set of graph G, to be the components of a culture and E(G), the edge-set, to be the realtions in this culture. A structural model is, then, an abstract formulation of V and E. The model is interpreted when V and E are interpreted; the members of V may be individuals or groups, and the groups may individually have their own structure. As an example, "clique" has been defined to be, "for a particular value of n, the points that are mutually reachable by m-paths when $m \leq n$".[298] Again, the relation has-power-over can be represented by the edges of a graph, where the members of V are roles, positions, offices, individuals, or tasks.[299] Now a tree structure would represent that organization which minimizes conflict in orders.[300] A more stable structure, less vulnerable to disruption in paths of command, is represented by a "semilattice".

Given such structures, we can go on to investigate the actions of agents subject to them, the realm of action theory.[301] Action theory relates to the actor's purposes, knowledge of and assumptions about the social situation, and norms.[302] We can then introduce models of interaction, which allows us to say something about individuals as members of social systems. Parsons presented[303] a micro-social model, then extended it to social structures in general. Interaction, heheld, occurs when any one actor ("ego") needs or wishes to take account of the actions of another actor ("alter"). Interaction results in a pattern of mutual expectations which becomes a set of norms. The rights, duties, etc. imposed on ego and alter by the resulting norms define their "roles" in relation to one another.

A great advantage of the interaction approach is that social change - which remains intractable for many rigid structuralist accounts - is seen to result from the conditions and processes of interaction itself.[304] Furthermore, this change is unintentional, for as soon as ego must take into account the actions of alter, the intentions of both are at most like initial moves in a game.[305]

Now the concept of functional interdependence refers to the way in which different sets of rules, norms, values, role-structures and institutions characteristic of social life are inter-related. It has been claimed that the only theory which accounts for this at all satisfactorily explains it "as the largely unintentional product of social interaction over time".[306] The greater functional integration of simple societies can be expressed in terms of the relation between an individual and the structure of his society. It is held[307] that at the "ideational level", the greater functional integration of simple societies results in a "patterned relation between the different items of culture". This is for two reasons. Firstly, there is "total" internalization - each member internalizes all or most of the norms and symbols of the culture - because each member tends to participate in all activities. Secondly, constant interaction between members favours standardization. In complex societies, different individuals participate in different components and, when the same individual participates in two components, he does so by fulfilling two distinct roles. So different individuals internalize different sets of norms.[308] Again, when the individual is "drawn into" distinct sectors, "the different parts of the self are possibly compartmentalized, so that the internal strain to consistency may ... be low".

I fail to see, however, that any of these points[309] show that cases of functional integration must or even can be accounted for by involing the notion of internalization. Meaningful connections between systems of cultural activities can be accounted for just as well in terms of one sort of activity exploiting another - or both exploiting each other - so that any individual who has the knack in one will find it easier to learn how to do the other. For example, industrial conditions exploited the Japanese family structure in that Japanese society has become one of consumers, producers, importers, and exporters like Western society. Conversely, the Japanese family structure exploited industrial conditions in that industrial organization in Japan relfects family relationships and the economic and professional aspects of Japanese life remained integrated in much the same way. What did change was the efficiency of production and the availability of goods and services, which were desiderata before industrialization. This is not to say that industrialization has left Japanese culture as the generation which began it would have liked; there have been a good many unintended consequences. But we need not appeal to industrialization alone to account for these.

In such cases it is even self-defeating to hold that two components are internalized. We can imagine a person who has mastered two completely disparate sorts of social activities, e.g. a pre-industrial Japanese who went to England for his education and mastered the English language, system of etiquette, etc. On returning to Japan, he acted like anyone else; but if he had returned to England, he would have spoken impeccable English, taken up cricket again, etc. There is no reason to think that any English manners or knacks which he might have displayed or employed in Japan could be described in terms of the integration of two sets of norms resulting in new ones. The Japanese did exploit those Western techniques they found advantageous; and this did lead to more fundamental social changes. But this was because the techniques were employed by the society at large or a component of it. If acquiring these knacks were thought of as internalizing the procedures, we would still have to account for the fact that the procedures have become those of Japanese and not, e.g., English culture.

Again, there is no reason to think that the knacks of the person in our example must be such that "the different parts of the self are compartmentalized". If our Anglicised Japanese had two compartments, one for Japanese norms and rules and one for English, it could be asked how he knows, when he is in Japan, that just these rules and norms are appropriate. He might display behaviour which would have been appropriate in England, but is not in Japan. But the explanation of this would be like the explanation why a pianist inappropriately plays a flat when he has changed key. We largely follow rules, behave in accordance with norms, etc. without formulating the rules and norms and without debating whether they apply. Indeed, if we had to formulate every rule and debate every case, we could never get started. As a consequence, we do not always catch ourselves behaving in a way appropriate to some situation, but not the present. Furthermore, some structures are sufficiently like others that a knack with the one makes it easier to develop a knack with the other; however, sometimes one does not master the second, because one can get by without. When errors occur, it is not because there are two competing components in the person, but rather because the person is exercising a competence which basically is not appropriate for the case.

The social structure can be described as having components and accordingly, the society can be thought of as compartmentalized into professional, socio-economic, religious, etc. groups. But while sociological roles are determined by the structure, persons are not. One person can fulfil any number of roles or none at all (e.g. Robinson Crusoe); the person is individuated independently of the role he fulfils. Although what sort of action a person does is often determined by the role he fulfils, the performance is not attributable to internalized components - there is only one agent.

Parsons has a notion of personality which has little to do with persons. He holds that the specific motivations to conform or the general need to conform are internalized, so that the fundamental values of the society become part of the "personality".[310] So what becomes part of the personality is general to the culture. This is reflected in the fact that the highest of Parsons' three levels of abstraction relating to social action is the personality, the system of motives and concepts as internalized in each individual.

Despite appearances, the terms "internalize" and "personality" are meant to have no psychological overtones. Psychologism is generally rejected in sociology because the factors it postulates to explain social forms result from the very forms themselves.[311] Action theory shares in this end, and, indeed, its intention is to exclude psychology from social explanation. Parsons' theory of action has been criticised[312] for having no actors and little action and for separating the personality system from the social system, dealing only with the latter. It is suggested that sociology, to be explanatory, must include propostions that are psychological in the sense that they are stated and tested by psychologists.[313] But this falls victim to the original criticism of psychologism.

What is really wrong with a great deal of sociology which is labelled "functionalism", "action theory", or "structuralism" (hence a great deal of sociology) is that it overemphasises its own variables. Structure is something abstract; when it is complex, it requires mathematical methods to be clearly presented. Personality, as treated by Parsons, and roles are also abstract. Internalization, is a relation between abstractions. The situation is not improved by introducing considerations about the natural equipment of homo sapiens, for this does not relate to the circumstances described in a way relevant to the questions at hand. Rather, what is wanted is a notion of a person and his behaviour in circumstances described in the relevant way. A person's actions are not all subject to the rules, norms, etc. of the society. Further, it is up to the person to apply the rules, to determine when they are appropriate, and to decide what to do and when to do it. Social rules make the activities possible. But, if these constraints are held to determine what happens, then we can no longer speak of (human) activities.

Chomsky claims to give a rationalist account of the acquisition of language in particular and knowledge in general; the similarity lies in innatism. But his historical claims are unsupportable and there are very fundamental differences between his position and seventeenth century rationalism. Innatism was not a biological thesis for the rationalists, they found it necessary to keep some vestige of the concept of a person, something beyond the individual was regarded as essential for cognition, and they denied that there could be inaccessible possible fields of knowledge.

Of the philosophers with whom we are concerned, Chomsky discusses Descartes at length and occasionally cites or mentions Leibniz. Locke is not mentioned in Cartesian Linguistics, Chomsky's historical work, and only twice in Aspects (stating that he presented a parody of innatism).[314] Malebranche is not mentioned at all. Indeed, Malebranche would be an acute embarrassment for Chomsky, for he was a rationalist, yet denied innatism. Furthermore, he held that ideas in the mind could not account for knowledge; the standards must be present to us, but must be shared with others.

Chomsky's citation[315] of Descartes' two criteria determining whether something is a man - i.e. involves body and mind, and so is not a mere machine or animal - is unobjectionable. The fact that one of these criteria involves language, however, gives him a historical starting point to go on to claim the Grammaire Générale et Raisonnée (Port Royal Grammar) and other works on language are of Cartesian inspiration.[316] These criteria also suggest to Chomsky a broader position: a distinctively Cartesian theory of mind. But, in fact, both criteria were presented in much the same form by Suaraz, Descartes' great Scholastic predecessor, and the criterion involving language was presented by at least one anti-Cartesian, Sergeant. (We shall present the passages in chapter VIII.) Suarez uses these criteria to distinguish between what wereknown as material and spiritual faculties; both were attributed with cognition, but only spiritual faculties with rational cognition. These criteria were used by Suarez and Descartes to distinguish between men and animals; they were also used by Descartes to distinguish between what is not and what is explicable purely mechanically.

Chomsky sides with Descartes' theory of mind for two reasons. Firstly, he sees Cartesianism as emphasising the creative aspect of human, especially linguistic, behaviour, and so incompatible with behaviourist positions.[317] Secondly, Chomsky shares Descartes' nativism.[318] The similarities, as I think Chomsky would admit, end here.[319] Chomsky's "mentalism" is that of Sapir; it is the firm denial of operationalism. And he claims[320] that seventeenth century mentalism was an attempt to save something from mechanism and that its eventual demise resulted from a more general scientific view.

One difficulty with Chomsky's historical position is that innatism and certain grammatical positions appear to be all that is isolated under the label "rationalist" and even these two aspects lack any evident connection. Book IV of the Essay has been called rationalist because (propositional) knowledge and reasoning are accounted for largely without reference to experience. This account, furthermore, was typical of the empiricism of the day, the major claim of which was that the mental inventory comes from experience, and then can be used to formulate knowledge which is not given in experience. Furthermore, the Cartesians (especially Malebranche, but also Descartes in Les Passions de l'Ame) had a keen interest in recurrent patterns of thought; they differed from Locke on this point in that they sought an explanation in corporeal dispositions.

The universal and explanatory nature of the Port Royal Grammar, a major theme of Cartesian Linguistics, is seen to be Cartesian in inspiration.[321] This has been convincingly refuted by Lakoff.[322] She points out that the generative and transformational elements of this work are more clearly and extensively presented in an earlier and better known work by Lancelot (co-author with Arnauld of the Port Royal Grammar), the Nouvelle Méthode pour facilement et en peu temps comprendre la Langue Latine. The third edition (1654) of this work disclaims credit for the contents, which it attributes to the infleuntial sixteenth century Spanish grammarian Sanctius.

The first edition (1644) of the Nouvelle Méthode was prior to Lancelot's discovery of Sanctius' Minerva and contains none of the elements of transformational grammar. Chomsky discussed the Minerva in Cartesian Linguistics, but claimed that it was concerned with literary criticism.[323] However, Lakoff's closer investigation easily reveals that it is as much a work in universal grammar as was the Port Royal Grammar.

Chomsky replied that what separates the Port Royal Grammar from Sanctius is the Cartesian revolution.[324] But this is simply begging the question.

There is also the suggestion that later works in universal grammar had Cartesian inspiration. There is little to be said for this in the case of the Romantics, and Chomsky did not mean to suggest an historical connection in this case.[325] But a connection is suggested in the case of the eighteenth century figures, the most important of which is Du Marais.

However, Aarsleff[326] has shown that universal grammar in the eighteenth century looked to Locke for theoretical support and that this is especially true for Du Marais.

Harman has replied for Chomsky that Locke was subject to a Cartesian influence which he transmitted to his successors.[327] The historical claim appears to be vacuous now; if anything, there is a claim that all human languages have a common element which is not due to convention. This follows from the general point we maintain, that convention was not understood in the period under considerations. Universal grammar can be supported, not only by appeal to universal innate factors, but also by appeal to universal environmental factors - we all receive much the same mental stock.

We shall see that there are very significant differences between the Cartesian and Lockean theories of mind; indeed, there is as much accord between each of them and certain Scholastic theories as there is between the two themselves. Their accounts of language use are also significantly different. Locke accepts a two-sign theory: a word is a sign of an idea, which is the sign of a feature _in re_. This is the standard Scholastic acccount. Descartes, on the other hand, criticised this theory thoroughly in the _Dioptrics_. (Chomsky ignores this work, Spinoza's discussion of knowledge involving words, Malebranche's on words replacing natural features, Leibniz's criticism of Locke's two-sign theory in the _Nouveaux Essais_, and generally all the Cartesian literature which concerns the meaning of words and the use of verbal tokens.)

The agreement with the Cartesians is on a very broad level, that certain distinctively human activities and our ability todiscern certain features depend on innate capacities. However, the capacities which are of interest are different in the two cases. The Cartesians often parrot Descartes, giving the two criteria; thus the quotations from Cordemoy which Chomsky presents.[328] They have a reasonably clear and frequently articulated position on the meanings of words and the use of verbal tokens. But most of this is developed with an eye on mathematics. Grammar was one of the subjects of the trivium, so was suspect of producing "prejudice"; at any rate, it was regarded as lacking the clarity of methematical subjects, being a "historical" subject. The _Port Royal Grammar_ was not directly part of the Cartesian programme; rather, it was the product of a pedagogical movement whose quest for clarity and simplicity in traditional subjects was in large part inspired by the general CArtesian outlook. Universal grammar was not a central Cartesian interest; _mathesis universalis_ was. Indeed, the work in which Descartes presents the two famous criteria is a popular account of _mathesis universalis_. W.K. Percival has concluded that

> Chomsky has so far failed to show convincing proof that Descartes had any influence on the French universal grammarians of the late

> seventeenth century. ... unlike most of the other major philosophers of the seventeenth century, Descartes was relatively uninterested in language.[329]

Rodi-Lewis mentions Cordemoy's Discours Physique de la Parole as a counter-example to this. But this work is on exactly what its title states - the physiological production of speech sounds. Such investigations were inspired by Descartes' physiological outlook and sought to describe what we earlier sketched as the output of the nervous system (when this results in a natural utterance). That is, they are concerned with "speech" as this in principle could be imitated by a machine.

As to further hsitorical suggestions, Chomsky associates Ralph Cudworth, the Cambridge Platonist, with Descartes.[330] There indeed are similarities: Chomsky finds the major one when he parallels their statements about the need forinnate ideas to perceive geometrical figures. But it would be a mistake to think that Cambridge Platonism owed much to Descartes. Henry More, one of its earlier representatives, became a firm opponent of Cartesianism, thinking it a form of materialsim. If one looks for sources, a common source can be found to account for the similarities between Cambridge Paltonism and Cartesianism. We shall see in the following chapters that Cartesianism has knowledge-theoretical affinities with Thomism; references to an inborn light, a divine spark, etc. are completely within this tradition. In fact, Cambridge Platonism, with its reliance on such things as plastic natures to account for physical change, denied one of the main tenets of Cartesiansim: universal mechanism.

Cambridge Platonism is significant in a discussion of seventeenth century innatism because of Locke's familiary with it at least as early as his first opposition to innatism in the 1660s. The deism to which Cambridge Platonism tended and the notion of plastic natures were earlier presented by another representative of innatism whom Chomsky discussed in detail;[331] Edward Herbert of Cherbury. This is the only adherent to innatism discussed by Locke in the Essay; references in the early drafts show that he came across Herbert's De Veritate in 1671.

Herbert's nativism is considerably different from Descartes'. Herbert has a theory of faculties according to which reason ("discursus") is the least reliable and "natural instinct" the most reliable.[332] The mark of reliability is the control of unhesitating action. This is obvously unacceptable to Cartesians, not only because it is incompatible with animal-mechanism (not to mention mechanism in general), but also because for Descartes judgement, hence the possiblity of hesitation, is essential to human cognition.[333] Indeed, Herbert regards all faculties as sorts of sense ("sensus")[344] and knowl edge as the conformity between faculty and object, i.e. feature.[345] For Herbert, knowledge is necessarily related to the general make-up of the environment. Empirical knowledge is accounted for by the so-called analogy between the microcosm and the macrocosm,[336] which is spelled out in medical terms (his medical theory is called anatomia vitalis[337]) as the harmony between the humours within the body and the corresponding elements in the world.[338] There are harmonies within the humours and within the elements; but these amount to the same, since the harmony of the world is the standard by which the relation of bodily humours is evaluated. Holding this, Herbert maintains that we know all things because we contain (elements of) all things.[339] Rational knowledge is accounted for by the so-called analogy between the mind and God,[340] which is spelled out in legal terms. God is held to direct the aspects of the world relevant here by "universal providence".[341] Thus the world is a well-ordered state and a person's rational faculties are harmoniously disposed (so that he is attributable with knowledge) in so far as they are analogous to the harmony of the world-state. Herbert is concerned mostly with general principles of conduct, largely related to religion; his goal was to further religious harmony by finding a set of principles acceptable to all parties. He only incidentally mentions mathematics in this context. These rational principles are discovered by universal consent ("consensus universalis"); "consent" here does not refer to a speech act, but to a "consensation", a "feeling togher", the common acceptance of principles making social life possible. Thus these principles are accepted only by omni homine sano & integro.[342] (Herbert cannot avoid some sort of circularity: those who follow the principles are those who give the evidence that counts.) The system formed from the totality of such principles is called the providentiae Divinae universalis idea & Typum optimum,[343] and is a sort of objective structure which regulates the world in universal providence. As God governs the world, so (it is maintained) the mind has dominion over the body[344] and the universality of rational knowledge vis-à-vis empirical knowledge is accounted for.[345]

This was unacceptable to Descartes, as he let Mersenne know in correspondence.[346] On the other hand, Gassendi presented a proof for the existence of God from universal "consent" (as did his disciple, Bernier). Gassendi published a letter to Herbert[347] in which he was critical of some of Herbert's more naive reliance on universal consent, but did not criticise the overall programme. Indeed, Herbert's theory, with its reliance on sense and view of reason as unreliable, could be called empiricist in many respects. Herbert and Chomsky agree - and in this they are in sharp constrast to the Cartesians - in their biological prospect. Otherwise, there is the vague agreement that, in Herbert's language, experience is not possible without certain first notions.[348] But Chomsky holds that linguistic competence depends on the environment only to be triggered; Herbert, on the other hand, holds that knowledge essentially involves a relation between that which knows and that which is known.

Another philosopher discussed by both Chomsky [349] and ourselves is

Leibniz. In fact, Leibniz maintains points that are more than superficially related to Herbert's - e.g. the body somehow mirrors the macrocosm - and shares with the Cambridge Platonists the view that there is life throughout. However, Leibniz makes it clear that he considered Cartesianism "the antechamber to the true philosophy" and for most points it is best to regard him as broadening the interests of Cartesianism and making good its defects. In so doing, he attempts to work in non-Cartesian elements. One such element is simultaneously worked into Cartesian mechanics - to correct the conservation laws and supply a guarantee that mechanical configurations are instantiated - and into Cartesian metaphysics - to guarantee individuation. This element is the monad, and, although it is introduced into mechanics, it is what supports thepositions that there is life throughout and that simple substances mirror the universe.

A second element, or group of elements, is introduced to supplement Cartesian mathesis universalis. One of these elements has the same source as Herbert's "Zetetica" (a method for relating first notions and the idea & Typum optimum) and involves recursive elements for generating propositions. Chomsky never mentions this. (In fact, he only briefly mentions one of the notions exploited by Leibniz, and this not in connection with Leibniz.[350]) The source in question is the ars magna of Raymond Lull.[351] This was conceived by Leibniz's predecessor's in terms of a circle or a series of concentric circles with symbols for concepts positioned on the circumference(s) at equal distances. Complex concepts were seen to be generated either by the alignment of symbols on the series of concentric circles whose relative positions could be changed by rotation of one or more of the circles, or, when only one circle was given (as with Herbert's Zetetica), by the series of symbols occupying a given position in a sequence of rotations. In either case, the symbols are a finite set of generators, and the set of strings thus generated together with the operation of rotation and concatenation form a semi-group. Given a subject-predicate analysis of propositions, the concatenation of symbols could also be thought of as forming subject-predicate sentences, with the subject and predicate of various degrees of complexity.

Leibniz took over this method in an early work entitled De Arte Comninatoria. He was critical of his predecessors because they envisioned a fixed set of concepts. Herbert, for instance, chose the ten Aristotelian categories. When interpreted propositionally, the resulting concatenations were not usually taken to be true; in the terminology of the time, this was not an ars judicandi. Rather, it was seen as an ars inveniendi, as presenting concatenations whose truth values were still to be determined.[352] As what can be true depends on the form of the propositions, the simples indicated by the generators should be of general interest for a theory of entailment and a theory of truth. Leibniz saw them as just this. Finally, it is possible to arrange the apparatus in De Arte Combinatoria in the form of a rewriting system generating tree structures.[353]

Attempts have been made to find the elements of a generative grammar in Leibniz's work in general.[354] Leibniz was very interested in grammar as a universal, formal subject. In his proposed revisions of Alsted's Encyclopaedia, in which he lists subjects according to their conceptual priority (whereas Alsted arranged subjects according to pedagogical exigencies), Leibniz lists grammar first; he speaks of argument forms which are licensed by grammar. His later interests in a universal character as well as in logic appeal to the simples of the ars combinatoria. All these aspects of Leibniz's work are relevant to contemporary syntactic analysis; however, a great deal remains to be done to show precisely where the similarities lie and what they amount to.

Leibniz owes none of this to Cartesianism. Rather, his interests in grammar and combinatorial methods were acquired from within Germany. Representative of the German tradition, and very influential on the young Leibniz, were the members of the Reformed university at Herborn.[355] Chief among these was Johann Heinrich Alsted (1588-1638), whose reputation was guaranteed for the next century by his Encyclopaedia (1630). This was a massive work, covering every aspect of philosophy, every academic and many practical subjects. Leibniz wrote: "Diligentissimus Joh.Henr. Alstedius, cujus Encyclopaedia mihi pro captu illorum temporum certe laundanda videtur".[356] Furthermore, Leibniz sketched a number of programmes to revise the Encyclopaedia. The Encyclopaedia contains a universal grammar and a section on the ars magna, with a number of sections on related artes.[357]

A further similarity between Leibniz and Chomsky not mentioned by the latter is their interest in automata. Chomsky's only references to automata in our period are with respect to Descartes' criteria that a thing is a thinking thing, where he mentions that the period was greatly interested in automata.[358] Leibniz, in fact, built or designed at least two automata: an "arithmetical machine" which performed arithmetical operations and a "geometrical machine" which performed inferences of sorts. Man-made automata were characterised as having a finite number of components. Monads[359] in general, on the other hand, were referred to by Leibniz as spiritual automata,[360] infinite in complexity, thus capable of retaining a trace of the past, relfecting theuniverse, and being charged with the future. The monad simulates the Dum Deus calculat et cogitationem exercet, fit mundus. Furthermore, Leibniz described the hierarchy of monads as an infinite tree structure; he even speaks of the relation of one monad (occupying a node) to those beneath it as "domination" - the term used for the relation between nodes in a P-marker. "Rational souls" differ from other monads in that they are capable of reflection, which requires "sensible signs" - vocal or written tokens; thus a rational soul can "dit ce Moi", and so is attributed with consciousness - it can refer to itself as the subject of actions, so is responsible for them.

The differences between the Chomskian and rationalist theories of knowledge and mind are vast. For Descartes, what is innate is immune from empirical data and is determined by reflection, or conceptual analysis. The universal restrictions for any human language which Chomsky gives, on the other hand are contingent and are supposedly established by empirical investigation. Furthermore, the phonetic and semantic features are universal in the sense that they are part of a universal human stock, but anyone of them need not be employed in any one language.[361] But what is innate for Descartes is common to all creatures which have science of things. Again, the innate components of our linguistic competence according to Chomsky are necessary in the sense that they are necessary <u>for</u> (are required for) the acquisition of language; it is a contingent matter that there are such components. Opposed to this, Descartes' innate ideas are concepts from subjects which contain only necessary, i.e. true non-contingent propositions. When they are said to be necessary for ..., it is in the sense that one cannot have one concept without having another.[362] Finally, the role experience plays in Chomsky's innatism is different from the role it plays in Descartes'.[363] The fact that there are deep structures "remote from sense" is an empirical fact, so for Chomsky the relative paucity of the child's experience is a contingent matter; and what experience it has is supposedly used to test hypohteses. But, for Descartes, what is "remote from sense" could not be a construct in any empirical theory. For example, what a (perfect) triangle is cannot be found by empirical investigation, but only by studying geometry. Experience could suggest certain ideas which are innate in Descartes' sense - e.g. a rectangular object used for one purpose, then cut along a diagonal to be used for another purpose might lead one to formulate the concept of a right traingle; but experience is a check only in the sense that looking back through one's calculations with pen and paper is a check. The propositions in question are in principle immune from empirical counter-evidence.

Chomsky considers the charge that his formulation of innatism as an empirical hypothesis removes the question from the traditional arena. He concedes that his conclusions seem " 'fully in accord' only with certain specific aspects of (classical innatism), namely, Descartes' theory of perception of regular figures, and Leibniz's remarks on innate and unconscious ideas and truths that are innate as inclinations, and so on".[364] His reply is that it is a mistake to read the seventeeth and eighteenth century figures in terms of the modern distinction between "scientific" and "philosophical".[365] Descartes' approach to innate ideas and mind is said to ignore this distinction.[366] Scientifically, he explained everything mechanically except certain observations about humans (himself and others) - thus he postulated a second substance. Descartes' doctrine of innate ideas (Chomsky claims) was not simply to account for necessary truths, for it was involved in a theory of percpetion including "Gestalt properties and related structure (and) goes well beyond the domain of necessary truths as understood at present..."

But, firstly, as Chomsky admits,[367] the "unconscious" knowledge which Leibniz allows is "accessible to consciousness", while the unconscious knowledge he allows is not. This difference is fundamental. In Leibniz's own language, we know necessary and eternal truths by reflection; as this requires "sensible signs", we can formulate them. Leibniz in fact draws a sharp distinction between necessary and contingent truths; Chomsky's linguistic hypotheses would fall on the empirical side. Furthermore, although Leibniz characterises innate truths as inclinations and innate ideas as dispositions to think, he never refers to our innate endowment as a system of beliefs, for in Leibniz's eyes competence is connected with practical knowledge, which he thinks can from the start also be characterised as systematic propositional knowledge.

Secondly, Descartes' doctrine of innate ideas is applied in perception in exactly the same way pure mathematics is applied in empirical enquiries. A very central problem for Descartes is how our knowledge of pure mathematics and other fields involving only necessary truths is applied in perception. Furthermore, innate ideas are those which have objective reality, are involved in clear and distinct perception, and are associate with true and eternal essences; necessary truths arise from them. (Much the same can be said for Leibniz.) Chomsky is concerned only with the acquisition of knowledge, which was of secondary importance for the rationalists; they were primarily concerned with the application of our "science".

Finally, Chomsky obscures a fundamental distinction almost universally drawn in the seventeeth century. This is the distinction between _scientia_ - knowledge which can be systematically organized and involves only necessary truths - and other sorts ofknowledge (sometimes said to be mere _cognitio_). It cuts across the contemporary distinction between science and philosophy in that pure mathematics and philosophy fall under "scientia", while the empirical sciences - including linguistics (to go by the claims made for it) - do not. The question of innateness in the seventeenth century concerned _scientia_; in this century it is an empirical question.

It is important to notice that Leibniz's position is also conceptual. The reason we cannot learn mathematical and similar truths from experience is not because of the paucity of examples, but simply because no number of particular truths suffices to establish a general, let alone necessary truth. Leibniz, admittedly, allows that animals perceive and, further, that they apperceive because they have the requisite structural complexity - sense organs in particular; and humans reflect (so are conscious) because they have the further complexity required for the use of sensible signs. Furthermore, perception (and everything following from it) is described as a computation by spiritual automata. Yet the principles of their computation are conceptual, arrived at by conceptual analysis. The primary move is to formulate _scientia_ or science by reflection, and then determine how it is applied to things _in re_.

Another significant difference is that consciousness plays no role in Chomsky's account; but we have seen how central it is for the rationalists. The significance of this is twofold. Firstly, it allows that rational beings apply rules, and do not (just) operate by them; for the notion of consciousness was connected with the possibility of making errors (particularly in judgement) in the seventeenth century. Secondly (and related to the first point), consciousness concerns the whole and individual person.

The rationalists took account of our concept of a person. It is all too true that odd things happened to this concept. The notable aspect of a person which leaves no trace in either _res cogitans_ or _res extensa_ is his (gross, overt) behaviour. This is because a mathematical analysis was applied to every aspect of any spatial display; what could not be explained in terms of the gross parts was held to be explicable in terms of the internal, minute parts standing behind gross activity. But some of the things which people do remained enshrined in the concept of _res cogitans_. And this concept bears some relation to public behaviour: the two Cartesian criteria show this, as does Leibniz's comment on Locke's discussion of personal identity.

Also, the rationalists found it necessary to introduce something beyond the individual thinking thing. If thoughts or trains of thoughts had no standard by which they are judged right or wrong, they would be no better than mechanical operations. But the standard was supplied for the rationalists by God, divine science in particular. So one thing Chomsky has missed is the move in the Third and Fourth Meditations which introduces divine science and explains our errors in relation to it. At this stage Descartes has eliminated the evil demon.

The rationalists were aware of the relevance of circumstances to a person's activities. Leibniz has monads reflect the whole universe from their own point of view, thus insuring that actions are relevant to circumstances. The same guarantee is established with occasionalism. Part of the motivation for both views was the realization that human activities are not described in physical or physiological terms.[368] This disparity was regarded as unbridgeable by causal relations. Recall that Chomsky seems to make all faculties innate, but is still faced with theproblem how they relate to circumstances. Leibniz circumvents this problem with pre-established harmony.

Finally, Chomsky misses the first move in the elimination of the evil demon, at the beginning of the Second Mediation, where Descartes establishes that there is nothing in the mind of which we are not conscious. This eliminates the traditional sensitive (biological) faculties, leaving only the rational soul. Chomsky, who is concerned with our biological equipment, cannot escape the evil demon. Let us grant, what we have argued against, but what is consonant with Chomsky's position: that elementary mathematical knowledge is determined by our biological hardware. Following Chomsky, imagine that only certain results of computations are "accessible to consciousness". Suppose the device functions on a threshold principle such that the component responsible for the flow of information to consciousness and activities directly related to consciousness can let through only six bits of information consecutively; it must then accept a seventh bit before it can let through another six. Thus, when seven distinct objects are picked out, only the first six are recorded in consciousness; a seventh recording in consciousness corresponds to an eighth recording by the whole device. Likewise for rational activities: eight units or numerals must be generated in the deep workings of the device for seven units or numerals to be let through to the conscious part. The deep workings count as we consciously count, except they include a number between six and seven.

As things turn out, we get by with our conscious arithmentic. But this is all show, for the operations we really perform and the mathematics we really know is something else. For example, when we divide a group into seven, we actually divide it into eight; when we seem to count ...-5-6-7, we actually count ...-5-6-α-7, where α is really the seventh numeral. We might expect physiology to tell us what we really do, but it could not. Suppose our physiological science is so sophisticated that we are able to identify some of the happenings that control the flow of information to the conscious part. We would still not discern that the conscious part does not register the real process; for the seventh happening would not be counted by the conscious part as we observe these neural happenings.

But would there be any reason to say that we really count this way, that the real, occult arithmetic contains the numeral α between six and seven? Would the real arithmetic not be the one we get by with, with which we describe things? The functioning of the hardware (its software) would not be an arithmetic at all; rather, it would be a biological law (or general fact) that we cannot count the seventh item in a sequence. If there is no technical way around this biological fact, then it would somehow be a general physical law that the seventh item in a sequence has not the same effect as the first six or subsequent ones. There would then be something myseriously arbitrary about the laws of nature - in seventeenth century terminology, the universe would have an imperfection.

CHAPTER VI

Suarez and Seventeenth Century Philosophy, and the Distinction Between Material and Spiritual Faculties.

We wish to do a number of things in this chapter, which will eventually culminate in chapter VIII in the identification of two uses of "idea" and their immediate historical background. First of all, we shall show the pervasive influence in seventeenth century Scholasticism of Suarez and his colleagues of the Jesuit College at Coïmbra. We shall also argue that any relevance one might think Neo-Platonism has for our subject is more reasonably attributed to the positions maintained or simply discussed by Suarez, his colleagues, and followers. Their distinction between material faculties (common to man and beast) and spiritual faculties (attributed with rational cognition and knowledge) - which will occupy the next three chapters- is introduced. Most Scholastic accounts held that these two sorts of faculties are bridged by the <u>intellectus agens</u>, to which the following chapter is dedicated. We discuss it here only to draw a distinction between Thomism and nominalism. Roughly, as concerns accounts of knowledge, seventeenth century rationalism follows in the footsteps of Thomism, seventeenth century empiricism follows (sometimes explicitly) in the footsteps of nominalism. However, Descartes, Malebranche and Leibniz accepted a thoroughly mechanical physiology which eliminated material faculties in the Scholastic sense. Mechanical physics made obsolete the position held by most Scholastics, that inceptive cognition involves the transmission and reception of an accident distinct from the subject in which it inheres. Certain nominalists had already denied this, and to this extent all new philosophers shared a nominalist legacy. Furthermore, Suarez, despite his purported Thomism, was heavily indebted to nominalism. A case will be presented for Locke's dept to nominalism; his position is compatible with this Scholastic movement because he explicitly rejects Cartesian physiology and so can include the equivalent of material faculties under "mind". His theory of ideas is Scholastic in that ideas for him (like Scholastic species) are characterised as signs. We then discuss Suarez's theory of species and the Scholastic doctrine of material faculties. The last part of this chapter shows the difficulties encountered when a distinction in terms of operations is used to distinguish between material and spiritual faculties - or between animal and distinctively human cognition - if even empirical essential cognition (i.e. cognition by means of species or signs) is allowed to material faculties.

The failure of such attempts leaves the distinction between empirical and rational cognition to be accounted for either in terms of what is done with what is offered by material faculties, or in terms of objects peculiar to spiritual faculties. These approaches concern the <u>intellectus agens</u> or what takes its place and are discussed in the following chapter. The issues introduced in this chapter lead, in chapter VIII, to a distinction between two uses of "idea" corresponding to two sorts of objects of cognition: 1) natural signs, involved in casual or genetic accounts, and 2) concepts (considered as part of divine science) which are applied in both inceptive and exercisive cognition.

Francisco Suarez ('Doctor eximus', 1548-1617)[1] entered the Society of Jesus in 1564, completing his theological studies at Salamanca in 1570. He taught theology at the College of Rome from 1580 to 1585. In 1597, he was called to Coïmbra in Portugal expressly by Philip II (Portugal then being under the Spanish Crown), where he remained (except for a brief trip to Rome) until his death. His works of interest to us are: <u>De Anima</u> (1621, all but the first two chapters of which were written in his youth), <u>De Deo Uno et Trino</u> (1621), <u>De Angelis</u> (1620), and especially the <u>Disputationes Metaphysicae</u> (1597). The Jesuit College at Coimbra was the centre of the energetic post-Tridentine renaissance in Scholastic philosophy. The Iberian philosophers of this period (1563-c.1675) have been divided into six generations.[2] Suarez is placed in the fourth. The third generation includes most notably Pedro

Fonseca ("The Aristotle of Portugal", 1526-1599), author of the Institutionum Dialecticarum (the most influential non-Ramist logic of its day, receiving thirty-four publications between 1564 and 1625) and the Commentatorium in Libros Metaphysicorum Aristotlis Stagiritae (two volumes, 1577-1589) and leader of the group of scholars at Coïmbra which produced the excellent and widely used commentaries on the works of Aristotle.

Descartes knew and respected the Jesuit philosophy (he attended the outstanding Jesuit college at la Flèche), but he also realised the incompatibility of his principles with those of Scholasticism and the Jesuits soon regarded Cartesianism as an enemy. Descartes maintained in the Principles that none of his principles are new, but are very old and common and used by Aristotle.[3] He even once denied to a Jesuit that he wished to refute the received opinions of the Schools.[4] Mersenne wrote to Descartes informing him that a certain person's respect for him was increased on knowing his familiarity with Aristotle, adding that he corrects those who are misled by the clarity of his style into thinking that he is ignorant of Scholastic philosophy by telling them that Descartes knows it as well as those who teach it.[5] Descartes himself wrote that it is very useful to have studied the entire course of philosophy as it is taught in Jesuit schools before elevating one's mind above pedantry; philosophy, he adds, is no-where better taught than at his own school, la Flèche.[6] Still, Descartes' works were on the Index in 1663 and a cascade of anti-Cartesian literature flowed from Scholastic, especially Jesuit, pens from Bourdin's Seventh Objections to well into the next century. When a Jesuit journal was established at Trévoux in 1701 to review newly published works, the editors, while promising to remain neutral in all matters but those of religion, were openly hostile to Descartes and Malebranche.[7] Descartes anticipated this attack, as is revealed in his correspondence with Mersenne just before the publication of the Meditations. Expressing apprehension of the attacks of Bourdin the Jesuit author of the Seventh Objections, Descartes considered studying certain Jesuit philosophical works, but eventually abandoned the project.[8]

In this correspondence, Descartes never mentions the works of Suarez; yet he retained a familiarity with the Disputationes Metaphysicae: when queried by Arnauld in the Fourth Objections about his phrase 'materialiter', he refers to its use 'apud primum authorem qui mihi jam incidit in manus', i.e. Suarez.[9] With the exception of those of the Coïmbrians, the works which Descartes mentions in this correspondence were heavily indebted to Suarez, whose works are not mentioned here probably for the same reason that those of the Coïmbrians were found unsuitable, i.e. they are too long. Indeed, Descartes' position on the creation of eternal truths is in express contrast to Suarez's and there are close similarities between Descartes' notion of objective reality and Suarez's notion of conceptus objectivus.

Malebranche as well was raised on the Jesuit philosophical corpus, which dominated in the Catholic parts of Europe throughout the seventeenth century. He also retained a familiarity with Suarez's works throughout his life: in the important Exlairassent XV (on occasionalism) he cites the Disputationes six times,[10] and in his last work he presents a large passage from Suarez to counter his opponent's assertion on the position of the Church Fathers.[11]

In the course of the first third of the seventeenth century, the Jesuit philosophical corpus (especially the Disputationes Metaphysicae) was taken up and adopted throughout Protestant Europe. Throughout most of the century, then, Suarez and, to a lesser extent, the Coïmbrians, were considered the definitive Scholastic philosophers throughout Europe. Still, the Jesuit philosophy was not accepted uncritically by the Protestant Schools. In addition to the obvious religious differences, there were different presentations of the important notion of conceptus objectivi. The reason for this dissemination is to be found in the vacuum left in philosophical education by the Reformation and the need for polemic reasons of some philosophical ability. The process began in Germany, whence the original works, but more commonly Protestant adaptations, spread to Britain.

In German Protestant Scholasticism,[12] the Jesuit philosophy first made its mark among the Lutherans. Their most important representative was Christoph Scheibler ("the Protestant Suarez", 1589-1653), Professor at Giessen from 1610 until the suspension of the University in 1624. His Opus Metaphysicum (1617), the most widely used text on metaphysics in Protestant Germany,[13] was a complete resumé of Suarez's work without modification of plan or doctrine.[14] The most important Reformed philosopher was Franco Burgersdijk (1590-1635), Professor at Leyden from 1620 until his death.[15] A. Heerebord, his editor and pupil with Catesian leanings, asserts in the preface to Burgersdijk's Institutionum Metaphysicarum Libri Duo (1640) that these volumes "compendia tantum esse Suaresiorum conceptum" and in his own work calls Suarez "omnium metaphysicorum papa et princeps."[16]

Leibniz's relation to Scholasticism has been the matter of some controversy. But Eschweiler[17] points out that von Nostiz-Rieneck's conclusion[18] that Leibniz was not familiar with Scholasticism is due to not considering later Scholasticism and[19] that the conclusion Leibniz reached in his youthful "Disputatio metaphysica de Principio Individui" (1663) was Suarezian, all his sources (not citations) most probably being from the seventeenth century. Leibniz's two teachers at Leibzig - Jakob Thomasius (who had a paternal relation to him and later corresponded with him) and J.A. Scherzer - belonged to the school of Daniel Stahl from Jena, whose positions according to the preface to the Praecepta Metaphysicae of 1641 were "selecta ex metaphysicorum doctoribus et magistris Suarezio, Fonseca, Mendoza allisque..."[20] Leibniz himself mentions that in his youth he studied Rubius and Fonseca and claims to have read Suarez like a novel.[21] In his maturity, Leibniz most often assumed a position revealing some Scholastic inspiration when criticising the Cartesians.[22]

Dutch domination of Reformed philosophy was guaranteed by the dispersion of their co-religionists in Germany in the course of the Thirty Years War. The last major product of German Reformed philosophy was Alsted's Encyclopaedia. We have previously noted Alsted's influence on Leibniz. Loemker suggests that Leibniz derived platonic elements from the Herborn School.[23] But, allowing for Alsted's originality and eclecticism, one need only rarely go beyond the dominant Scholasticism we have discussed to find materials for Alsted's pedagogical presentations. He typically rearranges subjects to meet his needs. For example, his "Pneumatica" is a considerable departure from the arrangement of the traditional de anima. The unifying theme is not the anima - the by virtue of which something is alive - but spiritus. Yet spiritus is defined (as in Scholasticism) as "substantia omnis corporaturae expers" and the discussion is in terms familiar from Scholastic texts labeled de anima, except plants and animals are excluded, while God is included.[24] More generally, Loemker himself maintains that Suarez was the source for the Herborn School in metaphysics.[25] And Mora asserts that both the Encyclopaedia and Alsted's contemporaneously published metaphysics are "strongly inclined to the philosophical teachings of Suarez."[26]

Through connections with their co-religionists on the continent, the English universities absorbed the Scholasticism dominated by Suarez and came to regard Suarez as the model in metaphysics. We are particularly interested in the Oxford of Locke's youth and early manhood, where he spent fifteen years, from his entrance as an undergraduate in 1652 until his move to the London residence of the future Earl of Shaftesbury in 1667. Locke apparently mastered his studies at Oxford, but became dissatisfied with them.[27] Nevertheless, some could place the Essay within the bounds of the essentially Scholastic subject of logic. (We shall use the term "logic" in what would now be an extended sense to coincide with the seventeenth century sense. "Method" would pehaps be a better name, but even this is too narrow). Edward Bentham, writing an apology for the usefulness of logic in the middle of the next century, claimed that the logical theory of the Essay was generally Scholastic[28] and that its disparaging remarks on Scholastic method are accounted for by the mood of his day.[29] Now we can identify the most important logic text for Locke, for, while a tutor, he kept a notebook entitled "Notes on Logic", which contains inter al. eighteen folio pages of notes on the Manuductio ad logicam by Philip du Trieu, a Jesuit who taught at Douay early in the century.[30]

Scholasticism in general was imported to Oxford from the continent and included the Protestant re-writings of Suarez and the more important texts of the Jesuit corpus, especially the Disputationes Metaphysicae. Locke mentions Burgersdijk and Scheibler disparagingly in "Some Thoughts on Education".[31] The fact that he was familiar with the works of these philosophers is confirmed by a list kept by Locke of books he bought and directed his students to buy.[32] The importance of these two continentals at the Oxford of Locke's day is confirmed by at least two other sources.[33]

Oxford also relied directly on Jesuit sources.[34] One of the sources referred to above gives prominance to Fonseca and Suarez and his commentators; it adds that the best arguments of many parts of logic on predicaments, etc. are in Suarez's metaphysics.[35]

The importation of the Jesuit philosophy was one aspect of a brisk exchange of men and ideas in the first half of the seventeenth century between England and the Protestant areas of Germany and the Low Countries, which was facilitated by religious affinities.[36] Germany, among other things, gave the legacy of Herborn to England through J.A. Commenius, an educational reformer and student of Alsted. Locke possessed four of his works on language and the Royal Society's programme for a universal language has been seen as one of Commenius' influences.[37] In the other direction, Bacon, for example, was well known in Germany - Leibniz at an early age was a Baconian.[38] Indeed, Herborn, and Commenius in particular, shared many of Bacon's goals: Commenius' Vis Lucis is dedicated "to the torch bearers of this enlightened age, members of the Royal Society of London"[39] and Yolton places it in the course of the Baconian goal of a universal natural history.[40] Locke and Leibniz, then, were exposed to many of the same currents of thought. In both cases, Suarez, whose importance for Herborn we have already noted, was a major figure.

We wish to maintain that Platonism (which often had little to do with Plato himself) played only a subsidiary role in the development of seventeenth century theories of ideas. Those factors which could be called Platonist are accounted for by their inclusion in Scholasticism, which always kept an eye on Augustine.

From Arnauld's objections appended to the Meditations to the present day, commentators have looked for an affinity between Cartesianism and Augustine.[41] Indeed, Descartes' successors fostered this view.[42] Malebranche, for instance, often appealed to Augustine's authority.

But any thesis of Descartes' conscious borrowing from Augustine is dashed by his expressions of gratitude to correspondents for references to passages from Augustine resembling his positions.[43] Gilson asserts that throughout the Middle Ages the authority of Augustine and pseudo-Dionysius made theologians concede what accorded poorly with Aristotelianism.[44] The position that the senses only excite the soul to form an image of the object,[45] he holds, was transmitted by the Jesuit philosophy to flower in Platonism and Augustinianism only after 1650.[46] Malebranche's citations of Augustine are not imposing when it is realised that they are almost always the same and can be found in the selections from Augustine published under the title Philosophia Christiana (1667) by his fellow Oratorian A. Martin.[47] The telling point is that Malebranche asserted that he had already developed his position when he noticed the similarity with Augustine which gave him the security to make his position public.[48] Applying Gilson's point in the case of Malebranche, Connell maintains that the Scholastic doctrines of creation and divine exemplarism are deeply influenced by Augustine and Neo-Platonic thought. Malebranche rejects the Scholastics for their Aristotelianism, but he would not have found fault with them where they follow Augustine.[49]

Such a selective adaptation of Scholasticism was suggested by Cartesians themselves[50] and by Malebranche's major (but not always faithful) English disciple, John Norris (1657-1711).[51] Norris maintains that the archetype of created things (the objective structure) is the Verbum, the second person of the trinity. For precedents, he cites an enormous amount of Platonist literature, most enthusiastically Augustine.[52] But these citations are equalled by those of seventeenth century Scholastics; those which are called on most are Scheibler,[53] Burgersdijk, and especially Suarez ("the great metaphysician").[54] He rejects the Scholastic account that ideas are had on the presence of bodies, so are caused by those bodies.[55] The Schools, he states, admitted divine eternal ideas as principles of knowledge and nothing could be more representative of things; so they need not have looked elsewhere for the "immediate objects of our understandings."[56] Norris concludes that, admitting what they do, it is surprising that the Schools did not hold this view, especially as it "is favoured by St. Austin (i.e. Augustine), whose authority is so sacred with them upon other occasions."[57] In short, "if the Schools had followed St. Austin more ....., and Aristotle less, they would have left us another system ...."[58]

The major reason Norris gives for rejecting the Scholastic genetic or casual account is that our ideas are things of a sort different from those things which are meant to cause them. The most common way around this problem in Scholasticism was to appeal to the intellectus agens as a bridge between what is material and what is spiritual, where the latter, by virtue of casual relations, can know the former, but not vice versa. Norris ridicules this faculty, as did Malebranche and, indeed, many of those who turned their backs on Scholasticism in favour of a mechanical account of nature. Norris' (and Malebranche's) alternative is that the soul "sees" things "in their eternal reason by participation" because the "intellectual light" in us is a "participated similitude of the uncreated light, wherein the eternal reasons are contained."[59] Seventeenth century rationalists in general relied on God to supply and guarantee the concepts which we apply to things. But, in fact, the way Norris typifies the "intellectual light" could be accepted verbatim by orthodox Thomists as specifying the intellectus agens. As we shall see below, there were various interpretations of the intellectus agens and different ways in which its role was otherwise fulfilled in seventeenth century philosophy.

Hand-in-hand with the intellectus agens go intelligible species. The intensional species is what we have called a feature, taken along the whole length of the input course and including dispositions in re to produce it. Dispositions established in whatever number of faculties to which cognition is attributed - cognoscitive or cognising powers - were admitted by the position in question. Intensional species were held to be accidents distinct both from what produces them (since they were held to be due to the particular sort of activity, but not to be the activity itself) and from what receives them (since the power need not have the particular dispositions it has, i.e. it need not be "informed" by these particular species). Cognising powers were divided into material faculties - corresponding to some part of the anatomy - and spiritual powers - which alone are immortal and are responsible for our rational functions. Suarez and most Scholastics maintained that there are intensional species - called intelligible species - in the intellect; these relate our rational essential knowledge (since they are in the intellect) to our histories in our environment (since their presence is somehow due to things which have been in our environment). The central role of the <u>intellectus agens</u> was to bridge the material and spiritual faculties, and thus account for the presence of intelligible species - i.e. to "spiritualise" intensional species.

"Spiritual" and related terms were interpreted differently by different moderns; the distinction is roughly that between empiricists and rationalists. This distinction is already represented (though somewhat differently) in Scholasticism. Rationalist theories of cognition share much with Thomist theories, while empiricist theories of knowledge are in many respects nominalist. Within Scholasticism, the distinction is sharply drawn by positions on the <u>intellectus agens</u>. Nominalists changed the account we have outlined. Generally, they regarded the <u>intellectus possibilis</u> as the central faculty in rational cognition. They either rejected the <u>intellectus agens</u> and intelligible species or made the <u>intellectus agens ad hoc</u>, holding that initially there are intelligible species only of material singulars (by which is usually meant spatio-temporally distinct material features). In either case, this is a pure genetic account. Our knowledge which is not of material singulars is held to be made by what we shall call "elevating operations" on the materials received, i.e.

by changing their roles by comparing them, reasoning about them, etc. The nominalists thus maintain that there is a distinction between our cognition which is inceptive of dispositions - inceptive cognition - and that which is the exercise of dispositions - exercisive cognition - because elevating operations intervene.

On the Thomist position there are certain <u>semina scientiarum</u> - seeds of our science - in the <u>intellectus agens</u>, which are applied in both inceptive and exercisive cognition. These two sorts of cognition, then, are held to be symmetric. Intelligible species of material singulars are not admitted because there is no need for materials from which our science is made by elevating operations, for objects peculiar to our science and so to our spiritual faculties are supplied by the <u>intellectus agens</u>. All acts and dispositions of the <u>intellectus possibilis</u>, then, are held to concern universals or at least something other than material singulars. Still, our science is held to apply to things because the acts of cognition of the intellect - whether inceptive or exercisive - are held to be rendered particular by the products of the acts of cognition of the fantasy, i.e. phantasms. This application of our science to things was called "conversio ad phantasmata" and the act of intellection in such cases was called the "verbum". Because on the Thomist account all acts of intellection, inceptive or exercisive, are held to involve objects furnished by the <u>intellectus agens</u> and thus not made, the Thomist account greatly restricts the genetic account.

Suarez, despite his purported Thomism, rejects the essentials of the Thomist account - <u>conversio ad phantasmata</u> and the <u>verbum</u>. In place of the latter, he introduces the <u>conceptus objectivus</u>, differing from the <u>verbum</u> in the way it is known. It is somewhat like what we have called a concept yet it is held to be made by the cogniser. There is a direct historical link between Suarez's term "conceptus objectivus", on the one hand, and, on the other, Descartes' term "objective reality", "idea" as used by Malebrance and Leibniz, and "notion" as used by various Scholastic and non-Scholastic philosophers. <u>Conceptus objectivi</u> and the like were often referred to as spiritual objects. Yet the Cartesians and Leibniz, unlike Suarez, accept <u>conversio ad phantasmata</u>.

Cartesianism is irreconcilable with Thomism, however, on what is probably its most significant position: that all extended things (hence all things which can in any sence be called material) are in principle describable in mechanical terms alone. Substantial forms and intensional species distinct from their subjects are thus rejected. As there is nothing for the intellectus agens to "spiritualise", it drops out. Yet its position is taken by divine science, which is identified with human science. The body, now seen as in principle capable of a purely mechanical description, takes over the role of the intellectus possibilis as that which secures dispositions. In the Dioptrics Descartes explains one class of cases included in the relation between exercises of corporeal dispositions and occurrences in the mind as meeting conditions imposed by the objective structure. It was in the Dioptrics that Descartes first presented his mature views on judgement and the will. Generalised versions of this explanation were accepted by the Cartesians and Leibniz. The most natural approach in individuating rational beings is spatio-temporal continuity. Consciousness, not as memory of past deeds, but as continued responsibility for what one undertakes or does might seem a candidate for the principle of individuation. But one must be able to pick out the agent before responsibility is assigned to him. The difficulties of individuating agents for Cartesianis are notorious; Spinoza's position, in fact, seems the most natural Cartesian position on this point.

The physics of the rationalists brought them closer to nominalism than to Thomism. Nominalism had a great influence in the seventeenth century. In addition to Suarez's near-nominalism, nominalist positions were presented in detail in his works and those of the Coïmbrians (who were more nearly Thomists). The nominalists were the most outspoken critics of accidents distinct from their subjects, a view held to be incompatible with a mechanistic physics. Because of this, Malebranche, looked for precedents for occasionalism among nominalist authors in the fifteenth éclaircissment appended to the Recherche; and Leibniz stated the debt of the new philosophy to nominalism in the introduction to his edition of a work by Nizoli a sixteenth-century nominalist. As the rejection of accidents distinct from their subjects concerns an account of knowledge, it goes with the general rejection of the intellectus agens and intelligible species in the new philosophy. Nominalism, however, had a more direct influence than this: Gassendism was allied with it. This is most clearly revealed in the Abrégé de la Philosophie de Gassendi [60] (1678) by the physician and noted travller, François Bernier (?—1688). Bernier, as we shall see, follows the nominalists, particularly Durandus, on the relation between the understanding and the phantasy.

Gassendism introduces difficulties into the nominalist position, however, because all material activity is to be explained by atoms of various shapes and sizes in various states of motion. Our material faculties and those of animals are held to be cognising powers, yet are to be explained by atoms. Thus the leap which is inexplicable for Bernier is not between material cognising powers and the intellect, but between insensible atoms and the sensation they cause. The thing which thinks, then, spills over into the phantasy. Gassendi, who expressed surprise that Descartes meant by "idea" something other than a phantasm (as he in fact had in the Regulae), suggested that "mind" ("mens") should include the phantasy. The mind on this position secures dispositions and is outfitted by the senses. These ideas occur in roles; new roles are created by elevating operations and we are subject to rules only on having cognised the relations between disjointly-received materials of what results from them by the mind's own operations. Only then have we a science to apply to things in re. Perhaps the most extreme view of this form known in the seventeenth century was that of Hobbes, who maintained that all of our cognising faculties are material; elevating operations are attributed to speech. Thus Leibniz, while stating the debt of the new philosophy to nominalism, warned against Hobbes' plusquam nominalism. Hobbes and Gassendi found common ground and both wrote unsympathetic objections appended to the Meditations. [61] Descartes was eventually reconciled with Gassendi, but rejected Hobbes' attempt to find common ground in that they both sought explanations in terms of figure and motion alone.[62] (Leibniz, however, was heavily influenced by Hobbes from his fifteenth year[63] until his mature philosophy began to take shape. This influence was in physics and politics[64] and above all in the arithmetical model of reasoning, which, unlike terminalism, he never abandoned. But what Hobbes saw as elevating operations of material faculties, Leibniz saw as the rule-following exercises of spiritual faculties.[65])

A nominalist influence on Locke has often been suggested. Such an influence could be sufficiently explained by his early familiarity with the Scholasticism dominated by Suarez and his familiarity, beginning in the 1660's (probably through Boyle), with Gassendism. His familiarity with Gassendism was increased during his sojourn in France (1675-1679), where he met Bernier. Some[66] have seen a strong Gassendist influence on Locke's empiricism; Leibniz[67] was of this number. And some have seen Locke's empiricism as a debt to Hobbes.[68] Locke, however, was perhaps equally familiar with Cartesianism. A number of studies have indicated the extent of Cartesian influence in England in the seventeenth century, even before mid-century.[69] This influence (felt heavily in the Royal Society) was largely restricted to Cartesian science, method and plainness of style. Locke as well probably came to Descartes through scientific interests, as his earliest references to Descartes (1667) are from Boyle's writings.[70] According to Lady Masham, Descartes' works were the first philosophical works which interested him and, although he often disagreed, he found them very intelligible.[71] Locke's familiarity with Cartesianism was especially a result of his residence in France and was reinforced by his stay in Holland in the 1680's. His journals of the time and as late as the 1690's show a lively interest in the Cartesian literature, especially in the entry from 1678 entitled "Methode pour bien etudier la doctrine de Mr. de Cartes". [72] Still, Locke denies a number of theses central to Cartesianism in the Essay, which was not well received by orthodox Cartesians. [73] However, there were certain Cartesians, particularly those who engaged in polemics with Malebranche, Pierre-Sylvain Régis and notably Antoine Arnauld, whose theories of ideas showed some similarities to Gassendi's or at least nominalist views. Both held that ideas are simple apprehensions and allowed elevating operations. A large part of the Arnauld-Malebranche polemic consists of Arnauld's defence of abstraction and Malebranche's version of conversio ad phantasmata. Both, and particularly Arnauld, insisted that ideas are only perceptions in the mind. Locke met Régis in France, Arnauld's La Logique is mentioned in the journal entry singled out above and he had a copy of Arnauld's Des Vraies et des Fausses Idées in his library. Above all, Locke mentioned in his Examination of P. Malebranche's Opinion ... the thesis that our ideas are only perceptions. Arnauld and Régis, being Cartesian, held that these perceptions are not in the phantasy; still, imagination, after Suarez's duplication of material and spiritual faculties, left great room for ambiguity. In 1698 Locke wrote to Thoynard, concerning the publication of the French edition of the Essay, that he wished to offend neither those inclined to Descartes nor those inclined to Gassendi. If he had Régis and Arnauld in mind as those inclined to Descartes, the middle road would not have been difficult to find; he certainly sought no common ground with Malebranche.

For Locke, there is a particular reason not to distinguish between material and spiritual faculties and to allow ideas, the objects of the understanding, to be phantasms: he completely rejected Cartesian physiology. Thus he does not share Bernier's difficulty of the relation between insensible atoms in the phantasy and sensation. If we were to assign a vocation to Locke, it would be as a physician; he collaborated with Sydenham and was employed by Shaftesbury as a physician. Locke kept a medical notebook from his arrival in Oxford (1652)and learned the essential medical theory of his day in lectures, coming in close contact with a number of representatives of the dynamic subject of iatrochemistry.[74] Iatrochemistry - the chemical explanation of physiology [75] - and iatro-mechanics - the anatomical or mechanical (in the extreme, Cartesian case) explanation of physiology - were often followed by the same physician.[76] Locke kept notebooks on iatrochemistry just previous to encountering Boyle (1660), by which time he had clearly developed an interest in chemistry.[77] Although his first encounter with empirical science was through iatrochemistry, his greatest debt to medicine was to Sydenham's practice, which (rather than Boyle or Bacon) has been claimed the source of Locke's empiricism.[78] Sydenham's methodology rests on the Hippocratic tradition in which prognosis conforms to a general theory of signs of diseases and natural phenomena are held to manifest a teleological organisation whose end (in the case of patho-logical symptoms) is the conservation of life.[79] Sydenham used this only as a working hypothesis.[80] His own method is presented in the Preface to his Observationes medicae (1676): all diseases are to be reduced (without recourse to preliminary hypotheses) to determined phenomena, distinguishing those which are constant from those which are accidental and noting the accompanying conditions, especially those of the environ-ment contemporaneous with the stages of the disease.[81] Sydenham did not go to the lengths of the ancient medical empirics in opposing hypotheses; his opposition was founded on the belief that the understanding cannot reach a comprehension of the natural mechanism producing phenomena, which, at any rate, manifest a sufficiency rigorous order on their own level.[82] The two most important texts for Locke's medical empiricism are the manuscripts <u>De Arte Medica</u> (1669) and especially <u>Anatomia</u> (1668), in which he rejects the utility of anything approaching Cartesian mechanical physiology. There is no distinction between formal and material features. It is held that there is no way of getting at the causes of or mechanisms behind phenomena, which present a sort of superficial rationality with some basis in things.[83] Locke's theory of signs does not share Sydenham's preconceptions of a regular order to natural phenomena, for the observer has some part in their signification. From the time of <u>De Arte Medica</u>, Locke was interested in the procedure and conceptions of physicians, not experimental rules of practice.[84] Locke calls ideas as well as words "signs" in the last chapter of the <u>Essay</u> and speaks of a general theory of semiotics; he adds that perhaps a new logic could be built on this. Indeed, a good deal of what Locke says of ideas indicates their nature as signs. It has been suggested that this "logic" is Sydenham's medical "logic" generalised. It has also been suggested[85] that Locke's supposition of the objectivity of our ideas of material things has its source in his medical writings.[86] Still, the exercises of cognitive dispositions - either phantasms or concepts - were held by the Scholastics to be signs of material features and certain verbal tokens to be signs of them. Locke accepts both levels of this theory of signs, which had been rejected by Descartes in the "Dioptrics" and by Malebranche in the first book of the <u>Recherche</u> and was rejected by Leibniz in the <u>Nouveaux Essais</u>. Locke's medical empiricism banishes the problem of the materiality of the phantasy or imagination as included in the mind and further allies his position with nominalism in general through the theory of signs. It introduces an important distinctive aspect in putting our cognition of formal and material features - not perfectly distinguished in the primary-secondary quality distinction - much on a par, distinquished for the most part by the objects cognised, and adds a confusion in calling sensible qualities "ideas of secondary qualities" (rather than "secondary qualities").

We now consider Suzrez's theory of signs involved in cognition-species - and then the theory of material faculties. The basis of the Scholastic genetic account is the position that cognition is the assimilation ("assimilatio") of the cognising power (whether material or spiritual) to the thing cognised.[87] By "assimilation" is intended ad-similation, i.e. the cognising power becomes similar to the thing cognised. (We here follow Suarez.) What makes assimilation possible on this account is the intensional species, which is the feature transmitted. On being received by a cognising power (material or spiritual), the intensional species is said to be a <u>habitus</u>,[88] i.e. a disposition to cognise; thus, on receiving the intensional species, the cognising power knows. What it knows is the intensional species itself, at any stage from its production to its reception and to this extent it knows that which produced it. Intensional species are said to be "similitudes" of objects in cognising powers and indeed are themselves a sort of object, viz. that by which the objects cognised are united to the cognising powers.[89] As a real union between the power and the object is held to be either impossible or improportionate, it is held that the union is "intensional", achieved by a vicarious species of the object.[90] These are called "species" because they are representing forms; they are called "intensional", not because they are not real beings ("entia"), but because they function in cognition ("notio"), which is called "intentio".[91] Still, these similitudes (also called "images") do not have the same qualities as that which they represent (i.e. the species are not "ejusdem rationis cum obectis suis"); e.g., species representing colours are not coloured and those representing sounds have no sound.[92] They are nevertheless held to be similitudes because it is maintained that only a similitude <u>in essendo</u>, but not one <u>in repreaesentando</u> (such as that between an intensional species as a disposition in a cognising power and the same species in what produces it), requires a specific unity (i.e. must have the same qualities).[93] The intensional species is said to be a similitude of the object only by an analogy of attribution.[94] Species are accidents (for if they were substances, they could not be received)[95] and their union with cognising powers is accidental,[96] i.e. it is not of the nature of a cognising power to know this or that, to be informed or specified by this or that intensional species. They are held to be real entities[97] (i.e. they could be identified independently of what they inform or inhere in) and bear with them their own accidental being ("esse accidentale").[98] Finally, intensional species are held to be really distinct from the cognising powers they inform.[99]

The Scholastic genetic account relies on a physiology, which, however, is not as extreme as the Cartesian because their physics is different. Scholastic physics relied on a description of things in every-day terms and was concerned with the change and communication of qualities or accidents. These accidents, not being of the nature of that in which they inhere, were held to be really distinct from their subject and to have their own identity as instantiated <u>in re</u>. Cartesian physics, on the other hand, relied on a mathematical description of things, assigning qualities to law-obeying spatio-temporally continuous configurations. On this account there is no place for qualities or quantities identifiable <u>in re</u> independently of their subject. It was the success of this sort of physics which prompted many, Cartesian and otherwise, to turn their back on Scholasticism and its intensional species. J.B. de la Grange (like Malebranche, an Oratorian) published a work in[100] 1675 against the "nouveaux philosophes" in general. This work of 611 pages is consecrated to maintaining the Scholastic position that there are accidents really distinct from their subjects[101] and is opposed to explanations in terms of local motions. He disagrees with the Scholastics on the utility of logic, asserting with Descartes that "le bon sens naturel" suffices for reasoning well. Rather than begin with logic, one should begin by finding the truths which are the principles of others, the most important of which (he maintains) are those which concern accidental forms and sensible qualities.[102] Much of the work is taken up in support of the Scholastic genetic account. He concludes by advising the Cartesians (who, he claims, concentrate on anatomy and study nature in experiments rather than knowing it by reasoning) to eschew anatomy (which is useless in deriving philosophical conclusions and should be left to physicians and surgeons) and to spend less time on experiments. They should rather study the rules of reasoning and then Peripatetic physics and metaphysics.[103] The account of knowledge, in so far as it is contained in the Scholastic treatises on the soul (de anima), is tied up with the subject known as "physics" and thence with metaphysics, generally concerned with substances and what is attributed to them. This is one level on which intensional species are accepted or denied.

In the Scholastic account of how cognition comes about, two sorts of species were distinguished: species impressae and species expressae. The intensional species as dispositions in cognising powers were called "species impressae", which term was sometimes reserved for the intensional species in the spiritual cognising power, for something (as it were) impressed on the soul.[104] Species impressae are only dispositions and are said to be the instruments by which objects are united to cognising powers.[105] They represent the object only effectively ("effectivè"), not formally ("formaliter"), i.e. they take part in cognition in so far as they are the dispositions exercised, but they are not the cognition itself. If species impressae were formal representations, the powers in which they inhere would be formally conformal to their objects - they would actually cognise their objects - and we should always formally cognise all that of which we have species impressae.[106] Furthermore, there could then be only one *species impressae* in any one cognising power, for a power can cognise only one object at a time.[107] Thus the *species impressae* is not the analogical similitude by virtue of which the cognising power is said to be assimilated to the object; it is only an instrument for forming the actual and express similitude. The species whose occurrence is the act of cognition and the assimilation is the *species expressa* or *conceptus mentis* (not a concept in our sense, but an occurrence in the mind), known as the phantasm when it is an act of the phantasy. The *species expressa* is the product (i.e. cognition *in facto esse*), not the process (i.e. cognition *in fieri esse*) constituting cognition. Suarez explains the relation between the *species impressa* and the concept by an analogy hinging on the Latin verb "concipere". *Species expressae*, he writes, are like seeds of their objects commissioned to the cognising power to form concepts. As semen does not formally have in itself organs, but only a power of effectively forming organs in the foetus, so the *species impressae* are not formal, but only effective representations of objects.[108] The part played by the *species expressa* or concept is integral to the genetic account. It as well is a vicarious representative really distinct from the power in which it inheres, for it is the exercise of a *species impressa*. Indeed, since the concept is that by which the cognising power is assimilated to the thing cognised, an account of it is the end point of the genetic account.

The assimilation between the cogniser and the thing cognised is a correspondence between an occurrence in the cognising power (or in the mind, taking "mind" broadly), i.e. the *species expressa* or concept, and the object as productive of an intensional species. The cognition could be a case of picking out a feature, but it could also be remembering or imagining it, for the *species expressa* depends only on the *species impressa* and the power. The species expressa as an intensional (i.e. representing) similitude is said to have a unity (i.e. it is the same accident), identity (viz. intensional) and conformity with what it represents; this conformity is compared to that of a picture to its exemplar and is said to be by an analogy of attribution, i.e. the species and its object need not share qualities.[109] The notion of the assimilation between the cogniser and the thing cognised was taken by Suarez and the Scholastics in general to be conceptually prior to the notion of truth, which for them was primarily non-verbal. We say of statements that they are true; for the Scholastics this depends on the success nature of propositional cognition. Similarly, if we wish to have a terminal as opposed to a propositional notion of truth, the truth of the utterance of a referring term would depend on the success nature of essential cognition. Thus Suarez states (taking "thing" - "res" - broadly, for any subject matter, and "adequation" - "adaequatio" - as similar to "assimilation" - "ad-similatio") that real truth consists in a certain adequation or conformity between the thing and the intellect, while truth of reason or signification consists in the adequation between the signifying proposition and the thing signified.[110] The species expressa (which Suarez identifies with the verbum mentis)[111] is in fact an analogue of an utterance, as we have characterised occurrences in the mind. They would be analogues of natural utterances (if there were such for features) and no more have the qualities of their objects than tokens would have the qualities of the features whose reception occasions their utterance. Both could be thought of as signs of the features received. The utterance and not its role is important on this level because of the part played by the senses - material faculties - in this account. The assimilation between the cogniser and the thing cognised, then, can be thought of as the correspondence between the feature and a natural utterance of a certain type, although the feature need no longer exist (in the case of remembering) and may never have existed (in the case of imagining).

With the collapsing of the Scholastic distinctions between material and spiritual faculties, "species impressa" survived in philosophical terminology as "impression", indicating the disposition to cognise established in sensation. "Idea", as we shall see, was sometimes associated with "species expressa" to indicate an occurrence in the mind. Locke used "idea" for both occurrences and dipositions. This explains Hume's claim[112] that he perverted the word "idea". (Hume, however, used "impression" for a sort of occurrence, viz. a particularly lively one, acknowledging the novelty of this use).[113]

The Scholastic accounts of the sensitive or material faculties involved distinctions which were largely lost in the new philosophy. If they were not lost, they were treated either in terms of intensity and priority or in purely physiological terms, which were already present in the Scholastic account. The Scholastics included among the senses not only the five external senses ("sensus exteriores") which receive or perceive the species immediately from the material object, but also internal ("interiores") senses, which perceive, distinguish and conserve species.[114] Organs of internal sense are located in the brain and are described by their physical properties to explain the functions of the faculties. The Coimbrians[115] distinguish two internal senses: the common sense ("sensus communis"), which cognises all the (proper) objects of the external senses and is located in the wet part of the brain (humidity being conducive to reception); and the phantasy ("phantasia") or <u>facultas imaginatrix</u>, which perceives ("percipit") as present and absent what the common sense cognises only as present and is located in the dry part of the brain (dryness being conducive to conservation). Imagination, usually a function, but sometimes an act,[117] is strictly assigned to the phantasy, although more broadly it includes common sense as well.[118] Alsted and the Coimbrians[119] consider the phantasy a higher faculty, assigning it a judicative function ("partim componendo, partim dividendo"). The Coimbrians hold that this is peculiar to higher animals, although all animals have common sense.[120]

They call the memory the "thesaurus specierum"121 (a formula repeated by Locke) and assign two functions to it: one to conserve species (memory proper) and one to exhibit them (reminiscence, "reminiscentia").[122]

Suarez maintains for a number of reasons that the species of internal sense are distinct from those of external sense.[123] He holds it probable that internal species result from the efficacy of internal sense itself, for the vital powers in the soul all act together, having similar "consensations" ("consensiones").[124] Both the consensio and a sensus agens intentionales species - the internal sense itself - are needed for internal species.[125]

These material faculties were retained by certain new philosophers, but with the rejection of accidents distinct from their subject the distinctions between the faculties collapse.[126]

Now if species in spiritual faculties are derived from those in material faculties, the spiritual faculties differ from them only in their concern with the roles of the occurrences. Yet on the genetic account we become subject to the objective structure by virtue of having these occurrences, which already have roles in the material faculties. Higher animals, it was held, share material faculties with us, and so have similar occurrences in these cognising powers. Why, then, should they not perform rational activities? Two ways were given for distinguishing material faculties from spiritual: in terms of their objects and in terms of their operations. Those who distinguished them by their operations did so by what we have called elevating operations. Suarez, however, attempted to distinguish them as well by restricting material faculties to the first operation of the intellect. We now consider this attempt.

According to E.J. Ashworth, Aquinas (who was followed in this by many and disparate seventeenth-century logicians)

> held that the Organon, and hence logic as a whole, was organised according to the three operations of the human mind. The Isagoge of Porphyry and the Categories correspond to the apprehension of simples, the De Interpretatione to composition and division, and the rest to ratiocination. More simply, we have a division into three operations which produce in turn concepts, propositions and arguments.126

The first "operation" - simple apprehension - as usually construed was not an operation at all, but essential cognition. The term "conceptus" was applied to acts of cognition, inceptive or exercisive, in any faculty. When simple apprehension is said to be conception ("conceptio"), it makes no difference whether the first operation is in a material or spiritual faculty.

To the traditional three operations of the intellect a fourth - ordering or disposition, concerned with method - was added in Cartesian logics, such as Arnauld's and Nicole's Port Royal Logic (La Logique, ou l'Art de Penser, 1662) and the first book of Régis' Système de Philosophie (1690), also called "La Logique, ou l'Art de Penser". The four-fold distinction replaced the three-fold distinction even among many non-Cartesians and method, ordering or disposition was added as a further division of logical texts in addition to those concerned with simple terms, propositions and syllogism. The Cartesian logics give the impression that they treat of syllogism only as a matter of form and consider ordering the important complex operation.

For many in the seventeenth century, clear and distinct perception and "le bon sens naturel" took the place of Scholastic logical rules for composition and division (i.e. the second operation) and discourse or syllogising. According to the Cartesians, judgement is a function of the will, not the intellect, and is concerned with ideas, propositions and arguments. The term "idea" sometimes took over from "species expressa" and, more generally, from "conceptus". Thus the occurrence of an idea was identified by some as the first act of the intellect.[127] But again talk of simply having an idea does not determine whether or not the faculty is associated with a corporeal organ. Bernier maintained[128] that the principal function of the phantasy is simple apprehension, i.e. bare imagining of a thing without affirming or denying. As the phantasy is common to men and beasts, it would seem that simple apprehension should fulfil only a biological function, viz. an animal's or man's being alive to something in its environment. But judgement is held to be a complex apprehension of the units apprehended by simple apprehension. So if simple apprehension is allowed to be a function of the senses, the materials are present in these for the complex operations of the intellect.

Suarez states[130] that apprehension (thus called because the power receives the object as if by drawing it in) is the act following the reception of the intensional species by which the thing is first vitally conceived. (In general, apprehension is "mentalis rei formatio sue vitalis conceptio per potentiam cognoscitivam".) Apprehension in general is distinguished into simple apprehension (by simple concepts, not compounding one thing with another) and composition or composite apprehension. The latter divides into the second act or operation of the intellect (comparing or compounding and dividing simple concepts) and the third act or operation (<u>discursus</u>, which is comparing one composition to another as consonant to or inferrable from it). The gap, which is particularly important for distinguishing the material from the spiritual faculties, occurs between the first operation and the second, identified as judgement. Yet judgement introduces nothing beyond simple apprehension except another cognition which is not simple only because it is about the connection of what is simply apprehended. Judgement, which is not about bare things, but about how they are or how they are not, is said to be only division and composition.[131] It might be thought[132] that one could distinguish between only apprehending - only compounding the extremes without having an opinion ("sententiam") about the proposition - and judging- also adhering or not adhering to the proposition as true or false. But cognising the connection, Suarez insists, is judging and is only by reason distinct from composite apprehension. After forming the proposition, there is no need for the intellect to explicitly judge it true or false. On Suarez's view, judging involves no evaluation and apparently, given simple apprehension, is automatic. Yet by means of the distinction between simple apprehension and judging he wishes to distinguish between material and spiritual faculties. No external sense, he writes,[133] judges "componendo, vel dividendo", as they only discern between diverse/proper sensibles. Nor, he maintains,[134] does any internal sense judge by compounding and dividing, but only by simple apprehending.

The Coimbrians and Alsted placed the distinction between the material and spiritual faculties in their objects (e.g. singular vs. plural), not operations. The Coimbrians[135] accepted the Thomist position that the phantasy, as the vis cogitatrix, has an excellence in man ex defluxu rationis such that it compounds and divides singulars to form singular propositions and uses syllogisms composed of singular terms; the intellect is called "ratio universalis", the vis cogitatrix "ration particularis". Likewise, the sensitive appetite in man, joined with the will and arising from the same soul, is held to participate in reason. They point out that Aristotle holds that the reminiscences ("actus reminiscendi") of the sensitive memory are like syllogisms, deriving one thing from another. Alsted refers to the phantasy judging by composition and division as an "idolum rationis", making, not syllogisms, but idola syllogismorum.[136]

Suarez states[137] that Aristotle's terms "particular reason" and "passive intellect" for the phantasy express only the dependence of our intellect on the phantasy, which immediately moves and is often directed by the intellect. Both in the Disputationes[138] and in the De Anima[139] Suarez maintains that the imagination frames ("fingit") certain beings ("entia") which never were or even could not be from those which fall under sense (e.g., a golden mountain or a chimera). In the Disputationes this function is first said to be due to a participation of human imagination in the power ("vis") of reason, but is then said to be more simply attributed to reason. In the De Anima this function is mentioned to support the view that the senses err and are corrected by the intellect. Error, however, implies false judgement; thus if the senses err, they would be assigned a judicative function. This is avoided in the Disputationes[140] where Suarez maintains that truth and falsity are not in simple acts, whether in the intellect or the senses. As the imagination apprehending a golden mountain does not compound, neither do the external senses err when they apprehend something which does not exist or other than it is because they apprehend it as present and existing. This is not proper error (he claims), for, e.g., vision does not err formally, not judging about the subject of colour; rather than falsity, this is an imperfection and an occasion of error.

Yet even as occasions, the occurrences in material powers have roles as materials of judgements. Suarez maintains[141] that in every sense there is not only simple apprehension, but also judgement primo modo, intrinsic to the act of cognition. In the cognition by vision of black, a simple act is said to be elicited and likewise for the cognition of white. There is not held to be a third act elicited by which vision judges the one to be distinct from the other. Rather, vision is said to tacitly ("exercitè") judge that colours are different and the common sense to tacitly judge about the differences of diverse sensibles (e.g., colour and sound).[142] In admitting tacit judgements, although he avoids a further, complex act, Suarez admits that the occurrences in the material faculties are already in the roles in which the corresponding occurrences in the spiritual faculties take place. Intellectual competences must be presupposed, for even if these occurrences could be stated in a non-propositional fashion, e.g., as the apprehension of a body to be black, this presupposes the competences not only to apprehend the body to be black, but also to be not white and to be non-coloured. In addition, competences to apprehend bodies as spatially and temporally distinct must be presupposed. In a word, the logical structure of colour-words and a great deal more must be presupposed if the reception of sensible species even by the external senses is to be anything like what we call, e.g., seeing a body to be black.

Bernier, indeed, held that tacitly judging counts as judging and thus allowed the other two operations of the intellect to the material powers, albeit concerned only with singulars. Further, Bernier saw no distinction between the sensitive faculties of men and higher animals. An affirmative judgement, he maintains,[143] is only the apprehension of a thing with some adjoint, a negative judgement is that of a thing as distinct from such an adjoint. Thus, e.g., when a dog thinks a man to be his master, he apprehends the man with mastership. The dog's enunciation, then, is imagining "l'Homme maistre", which contains "est" tacitly ("en puissance").[144] Likewise, when the dog recognises the man not to be his master, he conceives "l'homme non maistre". Again, the judgement by the phantasy (privations being the products of the intellect) that absinthe is sour contains "en puissance" the judgement that it is not sweet. Given these "propositions en puissance", it is but a step to affirm that the phantasy reasons: as the phantasy can connect or separate two simple apprehensions (according to whether they agree or disagree), it can connect or separate in "argumentation" one of these apprehensions with a third.[145]

Bernier supports his position that animals make subject-predicate judgements and reason with a behavioural argument in which examples are evinced of animals responding to signs of danger or of other aspects of their environment.[146] However, while animal behaviour displays cognition of things to us, what animals are said to cognise depends on the objective structure present to us; animals, not performing conventional acts, have no objective structure present to them. In particular, in describing animal cognition, we sometimes employ non-descriptive rules and concepts, such as those governing the use of purely grammatical and logical terms as are needed for formulating propositions and arguments; yet this does not imply that animals follow purely conventional rules. Suarez allows a corrective function of the intellect over the senses; other Scholastics spoke of a participation of the higher sensitive faculties in reason and Bernier speaks of the senses performing rational activities restricted to singulars. All three positions to differing degrees bring out the implications of maintaining that the roles of feelings by which we are alive to things are determined by the reception of vicarious entities by sensitive faculties. Allowing simple apprehension in the material faculties places the materials of rational activities in these faculties, which are shared by man and beast. The correction of the senses by the intellect and the participation of higher sensitive faculties in reason would be better explained by the application of the objective structure in evaluating observation reports and governing the uses of the utterances involved.

Chapter VII

The *Intellectus Agens*

We have seen difficulties in distinguishing material and spiritual faculties in terms of operations. We might try instead a distinction in terms of objects. Species have already been discussed and we have mentioned what were known as intelligible species - species in a spiritual faculty, in the *intellectus possibilis* to be exact. These are an obvious starting point for the search for objects peculiar to spiritual faculties. As they are held not only to be essential for rational cognition, but also to derive from our relations to the ambient world, they are held to require the *intellectus agens* - the major subject of this chapter.

Three views about the *intellectus agens* are distinguished; the first was nominalist (and accepted by Gassendists), as was the second (much of which Suarez accepted), while the third was Thomist. The first position rejects the *intellectus agens* and intelligible species; rational cognition is due to the intellect's use of material species in new roles. On the second position, the *intellectus agens* is largely *ad hoc*, duplicating the species in the phantasy; the resulting intelligible species of "material singulars" are the material from which the *intellectus possibilis* constructs its science. The third position maintains that rational cognition is a function of the *intellectus agens*, which applies concepts in what is called *conversio ad phantasmata*.

Conversio ad phantasmata involves (it was maintained) a certain sort of spiritual object (viz. the *verbum*, an *objectum in quo*), which Suarez rejects as a veil between the cogniser and the thing cognised. Rather (he maintains), rational cognition of things involves only an object by which we cognise, but which is not itself cognised. However, when Suarez comes to discuss our knowledge of science, he finds it necessary to introduce an _objectum cognitum_ which is not a material singular - the _conceptus objectivus_. In Suarez's account, this is the object which is peculiar to spiritual faculties and accounts for our science. (None of these objects are identified with the intelligible species, which is dispositional.) "Conceptus objectivus" is also the historical antecedent of "objective reality" in Descartes' sense and "idea" as used by Malebranche and Leibniz.

The individuation of rational beings was attributed to the _intellectus agens_ or the _intellectus possibilis_ (or both). If the _intellectus possibilis_ is replaced by dispositions in an ultimately mechanical body and the _intellectus agens_ is held to be something common - as is apparently the case with Malebranche - then the standard accounts of individuation (which are questionable in any case) fail. On the other hand, if (as in the first nominalist position) species in material faculties are regarded as that by which we cognise and if a mechanical physiology is accepted, then there arises a mysterious relation between mechanical activity and sensation, precisely as Bernier finds. It is significant that the _intellectus agens_ or what stood in its stead was central to the theory of knowledge and the ontological status of rational beings.

In the following discussion, we follow Suarez in discussing first the opposition between the first position on the _intellectus agens_ and the other two positions, and then the clash between these last two. Suarez's notion of the _conceptus objectivus_ is then considered, and the chapter ends with the Cartesian solutions to the knowledge-theoretical and ontological problems associated with the _intellectus agens_.

The *intellectus agens* was the centre of some of the more persistent problems in the history of philosophy. The notion arises from Aristotle's *De Anima* III, 5 which Ross calls [1] "the culminating point of Aristotle's psychology." Aristotle maintains that there is a general distinction between the matter which is potentially each of a class of things and the efficient cause which makes them; hence, in the soul, one reason – νοῦς παθητικος (*intellectus possibilis*, which we call passive reason when used before Aquinas) – becomes all things, the other – νοῦς ποιητικος [2] (*intellectus agens*, active reason) – makes all things. Passive reason is held to become all things because it is an Aristotelian principle that that which cognises becomes (intensionally) identical with the object cognised. The sense in which active reason makes all things is meant to be explained in part by an independent example of the general distinction: the distinction between an art and its material. Ross suggests that the role of active reason is to make passive reason become its objects by apprehending them; so this is an instance of the general principle that "what is potentially comes to be actually by the agency of something that already is actually." (*Met.* 1049 b. 24). Aristotle continues: active reason is to the intelligible as light is to the visible. [3] This suggests that the fact that active reason already knows all intelligible objects makes it possible for passive reason actually to know and for the object to be known.

Although this is far from clear, the greater occasion of controversy arose from Aristotle's attempt to specify active reason beyond its function– "The active reason," he writes, "is separable and impassible and unmixed, being an actuality." "Separable" here evidently means "capable of surviving death". Aristotle apparently held that active reason goes beyond the individual and is obscured by its association with a particular body, while the passive intellect is mortal [4].

The relation between active and passive reason suggests the relation between an objective structure and behaviour which instantiates or applies concepts involved in it. Lack of space precludes going on to investigate to what extent Aristotle actually was concerned with a culturally determined objective structure.[5] Much Greek thought, and notably Aristotle's thought at times (he never mentions God in the De Anima), avoids the God-intoxication which followed it. Yet where it does so, it tends to rely on a uniform nature, thought to determine cultural aspects. At any rate, Aristotle's brief development of the notion of active reason was heady stuff. Theophrastus,[6] Aristotle's successor or Scholarch in the Lyceum, regarded [7] as serious, if not insoluble, the problems thus raised. Themistius (A.D.320-350) wrote [8] about this notion: "The philosopher himself is here more like a puzzled inquirer than a teacher." In fact, Aristotle discusses God expressly in Metaphysics Λ , which was a major reason for a persistent tradition of identifying active reason with God [9].

The identification of active reason with God took various forms but all concluded something about the ontological status of man from an account of human knowledge. Alexander of Aphrodisias (H. c. A.D.200, called the Commentator, because he was for centuries regarded as the most authoritative exegete of Aristotle) identified active reason with both divine intelligence and divine activity and held that there was no individual immortality. Among the Moslems, Avicenna (d. 950) held a somewhat similar position, as did Averroës (1126-1198) who added that individuation of rational beings is due to differences in their accumulated phantasmata (so individuality ceases at death.)[10]. The Jewish philosopher Maimonides (1135-1204)[11] made a slight advance on his fellow Spaniard Averroës : the accumulated intellectual capital enriches the intelligence common to all. With little textual support, some have seen Maimonides as a decisive influence on Spinoza; but scholastic precedents for Spinoza's pantheism (if they are to be sought) were present in his own country and day in the discussions of the intellectus agens, which drew from the Moslem and Jewish traditions.

To the middle of the thirteenth century, Latin Christendom was nurtured on Augustine's theory of mind and knowledge (which shows some taint of the doctrine of active reason).[12] It was then presented through the Arabs with a rich literature on active reason. Avicenna was first used to clarify Aristotle; then Averroës arrived on the scene.[13] An acceptable position was reached by Aquinas, although questions of the status of eternal truths and the role of the cognition of singulars in the acquisition of science- especially as asked by Scotus and the nominalists- kept the problem open.

What we are interested in is the opposition between later Thomism and nominalism on the subject of the intellectus agens, Suarez' position and various seventeenth century resolutions. Suarez and the Coïmbrians were famous for their encyclopedic references to previous positions, Greek, Arab, early Christian, and particularly Scholastic. All the philosophers we have mentioned were summarised by them. Thus the various positions, with arguments for and against, were readily available in the seventeenth century.

It is important to realise that, at the time Suarez and the Coïmbrians were writing, the identification of the intellectus agens with God was a live issue. Zabarella (1532-1589) of Padua argues as follows.[14] Aristotle states in De Anima (430a17) that the intellectus (mens) agens exists apart from matter. In Metaphysics Λ, where alone he expressly discusses the variety of immaterial forms, he limits these to God and intelligences. As the function of the latter is only to move their respective spheres, the intellectus agens must be God. Zabarella was the most influential non-Jesuit Scholastic for the seventeenth century: he is often cited by Suarez and the Coïmbrians and his popularity in Protestant countries is attested in the literature we previously referred to. His greatest influence was in logic (i.e. methodology), but it is as a commentator on Aristotle that he is still of value. With such an interpretation of Aristotle in the Scholasticism with which Malebranche was familiar, it is not surprising that at least one more recent Aristotelian scholar[15] has suggested that Aristotle's conception of active reason is similar to Malebranche's theory of seeing things in God.

The illustration of phenomena is the one action of the <u>intellectus agens</u> according to Suarez, but it goes under two other descriptions[15]. It is also said to be the abstraction of species from phantasm or a spiritualisation, de-materialisation, subtilisation or attenuation of intensional species. This abstraction for Suarez does not involve a movement from less to more general, for the species effected is said to represent the same nature as the phantasm. Nor does it involve a separation and transferring to the <u>intellectus possibilis</u>: "hoc enim est puerile cogitare". The third description of this operation is the effecting of things understood by their nature ("actu intelligibiles"), i.e. intelligible species; thus it is called "agens", for its function is to make the thing intelligible, to make the species[16]. This is the only reason it is called "intellectus", for the production of a species is not understanding.[17] Rather, the *intellectus possibilis* receives the species and produces the act of understanding and is called "intellectus" because it understands and "possibilis" because it is informed by species.[18] The *intellectus agens* is not a cognising power and its action is transient; while the *intellectus possibilis* is a cognising power and its action is immanent.[19] The Coïmbrians state that, as the *intellectus possibilis* is initially a *tabula rasa*, there must be a spiritual power - the *intellectus agens* - by which it is led ("ducitur") to act. These two *intellectūs*, they add, are really distinct as in other things there are two really distinct aspects ("affecta"), one effecting a disposition in the other for its operation: fire is distinct from the wood it heats and heat and other objects of the external sense are distinct from the senses on which they brand ("inurunt") their similitudes.[20]

Suarez allowed for "consensation" ("consensio") to account for the production of species in internal sense, given those of external sense. Why could he not allow for the same for the production of intelligible species? And why, given this *consensio*, could not species in the phantasy secure dispositions and intelligible species not be called upon? After all, it is the same soul. The best reason for Suarez to insist on intelligible species and the *intellectus agens* is the sharp distinction he draws between material and spiritual faculties as illustrated by his attempt to reserve the second two operations of the intellect to spiritual powers. The *intellectus agens* appears as an *ad hoc* bridge between material and spiritual powers, called upon only for the spiritualisation of intensional species. In particular, Suarez denies the Thomist instruments ~~of~~ the *intellectus agens* by which we judge all things, certain *semina scientiarum*, *primae conceptiones* intellectus put there by God and having divine exemplars.[21]

At the beginning of the third book of the De Anima, Suarez presents two reasons for denying species in general, i.e. for denying that there must be a conjunction of the object with the power for an act of cognising.[22] The first reason is from physics and denies that it is a prerequisite to action that the term ("terminus") be conjoined with the agent. This is the basis of nominalist rejections of species; it need not be generally applied, for species might be deemed necessary in one power and in this power suffice for another power. The second reason is that fictions would be species, yet they are not similitudes of objects. This is a powerful point, for it indicates that "cognise" is not a success verb. Suarez has his own way out with conceptus objectivi, which are integrated into his account only with the Disputationes. Here he argues only against the general point[23] and relies on physical arguments to support the need for species in all cognising powers. The burden is on what is said of external sense, where he produces arguments to show that what is received (e.g., a visual image) is indeed needed for cognition as a vicarious object. He then simply states that we experience ("experimur") that certain similitudes of corporeal things are formed in imagining and that if nothing remained in the power in the absence of the thing, the power could not cognise the thing. He thence concludes that species are needed for memory (disposition), reminiscence and intellection.

The general, physical position denying the need for a term in the agent, Suarez states,[24] has been attributed to Galens; he suggests Augustine on vision and adds (with more relevance) Ockham (In 2. Quaest., 17 & 18). This is a nominalist position, although some (e.g., Durandus and Biel) make some concessions. The interesting position is of those who concede that sensible objects must be conjoined to powers by species, but deny that there are intelligible species.[25] Durandus explicitly presents this opinion (Henry and a certain John Bacon are also mentioned), which appears to Suarez to be thought out expressly to avoid the difficulties which arise with regard to the means of producing intelligible species. On this position, the intellect cannot be excited to operate by a material object, because it is spiritual; but it can be by the cognition of the senses, for the same soul both senses and understands. All the cognising powers in man (this position continues) participate in reason and if the soul apprehends something by sense, it is thereby excited to cognise more exactly by intellect.

Suarez never directly replied to Durandus' opinion. In the immediate context in which it is presented, he gives only the proof described above for species in all powers and appeals to authority on the need for intelligible species and the _intellectus agens_.[26] Aristotle supports the _intellectus agens_. Intelligible species are supported independently by citing authorities with innatist positions, in all cases held to involve species. Plato is said to have posited "inditas omnium rerum species"; Dionysius[27] asserted that angels from the beginning have species of all things; and Augustine[28] wrote that God produced for all time things both in themselves and (by giving angels the similitudes of them) in the intellects of angels. Suarez, however, does not answer why there must be dispositions in spiritual powers of men.

Durandus' version of _consensio_ makes the _intellectus agens_ redundant. Durandus' arguments were the best known arguments by a Scholastic against the _intellectus agens_ in the seventeenth century, having been summarised by the Coïmbrians.[29] Durandus distinguishes two functions for which the _intellectus agens_ has been posited, arguing separately against each. The first concerns the _intellectus agens_ as Suarez envisages it, functioning only in inceptive cognition producing an intelligible species. Durandus interprets this position as implying that the _intellectus agens_ impresses something on the phantasm by which it is made fit to produce an intelligible species in the _intellectus possibilis_. But, then, either a spiritual or a material quality is impressed. Not a spiritual quality, however, because there cannot be a spiritual quality in something material; and not a material quality, which would make the phantasm no more fit to produce an intelligible species. The second, Thomist function for which the _intellectus agens_ is posited is the production of exercises of the _intellectus possibilis_. (The arguments against this position also apply to Suarez's position, for inceptive cognition is an exercise of the _intellectus possibilis_ due to the action of the _intellectus agens_.) Durandus objects that intellection is an immanent act and there is no reason to call what does not understand "intellectus". Again, if these two faculties are distinguished in this way, then an angel should have an _intellectus agens_, there should be a _sensus agens_ and there should be a _voluntas agens_ producing actions and a _voluntas patiens_ receiving them. Also, there is the problem of whether the _intellectus agens_ judges. If it does, then there would be two faculties judging things (it and the material _potentia intellectrix_) distinct from the faculty which understands. If it does not, then it is less noble than the _intellectus possibilis_; but according to Aristotle and Augustine what acts is more noble than what receives ("patiente"). Finally, Durandus presents a third-man argument against this position in that it posits the _intellectus agens_ to beget immaterial beings ("entia") of a degree and order different from that of phantasms. In this case, the phantasm cannot be even an instrumental cause, for a species which is already spiritual would be needed to concur with the _intellectus agens_, itself immaterial.

Rejecting species in the intellect and the distinction between two sorts of intellect or understanding, with the consequent disappearance of the _intellectus agens_, gives a different twist to the Scholastic genetic or causal account. This version was more acceptable to those in the seventeenth century who rejected accidents distinct from their subjects (which was anticipated by the nominalists). Bernier[30] rejects the distinction between the _intellectus agens_ and _possibilis_, said to be contrived by Aristotle. The usual distinctions appear absurd to him, most notably that according to which the _intellectus agens_ lacks understanding of things, yet forms species of them, while the _intellectus possibilis_, incapable of forming species, understands by species. If the terms are to be retained, he states,[31] we should follow Ockham and Gabriel, distinguishing the two intellects neither really nor by reason, but calling the soul "intellectus agens" as it produces actual intellection - an act of understanding - and "intellectus patiens" as it receives its own act. But the terms, he agrees with Durandus,[32] only create confusion: the intellect ("entendement") is a simple faculty of understanding.

Bernier also rejects intelligible species, for the intellect, he maintains, is a faculty of a genus superior to the phantasy, containing eminently all its force.[33] When the phantasy forms a phantasm ("phantôme", said to be an image or resemblance) of a thing (either in being struck or in exercising a disposition had by virtue of having been struck), the same phantasm is envisaged by both faculties - the understanding understands what the phantasy imagines - because the understanding is intimately present to and adheres to the phantasy.[34] The understanding _attendens ad phantasmata intelligit_ because the soul or understanding uses only the species furnished by the body while it remains in the body.[35] His rejection of immaterial, intelligible species is not new and extraordinary, Bernier insists, for it was held by Themistius among the ancient Peripatetics, Avenipare among the Arabs and among the moderns he mentions Henry and a number of nominalists: Durandus, Gotfrey, Bacon (presumably John) and Gabriel.

The understanding is not distinguished in Bernier's position from the phantasy by its objects; nor is the understanding unique in its logical operations, for Bernier allows all three operations of the intellect to the phantasy. Rather, the intellect can use phantasms in new roles. That the intellect uses no other species than phantasms is said to be shown by the fact that we understand everything under some corporeal species or phantasm; but we thereby understand incorporeal things (God, angels and the rational soul) and the understanding by its eminence can elevate itself on the occasion of phantasms to understand what the phantasy can only imagine. But the understanding or soul is held to develop these roles, making its own rules and concepts. All knowledge ("connoissance"), he states,[36] begins with singulars because the understanding understands only by species in the phantasy impressed by the senses, which perceives only singulars. Although we often argue from the more general to the more special (he concedes[37]), we must first begin with singulars to infer what is general, whence we can infer what is more special and eventually return to singulars. Thus universal axioms are said to be derived from singulars by induction[38] and the validity of a priori demonstration (from universal to more special) is said to depend on a posteriori proofs of its principles.[39] Again, the analytic or resolutive method (proper for teaching), proceeding by division from universals to singu lars, is preceded by the synthetic or composite method (proper for discovery), gathering together singulars to arrive at universals.[40]

These elevating operations, giving new roles to phantasms, according to Bernier indicate the disproportion between the properties of matter (i.e. the figure, solidity and local motion of atoms) and the understanding, and so prove it incorporeal and distinct from the phantasy.[41] Bernier, an atomist, rejects prime matter, but retains the Scholastic rational soul; hence for him there is an even greater gulf between the material and spiritual faculties and no bridge furnished by the <u>intellectus agens</u>. Indeed, he writes[42] that it is inconceivable that a phantasm, being purely corporeal, could be made or become an incorporeal species by being atten uated or subtilised. The species by which the intellect understands is still distinct from it, for the rational soul is distinct from the body. But now it is not evident how the intimate presence of the phantasy to the understanding adds anything which is not already given by the fact that the understanding is in an environment. Durandus could maintain that there is a sort of <u>consensio</u> between the material and spiritual faculties because he holds that man is a <u>suppositum intelligens</u>,[43] involving only one substantial form. But one sort of description Bernier gives of material faculties is like his description of the rest of the world, ultimately resting on atoms which already have their own substantial forms. Another way Bernier draws the distinction between corporeal and incorporeal is in terms of what is not passive or receptive, as opposed to what is: the understanding cognises ("connoît") without being struck, shocked or passive in any other way ("il ne patit ou ne soufre aucunement"), while the phantasy produces the <u>species expressa</u> ("espece expresse") when struck or when it envisages or conceives the thing as it is perceived by sense in being struck.[44] The <u>species impressa</u>

is said to be the fold caused in the brain, while the species expressa ("espece expresse") is the same fold (vestige or impression) looked at in actually imagining or thinking and is said to be alone properly the species or image, being the thing itself as it becomes the object of the imagination and objectively in the phantasy.[45]

Yet he maintains that even animals judge and reason, that they have sensitive souls and their behaviour in some cases is similar to rational human behaviour. The mystery for Bernier lies more in the gradual change from what is insensible to what is sensible than in the eminence of the understanding over the phantasy, for which he invokes the same principle as accounts for the fact that the degree of animal, more noble than that of plant, contains in a more excellent way vegetation, growth and generation.[46] He dedicates a chapter[47] to the problem of getting from atoms to what they cause, viz. sensation. Presenting numerous examples of things insensible on their own, but which cause noticeable sensations when taken together, he goes through various stages of animation, showing how sensation is continuous from the inanimate (e.g., heat) on up. He concludes that, since nature does not jump from one extreme to the other, "une chose insensible devient sensible par une espece de progres ..., quoy que l'intelligence humaine ne le puisse pas observer".[48] It is above the wisdom of the human mind to explain how corpuscles cause sensation in the soul. One would be no further removed from Bernier's position in asserting that there is life throughout as in asserting that the operations of the phantasy are explicable in terms of figure, solidity and local motion, which conspire to produce the roles in which phantasms occur; the function of the incorporeal understanding is then to produce new roles for phantasms, the materials of reasoning and knowledge.

On Bernier's position, as on the general genetic or causal account, the understanding or intellect is a tabula rasa to begin with, acquiring materials through its intercourse with its environment, whether these materials are located in the phantasy or are held to inform the intellect itself. Furthermore, on a position such as Bernier's, the understanding in a sense remains a tabula rasa, for what we have said to be physically in the mind is located in the phantasy. But how could a tabula rasa be something spiritual or anything else? For Bernier, what is spiritual is distinguished by its elevating operations. But for Hobbes speech takes over from the operations of the spiritual faculties and there is no problem of the relation between the locus of sensing and that of understanding. The explanation of things for Hobbes is uniquely due to knowledge of cause and effect (usually seen as a logical relation between premise and conclusion). Speech (it is held),[49] by the imposition of names and connections of them, helps in remembering causes and effects; thus the reckoning of the consequences of things in the mind is turned into a reckoning of the consequences of names. Universals, relations, negations and privations are all explained in terms of names and reasoning is interpreted on a mathematical model as reckoning with names. The second two acts of the intellect and the objects peculiar to it are thus taken over by operations with words. Simple apprehension can be either sensing features or sensing verbal tokens, which are natural singulars, but can be given new roles by us. Still, as with Bernier, we are to ask how what is simply apprehended has roles to begin with if everything is explained by motion. Hobbes, who collapses the distinctions between sensitive faculties, also denies that the species of sense are received in sensitive powers. Rather (as a consequence of denying accidents distinct from their subject) sensible qualities are held to be only phantoms. These are taken to be acts in no way distinct from the sense, as Hobbes states that there is no distinction between process (the act _in fiere_) and the product (the act _in facto esse_) in an instant.[50] Although phantasms or phantoms in no way resemble the motion which causes them, we cannot help attributing them to their cause; thus phantasms represent their causes, serving as distinguishing marks of them.[51] Again with Hobbes, as with Bernier, the mystery is in the leap from mechanical activity to sensation. Phantasms for Hobbes are our feelings as being alive to features; yet they fulfil roles and can be elevated into different roles in the imposition of names. This, however, is not the imposition of an objective structure, but an individual's effecting of rules. Effecting rules is itself a rule-governed activity, but for Hobbes there are no rules to govern this activity - thus Leibniz's charge of _plusquam_ nominalism against Hobbes.

We now consider the two positions which admit the _intellectus agens_ and intelligible species. This leads to Suarez's account, which, though basically that of the nominalist position presented here, is a mitigated genetic account in that he allows objects peculiar to spiritual faculties.

The Coïmbrians present three texts in which they opposite those who maintain that what is in the intellect represents the same material or sensible singular as the phantasm, on the one hand, to those, on the other, who hold that only the common nature represented by the phantasm and removed from the singular conditions is in the intellect[52]. The first position is attributed to Scotus and various nominalists; the second is Thomist. They portray the nominalists as holding that the abstraction done by the _intellectus agens_ does not result in an abstract nature and that all dispositions in the _intellectus possibilis_ are of singulars[53]. The burden of the distinction between spiritual and material, then is borne by the elevating operations of the _intellectus possibilis_, by which its exercises relate to universals.

The question arises of how on the Thomist position concepts (in our sense) are applied, especially as it is maintained that there is no proportion between the intellect and material singulars, for the intellect is completely immaterial[54]. But this (they hold) is consonant with the genius of nature, which never conserves with many what it can conserve with few[55]. Thus intelligible species of common natures suffice for understanding singular things, for as a phantasm concurs with the _intellectus agens_ to produce the intelligible species, so when the _intellectus possibilis_ is informed with the species of a common thing, the phantasm can concur, not as an exemplar only, but also actively determining the intellect to conceive the singular thing whose phantasm it is[56]. Aristotle's position, it is added, is that we do not understand singulars by direct, but by reflex cognition; if there were species of singulars in the intellect, they would be understood directly. The cognition of a singular is said to be reflective because it is said to be cognised in a _verbum_, which is the concept as interpreted by the Thomists, an act of cognition of a concept (in our sense of "concept") applied to things. The cognition of singulars in concepts is called "conversio ad phantasmata", which is the application of rules and concepts to things. This position relies on the symmetry between inceptive and exercisive cognition of the intellect. Because the _intellectus agens_ uses _semina scientiarum_, both "abstract" and "cognise" (when pertaining to the intellect) are success verbs. Thus it is maintained[57] that if the intellect conceived singular concepts, the _intellectus agens_ would be posited in vain, for a fiction ("fictitia") would be an abstraction and the work of the _intellectus agens_. "Intelligere" as used here means much the same as "understand".

The nominalist reply[58] relies on the view that inceptive and exercisive intellection are asymmetric. Our intellect (the reply goes) cannot use phantasms alone as a principle of understanding, but requires a principle intimately conjoined to it - the intellectus agens - whence it brings forth ("promat") the act of understanding. Likewise, an external assistance by phantasms is not sufficient for conceiving this or that, for it must be actively determined by an internal principle - here not the intellectus agens, but a singular intelligible species. This asymmetry, however, depends on the elevating operations of the intellectus possibilis, making its rules as it goes. Denying conversio ad phantasmata or any other means of applying rules and concepts not formulated by elevating operations, this is a full genetic or causal account.

Now Suarez, for whom the intellectus agens and the intelligible species cannot be just ad hoc because of the sharp division between material and spiritual faculties, also denies conversio ad phantasmata.[59] But he does so because of this sharp division. He insists that the intellect knows material singulars directly without reflection by their own proper species. Against the Thomists it is maintained that the intellect knows the particular conditions of things better than the senses; indeed, the intellect is a much more perfect memory, conserving intelligible species of particular conditions, than is found in the sensitive faculties, for the senses cognise pastness materially, while the intellect cognises it formally.[60] Angels must have more than abstract species, for by abstract species singular natures could not be cognised in a most perfect way.[61] If conversio ad phantasmata were allowed, only the phantasm itself, which is a material singular, could be cognised.[62] Not allowing that the phantasy in man participates in reason, the phantasm would not supply individuating conditions for the application of concepts to things, but would veil things from acts of cognition. Suarez wishes to maintain a sort of direct realism: the concept as the exercise of a species is said to be an objectum quo or non cognitum which is the act of cognition itself. The only term produced in cognition which he allows is the act itself, not as a process ("in fierei"), but as a product ("in facto esse"). In particular, the Thomist verbum is denied, for this would be an objectum in quo, i.e. that in which the singular is cognised, and would veil the material singular as an objectum quod (i.e. cognitum). This displays a misunderstanding of how rules and concepts are applied to things.

There is an ontological point (related to his sharp distinction between material and spiritual faculties) behind Suarez's disagreement with the Thomists on the status of the intellectus agens. Suarez has the intellect outfitted with species in the course of its history in its environment. Once outfitted, there is no need for the intellectus agens nor of the phantasy, which the intellectus possibilis duplicates. Given this duplication, Suarez apparently thought he had a principle of individuation of separated souls.

Rational beings were variously regarded as individuated by the intellectus possibilis and the intellectus agens. Suarez claims that almost all the Greeks held that both intellects are separated "substances" applying to the soul, which functions as an intellectus passivus[63]. Aristotle's statement that the intellectus agens is impassive and alone immortal is seen as favouring Avicenna's view that it governs all things from above. And Alexander of Aphrodisias, he adds, held that the intellectus agens is God because Aristotle stated that it makes all. Suarez[64] follows Aquinas in rejecting these positions on the intellectus agens because (he claims) Aristotle showed that the soul is intrinsically understanding and so needs something intrinsic to produce intelligible species. And Augustine argued that if the power ("virtus") producing species were a separate substance, its production would not depend on the phantasms of the body. But, we might ask, why would it not suffice to have occurrences of material faculties instantiate rational operations by virtue of being subject to conventional rules?

More important for Suarez is the individuation of the _intellectus possibilis_. According to Aquinas[65], both intellects are involved in acts of intellection ("dictio") and so are immortal. Suarez[66] follows Aquinas in explaining Aristotle's statement that the _intellectus passibilis_ is mortal. Aquinas holds that this refers to the phantasy as memory, which is a sort of intellect - the _intellectus patibilis_ - insofar as it is subject to reason. This does not prejudice the question of the immortality of the _intellectus passibilis_ as identified with the _intellectus possibilis_.

Suarez disagrees with Aquinas in having the _intellectus possibilis_ the principle intellectual faculty and the sole immortal one. Aristotle called the _intellectus agens_ a light (i.e. a source of light, "lumen"). Aquinas states this in the form that the _intellectus agens_ manifests or illustrates phantasms[67]. He holds that knowledge ("habitus") of first principles is an effect of the _intellectus agens_ and that the cognition of first principles is the same in all men because the _intellectus agens_ is innate ("insitus") in all[68]. The _intellectus possibilis_, on the other hand, is initially a _tabula rasa_; it (unlike prime matter, which is something only by having form) is not something by virtue of having intelligible species[69]. Opposed to this, Suarez takes "light" for what manifests others, not themselves, and so takes the _intellectus possibilis_ to be the light manifesting truth in things[70]. The manifestation of terms must be in that which, informed by species, elicits acts of cognition, i.e. the _intellectus possibilis_, which alone suffices for assenting to first principles[71]. This position is reinforced by his terminalism, according to which what is received via the senses alone need be cognised for the cognition of the connection of terms and so of first principles[72]. Rational propositional cognition is regarded as only a cognition of a series of empirical essential cognitions. Yet the _intellectus possibilis_ is also held to be a _tabula rasa_ initially[73]. What he is really interested in, though, is the intellectus possibilis as already outfitted, in the way separated souls and angels (he holds) have intellectus possibiles, but not intellectus agentes[74]. For him, but not Aquinas, the intellectus agens both effects acts of understanding and receives species[75]. Aquinas admitted a real distinction between the two intellects[76]; Suarez sees the distinction as something less than this[77].

Suarez insists that the intelligible species is the only light produced by the intellectus agens[73]. Aquinas held that phantasms are not purely material or spiritual, for the human soul abounds with different powers[74] and the soul in a certain way is of the body[75]. Suarez maintained that a soul of a more perfect degree (e.g. rational) always supposes the inferior (e.g. sensitive) and so the rational soul cannot be united to the body unless it receives some intellectual cognition through the senses[76]. But he holds that the intelligible species, being spiritual, must be made by the intellectus agens, not the phantasm, for a material thing cannot make a spiritual thing.[77] For the same reason he maintains that angels must have concreated or innate species.[78] However, the phantasm must have some hand in the making of the intelligible species, for the intellectus agens is indifferent to making this or that species. Suarez's solution is that the phantasm presents the material as a sort of exemplar to the intellectus agens by virtue of their union in the same soul.[79] Our intellect, he writes,[80] is like a medium between the angelic intellect and the senses. It, like the senses, which receive species from extrinsic objects, lacks species initially. But, like the angelic intellect, which has innate ("inditas") species of all things as if they spread out ("dimanarent") from it, as soon as our intellect cognises something, a species representing it flows ("manat") from the intellect (which could not be the case if the intellectus agens were really distinct from the intellectus possibilis).

It is far from clear how rational beings are individuated on such an account. There is not a correspondence between the rational soul and the material faculties, for phantasms are needed only for inceptive cognition or intellection. Some[81] have seen Suarez's view of the inefficacy of the phantasm as allied to Platonism, but he allows that the _intellectus possibilis_ in men is initially a _tabula rasa_ and the account so far says nothing of sorts of objects peculiar to the intellect. _Semina scientiarum_ drop out because of his terminalism. Because of Suarez's duplication of faculties, in some way it makes no difference whether singular intelligible species and their exercises are in the intellect or in the phantasy. In many respects, this is still a full genetic account, concerned with the outfitting of the soul.

Not allowing conversio ad phantasmata, Suarez must explain how we come to cognise things other than material features: how we get from empirical essential cognition to rational essential cognition. As there are initially no objects peculiar to rational cognition, we must arrive at rational essential cognition by the exercise of rational practical knowledge, i.e. by elevating operations. This, in fact, leads to a particular sort of object: conceptūs objectivi. We shall now consider Suarez's replacement for the intellectus agens, which is the conception of the intellectus possibilis, and conceptūs objectivi. These to some extent mitigate his genetic account.

Universals are one sort of object not captured by a purely genetic account and the clash between realism and nominalism centred around these. We begin by considering Suarez's position in the De Anima on our cognition of universals. (In fact, formal features and substances are on a par with universals.) Here, arguing against conversio ad phantasmata, he argues for the need of intelligible species of material or sensible singulars. He also argues against the view that universals are the product of the intellectus agens.[82] If they were (he maintains), then we would know every universal of the species apprehended, yet we are ignorant of many genera and differences. Again, seeing only whiteness (a singular), one does not thereby discern this from colour (a universal). He supports the nominalist position because (he states) the first species imprinted on the intellect are singular, our cognition begins with sense and given that the senses cognise singulars, the intellect can very easily cognise them.[83] Indeed, a species of Peter cannot represent this particular man without representing man simpliciter, so universal species would be superfluous.[84] The intellectus possibilis can cognise universals as such when it cognises diverse singulars with the same forms ("rationes"), whether simultaneously or successively. It then understands them by diverse species partly agreeing in representation. Considering universals, then, is considering what is represented in common by diverse species of singulars.[85] It seems probable, he adds, that the cognition of what is common leaves a species of it in the intellect, for we more easily cognise this universal again.[86]

In the Disputationes Suarez presents three opinions on how we know universals. The first, which he rejects,[87] is the Thomist position (also held by Fonseca) that universals are the product of the intellectus agens and are cognised directly by the intellectus possibilis, which cognises singulars only reflectively.[88] (Direct and reflex cognition are two operations of the intellectus possibilis. By the first it cognises by its own species and by the second it cognises by considering the conditions or denominations of a prior cognition.[89]) Rather, a universal is presented in the concept (conceptus mentis) with a more actual and proper esse objectivum than in the species impressa which is made by the intellectus agens and got from sense. According to this esse something is universal.[90] Esse objectivum is the esse a thing has, not simply as being cognised, but as being conceived (remembering the biological metaphor) in the intellectus possibilis and as the object of the formal intensional representation, the conceptus mentis.[91] The thing having esse objectivum is somehow made, for Suarez writes that those who maintain that the intellectus possibilis knows material singulars must also maintain that it makes universals.[92] One way of making such objects is rejected in Suarez's rejection of the third opinion, viz. that the universal is made by the comparative cognition ("notitiam comparativam") by which the intellectus possibilis, after abstractly apprehending the nature, compares it with things in which it exists; thus the universal nature existing in singulars is not something positive, but is only a similitude and agreement of a number of things among themselves or an ens or relatio rationis.[93] But this (he objects) only adds the cognition of the agreement of a number of inferiors in an abstract nature to the prior cognition of the nature in the individual.[94]

Suarez accepts the second opinion, viz. that the common nature can be abstracted by a simple abstraction or, better, precision ("per puram praecisionem") of the nature from one inferior without relating either a superior to an inferior or inferiors among themselves.[95] This is direct cognition, supposing an object.[96] (Still, he admits that this cognition ("notitia") is not enough to cognise the universality in the nature thus conceived, i.e. to cognise the universal as such, for which relating is required.) Allowing species of material features in the intellectus possibilis and relating "cognise" to any exercise of these species, Suarez destroys the success nature of this verb for intellectual or spiritual faculties. Even those who do not admit such species allow that the intellectus possibilis can cognise objects other than those of the species it has and thus frame new species, as this cognition leaves a disposition.[97] Suarez must admit that pure fictions are both cognised and are the objects represented by concepts (conceptūs mentis).[98] These objects could be said to have esse objectivum or to be entia rationis. It is very important to realise, however, that these terms were usually not used for such fictions, but for special sorts of objects which guarantee the success nature of "cognise", in particular, when universals or formal features are said to be cognised. The universality of the object is the work of the intellectus possibilis, for (Suarez writes)[99] if man existed in re as the object of the concept, man would be universal in essendo. But it is in the thing, for (he adds) a man is made singular by individuating differences, so from the fact alone that man (universal) abstracts from these by an actual abstract concept, it is universal. This statement could be taken in the sense that a particular man is an assemblage of properties. This is supported by the fact that a reason given for admitting species of material or sensible singulars in the *intellectus possibilis* is that it is held to know the individuating conditions of things much better than the senses. The statement could also be taken to imply that we can in principle give a definition of individuals. This is apparently Suarez's intent and species of material features in the *intellectus possibilis* are then needed only as materials of reason with the *intellectus possibilis* taking over the operations of the *intellectus agens*. The success nature of "cognise" is guaranteed when the cognition is of objects which require the operation of the *intellectus possibilis*, whose species are said to flow out and which is said to manifest truth in things.

The cognition of universals is part of a larger problem of the cognition of all but occurrences of material features which are transmitted to the senses and by the action of the *intellectus agens* establish dispositions in the intellect. These other objects are due to our conception and are what our science is about. The broader problem is presented in the *De Anima* (which lacks much of the distinctive vocabulary of the *Disputationes*). The senses, Suarez states here,[100] cognise only external sensible accidents (i.e. material features), which alone are imprinted on the intellect. They are said to be sensible *per se* since the senses receive species of them; the conceiving, formation of a concept, cognition or intellection of all else is held to depend on negation or what he calls "analogy". But the intellect from the cognition of accidents comes to consider what is hidden behind them, whence its name: "intus legens".[101]

The intellect is held[102] to first receive spiritual species representing the same sensible and material things as are represented in the phantasy, i.e. proper sensible accidents of some substance. These, however, also represent common sensibles (i.e. some formal features) which modify the cognition of the proper sensibles. (He does not say they modify the thing which produces the features.) Common sensibles in some way are manifest ("relucent") in species of proper sensibles because it is of the nature of the intellect to divide what is united and to apprehend such sensibles by proper and distinct concepts (but not to have proper species of them). His examples of concepts (in the sense of acts of cognition) formed by analogy are the principles ("rationes") of substance - matter and form - and substance. The concept of matter is held to be formed in analogy with the matter of artificial things and that of the form of man - the soul - by relation and analogy to his operation.[103] The intellect receives species representing proper sensible accidents of some substance which also confusedly represent their subject since the intellect represents in conception these accidents in concreto. It then infers ("colligit") the subject of accidents and so forms a concept of substance by discourse in considering these accidents (particularly their change) in the same subject and inferring something which supports ("substat") them.[104]

In the making or formation of concepts as occurrences in the intellect, the species received from the senses via the intellectus agens act as the materials or the vocabulary with which the intellectus possibilis performs elevating operations; but the resultant concepts still employ the same vocabulary. Suarez states[105] that the intellect cognises things lacking their own species by species of sensibles and discourse and then forms a species of them with the species of sensibles related in a way corresponding to such a cognition, as is shown by the fact that we more easily cognise the same thing later. Species of universals (he continues) are formed in a similar way, which is reflected in the phantasy (i.e. for _cognitio imaginativa_), which first conceives composite sensibles by species of simples and then forms species of these composites. With the phantasy this is but association (perhaps directed by the intellect), but for the intellect it is the use of signs. Suarez held (as did most Scholastics) that concepts of material singulars or features as occurrences in the intellect are signs of these features and that vocal tokens are in turn signs of concepts. These concepts are what we have called occurrences in the mind, shadows of supposed natural utterances. On their own they lack roles just as phantasms in the phantasy lack roles. But we have seen roles they can be given: they can have geometrical roles when formal features are conceived in considering them, a sort of grammatical role as the accidents of substance, and a general sort of explicative role as the manifestations of forms. In that concepts of material singulars simply have roles, they are individuated as the same feature, not as "same feature" refers to a spatio-temporal particular (token), but as it refers to a type. The type is the universal and is the common nature conceived in the singular as a token. Thus by conceiving the token or individual, we conceive the type or universal. The conceiving is using the exercise of a disposition caused by the reception of a species of a material singular or feature. The senses furnish the roles in that they supply the starting point. But only the _intellectus possibilis_ makes use of these roles. In simply using the exercises of species, the intellect performs elevating operations. The objects peculiar to the _intellectus possibilis_ - which have _esse objectivum_ - are what specify these roles or are the roles themselves. The _intellectus possibilis_ makes these objects by using the vocabulary got from sense, for which it has dispositions. Further dispositions correspond to further combinations, which are all given a use by us.

These objects peculiar to the intellectus possibilis are given more attention in the Disputationes. Concepts as occurrences in the mind are called "conceptūs formales"; the objects peculiar to them, which are concepts in our sense, are called "conceptūs objectivi". Intelligible species of material features are allowed because they furnish the vocabulary which the intellectus possibilis uses. As conceptūs objectivi are due to the operations of the intellectus possibilis, animals do not cognise substances or formal features. By "conceptus objectivus" Suarez principally means universals and entia rationis. These are objects in the same sense in which material features in re are objects, for either is said to be an objectum quod, the thing cognised, whereas the conceptus formalis is an objectum quo, intensionally representing, but not itself cognised. In the Disputationes, the conceptus objectivus replaces the Thomist verbum, an objectum in quo due to the intellectus agens as this is responsible for both inceptive and exercisive rational essential cognition applying to things. The conceptus objectivus does not disrupt Suarez's attempt at a sort of direct realism. Being an objectum quod, it is known directly. This is most easily understood with regard to formal features: the conceptūs formales in the intellect by which material features are cognised have a configuration and when these material features are cognised, their configuration is cognised because the vocabulary furnished by material features is not only exercised, but also used. The objection to an objectum in quo is that it does not begin with the intensional identity between material features in re and conceptus formales, but (because of the semina scientiarum of the intellectus agens) imposes roles on occurrences in the mind.

Although both the material feature _in re_ and the _conceptus objectivus_ is held to be an _objectum quod_, they are not on a par in that material features are physically or subjectively _in re_ and are intensionally identical with what is physically or subjectively in the intellect, i.e. _conceptūs formales_, while _conceptūs objectivi_ are said to have _esse objectivum_ due to being conceived. In so far as vocal tokens ("voces") only express _conceptūs formales_, they are like supposed natural utterances. But vocal tokens are also held to signify _conceptūs objectivi_ and as such they fulfil roles. _Conceptūs objectivi_ are also held to be that which our science is about. More directly associated with _conceptūs objectivi_ are other things which are essentially connected with linguistic use: truth, judging and reasoning.

The important part of Suarez's account of knowledge is borne by _conceptūs objectivi_. Yet these are due to our conception and no restrictions are put on how we make them either by _semina scientiarum_ in the _intellectus agens_ or by some equivalent in the _intellectus possibilis_, which Suarez allows to be a _tabula rasa_. Rather, the restrictions are furnished by the materials received from sense, which functions as the vocabulary for our conceiving. Suarez's attempt at a sort of direct realism relies on the intensional identity between what is physically _in re_ and physically in the mind or intellect. Thus it is held that what is physically or subjectively in the mind or intellect needs a cause. Still, this does not guarantee the success nature of "cognise" in the important set of uses which are connected with the application of science. This is guaranteed only by _conceptūs objectivi_, which have only _esse objectivum_ and are not held to need a cause because they depend on the conception or cognition of the _intellectus possibilis_. The success nature of "cognise" when concerned with the application of science depends remotely on the intensional identity between material features and conceptus formales. Universals and entia rationis are said to be founded in things only because they are first founded in our conceptions. This programme, then, stands or falls on this intensional identity. Yet there is no guarantee that our conceptions are related in the same way as are things in re. Indeed, material features which form the causal link are not primitives in Suarez's account of things, but are due to form informing matter. Suarez admits that to understand things we must get behind these features to formal features and eventually forms and substances.

Descartes replaces a genetic account such as Suarez's in an attack on two levels, one physiological and the other metaphysical; both, however, are concerned with our judgements and our application of science to things. The "Dioptrics" (one of the essays introduced by the Discourse) is the salient work on the physiological level. The first step is to reject the Scholastic intensional species. As concerns the cognition of formal features, Descartes maintains, receiving a material feature or similitude from the thing seen is on a par with hearing or seeing a token of a conventional sign representing it. The latter is not a sign of the former; rather, as signs they are on the same level and the cognition of formal features is due solely to the roles in which they occur. The "Dioptrics" occupies a pivotal position between the Regulae, where judgement is attributed to the intellect and "idea" is used for an image in the phantasy, and the Meditations, where judgement is attributed to the will, "idea" is used for something spiritual and objective realities of ideas replace the simple natures of the Regulae. It is essential to his position in the "Dioptrics" that the mind is not indifferent to the body, for the mind is held to judge (in the cases of interest in this work, formal features in vision) according to the dispositions of the body. Occurrences in the mind, such as cases of imagining and sensing, thus (as is emphasised in the Meditations) are due to its union with the body. Descartes speaks of a natural geometry in the "Dioptrics" according to which we judge of the configuration of things in our environment. We can do so only because this geometry is followed by us and instantiated in us (i.e. our body) and in our environment. By having the mind not indifferent to the body and cognitive dispositions secured in the body, Descartes has a solution to how our science applies to things. Descartes nevertheless draws a sharp distinction between mind and body, but this is conceptual. In the Sixth Replies he states that he admits only two substantial forms: thought and extension. Matter is considered only as it instantiates the super-concept of res extensa and the spiritual soul only as its operations instantiate the super-concept of res cogitans. Accidents are determined by the concept they are under, so there is no place for accidents which could be either of the body or of the mind and so both intensional species and the outfitting of the mind have no place from the start. As extended, we mechanically interact with the forms of things in our environment, there being no question of appearances; as thinking, we follow the rules and concepts which are instantiated or founded in re. We must somehow be involved with that science which is founded or instantiated in things, for the mind judges in accordance with the dispositions of the body.

The metaphysical level of Descartes' replacement of the genetic account is in the Meditations. Here he must allow occurrences physically or subjectively in the mind for there to be judgements and to account for the application of science to things. The important move is the validation of reason, which relies on maintaining that esse objectivum or objective reality needs a cause. Descartes' objective realities, like Suarez's conceptus objectivi, are signified by words and are what our science is about.

"Cognition" for the most part is not used by Descartes. It is largely replaced by either "thought" or by "perception" (simpliciter), corresponding to empirical cognition, and "clear and distinct perception", corresponding to rational cognition. The latter has a success nature guaranteed by what could be called (although Descartes does not use the phrase) spiritual objects: objective realities of ideas. The validation of reason depends on maintaining that esse objectivum or objective reality needs a cause and he insists in the Seventh Replies that à nosse ad esse valet consequentia. Descartes' objective realities, like Suarez's conceptus objectivi, are signified by words and are what our science is about. Descartes can also maintain that these are the objects of divine science, for, in express opposition to Suarez, he holds that God's science is created in the creation of extended and thinking things. (This position, discussed privately ten years before the Meditations, did not appear publicly until the Fifth and Sixth Replies.) The climax of the validation of reason is in the causal proofs, showing that the objective reality of the idea of God needs a cause other than ourselves. In fact, Descartes' idea of God is the idea of divine science and one thing established by the causal proofs and their sequel in the Fourth Meditation is an explanation of error in terms of our own wrong judgement and an identification of our science with divine science. This also identifies that science we follow with that science which is instantiated in things, for clear and distinct perception, which is concerned with occurrences in the mind only as they fulfil roles or have objective realities, is that by which we evaluate statements we naturally make or shadows of them. Only roles of occurrences in the mind are important and Descartes rejects any genetic account. The two sorts of substances of which we have essential knowledge are not cognised as substrata, but as what display objective realities, whether of the concept of res extensa, which are mathematical formal features, or of the concept of res cogitans, which are simply those operations we perform. Material features are explained by the union of the mind with the body and are that by which we are alive to things, performing both a cognitive function in the application of science to things and a biological function. Still, the science we have is independent of these features. There is nothing to get behind in the cognition of substances, forms formal features or our own operations, all of which are perspicuous, and there could be nothing to which our science does not apply.

Chapter VIII

Uses of "Spiritual", "Idea" and "Mind".

In recent chapters we have frequently compared material with spiritual. We begin this chapter with a distinction between two senses of "spiritual" in which it is opposed to "material": as used for what performs elevating operations and and as used for certain objects peculiar to certain sorts of faculties. There is a third sense, in which that is spiritual which is subject to rules. If the objects in the second sense are associated with these rules, there is no need for the intellectus agens. With this gone, there are two ways of drawing a distinction between what is to be explained like natural bodies and what is not: either, in the Gassendist fashion, between what is insensible and what is sensible, or, in the Cartesian fashion, between what is mechanical and what cognises spiritual objects or follows rules. The latter distinction does away with animal thought (which was anticipated by Suarez). It also rejects species or vicarious representatives and the intellectus agens, for rule-following suffices to instantiate the concept of res cogitans. Now, there were two uses of "idea" c. 1600, both found in Suarez. One is for divine ideas and corresponds to the Cartesian use of "idea" or at least "objective reality", for on this position we understand because divine science is present to us. "Idea" was also used for phantasms, corresponding to the Gassendist use, for on this position we understand because the phantasy is present to us. To these uses of "idea" and the two positions on what is not to be explained like natural bodies, there corresponds two uses of "mind" ("mens"), the one (Gassendist) including the material faculty, imagination, and the other (Cartesian) excluding all material faculties. We conclude with some comparisons between Descartes and Gassendi on ideas.

The objects peculiar to the intellect - the conceptūs objectivi of the Disputationes - offer four reasons for the spirituality of the rational soul in Suarez's De Anima: the intellect knows bodies not only superficially, but also penetrates their natures and investigates them with their causes, properties and effects;[1] it attains directly not only general principles ("rationes") of things, but even transcendentals;[2] ens, the adequate object of the intellect, is beyond the reach of the senses, for it is also the adequate object of angelic intellects;[3] and the cognising power which considers adequately the most universal - ens - is spiritual because forms of non-thinking things are limited by being immersed in matter, from which cognising powers abstract according to their degree of immateriality.[4] These statements correlate two senses of "spiritual", in both of which it is opposed to "material". In the one sense, the operations and cognitions of what is spiritual are held to be inexplicable in terms of material operations. In the second sense, certain objects are spiritual either because they do not involve material features (although they are resposible for their occurrence) or because they are not restricted by individuating conditions. The correlation between the two is not perfect for all those including Suarez who allow intelligible species of material singulars; thus they must rely on elevating operations.

The relation between these operations and the objects they supposedly produce is not clear. The view that there are objects peculiar to spiritual faculties, yet somehow made by the intellect was common in the seventeenth century and can in large part be related to the ambiguous status of Suarez's conceptus objectivus. The term "notio" instead of in emphasis between the two uses of "spiritual" among non-Scholastic philosophers who used the term "notion". This term was used not only in the place of "idea", but also (e.g. by some who followed Suarez, such as Burgersdijk and Alsted) instead of or in addition to "conceptus objectivus" for what we have called a concept. The first position among these non-Scholastics correlates with the first sense of "spiritual" distinguished in the last paragraph, insisting on the fact that notions are made, and on the gap between our knowledge and what it is of. The second position emphasises the second use of "spiritual" and the fact that notions are not given in sensation, and accounts for the applicability of notions to things by a certain sort of identity between them.

The first position is represented by Richard Burthogge (1638-1698+), who was a contemporary of Locke at Oxford and apparently respected the Essay[5]. He distinguishes two faculties which exactly mirror the Scholastic material and spiritual faculties[6]: sense, by which we know external objects by images or sentiments, and reason or understanding, by which we know external objects and our own acts by notions alone. Notions are explicitly identified with "the conceptus objectivi" of the Schools"[7] and the sense or meaning of a word. The sense of a word is said to be the immediate (also proper, adequate and formal) object of the first act of the intellect, the conception formed in the mind on the proposal of an object, word or proposition[8], an apprehension of reason, and an idea[9]. Burthogge holds that we apprehend all things under notions; but notions partially veil things, for (he insists) they are made by us and are twice removed from things, being founded on sentiments, which are caused by things.

The second position is represented by three English Catholics collectively known as notionalists: Kenelm Digby (1603-1665), Thomas White (1593-1676[10]) and John Sergeant (1622-1707). Digby was the most famous of the three: he had discussions and other contacts with Mersenne, Hobbes and Descartes[11] and was extensively studied by the young Leibniz[12]. The notionalists present an excellent opportunity to telescope the history we have outlined, since all were staunch Aristotelians and the first two were just as firmly Cartesian and were respected by Descartes[13]. Only Sergeant, writing nearly half a century later, was anti-Cartesian[14]. He interprets Digby and White as Aristotelians in competition with Descartes[15]. He classes Cartesians with Locke (whom he criticised thoroughly[16]) under the label "ideists", opposing ideas of any description, called "fancies", to notions. But, in fact, Sergeant's conception of notion is not far off Malebranche's conception of idea, for he claims that notions - here in the form of identical propositions, that is, definitions - coincide with archetypes in the divine mind[17]. All three, however, quite happily broke with Aristotelianism in accepting animal mechanism, and Digby dedicated half his magnum opus to the explication of such Aristotelian notions as rarity and density in terms of Cartesian physics. All were concerned with Aristotelian methodology, syllogism and identical propositions, with apparently no clash with Cartesianism. Sergeant specifies the historical affinities of this group further when he praises Aquinas for his faithful interpretation of Aristotle and criticises "the later Schools" (presumably nominalists) not only for their word-play, which he thought led to scepticism, but also for their lack of understanding of Aristotle[18].

Like Burthogge, the notionalists take notions to be the meanings of words[19]. They also distinguish sharply between notions or senses, and phantasms or ideas as images. Digby's example[20] is the case in which I ask for money; even though I imagine pistols (a type of coin) at the time, if crowns are brought, the meaning is satisfied. A notion is very much like a Suarezian conceptus objectivus or a Cartesian objective reality: it is said to be the thing itself existing in the mind[21]. "Thing" must be interpreted very widely. Digby, arguing that the thing apprehended must be in the mind of the apprehender, has "thing" corresponding to the object of rational essential cognition[22], then rational propositional[23] and practical[24] cognition. In a fourth argument[25], the object is the arrangement of propositions in a syllogism. Sergeant explicitly states that notions are the things objectively in the understanding and that the being they have is objective being[26]. The notion of being is central. Digby, in arguing for the spirituality of the soul, states that all distinctively human operations derive from the notion of being[27], which is innate[28]. All other notions are said to be "respects" "grafted" onto the notion of being. The most important of these other notions (which Digby also uses in arguing for the soul's immateriality) are what the Scholastics called _entia rationis_: universal notions and notions of numbers, negations and privations[29].

The notionalists insist that, by neglecting the fact that we have notions which are the "things" themselves existing in the mind, one is led into scepticism. In page after page of his examination of Locke's _Essay_, Sergeant expresses doubt that Locke can account for the fact that we have science of things. Their major concern is to show how science is applied to things. Their position is strikingly different from that of Burthogge, who holds that notions are merely "entia cogitationis" twice removed from things. Notions, Burthogge claims, are founded on sentiments and he criticises Spinoza and Malebranche for not keeping to the senses[30].

The role the notionalists assign to notions (held to be spiritual objects) in our cognition of things is an instance of the generally held principle that the spiritual faculties govern the material faculties. Bernier also accepts this principle[31]. He states that the actions by which we not only form universal notions but also cognise ("connoissons") universality (the "ratio universalitatis", i.e. that by virtue of which a concept applies to any number of instances) proves the understanding to be immaterial[32]. He argues for the same position with the claim that we understand universals, which by their nature lack any material, singularizing conditions[33]. What is not received from sense is identified as the essence or the quod quid est esse[34]. This is the Thomist term for the Aristotelian definition of an essence. For Bernier, this is not an object in its own right. He makes it clear elsewhere that the true object of such understanding are phantasms which have been given different roles by elevating operations. What he is concerned with here is the sort of understanding which is uniquely human; he makes it clear in the same section that certain sorts of practical knowledge distinguish man from beast[35].

We have already touched on a third sense of "spiritual": that in accordance with which only a spiritual being cognises the formal principle of good and acts from an intrinsic principle. Suarez[36] connects the intrinsic nature of action with the capacities, unique to the intellect, to reflect on (i.e. cognise) itself, its acts and the principles of its acts[37] (e.g., species) and the facts that choices are made between opposite operations and human acts cannot be predicted by other creatures. This sense of "spiritual" places what is spiritual under rules, while everything obeys laws. Suarez distinguishes between physical or natural providence (i.e. Herbert's divine universal providence, the realm of nature), which applies to all things animate and inanimate, even men and angels in so far as they have esse and operari in common with other things, and moral providence (i.e. Herbert's particular divine providence, the realm of grace), which is proper to men and angels because they alone are capable of moral actions and have free will.[39] Moral providence consists of precepts, counsels, promises, etc., by which God has a perfect knowledge of all free effects before they are done and after they have been done.[39]

But if all free acts are known by God, the problem of individuating intellects again arises, here in the form that there is perhaps not only one intellectus agens or light, but one intellectus possibilis which performs free acts. The problem in fact covers all creatures, for it is held that physical providence encompasses both creation and conservation and involves not only the actions of second causes (i.e. creatures), but also immediate divine concourse.[40] It is then not evident how the actions of creatures are distinct from divine actions, and thus how creatures themselves are distinct from God, who is said to have an immutable knowledge of real existents (which is of succession and order, as the external denominations of preterity and futurity are not in God) once He has established causal relations.[41] If we were to think of non-spiritual things as automata, on this view spiritual things would be automata as well and one would look for an explanation of free will and responsibility such as Leibniz's explanation in terms of infinite analyses.

We are not so interested in moral providence as it governs particular acts and introduces problems about the individuation and responsibility of rational agents. Rather, we are concerned with moral providence as it is a system of rules, which could as well be mathematical, logical and grammatical as moral, to which our acts conform. That is, we are concerned with "God" as the objective structure, like an unindividuated intellectus agens, which is displayed in things, not as something which acts or to which a will is attributed. This is what Suarez calls the divine Verbum, the second person of the trinity, said to be the essential formal concept in our sense of "concept" which God has of creatures as possible, which (he adds) is how some typify an idea, viz, a representing form.[42] It makes no difference, he states, whether one holds that there is one or a number of ideas in God; he prefers saying that there are a number, claiming that this is not contrary to divine simplicity.[43] The divine Verbum is similar to the verbum or concept as the product of an act of human cognition, for it is said to proceed from the first person of the trinity by an act of understanding. Still, the Verbum is held to be a person (but not a distinct substance) distinct from the first person and is said to proceed continually.[44] Furthermore, the Verbum has more than esse objectivum.[45] Finally, the Verbum is a concept which does not take into account the will according to which things were created.[46] The Verbum, in short, is the object of divine understanding in some way distinct from this understanding and comprises the rules and concepts which are displayed in re and which any rational creature follows.

Objects which are held to be spiritual are to be associated with concepts and rules since they furnish the standards of success of rational operations. This is the sense of "spiritual" which is important for the spiritualisation of intensional species. The sense of "spiritual" in which only spiritual things are under moral providence gives the rationale for the distinction between spiritual and material in which there is held to be some spiritual thing whose operations and cognitions are not explicable in material terms, for something must be posited as answerable to acts evaluated in accordance with moral rules. The senses of "spiritual" in which there are spiritual objects and in which something is subject to rules are to be associated in so far as only a rule-following being, in particular one which follows linguistic or mathematical rules, can know what (an) A is (for certain values of "A"), know certain relations and perform rational activities. This fusion, however, presents difficulties for a genetic or causal account because a natural cause is not rule-following. The intellectus agens - the bridge between what is law-obeying and what is rule-governed - is particularly problematic.

Doing away with the intellectus agens, there are two ways one can draw a distinction between those things which are to be explained as natural bodies are and those which require a different sort of explanation. For Bernier, the mystery is how we get from what is insensible to what is sensible. Cartesians extended mechanical descriptions to physiology and have no reason to look for more than a mechanical description of what is not rule-following, such as animals. For Bernier, the phantasy, common to man and beast, is present to the understanding, so it performs elevating operations productive of objects peculiar to spiritual beings. For the Cartesians, what is not explicable mechanically is rule-following by virtue of having the objective structure present to it and instantiates the concept of re cogitans. It is spiritual (and so subject to rules, moral or otherwise) simply by cognising concepts peculiar to spiritual things. There must be spiritual occurrences in the mind, but dispositions can be secured in the body.

Descartes in particular excluded from the mind what was known as the sensitive or animal soul. Those who held that the roles of occurrences in the mind are due to what causes them also held that animals cognise because they to some degree share our physiology and because their behaviour is displayed to us. But the organs and their function is explained mechanically by the Cartesians. The Cartesians also treated behavioural displays much like material features. Their approach is to by-pass our being alive to things, so, as their goal with inanimate things is to start with non-descriptive concepts instantiated in things or, in Scholastic terminology, the forms of things, so with animate things the goal is to start with the following of rules and concepts, in Scholastic terminology, the form peculiar to man or the rational soul. Some animate things do not follow rules, so are explained like inanimate bodies. Criteria are needed to distinguish the two sorts of animate things; the ones Descartes selected were used by others to draw the distinction between those animate things which are purely material and those which are also spiritual.

L.C. Rosenfield, in her work on animal mechanism in our period, speculates[47] that Aquinas (who denies that beasts have free will and once likens them to clocks) might have influenced Descartes once he had formulated the mechanistic view of animals for physiological and behavioural reasons. She thinks[48] that he was uninfluenced by possible precursors, such as Pereira, whose work he had not seen in 1641. Suarez, however, aired Pereira's opinion in his De Anima,[49] where it is called the second error whose refutation is needed to establish the distinction between the sensitive and rational souls. The opinion is that the operations of the senses are not material or subjectively or physically in corporeal organs, but in the soul itself; thus the sensitive soul is spiritual, rational and not attibutable to beasts. This opinion is said to be not only paradoxical and contrary to Scripture, but also contrary to sense. We immediately see that beasts have organs of external sense and incision or anatomy shows that they have organs of internal sense and those organs are not given in vain. Suarez held that species in material faculties are not animal spirits (fluids, perhaps corpuscular ultimately), but that all souls but the rational soul are extended. We experience (he continues) that animals are directed by sight, hearing, etc., and are moved by appetite upon cognising, many effects show that they have memory and there are no fewer signs of sensing in brutes than in children.

Rosenfield claims that denying animal thought was necessary to be a Cartesian, whose major opponents on this issue were Jesuits[50]. But the Cartesians themselves, according to Bayle, were divided as early as 1685 and granted spirituality, but not immortality to animal souls in the next century[51]. It is essential in denying animal thought to deny that simple apprehension is attributable to the senses. Norris insists on this[52], as does Sergeant in denying that animals have notions[53]. Sergeant distinguishes notions from phantasms or fancies (which animals have) by the fact that notions are the meanings of words[54]. This gives him one of the Cartesian criteria for distinguishing thinking from non-thinking things, for (he states[55]) animals do not answer pertinently nor learn languages, although they make sounds to express passions and some words affect them with phantasms.[56] Suarez gives both the Cartesian criteria in what he calls the first step in distinguishing the spiritual rational soul from the material sensitive soul, which consists in the refutation of the opinion attributed to Origen and other heretics that all beasts have a rational soul. He considers unanswerable the objections that beasts lack speech ("locutio") and that they have no freedom of action, but are led by natural instinct.[57]

The distinction by the Cartesian criteria, as it distinguishes what cannot be held responsible from that whose actions are evaluated, had theological significance both before and after Descartes. From a purely Cartesian point of view, with dispositions secured in the body, certain spatio-temporally continuous things not only are subject to rules, but also have a peculiar sort of temporal continuity in that they are responsible for actions performed under these rules. Rosenfield states[58] that part of the appeal of the Cartesian position was the resolution of the theological problem of the immortality of beasts, although the arguments against the animal soul were often thought to apply to the human soul as well. For example, Bernier[59], for whom the gap between sensible and insensible is most important, notes the intelligence of animals and then considers the view attributed to Pereira (Descartes only being mentioned) that animal mechanism is necessary for religion; he concludes that, on the contrary, as we are similar to animals, animal mechanism would lead to the belief that we are only machines. Bernier gives behavioural reasons for holding that animals reason about singulars and it is this sort of view which Norris has in mind when he comments that we are led to believe that brutes think by imaginary experience grounded on confused sensation, for we observe motions in brutes which in us are accompanied by thought, but we do not see the thought. Rosenfield sees[61] the turning point of animal mechanism to a more theological hypothesis in a work by Bossuet (not published until 1722) and especially the works of Malebranche.[62] This, however, was already achieved by Suarez, with his sharp distinction between material and spiritual faculties. A number of errors in faith (he states[63]) follow from the opinion that animals have rational souls. It would follow that either human souls are mortal or that the souls of beasts are also immortal and so capable of happiness and misery and other things usually connected with transmigration. The same points were presented by Norris a century later.[64] The apparent signs of discourse by beasts, Suarez explains,[65] do not show the use of reason in them, but rather the highest intelligence and wisdom in the author of nature, for what is produced by nature is the product ("opus") of intelligence (as the Aristotelians point out) and none of these signs show anything but a necessitated way of operating from the instinct of nature. Both Norris[66] and Sergeant[67] likewise save appearances by attributing the apparently intelligent activity of animals to the craftsmanship of the artist of the world-machine.

Malebranche maintains in the Entretiens sur la Metaphysique that we cannot help but think that animals have the passions they display. This is due to projecting what he calls "passions", e.g., fear, onto what cannot have them because they are pure machines. It is similar to the projection of material features onto inanimate things, which likewise are held not to have them, as they instantiate only formal features. Yet these passions are not on a par with material features, for feeling them is only sometimes due to the position we are in, where "position" is taken spatially. Account is not taken of natural behaviour, some forms of which we share with higher animals, and hence of cognition displayed by it. Still, an animal's apparent following of conventional rules is attributable to our rule-following description of its behaviour. The distinction between what merely instantiates or founds rules and what follows them is supplied by the Cartesian criteria, which in effect state that what follows rules does not act automatically in doing so. Only by virtue of following rules can one evaluate one's own behaviour, doubt and correct oneself. For those who maintain that our science is divine science, this gives a way to distinguish finite rational beings from God and from each other, for each finite rational being individually applies this science and is evaluated and held responsible for thus applying or following it. Still, there must be some way of picking out the performance of these acts, which are conventional forms of behaviour and so make use of natural forms of behaviour which we share to a large extent with other higher animals.

Sergeant objects to the intellectus agens because it is held to do something without knowing and was invented only because of intensional species. These in turn were invented by the schoolmen to account for a spiritual thing's knowledge of a corporal thing, but they cannot say whether they are corporal or incorporeal[68].

With the sharp distinction between what is mechanical and what is spiritual in the sense that it follows rules or has the objective structure present to it, the <u>intellectus agens</u> drops out or, if it is retained, it is unindividuated, as we see with Norris, whose eternal reasons distinct from the mind, but applied in cognition, replace the <u>intellectus agens</u> in the Thomist sense[69].

The Cartesians and the notionalists are largely concerned with spiritual objects of knowledge or cognition, those which we have by virtue of following rules and which are not shared with animals. For the Gassendists and nominalists, on the other hand, an account of our knowledge or cognition is about objects of material faculties (perhaps shared with spiritual faculties) and the elevating operations by which they receive new roles. "Idea " was used in three, not always distinguishable, ways in the seventeenth century: for what we have called concepts or the objects peculiar to spiritual faculties, for occurrences in spiritual faculties and for dispositions or occurrences in material faculties. (We add as a fourth, requiring special consideration, dispositions in spiritual faculties.) A number of reasons can be given for the confusion of these uses, such as the fact that ideas both in the first and in the third senses are called "objects" and the confusion between spiritual and material. All these uses were current to greater or lesser extents at the commencement of the seventeenth century. We have already encountered the first sense in Scholasticism as the divine Verbum, although it was only after Descartes that Malebranche identified ideas with the concepts of divine science. The third sense we have alluded to in the use of "idea" for species as dispositions, but more commonly for their exercises in conceiving or inception in the first operation of the intellect.

To find the source of the term "idea" one need not go beyond philosophical texts around 1600, particularly those of Suarez. We shall mention uses of "idea" from the sixteenth and seventeenth centuries taken from dictionaries, indicating the country and date in parentheses*; the ordinary language uses, however are derived from philosophical uses. "Idea" was predominantly used in a Platonic sense at this time, but its alliance with "species" and with representations led to its introduction

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* The countries and dates in parentheses indicate the following sources:

"France, 1600-1700": Dubois, J. and Lagane, R., Dictionnaire de la Langue Française Classique, Paris, Libraire Classique - Eugène Belin, 1960.

"France, 1690": Furtière, Antoine, Dictionaire Universel, laHaye et Rotterdam, A. and R. Leers, 1690.

"Germany, 1615": Golclenius, R., Lexicon Philosophicum Graecum, Marchioburgi, R. Hutwelckeri, 1615.

"France, 1500-1600": Huguet, E., Dictionnaire de la Langue Francaise du Siezième Siècle, Paris, Libraire Ancienne Edouard Champion, 1925.

"Germany, 1500-1600": Scapula, I., Lexicon Graeco-Latinum Novum, Editio Novissima, Thomae Harperi, 1637. This was frequently published in the sixteenth century.

into Scholastics account of knowledge. Suarez states[70] that "exemplar" signifies the same as "idea" as used by theologians. He cites Plato, Cicero, Seneca and various Church Fathers to show that there is general agreement among philosophers that there are exemplar causes. Yet "idea" is used with regard to human knowledge as well, as the need for an exemplar cause is shown from human artisans since they conceive in the mind "forman rei per artem efficiendae", called an "exemplar".[71] He holds that Plato was the first to talk of ideas and that they can be called the principal and original forms.[72] Even in this theological use, "idea" was applied beyond exemplars, for Suarez writes[73] that "idea" commonly signifies both an exemplar and a principle by which a thing is cognised even when the thing will never exist. Aquinas also held[74] that the Latin "forma" corresponding to the Greek " ἰδέα " can signify, in addition to exemplars, the forms or <u>principia cognitionis</u> of things and as <u>formae cognoscibilium</u> they are in the cogniser.

It is in this sense that Norris[75] claims that Plato really meant that ideas are in the divine mind. At the beginning of the century, "idea" in a Platonic context was taken for an eternal essence (somewhat like God's <u>verbum mentis</u>), not only just as an archetype, but also as a universal held to be what is called a second cause (Germany, 1615). As not necessarily connected with the divine mind, examples of "in Idea" are given by Norris to show "how connatural and agreeable the Notion of the <u>Ideal World</u> is to the common Principles of Human Reason ...[76]

> ... how often shall they use such Expressions as these, when the World, or this or that Creature in it, was only <u>in Idea</u>, and such a thing is conformable to its Idea, or comes up to the Perfection of its Idea, and as Fair as a woman in Idea.etc. And how common is it with them to talk of Vertue it self, Justice it self, Beauty it self, and Truth it self, and all these likewise in Idea, as also of a Line in Idea, a Circle in Idea, etc. 82.

Digby used "notion" where most of his contemporaries used "idea". When he uses the latter, it is not in the sense Sergeant uses it, i.e. for a phantasm, but in the sense of an ideal.[73] "Idea" used for a perfect type or a mode of living resembling an ideal was well established before the seventeenth century (France, 1500-1600). The O.E.D. lists three major groups of uses of "idea", the first of which is the Platonic sense; in this sense, it states, the word first came into modern languages (well before the modern period), including English.

The second major group given by the O.E.D. concerns ideas as figures, forms or images; these uses were common by the end of the sixteenth century. This could include exemplars in the sense of an external model for an artist (Germany, 1715). More generally, "idea" was applied to brief descriptions, patterns (France, 1500-1600), images, pictures or symbolic representations (France, 1600-1700). DuCange[79] even gives the following example from c.1130: "Portant Ideam ad praeditam ecclesiam cum scala." In the sense of an image or a sign, the meaning of "idea" and "species" converged. Brucker[80] relates a work on ideas from the early seventeenth century[81] which attempts a refutation of Aristotle's arguments against Plato's ideas and states that the doctrine of ideas is to be found in Aristotle's philosophy, for God (according to Aristotle) is not only the sole end, but also the only efficient cause. According to the author, whose presentation Brucker considers not very Platonic, ideas are exemplars as objects of the divine mind.[82] Brucker is sceptical of all attempts to reconcile Aristotle and Plato, yet "idea" was identified with the Aristotelian "species". Although Suarez gives "idea" a Platonic origin, ideas are placed in an Aristotelian framework, as Augustine held that the Greek term "idea" can be rendered into Latin as "forma" or "species" and Suarez takes Aristotle to be writing about exemplars in stating that the health of the body is made from the health which is in the mind.[83] "Idea" was regarded by some to mean the same as either the Platonic "forma" or the Aristotelian "species" (Germany, 1500-1600). Indeed, both "idea" and "species" derive from verbs for vision, the success nature of which allowed these nouns to be used for the objects of cognition in general. The meaning of "idea" was explained not just in terms of seeing, but also in terms of cognising because ideas represent what is to be made in the mind of the artisan (Germany, 1615). "Idea" was also explained in terms of the external form ("facies") transferred to "the eyes of the mind", the transferring being from an object of "videre" to an object of "intelligere" or "scire" (Germany, 1500-1600).

The third major group of uses of "idea" given in the O.E.D. regards mental images, conceptions or notions, which uses were also common by the end of the sixteenth century. In French at any rate, as a mental representation, "idea" was principally used for representations of persons, personal qualities, events or faculties and sometimes had a connotation of misleading (France, 1500-1600), which it retained through the seventeenth century (France, 1690). In 1616 John Bullokar defined "idea" in An English Expositor (the second English dictionary, more popular than its predecessor (1604), being reprinted twenty-four times between 1621 and 1775) as: "The forme or figure of any thing conceiued in the minde."[84] We have already seen "idea" used in the occurrence sense for the first operation of the intellect and for a concept either as a phantasm or as a species expressa. It was also sometimes used in a disposition sense for the intensional species or species expressa in any of the faculties. Furtière (France, 1690) uses it both for an occurrence, as a representation in the mind of what was previously before the senses, and for a disposition, as the knowledge ("connoissance") acquired by the relation or assemblage of a number of things which were before the senses. Gilson has claimed[85] that the use of "idea" for the content of human thought was new to Descartes. But this is contrary to the evidence we have presented for "idea" assuming the part of "species" or "concept". It particularly assumed the part of "species" in the sense of "phantasm". In a work published in 1622 to show that our ideas lack the efficacy of divine ideas, the author uses the phrases "l'espece ou l'idée" and "phantosmes ou idées".[86] The author makes use of a work of 1599 which speaks of ideas in the divine mind, but says nothing of ideas in the human mind, while he states that [87]

> l'esprit ne peut cognoistre les choses que les sens touchent et apperçoivent que par le moyen des phantosmes ou idées qui sont portées à l'intellect par l'imagination, et ceste puissance de l'ame qu'on appelle imaginative est dicte fantasie.

It is called "imagination", he adds, because an impression is left on it.[88]

This precise use of "idea" for a phantasm in the Scholastic sense and other uses of "idea" can be attributed to Suarez's uses of "idea". An exemplar or idea, Suarez claims, must be physically or formally in the soul, and so cannot be the _conceptus objectivus_ because it must direct the action of the agent "quoad specificationem (ut ajunt) ..."; rather, an idea must be the _conceptus formalis_.[89] "Idea" is not restricted to exemplars, but is generally used as a synonym for "conceptus formalis".[90] Because of Suarez's duplication of faculties, "idea" as used for a _conceptus formalis_ could easily be transferred to the phantasm. Referring to _conceptus formalis_, "idea" nevertheless retains its meaning as a divine exemplar, for it is held that exemplars or ideas are formally or physically, not objectively, in the divine intellect, so even the divine ideas are _conceptūs formales_.[91] However, as such, ideas are no longer species and are not dependent on sensible materials. _Conceptūs formales_ are normally accidents distinct from the intellect in which they are said to inhere; but for God "inhere" is not used properly and exemplars as conceptus formales are not distinct from the divine intellect.[92] God alone is said to exercise exemplar causality with respect to all substances and natural accidents, while the art of intellectual creatures is restricted to the change of accidents by the use of accidents.

Alsted also identifies "idea" in the created case with "conceptus formalis" and "species" and distinguishes an idea from a conceptus objectivus or notio.[93] Some German authors (perhaps following Fonseca), however, used "idea" more in the sense of the Thomist verbum, something involved in a reflex act. An idea here is associated with the definition of a thing and (although it is still something made) the term is used in a sense recognisably related to its Platonic origin.[94] Alsted, in logical contexts, uses "idea" in the sense of the essence of a thing known to us.[95] He also has an intermediate use, considering idea as exemplars, yet having a logical use.[96]

Descartes in the Meditations spoke of ideas as occurrences in a non-corporeal or spiritual thing. In addition, when he speaks of innate ideas and clear and distinct ideas, the burden is borne by objective realities, which, like the notionalists notions, are objects peculiar to this spiritual thing. Gassendi and Hobbes unhesitatingly took "idea" as referring to a phantasm. This was not a new term, but the explanations of material and spiritual things had changed; in particular, there is disagreement as to what is to count as an occurrence in the mind and as thought, for neither "mind" nor "thought" clearly distinguished between what we share with animals and what is peculiar to us as rule-following beings. Descartes, furthermore, had to give a new twist to an established use of "idea".

There are two texts in particular in the Meditations which occasioned the disagreement between Descartes and Gassendi and Hobbes. One text, which was written to draw a distinction other than that which is important for the controversy, occurs in the Second Meditation. Descartes here states[97] that certain of our thoughts - ideas - are like images, while others, such as judgements, which alone can be true or false, and affects (e.g., fear or desire), add something to these similitudes of things. Hobbes quotes this in his objections and, naturally taking "image" and "similitude" as applying to phantasms, asks how there can be an idea of God.[98] Gassendi noted the same in his objections and in his Disquisitio,[99] an extended reply to Descartes' replies, re-asserts that the only images of things (as Descartes defines "idea") are appearances in the phantasy. The second text occurs in the Sixth Meditation,[100] where Descartes explains the difference between imagination, which depends on the body, and pure understanding. One should be cautious of what Descartes means by "pure understanding", as words play an essential part in pure understanding and all cognitive dispositions are secured by the body. Pure understanding is called upon for rational cognition which is not applied to things, which is not to say that sensible signs are not necessarily involved. Here Descartes takes our essential cognition of a triangle as an example of imagination and our essential cognition of a chiliagon as an example of pure understanding. We not only understand a triangle, he writes, but also intuit as present the three lines comprising it, i.e. we imagine it, while we understand a chiliagon to be a figure comprising a thousand sides just as well as we understand a triangle to be a figure comprising three sides. Although by habit (he adds) we imagine some confused figure when we think of any body, the figure, when we think of a chiliagon, is not peculiar to a chiliagon because it is not different from what would represent any other figure comprising a large number of sides. Gassendi comments[101] that, as Descartes admits, an idea is an image and an image represents the thing as it is; but then the image and the representation of the chiliagon would be confused and the perception of it would not be intellection, but imagination.

Gassendi, with his nominalist position, cannot accept that there could be an idea or object of the understanding which is not in a material or corporeal faculty; furthermore, images can only represent corporeal things, with which they have something in common. If we imagine and understand some body, he asks in the Disquisitio,[102] how could we distinguish the image in the corporeal imagination from the image in the incorporeal intellect? If the latter are to represent bodies, then the intellect would have to be extended; and if the mind is not extended, how can there be an idea of it? Still, if understanding or intellection were without images, there could be no understanding of bodies. He suggests, to allow for images in the intellect, that if the same faculty reasons and understands, we should allow that it also imagines (unless we are to have a cognate faculty for every function). This repeats the suggestion presented in his objections appended to the Meditations.[103] He quotes Descartes from the piece of wax example to the effect that the perception of colour, hardness, etc. is not a vision or feeling in the corporeal organs, but is only the inspection of the mind. In that case, Gassendi states, the mind would not be distinct from the imaginative faculty ("ab imaginatice"). These suggestions are of prime importance for what is to be taken as the mind, occurrences in the mind, thought and consciousness. We have already seen that the important gap for Bernier is between what is insensible and what is sensible. This suggests a use of "spiritual" other than that with which we have been concerned and animals would be, if not spiritual, as least thinking. "Spiritual" was already used in the 1670's by those who adhered to Scholasticism for corporeal sensations, suggesting that the functions of the sensitive soul, whose objects were duplicated in the rational soul by Suarez, were usurped by the rational soul. La Grange uses "idée" for any act of cognition as a product and an accident distinct from the soul. The only part of the path of the intensional species which is not in a spiritual faculty is from its production to its reception; the reception itself takes the place of the intellectus agens in the change from corporeal to spiritual. This is described by stating that what is corporeal causes something spiritual, which la Grange admits is incomprehensible, but appeals to experience for proof that there are such causal relations.[104] Ideas are held to be images, but they must be spiritual, for la Grange, like Suarez, holds that the object must be proportionate to and specify the power. Against the Cartesians and others who deny accidental forms, it is maintained that an idea cannot be the soul itself sensing, for cognising the object - the connoissance - is not the soul itself, but a spiritual being.[105] Bernier,[106] while discussing the first operation of the intellect, identifies an image with an idea, which is said to be present to the understanding when we think of something. (Bullokar's English dictionary of 1616, as we have seen, already stated that an idea is a form conceived in the mind.) If "mind" is taken to include the phantasy, the occurrences in the mind are objects of the understanding and are (in Scholastic fashion) distinct from the understanding, but not from the mind. This allows a neutrality to a causal or genetic account in not specifying how dispositions are secured and on this account one need not specify what sorts of objects must be present to us for us to be thinking things.

Descartes, on the other hand, keeps "spiritual", "mind", "thought" and "conscious" solely in the realm of what is subject to rules and all else is merely law-obeying and to be explained mechanically. Replying to Hobbes,[107] he states that he has always taken "idea" for all which is immediately perceived by the mind (i.e. is not in the body). When I desire ("volo") or fear something, he continues, since I at the time perceive that I desire or fear, the desire ("volitio") and fear count as ideas. The same position is emphasised in the definition of "ideas" in the presentation of his system appended to the Second Replies. Here he states that he calls images depicted in that part of the brain called the phantasy "ideas" only in so far as they present something to ("informant") the mind itself applied to ("conversam") that part of the brain. This is Descartes' equivalent of conversio ad phantasmatam, but the phantasms are purely mechanical occurrences in the brain. Still, occurrences in the non-corporeal mind are needed, which are ideas as here described. These are feelings, but they need not be our being alive to something, for that to which the mind is applied or converts is the brain, which secures cognitive dispositions. Rational knowledge is associated with the mind alone and this is applied in the mind being applied to the brain; by purely mechanical connections from the brain to our environment, this knowledge or science is applied to things beyond the body. There is a symmetry between inceptive and exercisive essential cognition and some account is to be given of those sorts of objects - objective realities for Descartes - which must be present to us for us to be thinking things.

There is no difference between sensing and imagining on this level. To distinguish the two, we must be able to evaluate these occurrences, which can be done only in considering the roles of the occurrences.

Judgement is essential to this distinction. Asked by Arnauld in the Fourth Objections how an idea of a sensible quality could be false, Descartes refers to Suarez's use of "materialiter". An idea taken materially or an idea materialiter, Descartes replies, is an occasion for judging falsely. Simply as an occurrence, it makes no difference whether it takes place in the brain or in the mind. But, being an occurrence in the mind, an idea materialiter is not indifferent to judgement. Opposed to this is an idea taken formally or an idea formaliter, which is said to have objective reality, i.e. that in accordance with which we judge. Ideas formaliter are individuated by the objective realities they have, but Descartes looks on them as dispositional. Exercises of these dispositions occur in roles specified by the objective realities which individuate them. By virtue of occurrences in the mind having objective realities, they can be evaluated and imagining can be distinguished from sensing. The disposition is secured in the brain and the occurrence is physically in the mind. The objective reality is in the mind in so far as there are occurrences which are said to have (instantiate or found) it. Yet it is essential to Descartes' position on the applicability of science that certain objective realities - formal features - be instantiated in re.

In the same reply to Hobbes, Descartes states[109] that he used "idea" for lack of a better term ("nullam optius habebam") because it is used by philosophers for the forms of perception in the divine mind, which has no phantasm. This is odd in that it was held that there are no temporal acts in the divine mind. Yet Suarez applied "conceptus formalis", identified with "idea", not only to human intellects, but also to the divine intellect, where a conceptus formalis is no longer a species, is not distinct from the intellect and does not depend on sensible material. Descartes elsewhere states that the world is an *ens rationis divinae mentis* and held that divine science - the objective structure - is created by God in creating the world. The "perception" which could be allowed in the divine mind, then, is this act of creation, the forms of which are those concepts which (assuming divine and human science are the same) we follow and are instantiated *in re*. "Idea" in this sense is the object of a spiritual faculty. Often when Descartes uses "idea", especially when he speaks of clear and distinct and innate ideas, the emphasis is on the objective reality. These play a part both in the mind and *in re*; the "forms of perception" in the divine mind form a bridge between the two.

Both the Cartesian and the Gassendist positions we have treated so far are concerned with occurrences in the mind which are not judgements and to that extent are simple. Still, there is an important difference between the two positions in that occurrences in the mind are never indifferent to judgement for Descartes, hence we are conscious of all occurrences in the mind. Again, an essential aspect of objective realities is that they are standards for our judgements. In so far as Descartes' followers either assimilated occurrences in the mind to the Scholastic first operation of the intellect or minimised the importance of the objective reality of an idea, they presented a theory of ideas amenable to Gassendi's position even if they insisted that ideas are not in the phantasy. Arnauld and Nicole do the first in the *Port Royal Logic*, where an idea, the form by which we represent things, is associated with the first operation of the understanding, conceiving or *simple vûe*. 110 P.S. Regis minimises, if not eliminates, the notion of objective reality (while employing the term). In his *Systême de Philosophie* he compares the causes of an idea with those of a picture; God is said to be the first efficient cause, the action of the object the second efficient cause, the soul itself the material cause and the object the exemplar cause.[111] If this account is not to be simply causal, the exemplar cause must play an important part. However, under the criticism of du Hamel, he admits that objects are only metaphorically exemplar causes, which properly involve an intention.[112] To the objection that even if objects were the real exemplar causes, they, like pictures, would not contain formally all the ideas represent, he replies that pictures which do not represent their originals are not really pictures.[113] But this is false if it means that pictures must be like what they portray and ignores Descartes' insight in discarding the intensional species in the "Dioptrics" that a likeness is not required for representation. Du Hamel concentrates on the relation between similarity and resemblance, pointing out that the Scholastics hold that an idea is similar to the thing by an intensional resemblance, which is <u>sui generis</u> and not like a picture in relation to what it portrays, while the Cartesians alone hold that we are to judge external things by our ideas. But how does an idea represent what it does not resemble? Regis agrees that the issue is not decided by saying that an idea represents as an image, formal or objective. Rather, he claims, "represent" means "make known" and ideas, being <u>connoissances</u>, make known even if we cannot show how they do so.[144] Mention is never made of objective reality in a context where it should be critical; rather, Descartes' embarassing use of "image" is given the central part.

There was a good deal of confusion about Descartes' meaning of "idea" and its relation to images and the operations of the intellect. P.D. Huet, in his <u>Censura Philosophiae Cartesianae</u> (perhaps the most influential criticism of Cartesianism in the closing years of the seventeenth century), writes that Descartes sometimes (following most philosophers) meant by "idea" the first operation of the intellect, but sometimes the image of a thing, not in the phantasy, but in the soul, and sometimes the second and even third operations of the intellect.[115] Gassendi[116] thought that Descartes, in distinguishing ideas from phantasms, used "idea" for the inferring (i.e. a necessary consequutio) from a supposed antecedent and held[117] that inferring is no more intellection or understanding in the sense Descartes intended than is imagining. A spokesman for Gassendi (in a letter intended for Descartes) took up the same issue. He cannot understand what is meant by "idea of God", "idea of the soul" and generally "idea" when it is said to be of something insensible, for philosophers usually mean by "idea" a simple concept such as an image in the phantasy or a phantasm.[118] Rather than spiritual occurrences or objects, he suggests phantasms and elevating operations. He refers to the Third Meditation, where Descartes speaks of an idea of the sun which astronomers have from innate ideas in demonstrating its size. The idea expressed by a simple name such as "sun", he replies, is of, e.g., a luminous small circle and by reasoning we infer that it is much larger than this; but, while saying that it is much larger, we still have the same idea.[119] Perhaps, he suggests,[120] Descartes meant by "idea" what is expressed by words and the distinction between ideas in the phantasy and those in the mind, intellect or reason is between what is expressed by a simple term and what is expressed by a proposition. Thus the idea of a chiliagon acquired by counting its sides (different from that acquired by seeing it) would be expressed by the proposition "This figure has a thousand sides."

The Cartesian position avoids the terminalism of Suarez or Gassendi because it admits no occurrence in the mind indifferent to judgement and rational essential cognition, concerned with objective realities, is the cognition of a concept in the objective structure. The cognition itself is discrete, but the concept is defined only by its position in the structure. Essential rational cognition involves propositional rational cognition. For example, the rule that the sum of the angles of a triangle are equal to the sum of two right angles involves the concept of a triangle, which in turn involves the rule. Spinoza uses this example in maintaining that there is no affirmation or denial besides the idea itself and vice versa and further maintains that there is no distinction between will and understanding, which are only the individual volitions (e.g., affirmations and denials) and ideas. [121] Both are modi cogitandi and he maintains that if one recognises that an idea is a "modum cogitandi, nemp ipsum intelligere" and not a mute picture, one must admit that we cannot have a true idea, the standard of certitude and the norm of truth, without being certain of its truth. [122] A modum cogitandi for Spinoza takes the place of Descartes' objective reality because of his ontological position, for it is a concept of divine science. His point on one level is that there is no standard other than the rules we in fact follow. On another level, with which Spinoza is more concerned, what is involved are the concepts instantiated in things, including our own body, of which the mind is the idea. He allows for error, but attributes it to particular affects and eliminates free will, hence rule following and responsibility as we have treated it, holding that the ideal in method is achieved by a spiritual automaton. The position maintained by Descartes and Malebranche, on the other hand, takes the will to be that which is responsible for the deviations from the norm as well as successes and as that by virtue of which an individual is responsible.

Now Descartes could have replied to Gassendi's spokesman by asking for the norm of truth in those rational activities by which the phantasm caused by the sun is elevated to the role of representing an astronomical body of solar magnitude, for there must be some rules and concepts governing the inferences. Instead, he concentrates on the use of words. Gassendi in the Disquisitio felt that definitions of "clear understanding" and "distinct perception" are needed. As we go from a three-sided figure to a four, five, ... -sided figure, there is apparently no boundary where imagination stops and understanding begins; indeed, the obscurity of the chiliagon is apparently due to understanding. Knowing that a chiliagon has a thousand sides, that a triangle has three, being able to demonstrate things about them and being able to understand them all at once, after all, is only understanding the words.[133] Leaving out "only", this is exactly the point and it is essential to Descartes' major endeavour - the renovation of the sciences - that imagining and sensing are the application of the same science which is considered unapplied in simple understanding. Descartes states[124] that he understands by "idea of God", "idea of the soul", etc. only what Gassendi's spokesman understood when he wrote that he did not understand them; he did not say that he conceived nothing by "God", "soul", etc. For we cannot express anything by our words ("paroles") when we understand what we say but at the same time we have the idea of the thing signified by our words.[125] There is the same distinction between what is expressed by a name and a proposition for both the mind ("esprit") and the imagination; it is the manner of conceiving which makes the difference: everything we conceive without an image is an idea of pure mind and everything we conceive with an image is an idea of the imagination.[126] By "imagination" Descartes does not mean a corporeal faculty, but our being alive to things or similar occurrences in the mind due to our position or history in our environment by virtue of which our science is applied to things. By speaking of pure mind he does not intend to imply that there are occurrences in the mind corresponding to nothing in the body and that dispositions are not secured in the body. Rather, in these cases there is no natural connection between the (spiritual) object of thought and the occurrence in the body. This is considering solely the roles of occurrences, e.g., those which correspond to conventional signs. For Descartes, the meaning of a word is not tied to a natural type of occurrence in the mind. As our imagination is very restricted, Descartes continues,[127] but our mind hardly at all, there are few things, even corporeal, which we can imagine, although we can conceive them. The science of bodies (perhaps thought more than anything else to be subject to our imagination because it concerns only sizes, figures and motions) is not founded in phantasms, but on clear and distinct notions of our mind. "Understanding" as used by Descartes means just that and we apply our understanding of bodies by virtue of imagination as this is taken broadly to include sensing. The rules and concepts - the objects of spiritual faculties - furnish the criteria of success, clarity, distinctness and simplicity and furnish roles for utterances and occurrences in the mind.

Chapter IX

The Vision in God.

In this chapter we are primarily concerned with Malebranche's account of our knowledge, which was labelled "the vision in God". This account is allied to his occasionalism which maintains, *inter al.*, that God causes occurrences in the mind on the occasion of occurrences in the body. And it depends on his position that ideas (i.e. Descartes' objective realities) are not in the mind. The vision in God is faithful to the general outline of Descartes' account and is in a line of development leading to Leibniz's account. An important part of Descartes' position that substances are perspicuous is the identification of divine and human science. To make this identification, he held that divine science is created and consequently that the divine will and intellect are not distinct. Divine science is the idea of God, but this is distinct from God according to Descartes, and so there is a gap between God and the idea of God. If it is maintained, as Spinoza maintained, that there is no distinction between divine intellect and will and no distinction between divine science and God, then extension is as necessary as God. Malebranche's occasionalism depends on the rejection of species, on the rejection of the allied Scholastic account of causality and on the view that substances and divine science are perspicuous; it also depends on the distinction between divine intellect and will, on which he is in agreement with Leibniz. Occasionalism does not introduce a *deus ex machina*; rather it is close to a dual-attribute theory, with instantiations of the concept of a rule-following thing individuated by mechanical configurations.

Malebranche's account of our application of science to things is largely given in terms of what he calls intelligible extension: all the rules and concepts of geometry. This is in keeping with the Cartesian programme, which emphasises the part played by units. It also accounts for the major part of our rational cognition according to Malebranche, who holds that ideas are relations and judgements are relations of relations. Malebranche sharply distinguishes ideas from what he calls sentiments, which are occurrences in the mind. We are held to know ourselves only by sentiments, as there could be no application of science to occurrences in the mind simply as such.

The Malebranche-Arnauld polemic is a clash between the two major theories of ideas which we have distinguished: Malebranche held that ideas are concepts (and also are not in the mind) and Arnauld held that ideas are occurrences in the mind, viz. perceptions. The polemic covers objective reality (which Arnauld holds to be a property of ideas), whether perceptions in the mind can represent what is infinite and how "idea" must be taken for Cartesian clear and distinct perception to serve its function. In all cases, perceptions in the mind cannot account for what is intended. There must be something which is not physically in the mind to serve as a standard. Thus Malebranche justly accuses Arnauld of scepticism. Arnauld also accuses Malebranche of scepticism because, in his account of how our science is applied to things, a third thing distinct from the mind and what is cognised _in re_ is involved. But Arnauld's criticisms exhibit a misconception of the function of concepts in the application of science, a misconception allied with his misconception of objective reality. Leibniz sympathises with Arnauld's general position that ideas are in the mind, but he agrees in detail with Malebranche. He must hold that ideas are not only in the mind, but are dispositions to think because, to insure the individuation of things, he holds that the objective structure is instantiated in every monad, which instantiates an unextended analysis of its spatial display. Ideas for Leibniz are what we have called ideas formaliter and are individuated by their objective realities.

It is not until the Meditations that Descartes presents his mature position on objective reality and judgement. Still, there are parallels between the position presented in this work and those presented in his early Regulae, the most notable change being with regard to judgement. In the Regulae, he speaks of simple natures instead of objective realities. Here he has judgement as a function of the intellect and uses "idea" for images in the phantasy. This position is changed in the "Dioptrics", the essay on the judgement of formal features in vision published with the Discourse, with Descartes' criticism of the intensional species. For vision in particular, the criticism goes, but for any cognition of the world about us, an image is not necessary to pick out spatio-temporal positions; a word does this, yet it is in no way like what it signifies. The feeling associated with hearing a token of the word is on a par with the feeling had in being alive to the spatio-temporal position. Hearing the token need not elicit a feeling similar to seeing the position for the utterance of the token to pick out the position. Rather, either feeling independently of the other is capable of picking out the position if it fulfils the proper role. These roles in the "Dioptrics" are held to be specified by a natural geometry in accordance with which we judge distances and other formal features. With the "Dioptrics", the theory of judgement has changed and images in the phantasy would have no more part than intensional species. The presentation of the "Dioptrics" emphasises what we do in accordance both with certain concepts and with the disposition of the body. With this work, new support is given to innatism, as we shall see.

A certain part remains basically unchanged throughout Descartes' works. This is the part filled by simple natures in the *Regulae* and objective realities in the *Meditations*. These are the concepts of the science which we follow and which is displayed in the world. The intuition of the *Regulae*, the rational essential cognition whose objects are simple natures and their composites, becomes the clear and distinct perception of the *Meditations*. The equivalents of objective realities in the "Dioptrics" would be the concepts of the natural geometry, but these would only play some of the part. For some objective realities or simple natures apply to extended things, but others - e.g., those of understanding and volition - are not distinct from the thing which thinks, while others - e.g., those of substance and numbered things - apply to both.

The distinction between imagination and pure mind is critical to Descartes' mature position. Imagination includes all those occurrences we are said to have by virtue of the mind's union with the body, whether or not they correspond to the reception of a feature. These are empirical cognitions and are usually called perceptions. These are ideas *materialiter* and their role is not important; yet they are not indifferent concerning judgement, for they are said to be for the good of the body and in having them we are "led by nature" to think that they are in things. The paradigm of these feelings is pain. Opposed to perception is clear and distinct perception, for which occurrences in the mind are of interest only in so far as they fulfil roles. This is the function of pure mind and is concerned with objective realities, corresponding to Suarez's *conceptus objectivi*. However, they present restrictions by virtue of which occurrences in the mind count as thought of something or other. The occurrences in the mind and their dispositions are said to have objective reality, but it is not clear that the objective reality itself is in the mind. At any rate, it is not physically in the mind.

Descartes distinguishes in the Sixth Meditation two ways in which we exercise our science. In either case, there is an act which is evaluated, so there is not just an analogy for Descartes as there is for Herbert. The two ways in which our science is exercised are distinguished by the phrases "mentem se convertere ad se ipsum" and "mentem se convertere ad corpus". The latter is _conversio ad phantasmata_, but the phantasms are held to be only mechanical occurrences in the brain. This is also described in the _Regulae_, where Descartes insists that we are not to consider simple natures in abstract, as isolated meanings of words, but are to consider them as constitutive of complex concepts and as instantiated _in re_. (E.g., we are to consider a line as the termination of a surface.) What is needed in addition to the concepts or objective realities which are applied to things and the end products of a mechanical process originating outside the body are occurrences in the mind or feelings which are our being alive to features to which these concepts are applied. These are what we have called ideas _materialiter_ as they fulfil roles and the _conversio ad phantasmata_ is imagining, remembering or sensing, depending on the relation of the body to its environment. In sensing and vivid imagining, these feelings are projected onto spatio-temporal positions. The projection, and so the _conversio ad phantasmata_, are open to evaluation by the same concepts which are applied; in the case of vivid imagining, the act is evaluated as incorrect. All essential cognition for Descartes involves rational essential cognition; thus beasts, as they have no objective structure present to them, are held not to think.

When the _conversio_ is the application of concepts to things _in re_, the objective reality of the ideas in question functions an as _objectum in quo_, like the Thomist _verbum_. When the _conversio_ is that referred to by the phrase "mentum se convertere ad se ipsum", occurrences in the mind are needed only as something fulfilling roles and whose objective reality functions as an _objectum quod_, like Suarez's _conceptus objectivus_. The Cartesians speak of this as reflection, which is similar to what Suarez calls reflection, but need not concern objective realities as they are in fact founded in the occurrences in the mind of the particular person. In this way, we can judge about things from our ideas, i.e. we can consider concepts or objective realities of these ideas which are instantiated in things and are constitutive of them. Both sorts of _conversio_ are immanent acts, although they could be accompanied by transient acts. The first sort is a transitive act, the second sort, reflection, is an intransitive act.

In reflection, then, one considers non-descriptive rules and concepts on their own. These are independent of what physically exists _in re_, but for Descartes they are not independent of how the world is. For according to Descartes eternal truths - the rules of the objective structure - are created by God. They are created in creating both extended things and thinking things and are held to be things of a sort themselves: Descartes once called these truths _entia moralia_, comparing them to the laws effected by a monarch. His position on this was formulated in opposition to Suarez's position that from the fact that God knows eternal truths, it follows that they are independent of Him. What the shift to his position achieves which is of interest to us is the identification of divine and human knowledge. Only by the divine guarantee arrived at in the Third Meditation can we (on Descartes' view) be guaranteed that that which we formulate in intransitive self-teaching is the objective structure, which we tacitly follow both in intransitive self-teaching and in our cognition of things _in re_.

The middle four meditations are an exercise in reflection. He begins by eliminating everything from the soul or mind except occurrences simply as they fulfil roles. Descartes is interested only in what is perspicuous, with non-descriptive concepts which are independent of their instantiation; yet he needs something to instantiate them to guarantee that the objective structure has an application and that there is in fact something which can apply it. As species are eliminated, one considers only what is essential to a rule-following being. The concern initially, then, is with that part of the objective structure which we have called the concept of _res cogitans_. These meditations are not an exercise in introspective psychology. The concern is with formal features, concepts comprised in _res cogitans_ and instantiated in any rule-following thing and instantiations of the concepts of _res cogitans_ and _res extensa_, which Descartes calls substances. Material features, both as felt by, e.g., Descartes and as projected onto things (by virtue of which we pick out things) are discounted. Descartes thus begins with those rules and concepts to which we are subject and which supply the criteria of success in our non-natural endeavours, reversing the order of the genetic account. The problem of other minds arises only in so far as the problem of the application of the objective structure to any sort of thing arises, i.e. in so far as the existence of things distinct from Descartes' own following of the objective structure is in doubt.

The problem Descartes faces is due to the fact that acts of rational essential cognition are discrete, but are successes only in so far as what is cognised has a position within an objective structure. In particular, he must rule out the possibility that there is more than one objective structure present to us or that the object of a purported act of cognition is not comprised in the objective structure. Given that there is only one objective structure and that it comprises all possible cases, all acts of rational cognition, whether essential, propositional or practical, interrelate. This is shown in the causal proofs for the existence of God. Having justified purely rational cognition, i.e. clear and distinct perception, Descartes can explain error as wrong judgement and appeal in the Sixth Meditation to purely rational knowledge in the evaluation of the judgements we make by virtue of having feelings as they relate to the positions we are or have been in. This gives a distinction between imagining and sensing in terms of the coherence of the latter. With this, the application (so Descartes holds) of the objective structure to things <u>in re</u> is justified; the justification in effect is an appeal to the eminence of the spiritual soul over the material body, for rational knowledge is due to <u>res cogitans</u> alone, while the feelings which are the occasions for judgements about our environment are due to the union of <u>res cogitans</u> with <u>res extensa</u>. This could be looked on as an attempt at direct realism of a sort, undertaken by rejecting Suarez's attempt in so far as it excludes species and relies on the equivalent of an <u>objectum in quo</u>.

Descartes' programme exhibits an understanding of how concepts and rules of our conventional knowledge are determined by their positions in an objective structure, how they apply to things and how they furnish the standards of success. By identifying the objective structure with divine science, perspicuity is extended to everything. Substances, whether thinking or extended, are not veiled by their qualities; everything in principle, whatever its dimensions, can be explained either mechanically or in terms of the rules it follows. This is an ideal for a highly sophisticated endeavour in which the explanatory and predictive power of our theories and their simplicity and exactness are maximised. For Descartes, as for Malebranche and Leibniz, the whole objective structure of this sophisticated endeavour is present to any rational being throughout its whole history. This is sometimes stated by saying that we know the infinite before the finite. Descartes makes use of this in the course of the causal proofs and it is intimately connected with his view that we do not contain eminently all of God's perfections, so the idea of God needs a cause distinct from ourselves which contains these perfections. For Descartes, the idea of God is primarily the idea of divine science or, rather, divine science itself. This science is not something we extract or form, but something present to us, whose rules and concepts we are subject to. The view that this complete science, which leaves no room forfurther rules and concepts, is present to us is associated with the desire to have everything perspicuous and exact, for there is no place left for indeterminancy in the application of rules and concepts. We have already shown what is wrong with this view.

In maintaining that the divine science or objective structure is created with the things which display or follow it, Descartes denied that there is any distinction between divine intellect and divine will; God does not first understand eternal truths and then will in accordance with them that things exist. However, the idea of God is identified with the objective structure thus created. The faculty by which we know God is said not to be distinct from the faculty by which we know ourselves, displaying our dependence on God. We are images of God, Descartes maintains, in so far as our will is infinite and free. He denies that this is a liberty of indifference, as he should, for only rule-following beings are free in the way he intends; we have free will in so far as we have the objective structure present to us or, as Descartes writes, we share the same "vis cogitandi" with God. As in the Third Meditation he is concerned only with res cogitans, the dependence in question is not just for conservation, but also for the concepts we follow, i.e. objective realities of ideas, which alone need a cause. The intellect, as opposed to the will, is said to be finite: its capacity to clearly and distinctly perceive is limited. By virtue of this difference between intellect and will, Descartes exculpates God from our errors. God, he states, did not give me a faculty for error. There could not be a faculty for error, as what a faculty is for is determined by what counts as a success. Error, an imperfection, is said to be due to the will, in judging, outstripping the intellect. An infinite will is held to be a perfection and the responsibility rests with us because the concepts are present to us; we could always have judged otherwise or suspended judgement. We could (he states in the second causal proof) give ourselves perfections - ideas having objective realities, as only res cogitans is in question - but there would always be some which we lack. In both causal proofs, the fundamental opposition is between the finitude of the objective realities of the ideas we actually perceive and the infinitude of what we could clearly and distinctly perceive.

There is thus a gap for Descartes between God and the idea of God, for we cognise that according to which God operates and not God as He is whether or not He creates the world. This leaves God behind a veil of His own science. Descartes happily drops his desideratum of perspicuity for God (he warns particularly in the Principles not to consider what is beyond the scope of the human intellect, such as the counsels of providence) to identify that science which is instantiated in the world with our science. But even God becomes perspicuous in looking at things from God's point of view, which can only be done by identifying the idea of God with His science, as Spinoza does. Descartes maintains that we can affirm of a thing what is clearly and distinctly perceived to be contained in the idea of it. Necessary existence, he claims, is contained in the idea of God; therefore God necessarily exists. But, Spinoza adds, necessary existence is contained in the idea of extension, therefore extension necessarily exists. Descartes maintained that extended things are in God eminently; but they are also in extension eminently, as extension is the essence of all extended things. If one maintains that there is no distinction between the divine intellect and will and identifies divine science with God, then there is no way to avoid the conclusion that extension is as necessary as God. Furthermore, bare extension is immutable, omnipresent and simple, as one cannot separate one part of extension from another.

Malebranche does not veil God behind His science. Rather, ideas (objective realities), divine and human (for they are the same according to Malebranche) are said to be God as participable by creatures. I.e. divine science is comprised in God. In particular, the idea of extension is identified with God. Still, he avoids Spinoza's position by distinguishing the divine intellect and will. As what is actually created depends on God's will, extension instantiated *in re* is distinguished from the idea of extension in God. Admitting a divine will distinct from the divine intellect re-introduces final causes and Scholastic moral providence or the realm of grace. Malebranche was praised for this by Leibniz who also distinguishes between divine intellect and will and holds that divine science, and so God, are perspicuous. Still, both Malebranche and Leibniz held that nature is to be explained purely mechanically. Furthermore, nothing more than divine science is perspicuous. What Malebranche says about the divine will which goes beyond the account of the employment of our science is introduced in an attempt to give a clear explication of religious dogmas. He felt that he was doing for Descartes what Aquinas did for Aristotle and states that he takes scripture and the pronouncements of the councils as his facts in religion. What is perspicuous is what we have said is comprised in the objective structure. For Malebranche, this includes what he calls "l'ordre", a system of supposedly universal moral rules regarded as relations of value after the fashion of geometrical propositions stating proportions. (His favourite example is the rule that a man is of more worth than a horse.) He holds that these rules, unlike ideas, are in some way in us and are manifested in what he calls "natural inclinations". More importantly, the objective structure comprises for Malebranche the rules and concepts of mathematics.

The perspicuity of divine science is like the perspicuity of substance. Maintaining the perspicuity of either relies on denying a part for intensional species and minimising the part of material features. The essence of body is held to be extension and material features are only that by which we pick out various spatio-temporal positions. Furthermore, the operations of things _in re_ are held to be explicable solely in terms of extension, i.e. mechanically. We know (on this position) the forms of things _in re_ - formal features - and hence extended substance.

It is only a matter of projecting material features as occurrences in the mind so that we cognise instantiations of these forms and so of extended substance. A similar account for mind or thinking substance is presented by Descartes and Leibniz, although the first-person case differs from the third-person case, for there is a procedure involved in determining that the concept of res cogitans is instantiated in things distinct from us, Malebranche does not allow that there is a concept or idea of res cogitans, yet our own thought, and so ourselves as thinking things, could not be veiled from us; still, there is a disparity between the first- and third-person cases.

Malebranche's occasionalism is a consequence of the position on the perspicuity of substances and divine science and the account of the application of science to things. Occasionalism is often parodied in the form that God raises my arm when I go to lift something and causes pain in me when my hand is burned. But Malebranche's account is not that God reads my mind and then decides that my arm should go up. Malebranche distinguishes five levels of occasionalism. Two of these are concerned with his explication of religious dogmas and we shall ignore them. On the other three levels, God is little more than the objective structure and His will is invoked only to account for what in Scholasticism had been explained by causes. According to Malebranche there is established by providence a plan for the course of the world before its creation. Furthermore, divine concourse is required for the unfolding of this plan, for God is seen to be as necessary for conservation as for creation. So far, this is in agreement with the general Scholastic position and Descartes invokes continual creation in the second causal proof in the Third Meditation. But the Scholastics also maintained that second causes - particular finite things - are causal agents. Their explanation of causality was much the same as their account of how we come to have essential knowledge of material features, which, indeed, is a special case of causality. For causality was attributed to the production of an accident by the cause and its reception by that which is affected. But this is no longer acceptable in a mechanical explanation of things in which motion is not distinguished from the thing moved. Thus divine concourse is seen to be the only causal activity. As this follows a plan, in which everything has been determined, there are no choices made by God after creation. Furthermore, the plan itself is supposedly subject to very tight restrictions, for (it is held) God, if He is not to belie His attributes, must create that world in which the simplicity of laws and the number and variety of individuals are mutually maximised. This description leaves things much as before, with only extended and thinking things, each of the latter united with one of the former.

One sort of occasionalism is that between bodies. The laws governing this are mechanical, and causal activity is replaced by extended things whose motion obeys mechanical laws. A second sort of occasionalism is that between occurrences in the mind and the presence of ideas (equivalent to Descartes' objective realities). This is stated in a number of ways, some of them misleading, as when it is stated that when we look for an idea, it is already present in a general way, or when it is stated that God makes ideas present to us when we wish them. What is intended, however, is simply that occurrences in the mind have roles which are specified by the concepts (i.e. ideas) in the objective structure present to us; when we properly formulate a mathematical problem, the solution is found by intransitive self-teaching and to this extent was contained in a general way in the formulation.

The most interesting, best known, and most often parodied form of occasionalism is that between occurrences _in re_ and occurrences in the mind. However, mind-body occasionalism is a consequence of considering things under two concepts, one of that which follows rules and one of that which obeys laws and instantiates geometrical features. This sort of occasionalism was almost common property among Cartesians in the two decades after Descartes' death and was suggested in Descartes' later works. Malebranche is very explicit in the eleventh _éclaircissement_ in rejecting dispositions in the mind or various "facilités" in the mind; rather, dispositions are secured solely in the body. The body, then, takes the place of Suarez's _intellectus possibilis_. From the time of the third book of the _Recherche_, Malebranche saw the account involving the _intellectus agens_ as one of the two major competitors with his vision in God. (The other was innatism of various forms.) He objects to the _intellectus agens_ because it is held to make a spiritual object from something material. He also objects to it because it is held to produce these objects without models, i.e. the production presupposes the cognition which the object produced is meant to make possible. God, in the office of what we have called the objective structure, takes the place of the _intellectus agens_ and the ideas in God specify the roles of the occurrences in the mind, all of which correspond to occurrences in the body. The important aspects in Malebranche's account are the mechanical system from the object cognised to the occurrence in the brain and ideas specifying occurrences in the mind. Occurrences in the brain are purely mechanical happenings as Malebranche divides up things, and so occurrences in the mind corresponding to them must be introduced for his theory of judgement. The occurrences in the brain cannot be said to cause those in the mind, because their only activity is mechanical, while occurrences in the mind function only in the realm of judging and cognising. Both mechanical activity and thought are perspicuous and the introduction of a causal relation between the two would introduce something opaque. Descartes most often, as in his correspondence with Elizabeth, relied on an opaque notion of causality when concerned with the correspondence between the body and the mind. A notable exception is in Notae in Programma, a late work in which he defends innate ideas. He extends the term "innate idea" to cover material features. Such occurrences are called innate to emphasise the fact that they are not got from something else, for they could not be understood except as instances of thinking. He insists that these occurrences are not like motions, which he calls occasions of them. Now maintaining that there is a causal relation between what is in re and what is in the mind furnishes much of the support for the view that there are two substances in a sense other than instantiated concepts. If we consider the difference between thinking things and extended things as the difference between two concepts, there is no reason to look for a bridge between them in terms of a natural activity. To a large extent, Malebranche's occasionalism is a dual-attribute theory with the attribute of rule-following thing individuated by mechanical configurations.

Despite the fact that in Malebranche's occasionalism, what God does is determined by the initial "choice", Leibniz held that occasionalism relies on a continual miracle, and so denigrates divine wisdom. For Leibniz, the fact that a thing is distinguished from others by its properties depends on the fact that its history is the sequence of its own activity. The Cartesian display of science in re, with the essence of body only extension, although held to be determined by laws, involves only God's activity: the only history enacted is God's. Likewise, the occurrences in the mind corresponding to those in the brain exhibit God's activity. To avoid this, Leibniz replaces Malebranche's occasionalism with his pre-established harmony and divine activity is restricted to an approving concourse. As simple substances are held to be unextended, interaction has no place. There is only one substance, the monad and the spatial display founded by those monads it dominates.

When Malebranche speaks of the objective structure, he generally speaks of what he calls intélligible extension ("l'étendue intelligible"). This term was introduced in the _éclaircissements_ in 1678 in explaining vision in God. It is regarded as the whole of geometry. In the _Recherche_ he uses "idea" in three ways. Firstly, he speaks of occurrences in the mind, such as material features, as ideas in the first two books, then restricts "idea" to his proper use of the term in the third book. He was criticised for this by Foucher as early as 1675 (before the appearance of the second volume of the _Recherche_) and by Arnauld and eventually by Locke. He admits to both Foucher and Arnauld that he did use "idea" for an occurrence in the mind, stating that he did so to facilitate his exposition. The second way he uses "idea" in the _Recherche_ is for an objective reality (although he does not explicitly state that he uses "idea" in this sense until his polemic with Arnauld). And the third way is for an idea applied to a thing (as when he speaks of the idea of the sun, which is the same as the idea Descartes says astronomers have from innate ideas). Intelligible extension replaces ideas as objective realities. This is not a great move, for intelligible extension contains all the concepts of geometry and even in the _Recherche_ Malebranche looks on ideas or concepts as being defined only with regard to their relation to other ideas.

Two aspects about intelligible extension become apparent in the polemic with Arnauld. Firstly, intelligible extension is not all of divine science, which also comprises what he calls "nombres nombrants", i.e. numerical concepts regarded (in the case of counting numbers) as concepts of sets of A's, where "A" is some sortal term. Secondly, although our ideas are identified with the divine ideas, we do not use the same ideas or concepts as God in cognising things. Intelligible extension is said to be the archetype of all created things. Malebranche even admits that it comprises the perfections of a toad, that is, there is a concept or idea of a toad as a very complex mechanical structure. Although we apply the same geometry in cognising, e.g., a toad as is instantiated in the toad (and so was applied by God in constructing the toad), we do not apply the same concepts of this geometry, for we do not cognise the toad's minute structure. In fact, as Malebranche holds that natural systems are infinitely complex, we could never apply the same concepts to a thing which God followed in constructing it; the latter concepts are an unattainable ideal.

The emphasis on geometry is in keeping with the Cartesian approach to begin with what furnishes the standards of simplicity and exactness. In the "Geometry", an essay appended to the <u>Discourse</u>, Descartes identifies the unit of length with the unit of counting and develops the coordinate geometry in establishing an isomorphism between operations on lengths (given a unit) and addition, subtraction, multiplication, division and root extraction. In the <u>Regulae</u>, above all concerned with perspicuous simples, the two most fundamental simples he presents are a unit (in general) and magnitude (in general), which are correlatives, as in specifying a unit, one specifies a magnitude. These are fundamental to the Cartesian endeavour (as we have indicated above) and the general programme presented in the Regulae is to analyse complexes into simples. Descartes suggests that magnitude be treated as extension, but this is for facility and leads to his geometry, one of whose advantages he saw as the ability it gives us to grasp an algebraic problem in a geometrical display.

Malebranche gives a central position in the sixth book of the Recherche to what he calls the idea of unity: a general specfication of the role of a unit in any dimension. Ideas in general are said to be relations. Usually a unit is supposed for two related quantities, but he also allows for relations in which a unit is not specified or one of the relata is taken as a unit. All in principle can be explained, given units and rules for generating mechanical configurations. Still, the "in principle" is important, for he allows that extension is infinitely divisible. With units, relations and methods for generating configurations, he feels he has a way to overcome the restrictions imposed on our knowledge of nature by our biological conditions. For what is veiled (e.g., by material features) is veiled only because we are of a certain size and have certain organs. These restrictions can be overcome with instruments. (Malebranche, in addition to being an expert mathematician, was an expert microscopist and gave numerous talks on the anatomy of insects to the French Academy of Science. He illustrates the relativity of our perception of size in the Recherche with the example of a mite, whose visual field can be supposed the same as ours but which sees things veiled to us because of our size.) Malebranche holds that arithmetic and geometry are the true logic and replaces logical and grammatical relations with mathematical relations, as when the grammar of words referring to pitches is replaced by the ratios of the frequency of pitches. As ideas are held to be relations, judgements are thought of like proportions as relations of relations and arguments are said to be relations of judgements. Although Malebranche did not state that necessary truths are seen in God until the Eclaircissements, the relational view of judgements was presented in the sixth book of the Recherche and, given that ideas are in God, it is a short step to hold that their relations are as well.

An essential distinction for Malebranche is between "sentiment", used both for individual occurrences in the mind and for the process of having these occurrences, and "idée". In the polemic with Arnauld, he identifies ideas both with objective realities in Descartes' sense and with clear and distinct ideas in Descartes' sense. Ideas are spiritual objects of a spiritual faculty and are of formal features. Sentiments, although they are occurrences in a spiritual faculty, are not objects. They correspond to occurrences in the body and are either material features or passions. Ideas are the meanings of words, or at least of mathematical words, whereas the only linguistic function sentiments have is as they are connected with natural expressions or their conventional replacements as these have an emotive role, concerned with our connection with others according to Malebranche. As ideas are the meanings of words, we can demonstrate things about ideas or what they are of. On the other hand, we can demonstrate things about material features only as they are made extensionally identical with formal features. He uses the term "connoissance" for the science we have articulated and "connoître" is used for rational cognition, i.e. that which has ideas as objects, whether or not the idea is applied to things. "Sentir" is opposed to "connoître" for that cognition which does not involve ideas.

Now Malebranche maintains that we have no idea or concept of _res cogitans_; in particular, there is no idea or concept which applies to ourselves as thinking things. He does not deny reflection (he uses the term), which is rational cognition not applying the things. This is also called "pure perception" and is said to correspond to nothing in the body. This is misleading, for in the fifth book of the _Recherche_, concerned with passions, he states that there is no thought without some passion, which has a connection with occurrences in the body. The connection he denies is a natural connection, for when he speaks of reflection in the sixth book, it is always with regard to conventional signs. Having no idea of ourselves, we have no _connoissance_ of ourselves. He admits we know ourselves, using "connoissons" in its broader, ordinary use; but this is solely by what is called "sentiment interieur". _Sentiment interieur_ includes all occurrences in the mind, most notably passions (e.g., fear), but also material features even though they are projected, and so attributed to things _in re_. These are treated on a par in so far as they fulfil no roles. These occurrences as such are acts of purely empirical cognition since they do not involve ideas. All such cognition, then, according to Malebranche is of ourselves, although these occurrences correspond to occurrences in the body and thence, perhaps, to occurrences in our environment. (Although we cannot know ourselves by demonstration, _sentiment interieur_ is supposed to give us a more intimate knowledge.)

Although he denies that we have rational cognition of ourselves, he admits that we can sense or feel ("sentir") that we rationally cognise ("connoissons"). For example, when we count, there is _sentiment interieur_ corresponding to each act of counting. But these acts of counting are just as discrete as what is counted and likewise found numerical concepts. That he does not allow this to be cognition by idea shows the importance he places on geometrical concepts over arithmetical concepts in picking out things, for bodies are extended and we must pick out extended spatio-temporal segments to be able to count. It also shows the importance he places on measurement. In the discussion of our knowledge of ourselves both at the end of the third book of the Recherche and in Eclaircissement XI he states that we cannot demonstrate things about ourselves (as thinking things) because we know ourselves only by sentiment interieur. But, he adds, we can establish extensional identities between those of our sentiments which are material features and formal features. His example is the reduction of tones to the lengths of strings and eventually to frequencies. We can then demonstrate things about sounds, but this is no longer knowing something about ourselves, for what is measured is in the production, transmission and reception of the feature. Still, he should allow that sentiment interieur, a temporal process, can be measured with temporal units.

A reason Malebranche gives for his position that we know nothing of ourselves by idea is that ideas are representative, i.e. they are concepts which specify roles by virtue of which occurrences in the mind are fit to pick out things. Indeed, we have and do not pick out our own feelings. For example, the statement "I am in pain" is normally a criterion of pain. If we were to say "I know I am in pain", if the use of "know" is allowed, it adds nothing to the original statement. There is reason even to hold that "know" is not properly used in this case because there is no way we could be mistaken; there is no standard of success, except in the performance of the intransitive act which is the uttering of the statement, and there the standard is simply grammatical. Malebranche considers the cognition of material features as analogous to feeling pain. We can now see his reason for not admitting that even temporal measures and numerical concepts are applicable to us as thinking things, for their application depends on us picking out things which are counted and events distinct from us which are timed.

Still, we pick out pain in others and this is where a concept of pain has a place; but not always. When we see another person or a higher animal, in pain we cannot help but have a feeling sympathetic with him or it. Now Malebranche holds that when we see even a higher animal in pain, we project our "passion" - pain - onto the animal as we project material features onto bodies. Immediately after discussing our knowledge of ourselves in the Recherche, he discusses our knowledge (again using "connoissance" in what for him is a broad sense) of other minds. This, he states, is by conjecture, meaning not that we have a thought-out judgement, but that we project our feelings onto others. Feeling in this way that another feels pain is unlike feeling pain ourselves because we could be mistaken, even though it is an automatic reaction. In this sense, our knowledge of other minds (and all that is physically in the mind according to Malebranche are feelings) is by conjecture.

An essential part of Malebranche's account is that ideas are not in the mind. Around this centers his polemic with Arnauld, who maintained that ideas are only perceptions, not like species or concepts in the Scholastic sense, but the mind itself. The polemic began with Arnauld's publication of Des Vraies et des Fauuses Idées (1683) and was most heated in the 1680's. A second phase occurred in the 1690's with an epistolatory exchange published in the Journal des Sçavans and occasioned by Regis' criticism of Malebranche in his Systême. After Arnauld's death, it was continued by Malebranche in the first decade of the next century, with a further work and a collection of works from the polemic. The polemic was closely followed by Leibniz during his most formative period. And Locke repeats many of Arnauld's points in his Examination of P. Malebranche's Opinion ... , whose major thesis as well is that ideas are only perceptions.

Both Arnauld and Malebranche affirm that the controversy is about the nature, not the origin, of ideas. As Malebranche uses "idea" in the sense of objective reality, the controversy naturally turns to the nature of objective reality. For Arnauld this must be a property of a perception. He insists that it is of the nature of a perception or idea to represent and that one cannot show how it represents, as representation is something primitive. To explain how objective reality is a property of an idea, he states that an idea has objective reality as a purse has or contains five coins. But, Malebranche points out, an idea cannot become an idea of something as a purse can come to have five coins. It is not the perception, but what it is of which is important. The principle of individuation of that by which we know something is not given by stating what is physically in the mind. Rather, an occurrence in the mind is fit to pick out something because it fulfils a certain role and this role is specified by a concept, objective reality or idea in Malebranche's sense. The concept could not be an occurrence, for then temporally distinct occurrences could not fulfil the same roles. Nor could it be physically in the mind, for it then could not act as a standard. For the same reason, the concept could not be just a disposition physically in the mind.

The argument for the vision in God which Malebranche relied on most heavily from the time it was first presented in the third book of the _Recherche_ begins with the observation that our ideas, reason or the science we use is infinite, immutable and necessary. But, it continues, we are none of these, while all three are true of God. Therefore, our ideas or reason is in or simply is God. Now neither occurrences nor dispositions in the mind are immutable. Concepts, on the other hand, are neither physically in the mind or physically _in re_. In this sense we can allow that they are immutable, although an objective structure is tied to a culture and its endeavours, which change. Still, one evaluates the judgements of any rational being at any place or time according to the objective structure present to one. Furthermore, one applies the concepts of the same objective structure to all things at all times and places.

Regis introduced into the polemic the question of whether something which is finite _in essendo_ can be infinite _in repraesentando_. He and Arnauld must maintain that it can, Malebranche maintains that it cannot. Now we can use a sign - "∞" - for infinity and we can use a complex sign, e.g., "1, 2, 3, ...", to represent an infinite series of, e.g., numbers. Likewise, occurrences in the mind corresponding to these signs can be of infinity and of an infinite series of numbers. But the marks or the occurrences alone do not represent. Rather, they represent by virtue of fulfilling roles, which are specified by concepts, objective realities or ideas in Malebranche's sense. On Arnauld's position, a type of occurrence in the mind, perhaps as an exercise of a disposition, is potentially infinite in application. But then we need some standard by which to judge that these occurrences are of the same type. This standard could not be another occurrence, for then we would need a further standard to judge that the other occurrences are to be ranked under it.

The polemic also concerned whether "idea" must be taken for a perception in the mind or something distinct from the mind for one to be able to conclude God's existence from the idea we have of Him. Arnauld maintains that unless the idea of God is a perception or a type of perception, and so is caused, one could not ask for the cause of the objective reality. If the idea (i.e. objective reality) of God is God Himself, then our knowledge is no longer what is in question and one cannot begin by considering oneself as a thinking thing. Malebranche replies by repeating that what is finite cannot represent what is infinite. Furthermore, what is caused is a mind knowing God, not the objective reality itself. Finally, we have knowledge of God only because of His presence, not because of something intrinsic to us.

Another question raised was whether "idea" must be taken for a perception in the mind or something distinct from the mind for the truth of the maxim that we can affirm of something all which we clearly and distinctly perceive to be contained in the idea of it. This concerns the necessity of our ideas and reason and the necessity of the objective structure or God. Now non-descriptive rules and concepts are necessary in so far as there could be no description which could lead us to reject them, for they specify the roles by which utterances and occurrences in the mind are fit to pick out things and are the standards by which we evaluate these utterances and occurrences. Furthermore, they could in principle be learned intransitively and even (given that one has a handle on an objective structure) could be formulated by intransitive self-teaching. Arnauld's position with regard to the Cartesian maxim is that if ideas were distinct from the mind, clear and distinct perception would not be about our knowledge; rather, it would be about some third thing. But this is a misconception of the nature of the third thing. This misconception is related to Arnauld's position on how an idea has objective reality. Knowing a concept is having a concept, where "having" is used in the sense of having it present to us, not in the sense of either having an occurrence in the mind or having a disposition. Malebranche replies that if clear and distinct perception were of ideas in the mind, then there would be no guarantee (indeed, no reason to suspect) that what is clearly and distinctly perceived to be in the idea of a thing can be affirmed of it. We could, in that case, only say what is true of our ideas. Malebranche accused Arnauld of holding a position leading to scepticism in the later part of the polemic. In the preface to the collection of works from this polemic which Malebranche had published in 1709, he states that his reason for presenting these again is to combat scepticism. It is significant that Malebranche mentions Locke's <u>Essay</u> in particular as a work whose views lead to scepticism. Without concepts, objective realities or ideas which are not perceptions in the mind, we have no standards to evaluate our judgements and nothing to specify roles by which what is physically in the mind is fit to pick out things.

Arnauld also accuses Malebranche of scepticism because of the third thing introduced in clear and distinct perception. Malebranche presents his position largely in terms of intelligible extension. But the third book of the <u>Recherche</u>, where he first explicitly treats of ideas, was written before he developed the notion of intelligible extension. Here he refers to ideas as spiritual beings, as representative beings (although he later states that they are neither modes nor substances) and as objects of thought distinct from the mind.

Arnauld opened the polemic by accusing Malebranche of re-introducing Scholastic species, the elimination of which was vital to the Cartesian position that substance is perspicuous. Malebranche replies that he used the language of the Schools because he wished to combat their position. Still, it is important to Malebranche's position that ideas are spiritual objects of a spiritual faculty, that they are not in the mind and that only by having them present to us can occurrences in the mind pick out things _in re_. On the other hand, ideas cannot be intelligible species or _conceptūs formalēs_ in Suarez's sense, for ideas according to Malebranche are only of formal features and are applied and not caused. The function Malebranche assigns God is similar to the function of the Thomist _intellectus agens_, yet ideas for Malebranche cannot be universal species or _verba_ in the Thomist sense, for they are not dispositions or occurrences and are not in the mind.

Arnauld again accuses Malebranche of introducing a veil in his criticism of Malebranche's version of _conversio ad phantasmata_. According to Malebranche, our science - primarily geometry - is applied to things by projecting sentiments which render intelligible extension particular. For example, in seeing a red square on a blue background, the concept of a square, which intelligible extension comprises, is cognised and is applied to a particular spatio-temporal position by virtue of the sentiments of red and blue. The sentiments themselves would not be projected without the concept. Only what Malebranche calls weak and languid sentiments, which we have called material features, are held to be projected beyond the body; what are called strong and lively sentiments - e.g., pain - are not. This is a type distinction among sentiments. For each weak and languid type, an occurrence of it is projected only if it is sufficiently strong, as when we sense something or have a strong imagination of something, as in hallucination. If the sentiment is very weak, as in normal imagination, it is not projected.

Malebranche, in a misleading, figurative style, sometimes speaks of this as the soul painting portions of intelligible extension to render it particular. Arnauld holds that on this view, one would cognise only a third sort of thing, a depiction in intelligible extension. But Arnauld fails to distinguish between ideas and sentiments. The sentiment, according to Malebranche, like Arnauld's ideas as perceptions, is only in the mind. The idea is that by which the sentiments are projected in spatial configurations, but it is not something particular on which they are projected nor is it that in which they are. Arnauld writes as if formal and material features were on a par for Malebranche, and so must both be either in the mind, <u>in re</u> or in a third thing.

Arnauld, maintains that the projection of sentiments onto intelligible extension to render it particular, quite apart from introducing a third thing, could not explain how we cognise particular things. Intelligible extension, the criticism runs, is capable of representing anything. To say that it is rendered particular by sentiments, and and is thereby that by which we cognise particular things, involves the same sort of problem as presenting a painter with a blank easel or a sculptor with a block of marble and asking him to produce a picture or sculpture of St. Augustine. Intelligible extension could not explain representation because we would need a model to depict the thing represented in it. Malebranche's reply is that the sculpture of St. Augustine is potentially ("en puissance") in the marble. The particular conditions are all furnished by sentiment, according to the correspondence with the body. Intelligible extension is capable of representing anything because it contains the models of everything. It is the raw materials which must be given for sentiments to be anything more than occurrences in the mind.

Still, this does not guarantee that what is picked out is St. Augustine and not a complex geometrical figure, perhaps in the mind, coloured in the same way as he. We can allow that intelligible extension suffices for intransitive acts and that by it transitive acts are fit to pick out things. But given only it and occurrences in the mind which are projected, there is no way of getting beyond diagrams to things. The problem arises because descriptive rules and concepts have dropped out. There are no natural sortals allowed, for the only sortals are units of measure. Nothing is said of principles of individuation of things, only of geometrical figures, which are not individual. Furthermore, the only way parts of extension are distinguished is by the material features which are projected on them; the universe could as well be one extended thing which we distinguish into variously coloured parts.

It is, then, not without reason that Arnauld accuses Malebranche of Spinozaism. Arnauld's reason in particular is that if we see all extended things in God, then God must be all extended things. This reason, however, will not do, as it again fails to distinguish between ideas which are concepts of any number of possible things and sentiments which render an idea particular and by which it is actually applied to something. Malebranche insists on the distinction between intelligible extension - God as containing the archetypes of all extended things - and the attribute of immensity - the attribute of God by virtue of which He is in all places. Yet Malebranche conflates these two in the _Entretiens sur la Mort_, appended to later editions of the _Entretiens sur la Métaphysique_. This work was written after a severe illness and was held by his biographers to be one of his most religious works. In the _Entretiens sur la Métaphysique_ he had developed his account of our application of ideas to include the projection of strong and lively sentiments - pain in particular - to parts of our body, which is included as a case of rendering an idea, viz. that of our body, particular. The sentiment corresponds to an occurrence in the body and the idea of the body is in God. In the _Entretiens sur la Mort_ he conflates the correspondence between the body and the mind with the rendering of the idea of the body particular by occurrences in the mind. The consequence is that the body itself is in God and the mind is what instantiates it. This is not exactly the position of Spinoza, for whom what physically exists is _conatus_, primarily to do with extension; but it is very close to it.

Leibniz,in his writings of the 1680's concerned with ideas, agrees with Arnauld's position that ideas must be in the mind. However, he holds this position for other reasons, most notably to avoid the Spinozaism on which Malebranche verges. (Leibniz was in correspondence with Arnauld at the time of the polemic with Malebranche and his _Discourse on Metaphysics_ forms part of this correspondence. Yet a number of parts of this work reflect parts of Malebranche's _Traité de la Nature et de la Grace_, which occasioned the polemic.) On the nature of ideas, Leibniz follows Malebranche except on the question whether ideas are in the mind. He distinguishes (especially in the _Nouveaux Essais_) ideas from perceptions, which are occurrences. He also agrees with Malebranche on the application of our science to things, on abstraction and generally on the question whether ideas are made.

Descartes'position on whether ideas are made is not always clear, but when the question is of ideas which are said to have objective reality, he allows for analysis and synthesis, but not for our making of new ideas. In the Third Meditation he distinguishes ideas into those which are adventitious and due to the senses, those which are factitious and made and those which are innate. Factitious ideas are made from adventitious ideas and neither as such have objective reality. This allows only what any one allows who admits imagination in addition to memory. Those ideas whose objective realities are important are those which are innate. When Descartes states that the objective reality of the idea of God needs a cause, he does not mean to suggest that all other ideas can be made; rather, he means that, given that we have those ideas whose objective realities are instantiated in us as thinking things, we can thereby have those ideas whose objective realities are instantiated in extended things. Again, clear and distinct perception is concerned with ideas which are innate, and so cannot be made, for (he holds) there must be a cause for what is clearly and distinctly perceived.

We must distinguish between concepts being involved or involving other concepts and representations being made from others or concepts being formed from representations. A concept involves another because rules involving further concepts converge on it. A concept is not formed from representations of what it is of, for the representations are of the thing in question only because they instantiate or found the concept. There are two ways representations could be made from others. In so far as the same thing has different roles at different times and in so far as a number of representations are associated or parts or aspects of one representation are given independent roles. In either case, the roles are specified by concepts.

Now analysis and synthesis as Descartes treats them are concerned with concepts as involved in or involving others. When he speaks of <u>conversio</u> in the <u>Regulae</u>, he speaks of a number of natures or concepts which involve one another. When he writes that an idea (e.g., of the sun) is made from innate ideas, what is meant is that a number of concepts are applied to the same things <u>in re</u>. This is synthesis and establishes an extensional identity between a concatenation of material features assigned certain spatio-temporal positions and a concept comprising a number of formal features. He in fact speaks of abstraction, but this is the consideration of one concept involved in a comples without considering the others; this is analysis.

This sort of abstraction is endorsed by Arnauld in the <u>Port Royal Logic</u>. But against Malebranche's position on the application of concepts he maintains that we make ideas which represent various features. This is in general by comparison and his position in this respect is compatible with Gassendi's. In particular, he holds that we form ideas of numbers by comparison. His example is of Thales, who gives twenty men each a thaler. By comparing the men with the thalers, he maintains, we form the idea of twenty, which is common to both. Malebranche's reply is that, to make the comparison, we must already have the idea (concept) of (a group of) twenty. If ideas were perceptions in the mind, one would compare two groups each with a third group, which only introduces another term of the comparison. Malebranche holds that ideas in general are relations; these are applied in making comparisons, but they are not formed from things compared.

For Leibniz, ideas are not made, but applied. He maintains this postion agianst both Hobbes and Locke. In the second book of the Nouveaux Essais he is continually critical of Locke on the formation of ideas. His postion against abstraction is presented against Locke's view that knowledge is from particular to general, maintained both against innate ideas in the first book of the Essay and against maxims in the fourth book. Leibniz replies that the evidence - what one would cite to support one's claim - on the particular case is due to the general concept or maxim which is applied in the cognition of the particular. Leibniz puts more emphasis on propositional rational knowledge than do the Cartesians, who are principally concerned with ideas and their objective realities. Thus he holds that truths of fact are justified or evaluated ("se justifient") by truths of reason. Leibniz maintained that ideas are in the mind because of the function he assigned them in the individuation of that which has them, thus avoiding the Spinozaism on which Malebranche verges. Simple substances were an early concern for Leibniz and the Cartesian position that the essence of body is extension and that of mind thought was a target of his from 1670. He gained a thorough knowledge of Spinoza's system in the early 1670's and saw in it the difficulties regarding individuals inherent in Cartesianism. His mature postion on monads begins to appear in the Discourse on Metaphysics, with the notion of an individual concept. Pre-established harmony, which was presented in opposition to Malebranche's occasionalism, appeared publicly in almost final form in the "Nouveau Systeme", an article published in 1695. Monads instantiate the objective structure and restrictions of it, mirroring the universe from their own points of view. Malebranche held that the objective structure is basically geometrical; it is not instantiated in the thing which thinks and we have no idea of ourselves. But Leibniz wishes to analyse geometrical concepts into mathematical and logical concepts. He takes logic to be a science, rather than an art, as it was generally held to be in Scholasticism and by Cartesian authors on logic; it is held to be of great importance, an attitude diametrically opposed to Malebranche's. Spatial displays on Leibniz's position are founded by simple unextended substances and the objective structure is instantiated in us. Thus we do not see all things in God; rather, we see all things, including God, by reflection. Still, we perform the same acts as God, as "same act" refers, not to the same occurrence, but to that which has the same standard of success. We perform only some of these freely and we perform them in a temporal sequence and from a point of view.

Leibniz does not usually speak of ideas as objects, but when he does (as in the Nouveaux Essais and his writings of the late 1680's), he states that they are objects in us, as they must be if we instantiate the objective structure. Still, in his comments on Locke's Examination of P. Malebranche's Opinion, Leibniz agrees with Locke that if we see all things in God, we should see the idea of ourselves in God. When he treats ideas as objects in us, he adds that God is the immediate external object. Knowing ourselves by reflection and thereby knowing the rules and concepts we follow, we know divine science, which is the divine intellect.

Ideas as objects are spiritual objects since all monads are spiritual automata performing spiritual operations; their activities (at least as God reads things) are arithmetical and logical. However, we are responsible for only some of these activities and what is spiritual is distinguished by the subject matter with which it is concerned. Law obeying is conflated with rule following in the translation of what is extended into what is unextended.

The objects in us are not held to be occurrences. Leibniz maintains that the object of thought must precede the act, as he should, for these objects are the standards of success of the acts. The monad (or mind for those things which are conscious) which dominates the body secures dispositions, for it instantiates the analysis of the body. Perception is the exercise of the dispositions and there are no bare faculties. Thought or rational cognition is an exercise of these dispositions, which are concepts and innate ideas. Thus Leibniz holds that innate ideas are like veins in a block of marble which mark out the sculpture potentially in it, for concepts are in us and occurrences in the mind are exercises of them. As the mind instantiates the objective structure, the dispositions to think are individuated by concepts of the objective structure, so they are what we have called ideas <u>formaliter</u>. Leibniz rarely uses the term "objective reality", for ideas as he uses the term are individuated by objective realities. We have the same ideas as God in the sense that we follow the same standards; but our ideas are not identical with God's in that they are distinct dispositions.

Chapter X .

The Cartesians and Leibniz on Naturally Following Rules.

We do not acquire rules and concepts because of our causal relations in the world; rather, we become subject to them by being inducted into a culture. By being subject to non-descriptive rules and concepts, we can apply rational knowledge to natural things. We can accept the accounts of the Cartesians and Leibniz in so far as they hold that ideas, objective realities or concepts are not physically in the mind and are applied to things to which we are alive. But on their accounts, these rules and concepts are not acquired and are common to all rational beings. In this chapter we shall consider two related reasons they had for maintaining this view. One is the correspondence between the mind and the body, especially as described in their theories of vision. The body is to be described according to the ideal science and the mind is held to perform mathematical operations according to the disposition of parts of the body. These calculations are not corporeal or material, yet are held to be naturally performed; so they are performed by something spiritual. This conflates law-obeying with rule-following. The second reason is that the ideal science and the reduction of all descriptions of natural phenomena to it, although this must be formulated by us, is held to be already in effect as the divine science. Finally, on the position that we naturally follow the rules of this ideal, there is no way one could show that what this science is applied to is anything other than a diagram founded in occurrences in the mind.

The endeavour to maximise the explanatory and predictive power, the simplicity and exactness of our theories is a cultural ideal, yet Descartes takes the concepts and rules of this ideal to be naturally displayed _in re_ and followed by all rational beings. The rationale for this can be seen in the "Dioptrics" in which a maximally simple and exact physiological description of the body is applied to the physiologist himself. Descriptive concepts and rules drop out and are replaced by perceptions and feelings. Only _res extensa_ and _res cogitans_, motions physically _in re_ and occurrences physically in the mind are left. The account in the "Dioptrics" contains the seeds of Leibniz's monads as spiritual automata, for we are held to make geometrical judgements of things _in re_ in accordance with that geometry which is natural because of the disposition of the parts of our body, in particular, because of the disposition of the eyes and their constituent parts. Furthermore, consciousness is tied to the disposition of the parts of the body, for we are held to be able to be conscious of what is in a straight line from the periphery of the body. This position contains the view that we follow rules because the body instantiates the objective structure and that rational practical cognition occurs naturally. The natural geometry is then innate not only in the sense that anything which excogitates is held to follow it, but also in the sense that dispositions in the body are sufficient to specify ideas _formaliter_

and thus to determine which objective realities are present to the mind. What Descartes writes about the complexity of the body and the extent to which the relation between occurrences in the mind corresponds to the relation between occurrences in the body is not sufficient to determine whether this was Descartes' view or whether he had a view beyond that outlined in the "Dioptrics" and the _Passions of the Soul_. In the latter work he writes that we can change the relation between physiological activities and passions of or occurrences in the mind. Leibniz, on the other hand, states in the Monadology that if Descartes had the correct conservation laws for motion he would have come upon the system of pre-established harmony. If this were Descartes' view, then he would be committed to the position that the body's dispositions are infinitely complex, as the objective structure (according to him) is infinitely complex. At any rate, the position on judgement in the "Dioptrics" overburdens consciousness, for we are held to be responsible for all these judgements. Yet, because of the part Descartes gives to prejudice throughout his later works, it is essential that we be held responsible for a multitude of judgements we are "led by nature" to make and that we are conscious of all feelings physically in the mind because we are held responsible for the judgements we make on their occasion.

Leibniz's theory of monads is a generalisation of the account of the exercise of rational knowledge in our relation to our ambient world given in the "Dioptrics". The mind corresponds in infinite detail with the body and neither influences the other, for Leibniz's physics is deterministic. Geometry is reduced to logic and arithmetic. The examples Leibniz most often gives of simples are concerned with ens or a being in general, which is a universal unit of counting. Monads are held to engage in an occult arithmatic and their counting takes the place of Scholastic intensional species, for all correspondence between them is attributed to the correspondence between their rational practical cognition. There are no windows to admit species, since the cognition of simple substances themselves suffices.

Since Leibniz holds that matter or prime matter is an abstraction, an assemblage of simple substances or a spatial display in general, he finds no problem with the path from what is material to what is spiritual. Nor is there for him a mystery in the move from what is insensible to what is sensible, for what is sensible or apperceived is a concourse of insensible spiritual happenings: rational practical cognitions, which could in principle be spatially displayed if we had the requisite techniques and instruments.

Leibniz, unlike the Cartesians, held that animals think. But he holds there is life and perception throughout, as there must be simple spiritual substances performing occult arithmetic to found spatial displays. There is a threshold at which perception becomes noticeable, where the concourse of perceptions results in apperception. He sometimes gives behavioural criteria for apperception, as in the Nouveaux Essais, where he states that a boar responding to a call apperceives the cry. He more often relies on the physiology of those things which sense and apperceive at least in a simple way to distinguish them from those things which merely perceive; in particular, what senses has distinct organs of sense. Certain monads have a sufficient complexity that their apperception reflects the objective structure, which they can formulate and reflect by means of conventional or (as Leibniz says) sensible signs. Reflection involves consciousness and responsibility, which gives these monads a special sort of continuity as moral beings. Yet this continuity depends on the continuity they have simply as substances, for traces of conscious acts are secured in the substance as dispositions of which it is not conscious, but which have an effect on its future acts and may again be exercised in a conscious act.

In reflection and the formulation of rules and concepts and even in one's induction into a culture, Leibniz holds, we become subject to no new rules and concepts because we instantiate all the rules and concepts of divine science, as do all monads. Leibniz allows for periods of sensitive and even conscious monads in which they differ from those monads which do not sense only in their dispositions which some day may have a noticeable effect or which are the traces of past apperceptions. Monads during these periods are said to be dormant. He thus avoids the problem of the natural origin of simple substances. He thought that there was evidence for this in the existence of germ cells, a recent discovery due to the microscope. There were thought to be similar microscopic bodies having a unique relation to the developed body after the destruction of the latter. Leibniz held that every dormant monad is always associated with a spatial display and dominates an infinite number of other monads. The spatial display is said to be second matter, as opposed to prime matter, and is not an abstraction, for it is well founded. Only by its correspondence with second matter, it is maintained, can the continuity of a monad be guaranteed, for the continuity of a monad must reflect spatio-temporal continuity. What determines whether a monad is sensitive is the presence of organs; what determines that a monad is conscious or reflects is its use of conventional or sensible signs. No class of monads is distinguished by the fact that they perform rational activities, for all monads are spiritual automata.

Leibniz conflates law-obeying with rule-following because of the translation of what is extended into what is unextended. The rules and concepts of the highly sophisticated ideal of a perfectly simple and exact description are held to be followed by that to which they are applied. "Spiritual" is bifurcated by Leibniz between those operations which are merely calculations and those for which we are held to be responsible. This distinction corresponds to the distinction between the realm of nature and the realm of grace. The exact correspondence between these two realms which he thought he could explain was considered by Leibniz to exhibit divine wisdom, for a perfect craftsman need not interfere with his work. Some, such as Clarke (whom Leibniz thought denigrated divine wisdom), regarded such a view as materialist in the end. Indeed, God plays little more than the part of a concept comprising the rules and concepts of a complete science and the concepts of all possible individuals; the determination of which individual concepts are to be actualised is done by a calculation, albeit involving an infinite number of steps.

Leibniz's position is like Hobbes' position inverted: what Hobbes took to be material and extended, Leibniz takes to be unextended and spiritual. What is peculiar to rational creatures, Hobbes takes to be due to the use of language. Similarly, Leibniz held that reflection is always connected with sensible signs and that language is the best mirror of the mind. Still, he opposes Hobbes on ostensive and stipulative definition as the commencement of our rational knowledge, for giving a definition is itself a rule-following activity. Yet for Leibniz these rules are instantiated in all monads because of the correspondence between what is extended and unextended. Furthermore, the rules of natural languages are regarded as only approximations of the rules instantiated in all monads. He states that his primary concern is with ordinary language, but he treats ordinary language with arithmetical models and looks on it as a calculus. He looks for a natural language, which would mirror all minds, and a universal character, which would make explicit those rules followed by all minds. Logic is held to be an adjunct to grammar and to be involved in the analysis of any spatial display. In one fragment, Leibniz attempts to display prepositions as spatial relations. All of these are attempts to formulate that science which all things obey and follow and which is formulated in various imperfect versions by conscious things.

The seeds for Malebranche's vision in God are also to be found in the "Dioptrics"; but Malebranche does not hold that the infinite complexity of the body corresponds to a similar complexity in the mind, whose limited capacity he emphasises. Much of the first book of the Recherche is devoted to a development of Descartes' theory of vision. The position of this discussion in Malebranche's first work shows the importance of his theory of vision to his general account. Malebranche accepts Descartes' criticism of intensional species; the feeling ("sentiment") associated with a feature and the feeling associated with a verbal token are on a par. In particular, the meaning of a word is not held to be an occurrence in the mind, but an idea (in his sense). Malebranche differs with Descartes in that he maintains that sentiments and the roles they occur in are not determined by judgements made by us; rather, God must give us sentiments or occurrences in the mind in certain relations on the occurrence of certain dispositions of the parts of the body, in particular the visual faculties. Still, his position entails that we naturally follow rules because the objective structure is instantiated in the body; thus his position conflates law-obeying with rule-following.

Malebranche relies on God to give us sentiments because he insists that we do not cognise the operations of the muscles, nerves, etc. of our own body in our day-to-day commerce with our environment. This rules out the sort of correspondence between mind and body which Leibniz supported. Malebranche also insists on the limited capacity of the mind, although he holds that it has the same objects as God. The notion of judgement is not as overburdened as with Descartes, for all those occurrences in the mind which are occasions for us (and not God) to apply the rules and concepts of the natural geometry are to some extent explicit or, in Leibniz's terminology, apperceived. Since we are not held responsible for cognising the activities which result in discriminable spatial distinctions, the mind need not instantiate or found the whole objective structure or even that part of it - geometry - concerned with mechanical activity. Malebranche does not speak of a natural geometry. Rather, he speaks of a divine optics both in the Recherche and especially in the Entretiens sur la Métaphysique, for it is God who gives us occurrences in the mind in roles specified by the geometry displayed in the world. Nevertheless, the notion of conscious is overburdened, as we are held to apply the rules of this geometry to all discriminable spatial displays at all periods of our life.

Occurrences in the mind or sentiments are said to be given by God for the good of the body. They need not inform us how things really are, for they depend on the history of the body and its relation to its environment. The complex sentiment or sensation given us by God is called a natural judgement by Malebranche. Natural judgements relate to the geometrical distribution of things in our environment because a number of sentiments are involved. Malebranche holds that we are led by nature to consent to natural judgements, i.e. we are inclined to conform our own judgements, which Malebranche calls free judgements, to natural judgements. Natural judgements are the occasions of error because their function is to inform us of what is good for the body, not of the real distribution of things. As God gives us natural judgements and the distribution of things depends on Him, Malebranche states that natural judgements can be (and usually are) false from God's point of view. Thus God misleads us. But He does so for the good of the body: we ourselves, because of the limited capacity of our mind, could not take into account the infinite detail which we would have to know to preserve our body. Furthermore, God is not the author of our error, for the free judgements are made by us. Finally, we are supplied with a means of interpreting natural judgements so that we are not misled, for divine science or divine optics is present to us and by this we can evaluate judgements, either free or natural. The theme of the _Recherche_ is the avoidance of error. In the sixth book Malebranche presents the science which is to lead us from error, i.e. mathematics and its application to things. The first, second and fourth books are concerned with the relation between dispositions and occurrences in the body and occurrences in the mind, which are occasions of error. Malebranche's general remedy for error is the application of mathematical sciences to things, especially our own body.

We have seen how the correspondence between mind and body and the application of mathematical science to the latter supports the view that all rational beings follow the same objective structure, which is identified with divine science. The application of this science is held to be in a form of _conversio ad phantasmata_. Analytic and synthetic methods unpack and re-apply the rules involved in this, giving us formulations of them and their applications. The success of the progressive use of these methods gives the Cartesians and Leibniz another reason to hold that all rational beings naturally follow the same objective structure: divine science is the human ideal and all rational beings are held to be engaged in the same endeavour. The Cartesians propose a hypothetico-deductive method by which we eliminate hypotheses about extensional identities between formal features and descriptive concepts, especially those of material features. Eventually the ideal of divine science is achieved. What is obscure and confused is replaced by what is clear and distinct and perspicuous to any rational being. Leibniz put this in a more general setting. He is concerned primarily with propositions which are used to justify our assertions. He in fact describes the appeal to rules to which two interlocutors are subject and the coordination of conventions. But the ultimate case is supposed, in which there could be no further rules and we are held responsible for performing the logical steps which are meant to be assumed in our ordinary discourse.

In the Discourse Descartes speaks of suppositions which he wishes to eliminate, for he wishes to have all his explanations in terms of concepts which owe nothing to the senses. The elimination of these suppositions involves for the most part the extension of mathematical description to things which were described with descriptive terms. But the suppositions on which he particularly relies and only twice (in Le Monde and the Principles) "proved" are his basic laws of motion. These laws establish the conservation of motion as a scalar quantity and special cases of its conservation as a vector quantity. (For "motion" as used by the Cartesians, one can read "momentum".) To "prove" these laws, Descartes appeals to divine immutability, which must, he feels, be reflected in some way in the world which God creates and conserves. In fact, very little is made of the fact that immutability has a divine source. He warns that, solely judging by the senses, his conservation laws appear not to hold, but he also states that he is only extending to motion a principle which has been applied by others to other properties and even suggests that his laws agree with the most ordinary experiences. One should regard his reliance on divine immutability, not as an attempt to establish something factual about the world, but as formulating a regulative principle for our investigations of nature and the application of mathematics. In a similar vein, even the possibility of mathematics is held to depend on God as the _fons omnis veritatis_ in the _Meditations_. Divine immutability, however, is concerned solely with the application of mathematics: granted that some quantity is conserved, we have a handle on a mathematical description of nature, for we have some constant value to introduce into problems. Yet from the regulative principle alone, we cannot identify the quantity which is conserved. The fact that divine immutability is called upon only for a regulative principle is supported by the fact that Malebranche, in questioning Descartes' laws of motion in the sixth book of the _Recherche_, while accepting that it follows from divine immutability alone that some kinetic quantity is conserved, insists that we must consider descriptions of experiments to determine what this quantity is. In wishing to eliminate what is due to the senses, Descartes did not rule out experiments; he in fact states that we must rely on crucial experiments to arrive at the final explanatory system (which he appears at times to have thought was within sight) and suggests foundations for experimental work at the close of the _Discourse_. Rather, he wishes to eliminate our reliance on concepts involving concepts of material features and natural sortals and bulks. The regulative nature of divine immutability is further supported by the dispute between Malebranche and Leibniz, both of whom accepted the principle. In this dispute, carried out in the _Journal des Sçavans_ in the 1690's, the issue is settled (in Leibniz's favour) by appeal to experiments or descriptions of moving bodies alone.

Another sort of supposition, also called "conjecture" in the _Regulae_, which Desacrtes discusses in the _Discourse_ concerns what he says of deducing causes from effects. The cause-effect relation here is a logical relation or something similar. "Deduce", however, is usually used by Descartes for a relation between terms, those which are given being the causes and those which are deduced being the effects. This was the common use of "deduce" in the seventeenth century; "infer" was reserved for the relation between propositions. When the terms are mathematical, the deduction is the performance of a mathematical operation (e.g., "3+5 → 8") or the redescription of a formal feature in accordance with an isomorphism between disciplines (e.g., "circle with radius r and whose centre is at the origin" → "$x^2+y^2=r^2$"). In either case, the deduction could in principle be a case of intransitive self-teaching and the deduction establishes an intensional identity. Sometimes, if not usually, what Descartes intends by "deduce" is the "deduction" of terms for material features or natural bulks or sortals from terms for formal features. This establishes an extensional identity between the two and is the reduction of our ordinary descriptions of things into the language of the programme whose goal is to be able to explain or predict any event and to describe all of nature with maximum simplicity and exactness. This is the explanation of things by laws formulated in purely mathematical terms, which are held to owe nothing to the senses.

To achieve a complete science, this reduction would have to be performed for all ranges of material features and for every natural bulk or sortal. The "causes" in the deductions establishing the extensional identities are, at least initially, conjectures or suppositions. Descartes states in the Discourse that the deductions as much prove the causes by the effects as vice versa. In the endeavour to achieve the final physical science, one must form hypotheses - here taken as terms conjectured to be extensionally identical with others - and test their consequences in experiments; Descartes particularly suggests crucial experiments. This is the hypothetico-deductive method, but involving terms, not propositions. It is seen as an expedient when Descartes thinks that the complete physical science is within sight. The application of this method is seen in the essays following the Discourse, for which the Discourse was an introduction. In the "Geometry" an intensional identity is established between the concepts of geometry and those of arithmetic and algebra; the hypotheses are justified by following out the consequences of the isomorphism established between the operations of the two and in particular by solving geometrical problems with algebraic methods. In the "Dioptrics" he attempts (among other things) to establish extensional identities between homogeneous colours and the angular velocities of particles; the hypotheses are meant to be justified by accounting for various phenomena involving homogeneous and heterogeneous light. In the "Meteors" extensional identities are established between various formal features and atmospheric phenomena and the hypotheses are to be justified by predictions and explanations they allow one to give of these phenomena. Again, in his physiological works, Descartes attempted to account for not only all the observable motions of sentient creatures, but also the variety of sensations or feelings which we have in terms of his general mechanics. This subsumed physiology under his general description of the world, as given in the Principles or Le Monde, which he once described as a novel.

The details of Descartes' programme were all in a sense hypotheses to be justified by the explanations and predictions they give. Descartes had a sanguine and a practical side: he sometimes spoke as if the complete science was at hand, lacking only the details and that almost anyone, given enough time and following a few informal rules, could attain this; othertimes he recognised the tentative nature of his own general physical principles. Yet he never questioned the view that only those things which perform the analysis escape an analysis in terms of mathematical units and their relations. In the Discourse, where he presents his rules, in addition to rejecting various semi-formal methods current in his day, he claims that the methods of geometry and algebra are not general enough. He suggests in their stead the methods of analysis (claimed to have been a secret of ancient mathematicians) into simples and a consequent synthetic return. The method of analysis was to assign constants or variables to what is involved in a problem. Descartes suggests, not the replacement of this mathematical tool, but its general application to all but res cogitans, where a more descriptive approach is assumed. This method was sometimes described as assuming the truth of what is to be proved, as one forms equations to find the values of variables when certain parameters are held constant. The method of analysis and synthesis is central to the early Regulae, which leads into the development of his geometry, but is cut off before the proposed end. Simples of extended things are considered to be units and constitutive of things. Still, we must rely on conjecture sometimes to assign a particular simple. The synthetic return is then the deduction of terms which results in what can be tested.

Malebranche, in the sixth book of the Recherche, speaks of suppositions as conjectured formal features for the explanation of material features and natural bulks and sortals. Here again he presents the example of the reduction of tones to lengths and frequencies and he also introduces theoretical entities, specified in terms of formal features alone, to explain such phenomena as solidity and magnetism.

Leibniz, as in the Nouveaux Essais and his correspondences with Conring and Tschirnhaus, sees the hypothetico-deductive method in a broader setting, including not only relations of terms for formal features to other terms, but also relations between other sorts of terms and relations between propositions. Leibniz subsumes the hypothetico-deductive method under the method of analysis and synthesis in his exchange with Conring, in which he defends these methods against a rigid Aristotelian rationalism. Against Conring's view that all deduction must be from first principles which are known to be true, Leibniz insists that we rely on principles for which we have no proof and which would themselves rely on other principles for their justification. The purpose of analysis is to make some of these principles explicit. More generally, analysis exposes the truths of reason and their constituent concepts and the truths of fact involved in our cognition of a problem, configuration or state of affairs. The truths of fact here are for the most part general and are to be tested by their consequences. By further analysis beyond the particular problem, configuration or state of affairs, in Leibniz's ideal case one reduces all truths of fact to singular truths of fact which are related in series by the principle of sufficient reason. To reach this ideal, however, one must have made explicit the rules and concepts of our science.

Descartes, Malebranche and Leibniz share the method according to which formal features are posited to explain phenomena and these explanations are tested by their consequences. The purpose of analysis is to make explicit the rules and conepts involved and so give restrictions on which formal features are to be posited. In the ideal case, when we would have the complete science, no conjecture would be involved, as the analysis would reveal the formal features. In all cases which involve the explanation of material features, configurations _in re_ or natural bulks or sortals, the synthesis consequent to the analysis, although involving only rational operations, is a transitive act because the analysis begins with things _in re_ and the result of the synthesis is tested against things _in re_, i.e. the analysis and synthesis are set within an empirical context. The analysis and synthesis together is a _conversio ad phantasmata_ which has been unpacked, revealing the rules and concepts which are applied in our cognition of things. The _conversio ad phantasmata_ is a sort of intuition, while the analysis and synthesis which involve no conjecture is a discourse. Analysis and synthesis, when no conjecture is involved, applies a natural geometry to things in practical cognition as we are held to do naturally in Descartes' and Malebranche's accounts of our judgement of formal features in vision; but in the latter the rules and concepts are not formulated.

When a conjecture or supposition is involved in the analysis and synthesis, it does not unpack the steps we are meant to perform naturally, but presents a context in which to formulate and test hypotheses about the formal features which are constitutive of things. This is only a step on the way to the complete description of the world. Again, analysis and synthesis differ from _conversio ad phantasmata_ in that they are only sometimes concerned with a particular spatio-temporal expanse. More often, analysis and synthesis are seen as establishing the extensional identities we have mentioned. Establishing these identities supposes we already have the science which is followed. On the other hand, purported formulations of this science are held to be checked by _conversio ad phantasmata_. Descartes introduces _conversio ad phantasmata_ in the _Regulae_ as a check on the relation between simple natures, which, when treated merely verbally, are treated discretely. Malebranche discusses the use of the senses in demonstration in the *Entretiens sur la Métaphysique*. Although necessary truths are known only by means of ideas (he maintains), which are the meanings of words, they are more apparent in diagrams in which they are rendered sensible by the sentiments we project onto them: we literally see that the proposition in question is true. In addition, the sensible portrayal of propositions and terms instantiates them and shows that they are possible.

Leibniz repeatedly states that we must consider instantiations of purported formulations of rules and concepts to check their consistency. In the *Theodicy* he refers to a work by Joachim Jungius called *Geometria Empirica* in which theorems are proved by folding parts of figures onto themselves. (Various pages of this work contain figures cut out of the page, attached to it by only one side and contain lines along which theyare to be folded.) Constructions of this sort are only more complex diagrams. Both constructing and diagramming are intransitive acts and are rational practical cognition, while picking out the concepts and rules involved is an act of rational essential cognition. Indeed, one could use natural things as diagrams or constructions in so far as they are only to display rules and concepts.

The establishment of extensional identities between formal features and material features, etc. and the application of science to things in the various ways we have discussed relies on ideas in the sense of objective realities which are not physically in the mind and are not properties of what is physically in the mind, but are standards. They are spiritual objects of spiritual faculties and are spiritual in the sense that they are standards against which our judgements are evaluated. The Cartesians and Leibniz hold that the complete science is the norm to which we are subject throughout our lives; their notion of prejudice depends on this. It is as if no analysis leaves room for conjecture and all acts of essential cognition are the application of the ideal science to things. The rules of a highly sophisticated cultural endeavour are thus looked upon as natural in a certain way, i.e. as spiritual and as the standards for the acts of all rational beings.

It is instructive to consider how Leibniz, by a number of steps, moves from treating these rules as conventional to considering them innate. Leibniz felt thatCartesian clear and distinct perception is not sufficiently perspicuous, for one can always ask for a justification. But he is particularly severe with Locke's terminalism, which relies on the perception of the agreement or disagreement of ideas, where an idea can be of a material feature or a formal feature or based somehow on these. He is particularly concerned to reject Locke's criticisms of praecognita and praeconcessa. These terms were used in the Protestant Scholasticism common to Locke and Leibniz. They are, for example, frequently used by Alsted for what is supposed in a discipline for there to be a common basis on which a disagreement can be resolved. They are at least conventions which must be posited for there to be coordination of conventions; they were also supposed by some to have some foundation beyond convention.

Leibniz held that praecognita must be assumed to be able to exhibit the logical validity of our everyday discourses. Leibniz unlike the Cartesians understood what logical form is and its relation to the validity of arguments. The Cartesians were concerned with verbal forms and their manipulations as these could be applied to arithmetical and geometrical instances; application shows their consistency and the primary function of our non-descriptive terms and conceptsis in their application to things. But Leibniz holds that the correct use of conventional signs is an application of them and their concepts, which are their meanings; thus the use of conventional signs shows the consistency of the statement and justifies the concept. He therefore applies his formalism well beyond the range of Cartesian clear and distinct perception, extending it to law and conventional endeavours in general with his universal character. In his personal papers, he presents his own adaptation of a method of reasoning used at least from Plato's time. One grants the opponent certain _principia directa_ and argues from these on certain unstated assumptions - _principia reflexa_. It is the latter on which the opponent's position is questioned. The opponent can contest the evaluation and one can maintain it, and so further _principia reflexa_ could be called upon. Eventually, if there is not a deadlock, the interlocutors arrive at what neither of them deny, and the issue can be settled one way or the other. This is appealing to common rules to which we are subject or the coordination of conventions. As the _principia reflexa_ were used in the arguments, the validity of the arguments depend on them. Leibniz's notion of evidence is shared by Sergeant (who criticises Locke on maxims in much the same way as Leibniz does) and is of Scholastic origin, related to _praecognita_ and _praeconcessa_. What is more evident (he holds) is not what could be more easily stated. Rather, it is that _principium reflexum_ which one would give to justify someone's (perhaps, but not necessarily, one's own) assertion or argument. The task is to articulate principles which are more and more evident in this sense, whether they are rules to which we are already subject or whether their articulation is a coordination of conventions. In either case, we build up a system of rational knowledge, an objective structure.

This objective structure is peculiar to a culture or even to a discipline within a culture. But Leibniz sees particular cultures or disciplines as manifestations of the same endeavour, following the rules and concepts inherent in a single natural language and articulated in the universal character. By a number of moves he has the supposedly unique objective structure instantiated in every rational being. The first step is the reduction of geometry to arithmatic and more basic disciplines. The next step is to introduce sorites or chains of syllogisms, in which the premises of an argument are substituted for its conclusion in its occurrence as a premise in another argument. Enthymemes are then called upon. Enthymemes (not in the Aristotelian sense, but in the seventeenth century sense) are syllogisms or sorites with suppressed premises. Leibniz holds that our reasonings in every-day life are enthymemes. To display their form, we should analyse them into sorites, each step of which is made with the greatest possible evidence. The analysis is to be in terms of the universal mathematics and the logical form displayed is the same for all rational beings. It is further held that we are responsible in a logical way for the premises of the sorites which are suppressed. Finally, Leibniz holds that we in fact perform the suppressed steps. This is similar to the Cartesian position that we are responsible for judging as we are led by nature to judge, for we could have always articulated and evaluated these judgements.

On the position that one naturally follows non-descriptive rules, there could as well be nothing besides oneself other than a diagram, perhaps only founded in the mind, and the objective structure one follows. We evaluate judgements we make about the world by means of these rules, but these judgements on this position have nothing to do with the acquisition of the rules. The part played by descriptive rules and behaviour in our cognition and our coming to have an objective structure present to us is lost.

In the Sixth Meditation, where Descartes justifies the belief in the external world, he begins by noting the difference between the strength of sensation as opposed to the weakness of imagination; by these differences, we are led by nature to judge of the existence of things. This, Descartes admits, is a sign of the distinction between sensation as a success and imagination, but it cannot itself be the criterion we appeal to in evaluating our reports about the world. Yet to allow it to be even a sign, we must allow that it works in the majority of cases and that our science is applicable. If our science were not applicable, God would be a deceiver, not because we are sometimes deceived, but because there would be no further standard of success beyond the criteria of success themselves. For Descartes, our science is primarily what has an application.

Later in the same meditation he briefly describes the physiology of sensation; this gives an explanation of error and eliminates the doubt whether there is a faculty for deceiving within ourselves. He concludes by presenting a criterion in terms of the coherence of sensing and memory, which are successes, as opposed to the incoherence of merely imagining, e.g., dreaming. The coherence is judged by those truths which are justified by clear and distinct perception. As Leibniz states, truths of fact are justified by truths of reason. Concluding with the evaluative part played by clear and distinct perception fulfils much of the purpose for introducing the arguments from illusion in the First Meditation.

God's goodness is relied on for only two points. First, and most importantly, it is appealed to for the reliability of reason. Without this, not even the questions could be framed. It is then invoked to guarantee that it has an application. But God's goodness is relied upon in different ways in these cases. In the first case, it is essential for the existence of God as the objective structure, for goodness here involves standards from which we may deviate and "all good" implies that the only science we can have is the one we in fact follow. In the second case, it is held that we could formulate the question even if God were not good in this manner. Goodness in the first case is something conceptual, in the second case it is not.

Malebranche, from the publication of the Eclaircissement, held that the validation of reason is a demonstration, by which he means that it is logically impossible for the conclusion to be false. On the other hand, he held (in opposition to Arnauld in their polemic), the rejection of doubt in the existence of the external world in the Sixth Meditation is only a proof, by which he means that one cannot reasonably doubt the conclusion, but it is not logically impossible for it to be false. He holds, then, that we could have all those occurrences in the mind which we have and apply the science we follow to these occurrence, while in fact there is nothing besides the occurrences and God. Leibniz held the same in the Discourse on Metaphysics, stating that it is possible for there to be only myself and God, while I have all the sensations which I in fact have with the world as it is.

Malebranche is correct on this point. Given the relation between following an objective structure and its application which the Cartesians and Leibniz accept, there is no way of showing that what is taken to be the world is anything other than a diagram founded in the mind. Our science is held to include only non-descriptive rules and concepts, which are independent of how the world is and what we are like. This is held to be applied by virtue of occurrences in the mind which are projected in spatio-temporal displays. This activity involves rules by which we evaluate whether such projections are correct or incorrect, but the evaluation need not go beyond moves on the diagram.

Malebranche (in the same contexts in which he writes that Descartes' proof is not a demonstration) allows a demonstration, albeit conditional, justifying the belief in the external world. If one believes (he states) what is related in scripture, then one must believe that an external world exists since it is referred to in scripture. This has been criticised for supposing the existence of a material artifact. But it does not, for all that is supposed is a belief that certain events took place. It has also been criticised for not demonstrating what it sets out to, i.e. that if one believes what is related in scripture, then one must believe that a material world exists. But Malebranche's concern is not so much with matter as with extended things and in so far as spatial relations are referred to, this conditional demonstration stands.

The reason the non-existence of the external world is possible for the Cartesians and Leibniz is because a conceptual connection is turned into a connection relying on divine goodness. This is so because occurrences in the mind are held to naturally take place in roles. Descartes indicates part of the reason this is held in introducing a physiological account in the explanation of error: the body naturally performs certain operations according to a natural geometry which it instantiates and these operations correspond to spiritual operations performed by the mind following this geometry. The concept of <u>rés cogitans</u>, it is held, is instantiated naturally in us. Furthermore, the will, which is held to carry out the applications of the rules and concepts, is regarded as a faculty, almost a force, distinct from the facilities we have by being evaluated in accordance with the rules shared with others. Yet the geometry and indeed all the standards of simplicity and exactness which we are held to follow naturally are conventions arising from a sophisticated cultural endeavour.

Now to be engaged in this discipline, we must (at least initially) be evaluated. To be evaluated, we must perform transient acts which can be picked out by another engaged in the discipline. But for these to be picked out, descriptive rules must be employed, either to pick out the person or to pick out an enduring intransitive act, such as a diagram. Furthurmore, in learning to apply a subject comprising only non-descriptive rules, one must be subject to descriptive rules. There are two things left out of the account we have just criticised which severs the conceptual connection between the fact that we have science and the existence of things spatially distinct from us. One is the role of behaviour, which is necessarily spatial: one can perform sophisticated activities only because one has been inducted into a culture by means of the evaluation of one's behaviour. The second thing left out is the part played by descriptive rules, which depend on how the world is and what we are like. By splitting these between non-descriptive rules and occurrences in the mind corresponding to physiological occurrences, the conceptual connection in question is lost and divine goodness is called upon to guarantee the existence of the external world.

CHAPTER XI

COGNITION AS RULE-GOVERNED ACTIVITY IN THE RATIONALISTS, PLATO, AND KANT

We maintain that the model for the rationalists' accounts of knowledge and cognition, despite some very serious flaws, was rule-governed actions. In this chapter, we shall present analyses of some of their positions to bear this out. Now Plato's position has at least a superficial resemblance to seventeenth century rationalism. In particular, Platonic Ideas or Forms are standards which are neither made by us nor derived from natural things. We shall discuss Plato, then show in what respects rationalist positions differed from his, especially in way of including elements relating to rule-governed activity. Again, it has been claimed that Kant was the first philosopher to maintain that rules are furnished by the mind. I do not dispute that much of what he wrote about cognition can be seen to relate to rule-governed activity. But, in discussing Kant's theory, I shall maintain that just as strong a claim can be made for the view that rationalist accounts were modelled on rule-governed activity.

We shall emphasise certain insights which are connected with construing cognition as a rule-governed activity. We shall look for them in the positions we present. However, in all these positions - the rationalists', Plato's, and Kant's - overt behaviour and convention are ignored. In all cases, furthermore, the reason these factors cannot play a proper part is because the accounts suppose an immaterial soul as the subject of knowledge and assign some essential part to God. The insights remain, but are, as it were, deflected upward to be incorporated in a conceptual framework built around the notions of an immaterial soul and God. Such a conceptual distortion introduces "problems", that is, pseudoproblems, many of which are well established and apparently respectable, but no longer face us if the insights are kept at the level of overt behaviour governed by conventional rules.

In the case of the rationalists, what remains of the activity of persons is captured by the concept of the mind. The acts this concept reflects are speech acts.[1] We are held to be conscious of occurrences in the mind - shadows of speech acts. Indeed, the notion of consciousness more than anything secures remnants of the concept of a person, for consciousness was linked to responsibility for our own acts.[2] Of course, something more is needed to pick out the thing we hold responsible; so we come back to overt behaviour.

A point to note, however, is that error, judgement, and responsibility are allowed for. Generally, the rationalists hold that we are not just spiritual automata functioning in accordance with the rules of divine science. (Spinoza, who does not invoke consciousness, accepts this consequence.)

There is, on the one hand, something modelled on a person, who errs and needs practice and method to develop his judgment. But, on the other hand, there is the individual performing acts which are best described by a mathematically trained anatomist and which follow the rules of a rigid and completely specified objective structure. The two positions are not easily reconciled. There opposition becomes particularly acute for Leibniz, who holds that in some sense we perform acts of infinite detail, although in another sense we perform only certain resultants of these acts. We are held responsible for - are conscious of - only the latter, while the former are simply the computations of a spiritiual automaton. But how can a person's (free) acts be resultants of computations, Leibniz's answer is taken from beyond the bounds of human action, for he treats acts as limits (in the mathematical sense[3]) of an infinite number of computations.

It is obvious that there are differences between the contemporary and rationalist notions of a rule and what it is to follow a rule. But all that I claim is that the rationalists had notions which can be properly characterised as such. When the differences are made explicit, the reasons for the differences become clear. The differences can be summed up by saying that, whereas the contemporary position relies on what is public - conventions and overt behaviour - rationalism cashed out "can be scrutinized by others" in terms of being subject to the scrutiny of God. The notions of God and the soul had such a grip on the minds of practically all men for centuries that insights which in the present cultural climate could have been formulated in a self-motivated way were very naturally formulated in terms of the immaterial soul and God. The supposed relations between God and the world are summed up in the theory of providence. Providence involved two systems of divine science: nature, relating to the architecture of the world and generally what is "material" (roughly, what requires materials for its construction), and grace, relating to the laws governing rational agents and generally what is "spiritual", directly subject to the laws.

In brief, considerations were deflected from their own proper sphere into a traditional framework. However, there was a great deal of latitude in the interpretation of "God" and "soul". And a great deal of philosophical and even scientific consideration had been deflected into this sphere well before the period under consideration. So much so that the resulting systems passed well beyond what was motivated by merely religious considerations and the philosophy became enshrined in religion. In some cases, indeed, what passed as a point on, e.g., the divine nature to us appears to have no religious relevance whatsoever. This sort of deflection is illustrated by the debate among the rationalists on how divine simplicity is manifested in the natural world, which, in fact, concerned the basic conservation laws of physics.[4]

The upward deflection of analysis, however, introduced "problems" which otherwise did not occur. For example, there appear to be two systems of rules: those which we appear to follow and those of divine science. This arises from the fact that a philosophical insight has been theologically enshrined. The particular insight is that, for something to count as a correct performance, there must be a criterion distinct from the performance and purported repetitions of it; and the criterion cannot be natural things, since, for them to be relevant, there would have to be a cognitive performance in the first place. Rather, the criterion must be a rule or principle of evaluation not unique to the person in question. This insight is deflected because God is regarded as having the last say in the evaluation of acts and thus as guaranteeing the public nature of rules. The rules are then thought of as governing not only overt actions, but also the architecture of natural things, and so as standing behind the natural behaviour of agents.

The fact that insights are theologically enshrined does not make vacuous the claim that the rationalists had notions of a rule and rule-governed activity, for some important insights are not thereby sterilized and still enter into an account of human knowledge and its application. We have just mentioned the insight corresponding to the private language argument. Another is the awareness of the roles of tacit knowledge - we always mean more than we say, or any act of cognition always presupposes more than one explicitly thinks. (This insight was behind the method of analysis and synthesis.) Finally, there is the insight that features are not simply read off things; rather, there is the contribution of the knower, for what we pick out depends on the rules we follow. This last insight calls for some comment. It relates to the emphasis the rationalists put on what I have called intransitive self-teaching or "reflection", the emphasis on non-observational knowledge, some of which was held by some (but not Malebranche) to be knowledge of self, since it relates to the concept of res cogitans. Rationalist accounts sometimes give the impression that no effort is needed on our part to become explicit about the concepts in question, that there is some sort of mystical intuition. Yet the rationalists with whom we have been dealing all emphasised the need for "sensible signs".[5] Still, the insight has been perverted to the extent that the rules and concepts in question are given ontological status (in God), they are held to govern a person's activities independently of his history or cultural relations, and the activities are thought of as spatially simple.

The upward deflection of these insights, although it did not sterilize them, introduced "problems", such as the problem of the attribution of cognition to individuals. Another problem arises from regarding agents as somehow following the rules of science (in the seventeenth century sense) from birth. Questions about the application of our science became extended to our being alive to natural features in our environment. This eliminates the motivation to consider how we are able to use words to pick out natural features, how convention links up with our natural environment, and thus blinds one to self-motivated considerations of how rational knowledge ties up with natural forms of behaviour and empirical knowledge. Being alive to features was regarded as, on the one hand, natural, but, on the other, similar to conventional acts such as uttering observation reports. This relates to the neglect of "descriptive rules" we discussed earlier. It also introduces traditional "problems of perception" and even enshrines phrases such as "the testimony of the senses". Even though the major figures of the framework are rejected the old "problems" and phrases die hard.

We can illustrate how some of theinsights remain by considering Malebranche's proofs for his position that we see all things in God. He uses the argument similar to the argument we relied on in Chapter V, that if ideas were in the mind, they would leave unexplained what they are posited to explain. Indeed, this is similar to the private language argument in that it maintains that private events need non-private criteria. We shall restrict the material to Malebranche's first presentation of the thesis, in the Recherche (1674), and his defence of this in Eclaircissement X (1678), and adds as a supplement an argument developed at greater length in the Méditations Chrétiennes (1683).

There is reason to take the points brought up in these proofs as representative. Malebranche always maintained that he developed a theory of ideas (objective realities in Descartes' terminology) which Descartes would have gone on to develop.[5] And Leibniz's theory of pre-established harmony was developed with a close eye on Malebranche's occasionalism,[6] which plays an essential part in these proofs. In opposition to Malebranche's position, Locke's Examination of P. Malebranche's Opinion ... (written in 1694) shows a neglect of the insights in question.

At the end of L.III, P.II, chap. 1 of the Recherche, Malebranche states that there are only five conceivable ways of explaining how we apperceive material things. In the next four chapters, he dismisses one by one the first four explanations. And in the sixth chapter he supports his own position.[7] The four rejected alternatives are: 1) that ideas of bodies come from these bodies; 2) that our sould has the power to produce these ideas; 3) that God produced our ideas with our soul, or that He produces the ideas whenever one thinks of an object; and 4) that the soul has in itself all the perfections which it sees in bodies.

The first alternative is the Scholastic account in terms of intensional species and the intellectus agens. The arguments against this in the Recherche all concern points of physics.[8] The philosophically more interesting points concern the second alternative.[9] Both alternatives are argued against more thoroughly in the Méditations Chrétiennes, where he maintains that features are not simply read off things and that some rule is needed beyond private events. If ideas are to perform their intended role, the argument begins, then they cannot be copies either of images received in the brain or of what is remote from the body.[10] The projections of the figures of bodies depend on their relative situation to us, yet we always see the same figure.[11] Furthermore, in perspective drawings, we see a figure different from that drawn on the surface.[12] We cannot be said to form the appropriate ideas, for the ideas play their part without us thinking of,[13] knowing about, or even feeling the supposed formation.[14] Again, if we form ideas, we must form them according to some model; but then the model would suffice.[15] In short, forming ideas either from bodies or from nothing presupposes that we have those ideas. In the Recherche, the view is aired that the mind has general and confused ideas which it does not produce and that those which it produces are particular and more clear and distinct. But, it is replied, as a painter would have no reason to think that he has portrayed a particular man if the man is not present and he has no distinct idea of him, so someone who has only, e.g., the idea of an animal in general would have no reason to think he has a distinct idea of a particular sort of animal if he has not already a first idea with which to compare the second; but if he has the first, there is no point in forming the second.[16]

Locke, referring to the first alternative, states that, "since my principles have been said to be conformable to the Aristotelian philosophy, I have endeavoured to remove the difficulties it is charged with."[17] He agrees that species as generally understood are unsupportable,[18] but thinks a new physics overcomes the difficulties.[19] So, e.g., the impression of a ray of light, when communicated to the brain, produces ideas in the mind. But how this is so, Locke says, is incomprehensible.[20] Locke, in fact, gives no reply to the points mentioned in the last paragraph; rather, he insists that ideas must have causes to link them to the world.

Malebranche saw the third and fourth alternatives - usually conflated -

as the main rivals to his position. In arguing against these positions, he makes use of insights about the need for non-private criteria and about tacit knowledge. His rejection of these alternatives follows from two premises.[21]

I. The ideas we use are infinite both in number and in reference, used by all, and are necessary and immutable.

II. But none of these attributes are true of the soul (but they are true of God, who is "intimately present" to us).[22]

Malebranche feels that Descartes' first proof of the existence of God (largely concerned with premise I) shows the falsity of the last two alternatives.[23] He feels that his proof shows that the mind apperceives the infinite, but does not "comprehend" it - i.e. "take it all in" - and also that the idea of an infinitely perfect being cannot be something created. Furthermore, this proof is meant to show, as Malebranche puts it, that the mind has the idea of the infinite before that of what is finite. This is justified by stating that we must have (or there must be present to us) at all times the ideas of all things, because one cannot set oneself to think of (or "see" as he uses the term) objects of which one has no ideas. Much the same is stated when he says that we cannot desire to "see" a particular object unless we have already "seen" it, if only confusedly and in general.[24] What he is referring to is not making a representation (as the second alternative maintains), but finding a model, for he states that the idea of the infinite is not from the confused assemblage of all the ideas of partuclar beings as (Scholastic) philosophers think. Generally, the point is that any act of cognition presupposes a great deal of knowledge which remains tacit; and all this knowledge interrelates; finally, general knowledge is applied in particular cases.

In Eclaircissement X, Malebranche speaks of "la Raison universelle" being present to us.[25] This Reason is said to be infinite: we celarly see that there are or could be an infinite number of geomatrical figures, that irrational numbers have an unending number of numerals in their decimal expressions, and that we apperceive infinity in space.[26] Reason is said to be "universal", i.e., the same for all men.[27] Here Reason is thought of not only as a system of ideas, but also as a body of necessary truths and "eternal laws".[28] (The latter are moral rules and are said to be relations of the perfections of things. They are conceptual without being mathematical.) Reason, Malebranche continues, is necessary, ideas are immutable, and ideas and numbers are immutable, necessary, and independent.[29]

Locke found incomprehensible Malebranche's statement that the immediate object of our clear knowledge is an immutable and necessary nature. Significantly, Locke argues against Malebranche's position as Malebranch and I have argued positions similar to his: i.e. ideas (or other sorts of cognitive equipment) do not expalin what they were posited to expalin. For, Locke states, "how can I know that the picture of any thing is like that thing, when I never see that which it represents."[30] More generally, if things are in God only eminently (i.e. as concepts), and we see them only in Him, "we can be said to see them only 'eminenter' too", and so seeing all things in God signifies "no more than that we perceive them we know not how".[31] That is, by "seeing" these immutable, necessary natures alone, we could never know what actually exists.

But this both misrepresents Malebranche's position and suggests in its place what Malebranche has disproved. It misrepresents his position because an idea in Malebranche's sense cannot be compared with a picture. Further, ideas are concerned, not with what exists, but with what can exist; our judgements of existence, rather, are related to sentiment. Malebranche draws this distinction sharply and clearly in Eclaircissement X,[32] the text discussed by Locke in this context. But Locke claimed that he found the distinction between idea and sentiment unintelligible. It was probably remarks such as this which led Leinbiz to suggest that Locke feigned ignorance in the Examination.[33] Again, Locke's criticism suggests the first two alternatives (already disproved) in that the need to already have ideas by which one picks out things is denied; Locke looks for the model in the things which themselves are picked out in the employment of ideas.

In the same comment on Malebranche's statement that theimmediate object of our clear knowledge is an immutable and necessary nature, Locke adds that

> (if) these words do not mean that ideas are true unchangeable representations or things, ... then they can only signify, that the idea I have once had will be unchangeably the same in my memory; but when another different from that comes into my mind, it will not be that.[34]

Universal reason, he states, is only the power men have to consider the ideas they have one with another (e.g. if two people consider two times two, they both must find that it equals four) and we reason by finding intermediate ideas for comparing ideas which cannot be compared by juxtaposition.[35] "Any idea that we have", he adds, "whencesoever we have it, contains in it all the properties it has, which are nothing but the relations it has to other ideas, which are always the same".[36]

But here again, Malebranche's argument against the first two alternatives tells against Locke: we must first have a model to form an idea (in Locke's sense) instantiating these relations. Ideas, like words, must be individuated functionally. Locke cannot give a criterion of individuation for ideas. Furthermore, reasoning presupposes the presence of an objective structure, what is physically in the mind is describable as reasoning, thinking of ..., etc. only as it conforms to this objective structure.

The second premise of Malebranche's argument against the third and fourth alternatives is that there is nothing in us which is universal, necessary, or infinite (but there is in God, who is intimately present to us). Supporting this in Eclaircissement X, he states that

> je puis n'estre point, ou n'estre pas tel que je suis: il peut y avoir des esprit qui ne me ressemblent pas; & cependent je suis certain qu'il ne peut y avoir d'esprits qui voyent des véritez & des lois differentes de celles que je vois ...[37]

On the other hand, we apperceive, claims Malebranche, the idea of the infinite, necessary and immutable natures, etc. And these ideas are identified with God Himself, who is traditionally assigned the requisite attributes.[38]

The move from premises I and II to the conclusion that we see all things in God involves premises which are suppressed in most of Malebranche's arguments. A brief look at these will indicate how the insights Malebranche captures are defected upward. And, as these premises involve what we "see" in God and how we "see" it, they help to explicate Malebranche's thesis.

The first such premise is connected with the fact that, for Malebranche, vision <u>in</u> God is not vision <u>of</u> God. This essentially Scholastic premise is that God, to create all beings, must have the ideas of all beings; thus He "sees" (cognises) these beings in considering the perfections He contains which relate to them. What is in God determines what we see in God and in Eclaircissement X this is "la Raison universelle".[39] Malebranche (in express opposition to Descartes) states that we conceive this reason to be in a sense more independent than God Himself because it is necessary and independent and God can act only in accordance with this reason. But traditionally it is held that God depends only on Himself. So Malebranche concludes that this reason is not distinct from God. Thus we know God by knowing this reason; also, he adds, by knowing "l'Ordre", i.e., the eternal moral laws.

Locke objects to Malebranche's statement that all creatures are in God, although in a totally spiritual manner. He thinks that this almost asserts a variety in God, making material things a part of Him. Alluding to Malebranche's view that we have no idea of the soul, Locke adds that

> yet I fear he must be forced to talk, who thinks he knows God's understanding so much better than his own, that he will make use of the divine intellect to explain the human.[40]

But on Malebranche's position we primarily know la Raison universelle and l'Ordre and "see" things in God because He is subject to these as well and is assigned the same attributes as those which apply to him. Malebranche says that ideas are universal, i.e., models which anything must follow if it is to be called rational.[41] It was generally assumed that there are activities universal in this sense; this is a result of not understanding the nature of convention. On Malebranche's position, in knowing universal reason, we know about others just as much as we know about God. Since it is held that all other rational beings must be subject to this reason and that this reason is independent of the fact that there are finite rational beings, a foundation is sought in an omnipresent being whose existence is not contingent.

How we are held to see things in God is enigmatically stated by Malebranche when he claims that the mind can see theworks of God in Him, given that He wants to reveal what in Him represents these works.[42] This qualification introduces occasionalism and the need for God not only to furnish the rules specifying the roles sentiments occur in, but also as a cause of these modifications. This does not introduce a deus ex machina, for God is held to have a plan - providence, involving nature and grace, the most important aspects of which are covered by l'Ordre - which He cannot transgress without belying His attributes.[43]

The part played by this so-called natural revelation is given by another premise which is usually suppressed in Malebranche's arguments for the position that we see all things in God. This premise can be stated in three ways.

i) God is intimately united or present to our mind; so what in God represents created beings - viz. ideas - are present to the mind.

ii) God can act on the mind and (as is consonant with occasionalism) only God can so act; so God can reveal ideas to us, He contains ideas and His substance is very efficacious.[44]

iii) God's substance is very intelligible;[45] the mind can "see" in God what represents created beings (viz. ideas) because they are very spiritual (i.e. abstracted from particular conditions, such as time and place) and intelligible.[46]

The presence of God is needed to identify the objective structure one is subject to with divine reason. And divine efficacy is a restatement of occasionalism. What requires an explanation is the part given to intelligibility.

The intelligibility of the divine substance or divine ideas concerns how God brings it about that we "see" bodies, ideas, or necessary truths. Malebrancheuses two success verbs when speaking about the exercise, acquisition, or formulation ofknowledge: "voir" and "appercevoir". His most famous thesis was formulated in terms of "voir", which Arnauld and Locke sometimes took (probably malignantly) as an ocular thesis. But "voir" or "see" is very much at home in non-ocular contexts, e.g., when it has the sense of "find out" or in the phrase "see about ...". More relevantly, "see" often has much the same force as "understand", implying, if anything, a clearer grasp: e.g., when we say we see what someone means, the point, or how something could happen.

The seventeenth century was familiar with the use of "see" in contexts of seeing God or seeing things or their essences in God as this was formulated in theology.[47] This use, in fact, is figurative or metaphorical, for it combines features of "see" as a general achievement verb, similar to "understand", with the feature of "see" in the ocular use, that things are sometimes said to be seen in something. Indeed, the analogy of seeing things in a mirror was used in theological contexts and also in cognitive contexts to explain cognition involving the Thomistic verbum, an objectum in quo.

Malebranche's use of "see" approximates its use which is similar to "understand". When only physiology is involved, he restricts himself to the activity verb "regarder"; "see" enters only at the level at which something is grasped. And Malebranche is interested in the portion of this level which involves conventional, especially linguistic, rules. "See" is given somewhat wider scope in that any activity evaluated as correct according to these rules is taken as a case of seeing.

Yet Malebranche accepts the feature of the theological use of "see", taken from the ocular use, by which something is seen in something else. Thus he speaks, on the one hand, of seeing bodies - or formal features of bodies (since the essence of body is geometrical extension) - in God, and, on the other, of seeing our own modifications - sentiments - in ourselves. What is seen in God involves ideas, that is, non-private standards, so success; what is seen in ourselves involves no such standards, so the question of success does not arise. Malebranche accepts Descartes' à nosse ad esse valet consequentia, so the standard of success attains an ontological status.

Grammatically, Malebranche's use of "appercevoir"[48] is closer to the Scholastic "cognoscere" than to the Scholastic "videre"; in particular, it is not followed by "en". Yet, unlike the use of "cognoscere" by the nominalists and Suarez (who did not accept à nosse ad esse valet consequentia), he uses "appercevoir", like "voir", as a full success verb. Indeed, "appercevoir" in seventeenth century French was close in meaning[49] and identical in grammar[50] to "voir". The major difference is that "appercevoir" avoids the physiological commitments and correlates with a much broader range of activity verbs than "voir" in its ocular use. This was especially true when "appercevoir" was used with no implication of direct investigation of one's environment, as w n the activity is expressed by the phrase "give one's attention to".[51]

Malebranche distinguishes sharply between one's apperception of external objects - which requires ideas[52] - and one's apperception of one's own modifications.[53] As "appercevoir" is a success verb, Malebranche holds that the understanding simply apperceives,[54] so it cannot fall into error.[55] Error goes with what we do - judge - which is assigned to the will. Malebranche also speaks of judgments in the sense of propositions; they are held to be relations of ideas, which themselves are relations. Reasonings in turn are said to be relations of judgments. He admits that the understanding apperceives judgments and reasonings; the apperception involved is said to be simple.[56] Malebranche puts a great deal of emphasis on "attention", which is essential in formulating arguments, judgments, and ideas; i.e. it is involved in making our tacit knowledge explicit. Attention, he states, presupposes apperception.[57] He is left to explain erroneous formulations. Error or falsity, he states, is a relation which does not exist, and so is not "visible" or "intelligible"; e.g. we can "see" that two times two is four, but not that two times two is five.[58] So, also in the context of the formulation of knowledge, the standard of success is given ontological status.[59]

We have partially answered the question in what sense ideas and the divine substance are meant to be very intelligible. For the divine substance simply is these ideas, which are standards of success. It remains to show how intelligibility is connected with divine efficacy and in what sense God is held to reveal ideas to us. Arguing against the third alternative, Malebranche states[60] that, even if the mind had a store of all the ideas needed to see objects, it would nevertheless be impossible to explain how the soul could choose the ideas to represent the things. Malebranche escapes his own criticism only because he maintains that, although all ideas are present to us confusedly and in general, certain ideas in particular are "revealed" to us by God producing modifications in the soul.[61] According to Malebranche's occasionalism, these are produced, not gratuitously, but strictly in accordance with certain laws of the union of the soul and the body.[62] And God created and conserves all things in accordance with the rules of la Raison universelle and l'Ordre. God, in creating what is physically in re and what is physically in the mind, follows these rules; what thus exists is what it is only in so far as it conforms to the rules. And by the laws of the union of the mind and the body, what is physically in us maps what is physically in re according to these rules or ideas. In this way, the efficacy of the divine substance "reveals" certain ideas to us. God thereby causes us to apperceive certain bodies. Malebranche does not hold that there is one idea corresponding to each body; rather, he maintains that ideas - which are mathematical universals - are "made particular" (his version of conversio ad phantasmata) by sentiments. Ideas - thus God's substance - being the standards of success, are said to be intelligible. Intelligibility is also connected with efficacy, because occasionalism requires divine activity in accordance with that reason which is held to be common property.

The insights on which this edifice is built comes from considerations of behaviour governed by conventional rules, particularly rules (such as those governing mathematical activities) which are relatively independent of how the world is and our biological equipment. The insights are translated into, and distorted by, the traditional language of divine science and the rational soul. How the doctrine of occasionalism arises can be seen by consdiering that rule-governed behaviour is appropriate to, but not determined by, the circumstances in which it occurs. Formal features are the contribution of the cogniser to what is cognised. They depend on the rules and concepts of the culture to which he belongs and are standards of intelligibility. But Malebranche thinks of them as worked out to the greatest possible degree and as standing behind all rational activity. Furthermore, rational activity is held to be non-spatial. There then arises the need for a bridge between this non-spatial activity and what instantiates formal features. Finally, the correspondence between the two is again thought of in terms of the same rules and concepts.

One reason the suggestion that rationalist positions capture insights about rule-governed behaviour might appear implausible is that so much emphasies was put on mathematical natures. These are not propositional and indeed our cognition of them is described as a sort of intuition.

Against this, we have maintained that these natures can be correctly thought of as concepts, the knowledge of which necessarily involves the knowledge of rules. This position is supported by the fact that the status of mathematical natures was discussed largely in terms of the propositions in which they occur; and, further, such propositions were put on a par with legal rules.

The crucial move in the formulation of rationalist positions was Descartes' identification of human and divine science. Although Malebranche and Leibniz rejected his position that God creates eternal truths, their attitude to such truths and their relation to human knowledge were much the same. What they differed in was the relation of eternal truths to divine knowledge and activity.

Descartes in 1630 wrote[63] that eternal truths are true because God knows ("cognoscit") them; it is not that God knows them because independently of Him they are true. For to will and to know ("connoistre") are the same in God; thus, from the fact the He wills something, He thereby knows it, and thus only are these true. So it is false that if God did not exist, these truths would still be true. Descartes' words are remarkably similar to one of Suarez's formulations.[64] Descartes contradicts Suaraz's position and adds that, if people understood the sense of their words, they could not hold this position without blasphemy.[65]

The blasphemy was the denial of God's independence. Descartes states that everything, not just what subsists (in re), but also order, laws, and the foundation (ratio)) of what is true and of what is good, depends on God; otherwise He would not be completely independent to create what He creates.[66] Eternal truths have some sort of ontological import for Descartes. He states that not only to will and to understand, but also to create are the same simple action in God without even a distinction of reason.[67] Furthermore, as truth (like objective reality) is something, God caused eternal truths as He caused all else, viz., as their efficient cause.[68]

Yet Descartes suggests differences between the way God created eternal truths and the way He created things in re. God, he states, created eternal truths "ex hoc ipso quod illas ab aeterno esse voluerit et intellexerit"; but he immediately adds that, if "creavit" is restricted to the existence of things, "disponuit" or "fecit" could be used.[69] Descartes later became less sanguine about divine efficacy and eternal truths. In the Principia, he rules out dispute about what is infinite, condoning only discussion about what is indefinite (e.g. the divisibility of matter).[70] He then states that, as we do not participate in the councils of God, we should not look for final causes, but consider God only as the efficient cause of all.

Still, it is crucial to Descartes' position that we participate in divine science. What we clearly and distinctly perceive presents restrictions on what there can be and in the Regulae the mind is said to have something divine: the basis of mathematics.[71]

The passage which reaches a happy medium is in the Sixth Replies, where God is said to be the efficient cause of eternal truths, but in the sense in which a king effects a law ("eâdem ratione qua Rex est legis effector"). Thus eternal truths do not depend on the human intellect or any other existing things, "sed à solo Deo, qui ipsas ab aeterno, ut summus legislator, instituit".[72]

However, the law effected is not a physically existing thing ("non sit res phsyice existens"), but an ens morale.[73]

We can now appreciate the ambiguity in the statement "Objective reality needs a cause". This can concern objective reality itself or the objective reality of what is physically in the mind. As God creates things phsyically in re exhibitng objective realities, so He creates occurrences in the mind having objective realities. But objective reality itself no more needs a case than does God creating, although God might not have created.[74]

Malebranche and Leibniz as well still regarded eternal truths as rules like the laws of a state, even though they held that these truths are not effected by God. For the realm of nature is placed beside the real of grace. The rules of both govern God's activity in creating and conserving the world, the demands of the one being belanced against the demands of the other. Indeed, la Raison universelle if anything took on more of the aspect of a body of laws, for consideration of final causality were admitted. Malebranche and Leibniz also maintained that divine science governs our activities. They rejected Descartes' position because they held that, for such predicates as "good" and "omniscient" to apply to God, He must follow rules, which then are principles of evaluation of His actions. A dependencce of God on something distinct from Himself was avoided, because divine science was held to be part of the divine substance. Descartes well knew that the question of truth does not arise unless there is something which could get it right or wrong.[75] For him, talk about divine science has a point only as this same science is followed by rational creatures. Independently of them, the concept of God, for whom Descartes was so anxious to allow freedom or (more properly) indifference, is idle; for in this case there are no criteria for God's acts.

Malebranche and Leibniz were also concerned with divine freedom (in opposition to Spinoza). But, because God must follow divine science and cannot belie His attributes, Leibniz (and Melbranche to a lesser degree) is faced here with a problem similar to his problem how rational creatures are free to act. His solution for creatures is in terms of free acts as limits approached by the infinite number of determined acts from which they result. In the case of God, Leibniz answers the problem in essentially the same way (as, in a less strict fashion, does Malebranche). Nevertheless, it remains in some sense true for both Leibniz and Malebranche that God must create things as He does. For, if the attributes in question hold of Him, He cannot make mistakes. In the end, God remains like a machine; or, rather, the plan of a machine, partially realized in the world.

The insights, deflected upward, take "problems" with them. In the present case, either God is somehow meant to perform rule-governed activities - viz. effect laws - while subject to no rules or laws; or He is meant to follow rules, yet necessarily be immune from error. Both positions are incoherent.

In light of what has just been discussed, it is worth emphasising that Leibniz, when he writes on logic and methodology, treats legal rules and less intuitive mathematical rules in much the same way. This reinforces our position that the rationalists thought of "eternal truths" in general along the lines of rules of a state or culture. This is further supported by a look at Leibniz's views on method in general. His position can be considered an emendation of the Cartesian position; to the basic view of analysis and synthesis, Leibniz adds non-Cartesian elements. In particular, Leibniz is more sensitive to the use of language independently of spatial displays of the features in question. He is concerned with making explicit tacit knowledge, which is the contribution of the agent in a cognitive situation. This is held to be non-private and to furnish principles for evaluating the activities of others.

Leibniz saw language - the use of "sensible signs" - as involved in all out thought.[76] Mathematics suggests to him a way of capturing the reasonings involved. For mathematics has the particular advantage that figures, numbers, etc. can be "sensibly presented" - mathematicians have been so successful in their reasonings because in abstract mathematics "on peut faire des experiences ou preuves continuelles, non seulement sur la conclusion, mais encore à tout moment, et à chaque pas qu'on fait sur les premises en reduisant le tout aux numbres..."[77] Leibniz claims that Aristotle dressed his logic in the form of a mathematical science; but he damningly criticises Aristotle for not learning from mathematics the lesson that our reasonings are captured by a symbolic formalism.[78] On the other hand, Leibniz claims that the Stoic legal theorists, especially Chrysippus, came close to the methods of geometers; their digests are said to contain demonstrations which are not captured by Aristotelian logic.[79] Now legal reasoning is not aided by diagrams the way geometrical demonstrations are; In Leibniz's language, the thoughts involved cannot be exhibited in corporeal ways. Leibniz holds that this is true of the greater part of human thoughts; so an analysis of notions in a symbolic formalism, he claims, is needed not by theorlogians andphilosophers, but also politicians and even physicians.[80] The formalism is meant to capture established <u>use</u>. He states that the formal force of arguments is above all recognised where they are "bound as if by ceremonies" so that "the mind cannot wander". This situation obtains when Scholastic formulae and geometric demonstrations are used; Leibniz also mentions the arithmetical calculations found in merchants' books; finally, particularly clear cases of these "ceremonies" are forensic and judicial processes.[81] The corresponding "ceremonies" in mathematics involve rules permitting one to write down one string of symbols, given certain others, to make certain marks, given a certain distribution of marks in a diagram, etc. On the one hand, judicial processes are regarded as having the rigourof mathematical demonstrations; on the other hand, mathematical demonstrations are viewed as public ceremonies constrained by rules.

For Leibniz, human thought is to be investigated through our use of language:

> ... je crois véritablement que les langues sont le meilleur miroir de l'esprit humain, et qu'une analyse exacte de la signification des mots ferait mieux connoitre que toute autre chose les opérations de l'entendement.[82]

The language in question is ordinary language. He claimed that religious disputes about predestination arise from the misuse of words ("missbrauch der worte"). He adds that a single clear word from ordinary language (" 'aus gemeinem leben genommen' "), circumscribed by an exact definition is more enlightening than a thousand Scholastic termini and distinctions. So he would write in German, he concludes, if it were an international medium; but he must settle for Latin, in which he attempts to present everything in natural manners of speaking, "deren sich auch ein lateinischer Bauer (wenn einer in der Welt wäre) gebrauchen würde ..."[83]

Leibniz, unlike most of his contemporaries, understood what logical form is.

> Mihi verò omnis ratiocinatio quae vi formae concludit, hoc est quae semper successura est, substitutis in praesentis exempli locum exemplis aliis quibuscumque, rectam formam habere videtur.[84]

Furthermore, there are, he emphasises, certain rules or laws by which logical form is explicated, whcih justify inferences, and which, if followed, guarantee that the conclusion is as "safe" as the premises, i.e., they are truth-preserving.[85]

He also understood the extent to which the notion of logical form can be applied. In the outline of a proposed encyclopedia, he suggests that under the article on logic the most commonly used modes of inference be ordered in classes and derived from certain simples to show that these inferences "in forma concludant". Still, they are not to be changed into other forms (as is done in the Schools), but left as they are found in ordinary use or the works of authors.[86] However, it was projected that the analysis of ordinary language would reveal general principles, seldom articulated, underlying all linguistic use, and so all thought.[87] Logic is said to be "summenda ... ex usu hominum loquentium scribentiumque". Yet there are logically valid inferences not captured by the principles of logic; these, Leibniz maintains,[88] must be demonstrated grammatically, from the signification of inflexions and particles.[89]

Leibniz wished to articulate the rules we tacitly follow in ordinary language; this would lay bare the logical form of ordinary language, and so exhibit the inference schemata it licenses. Given this, one could explicitly justify reasoning in everyday life. Locke, on the other hand, held that our (private) mental activity could not be evaluated by such "maxims" and schemata.

> When the mind draws an inference, it is not Syllogism that has discovered those Ideas, or shewed the connexion of them, for they must be both found out, and the connexion every where perceived, before they can rationally be made use of in Syllogism...[90]

Rather,

> it is by virtue of the perceived Agreement of the intermediate Idea with the Extremes, that the Extremes are concluded to agree ...[91]

In short, "A man knows first, and then he is able to prove syllogistically". "Maxims" and "axioms" (or "praecognita") are propositions which (according to Locke) are claimed to be principles of science upon which "the other parts of our knowledge depend"[92] and innate or first known because of their self-evidence.[93] Locke thinks this position is refuted by pointing out that self-evidence is not peculiar to maxims and axioms;[94] they are only one case of "intuitive knowledge", "where that agreement or disagreement (of ideas) is perceived immedaitely by itself, without the intervention or help of any other ..."[95] Indeed, Locke adds, those self-evident truths are first known which consist in the ideas first in the mind; these are particular ideas, for it takes time and pains to construct general ideas.[96] Thus maxims add nothing to the knowledge of the particular self-evident propositions of which they are generalizations.[97] So, Locke concludes, maxims are no use in confirming less general self-evident propositions, are not the foundations on which sciences are built, and are no use in the advancement of sciences and the discovery of unknown truth.[98]

Locke's attack on maxims is levelled in particular at the view "that all reasonings are Ex praecognitis et praeconcessis" and that maxims are "praecognita".[99] The term "praecognitum" occurred frequently in the German Protestant Scholastic corpus to which Locke and Leibniz were exposed. In this corpus, the term was used largely for what must be known before a subject can be taught or what must be agreed before a point can be discussed.[100] (A praecognitum thus had points in common with what Leibniz called a principium reflexum.) Locke and Leibniz both slightly distort the meaning of "praecognitum" so that it refers to supposedly innate principles. But they approach the question of praecognita differely. Locke is concerned with the order in which we acquire explicit knowledge and sees no need to justify what is in the mind. Leibniz, on the other hand, is concerned with the justification of what one claims; further, he holds that there are certain rules by which the activities of all persons can be evaluated, then moves to claim that these rules are innate.

Leibniz admits[101] that we first apperceive - can first formulate - particular truths. But general principles are said to enter into all our thoughts, even though it requires a great deal of attention to represent them distinctly and separately.[102] They are held to be known implicitly in knowing particular cases;[103] the latter are said to derive their truth from the incorporated axiom.[104] Leibniz draws a distinction between certitude and evidence. Locke claimed that the certitude of the existence of things in addition to that of God deserved to be called knowledge, although this knowledge extends no further than present sensation. Leibniz wishes to extend "certitude" further, for "l'on pourroit prendre la certitude pour une connoissance de la verité avec laquelle on n'en peut point douter par rapport à la pratique, sans follie ..."[105] (As such, certitude depends on the information available.) Certitiude relates to empirical and practical knowledge, while evidence relates only to intellectual truths and is "une certitude lumineuse, c'est-à-dire, ou l'on ne doute point à cause de la liaison qu'on voit entre les idées". Leibniz is not concerned with what is prima facie evident. The maxim or axiom incorporated in an example and making it true is evident, but what is evident is noticeable in the example only when the example is an instance of the maxim, not when it is any other sort of consequence of it.[106] Succinctly, "ea per se evidentia esse, quibus sublatis omnibus, sublata est veritas ..."[107] It is this sort of evidence which is given to justify one's inferences.

Leibniz replies to Locke's criticism of syllogistic reasoning in the Nouveaux Essais IV, XVII, § 4. Extended to all formal reasoning, this reply maintains that maxims are involved in all reasoning, even when they cannot be explicitly stated. Leibniz is concerned with formal arguments ("argumens en forme") in general: not just the Scholastic manner of arguing, but "tout raisonnement qui conclut par la force de la forme, et ou l'on n'a besoin de suppléer aucun article".[108] Leibniz introduces the notion of a "tissue of syllogisms" or of "sorites" ("sorite").[109] A vast diversity of "ingredient" syllogisms are held to enter into such tissues.[110] The validity of the sorites follows from the validity of its ingredients. So Leibniz maintains that a wellkept account, a algebraic calculation, and an analysis of infinitesimals are almost formal arguements "parce que leur forme de raisonner a esté prédomontrée, en sorte qu'on est seur de ne s'y point tromper".[111]

The importance of sorites is immense, as they allow Leibniz to argue that the underlying logic of ordinary language, hence that involved in common-sense reasoning, is captured by a linear array of propositions, each step justified by a maxim.[112] But to give plausibility to the view that verbal and mental processes are analysable as sorites, despite the fact that most of their steps would have to be contemporaneous and unapperceived, Leibniz needs the notion of an enthymeme. An enthymeme in Leibniz's sense (unlike Aristotle's - a species of probable reasoning) is a sorites in which a commonly accepted premise is suppressed. The need for enthymemes is obvious: wanting to expand all enthymemes to syllogisms, Leibniz states, is like wanting merchants to count all numbers one by one.[113] Yet it is essential that the enthymemes can be expanded into sorites which display their logical validity; only then can we ask for no further evidence or justification.[114]

Ultimately, each premise and rule of inference is to have "luminous certitude". The rational reconstruction of what is done, where each step is justified according to a certain standard, is taken to be what the agent in fact did. Furthermore, the principles used in the rational reconstruction are held to be known by the agent himself. So what initially is a project to make explicit the public rules governing our inferences becomes a project to describe principles of operation innate in all rational beings and which lie behind everyday activities.

Leibniz also describes the method of making explicit what is supposedly implicit in rational activity as analysis; the explicit reconstruction of the situation is synthesis. The analytic-synthetic method was shared with the Cartesians, but Leibniz has a wider view of what is involved. His most succinct discussion of analysis is in his replies to the criticisms of Conring,[115] whose supposedly Aristotelian picture of science is similar to the position Locke criticises in discussing maxims and syllogism: scientific discovery is a matter of deducing conclusions from an already established set of axioms.[116] Conring objects to what he considers to be Pappus' notion of analysis: one finds what is unknown by supposing it, deriving consequences from it until one arrives at what is given or known.[117] But, Conring objects, this is invalid: what is true can be inferred from what is false.[118]

Leibniz's reply shows that the question is not primarily concerned with knowing that something or other is true; rather, it is a question of formulating what is involved in cognition, of what is known. It is a question of coming to understand or, in some cases, explain what is known. In the basic cases, the interest is mainly in the contribution of the knower.

For Leibniz, analysis is concerned with more than propositions.[119] To analyse a proposition is to find those propositions (from some restricted set of propositions) from which it can be deduced. There is also analysis of terms. This is best thought of in terms of the <u>ars combinatoria</u>: one is to find the set of generators (from some restricted set of generators) from which the term can be generated. In the seventeenth century, "deduce" was used instead of "generate". Finally, there is analysis of problems. Leibniz said that analysis is practical, that it is an art; synthesis, on the other hand, is a science: it deduces (in the broad sense) conclusions from what is already granted (or "evident", in the ideal case).[120] Leibniz's examples are mathematical: e.g., the measurement of flat surfaces is facilitated by finding what geometrical theorems are involved. In general, the analysis of a problem is the resolution of a problem we cannot solve into simpler problems which are in our power; his own analysis (calculus) is given as an example.[121] Generally, the problem is a situation <u>in re</u>; But the analysis concerns fundamentally the contribution of the knower.

The amalgamation of the conditions of the situation to the contribution of the knower is apparent in Leibniz's discussion of propositional analysis. The function of this is to expose the propositions involved in a body of knowledge. This gives a way of defending praecognita.[122] For, although they must be known principles, Leibniz states, someone learning a science must believe the master until he has learned the higher science in which the principles are demonstrated; so the belief is only provisional. Likewise, he continues, principles which are not entirely certain can be used in demonstrations; although the conclusions are only conditional, at least their connections have been demonstrated. The hypothetico-deductive method in the empirical sciences is included here.[123] What is simpler, Leibniz writes, is what is more thoroughly analysed. He agrees that hypotheses are given more value according to their predictive power. But, he adds, hypotheses are also accounted more probable the simpler they are to understand; for simpler hypotheses "solve" more phenomena and involve fewer assumptions. Synthesis begins with principles,[124] which in a physical context are hypotheses assumed without demonstration. Hypotheses are not proved by deducing phenomena from them; they are held, rather, because of their part in the analysis of phenomena, which is the same movement, but in an opposite direction, as synthesis.[125]

The sort of analysis Leibniz particularly wishes to defend is that by which we purportedly find what principles known with "luminous certitude" are involved in given instances of cognition. Such an analysis supposedly leads to terms and their connection, and eventually to simple terms. Furthermore, all propositions whose truth is seen to be necessary by the resolution or understanding of their terms are held to be demonstrable by their resolution, which, for Leibniz, means by definition.[127] Analysis, then, is nothing other

> quam substituere simplicia in locum compositorum, sive principia in locum derivatorum, id est theoremata resolvere in definitiones et axiomata: et si opus esset axiomata ipsa denique in definitiones.[128]

The answer given to Conring is that analysis uses definitions and identical propositions, which are immediately known, as a means "de faire le retour et de trouver des démonstrations synthétiques".[129]

It is not at all clear how identical propositions and definitions are meant to enter; in the context of analysis, little more is obviously accomplished than introducing terms. Leibniz appears to officially regard identical propositions as what we have called intensional identities. But some of his examples are of extensional identities. Furthermore, he allows "partial identities": sentences whose predicate expression is analysable as a complex in which the subject expression and other expressions occur. Again, what is meant by "definition" seems to cover implicit definition; at least there is an attempt to force axiom schemata into subject-predicate form. Leibniz's ideal (it is doubtful whether he later thought it was attainable) was for analysis to lay bare certain simples which would be that part of the universal character not subject to imagination. These simples are said to contain "principia vinculaque etiam rerum imaginabilium et velut animam cognitionis humanae" and in them is said to consist "quod reale est in rebus, quemadmodum praeclavè animadverterant Plato et Aristoteles, secus quàm Atomicorum scholae".[130]

Leibniz's position can now be seen to move well beyond capturing the rules of cultural "ceremonies" and analysing the logical sturcutre of rdinary language. His ideal is to find the intelligible constituents common to all knowers and what is known. What has happened is that the upward deflection of the insights about rule-governed behaviour has exaggerated these insights almost beyond recognition. Cognitive activities are still non-private and rule-governed private events are seen to need non-private criteria; Leibniz makes the criteria universal and has everything that happens "express" a public display. He finds the need for tacit knowledge; indeed, every rational being in some sense is held to tacitly know everything. And he emphasises the contribution of the knower; indeed, the knower in a sense contributes everything.

When Leibniz reaches the level of terms, he is at the level where the Cartesians began with their analysis of formal features spatially displayed. Leibniz differs considerably from the Cartesians, for he holds that space is a phenomenon bene fundatum on simple, non-extended substances. Still, geometrical figures, though abstract, are instantiated in spatial displays and are a subject of Leibnizian science. The question now arises whether both the Cartesians and Leibniz relied on a form of cognition which has nothing to do with rules or activities, but is perhaps modelled on vision; we might think of an intuition of the intellect having its own objects as vision has its objects.

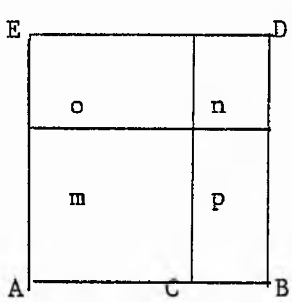
Leibniz[131] came to hold the position that in most cases we know that a sort of feature is possible only a posteriori, in that it is instantiated in re. He distinguishes between "nominal" and "causal" or "real" definitions. A nominal definition does not show that what is defined is possible; for this, we must rely on its instantiation. A real definition, on the other hand, shows the possibility of what is defined a priori, "en exposant la cause ou la generation possible de la chose definie". For example, [132] the definition of "parallel lines" as "coplanar lines which do not intersect even when continued in infinitum" is a nominal definition, for we can doubt whether such a case is possible. But when we understand that a coplanar line can be drawn parallel to a given line, as long as the point of the pen describing the line is kept at the same distance from the given line, then we immediately see that what is defined is possible and why the lines have the property of never meeting. Leibniz's examples of real definitions are almost all mathematical constructions. In the Théodicée,[133] he illustrates real definition in terms of Jakob Jungius' Geometria Empirica. Leibniz states that this work uses "experiences démonstratives" to prove a number of propositions of Euclid. When it is a question of the equality of the areas of figures (e.g. the Pythagorean theorem), one figure is cut in pieces which are reassembled to form the other.[134] There is no suggestion of anything like mere vision. Rather, having a real definition is a case of practical knowledge. It involves being able to perform activities governed by non-descriptive rules.

However, Leibniz thinks of these rules as independent of convention. When it is not a question of formulating, reflecting, or apperceiving, but merely of perceiving, the mathematical competence is still exercised in practical cognition - the cognition "expresses" activity in the body. Rather than modelling this account on a naive conception of vision, Leibniz presented a generalized theory of cognition of the ambient world inspired by the Cartesian theory of vision; to see formal features requires having the rational competence. Any sort of cognition of one's environment is rational cognition for Leibniz (he speaks of an "occult arithmetic" performed in perception); hence he has no quarantee that the world is not a diagram or some other concatention of sensible signs.

It would appear that Malebranche models mathematical cognition on vision, since he speaks of seeing ideas in God. But he uses "see" for its success nature. He also exploits the fact that "see" takes an object, but the "objects" he is interested in are concepts governing our rational activities. Ideas are held to be relations: given an arbitrary unit, an idea governs the relations of the iterated applications of this unit. An idea might be compared to a model for building; however, it is not copied, but would govern the procedure of copying as it governs measuring. According to Malebranche, there must be something besides an idea for cognition. He has a version of conversio ad phantasmata: sentiment makes the idea particular, i..e., apply in a certain case, and allows the idea to "affect" us so that we think in accordance with it. All cognition involves sentiment; the part played by ideas is to determine the roles sentiment occurs in and to govern our rational activities. Roughly, he admits three cases in which sentiment makes ideas particular: in the case of "attenation", in considering pure mathematics, certain ideas apply in certain cases because we use signs (verbal tokens, numerals, diagrams, etc.); in sensation, sentiment corresponds to features in re and leads us to judge in accordance with certain ideas; and in imagining, sentiment corresponds to physiological occurrences in the brain and allows us to think of formal features as instantiated. Because of his thoery of vision and because he treats things as diagrams, all three cases involved something similar to knowing how to construct diagrams, with ideas furnishing the rules. An important point is that ideas mediate between our actions and the world - this is the force of calling them representative.

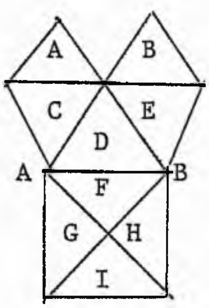
These points are illustrated in the fifth dialogue of the Entretiens sur la Métaphysique, entitled "De l'usage des sens dans les sciences". It is significant that Malebranche speaks of the construction of figures; but what he says could (on his theory) just as well be said of natural things. He here expounds on objection to the effect that rational knowledge derives from sensation. We are asked to consider the line segment AB cut at point C.[136]

The problem is to prove that the square of the whole line is equal to the sum of the squares of each part plus the two rectangles constructed from the two parts. This is obvious, it is suggested, from considering the following.



ABDE is the square of AB; it is equal to all it contains, so it is equal to the squares of each side - e+n - plus the two rectangles - o+p - constructed from the parts AC and CB.[137] This, he suggests, shows that there are truths which reveal themselves to the eyes ("qui sautent aux yeux"), and so the eyes are excellent masters. On the other hand, reason with its clear ideas leaves us in the dark. For we cannot prove to the untutored that, e.g., $10^2 = 4^2 + 6^2 + 2x4x6$; yet it is the same to prove this with intelligible numbers ("en nombres intelligibles") as it is to prove it by exhibiting before our eyes a line of ten units cut into segments of four and six units each.

Continuing the objection, Malebranche sets the problem of proving that the square of the diagonal of a square is double the square of its side.[138] He presents the daigram



The triangles A, B, ..., I are seen each to have a right angle and two equal sides; and our eyes tell us they are equal. And we see that the square constructed on the diagonal AB contains four right angles and that each of the squares constructed on the sides contains two. Thus the large square is double either of the others. The only reasoning involved, it is claimed, is on the faithful testimony of my senses - one need only compare the parts by moving one's eyes.

This objection is countered[139] with Malebranche's position that it is not our senses, but reason joined to our senses which enlightens ("éclaire") us. There is always clear idea and confused sentiment in viewing sensible objects. The idea represents their essence - the relations they have and can have among themselves - and sentiment informs ("avertit") us of their existence - makes us sense their difference and their relevance to our comfort and conservation. Against the counter-reply that the extension of the colour itself suffices, it is claimed that sentiments are regarded as extended only when they are referred to intelligible extention; from the fact that pain is felt as extended, it does not follow that it is extended. Asked why sentiments must relate to intelligible extension, Malebranche replies[140] that it is the archetype of bodies, so can represent their nature to me. Furthermore, if the extension I sense were a modification of me (as are sentiments), I could learn physics and other sciences which consist only in the knowledge of the relations of extension simply by attending to my own modifications. Finally[141], if, e.g., colour and pain were extended, then, when I simultaneously look at my hand and feel pain in it, I would sense two hands.

Returning to the second demonstration above[142], Malebranche points out that its evident and general character derives only from the clear and general idea of extension, straightness, and equality of lines, angles, and triangles, and not at all from the colours which make these things sensible and particular. It is not at all certain that this particular square is equal to the two others, for we are not certain that it is a square, that a certain line is straight, or an angle right.

Still, he adds, when sentiment is joined to intelligible extension, making it sensible, it can show the relations in which the truths of geometry and physics consist[143]. Since our senses make the ideas we have of bodies sensible, they awaken our attention, so indirectly lead to the understanding ("l'intelligence") of truths; thus we should use our senses in studying all sciences whose object is the relations of extension - as long as we judge things only by the ideas representing them[144].

This presents our cognition of features in re as if it were the application of colours to a surface in accordance with the rules of geometry. Indeed, Malebranche uses the analogy of a painter more than once when speaking of sentiments making ideas or intelligible extension particular.

Malebranche thought that we construct geometric figures in imagination. Some of his contemporaries held that such "ideas" were the objects of mathematics. But Malebranche insists that the construction of these images needs non-private rules, so the images cannot be what mathematics is about. When I construct something in imagination, he writes[145],

> c'est sur les idées de l'égalité et des proportions que je le travaille et que je le régle; rapportant tout à l'unité arbitraire, qui doit être la commune mesure de toutes les parties qui le composent ... C'est assurément sur des idées intelligibles que nous reglons ce cours des esprits qui trace ces images ou ces figures de nôtre imagination. Et tout ce qu'elles ont de lumiere et d'evidence ces figures, cela ne procede nullement du sentiment confus qui nous appartient, mais de la réalité intelligible qui appartient à la Raison.

The image of, e.g., a square which I form, he adds, is exact and regular only in so far as it corresponds justly to the intelligible idea I have of the square.

It might be suggested that Plato's δοξα is modelled on rule-governed activity, where the rule or standard is supplied by the Idea of Form (we shall capitalize these terms when used in Plato's sense) and the corresponding achievement, or facility therefore, expressed by ἐπιστημη. (In the following discussion, I shall follow I. M. Crombie, An Examination of Plato's Doctrines, vol. II: Plato on Knowledge and Reality[146] and D. Ross, Plato's Theory of Ideas[147].)

To support this claim, first of all, we point out that the Forms included both mathematical and moral Forms as early as the Phaedo[148]. It will be recalled that one reason we gave for considering the rationalist account of cognition as modelled on rule-governed activity was that moral and mathematical rules were placed on a par (or all rules were given a moral character).

The important distinction is between δοξα and ἐπιστημη. In the Gorgias, Plato distinguishes these as two intellectual levels[149]. In the Theaetetus 184-187[150] he contrasts αἰσθησις - sensory activity - δοξα - here, apparently, judgement - and ἐπιστημη. The senses are said to be abilities or tools through which the mind becomes aware of the world. There are qualities proper to each sense; but beyond these there are facts concerning existence, identity, number, etc., which are noticed by the mind without the senses (184c-d). Bodily disturbances (παθηματα) are perceptible by animals at any age, while the calculations (αναλογισματα) made about them which refer to "existence and utility" must be learned (186 c 3). So ἐπιστημη "is not to be found in the sensations we undergo, but in our thought about them; it is only by the latter that we make contact with existence and truth".(186 d). Ἐπιστημη is to be sought in the sphere of "properly mental activity about the world", the sphere of δοξα (187 a 5). Δοξα here is taken as judgement; notice how closely it resembles the Cartesian notion of something we are held responsible for and consequent to sensation, which occurs despite us.

However, δοξα is something more permanent, yet fickle. Plato's διανοεισθαι - thinking - is more like Cartesian judgement (and cogitare): it is said to be silent discussion; δοξαζειν - the verbal form of δοξα - is the decision the discussion comes to (189-190). One can be induced, persuaded, or jockeyed into holding a δοξα - it is more like Cartesian prejudice - while ἐπιστημη must be taught. It is judgement in a dispositional sense. As a translation of "δοξα", "opinion" is not far off, although we often think of opinions as simply held and not arrived at and rarely think of opinions as involved in our ordinary intercourse with the world; "belief" also is a near miss for much the same reason. It must be kept in mind that δοξα is the culmination of mental activity, given sensation.

Δοξα arises from mental activity, but right (ὀρθα) δοξα is fickle, and does not always lead to right action; to reach ἐπιστημη (which persists), it must be tied down by "working out the explanation" (αἰτιας λογισμος) (Meno 96-98). This suggests to Crombie that Plato's starting point "was the conviction that there is one state of mind which involves insight and hence is unshakable, and another which does not"[151]. Again, ἐπιστημη and δοξα, he claims[152], do not classify propositions; having the former is distinguished by being able to give an account (λογον διδοναι).

Yet ἐπιστημη involves understanding; and this alone might suffice. We might not have to be able to say what, e.g., equality is; seeing the analogy between its embodiments might suffice[153].

"Ἐπιστημη", as used by Plato, is like the seventeenth century use of "scientia", not like English "knowledge" in general. Crombie states[154] that "Plato often, but not always, denies that we can have ἐπιστημη of physical facts". When he does, "ἐπιστημη" must be construed as a technical term; "... Plato has no special desire to tell us that we cannot, in the ordinary English sense of the words, know matters of empirical fact"[155].

There are general distinguishing marks of ἐπιστήμη[156] in which it is superior to δόξα. It is tied to understanding, so is conveyed by teaching, while δόξα can be induced by training, persuasion, etc. (Theaetetus 201, Republic 429-430, Timaeus 51-52); further, it is tied to insight into necessity - why what is the case must be the case (Meno 96-98). And ἐπιστήμη is infallible in that it does not let us down in particular cases (Meno 96-98); this suggests that it is general and applicable in particular cases. Furthermore, it is direct in the sense that it relates to what is the case (Republic, Bks. 6 and 7). It is sometimes implied that the "object" of δόξα can be that of ἐπιστήμη[157]. But sometimes it is implied that they have different "objects" or spheres of operation, that of δόξα being the empirical world. The former cases, however, are apparently accounted for by the fact that Plato thought of ἐπιστήμη as something like direct acquaintance, going beyond the ability to describe correctly[158].

Plato's contrast between, on the one hand, the multifarious δόξαι held by different persons or the fickleness of one person's δόξα and, on the other, the stability and insightfulness of ἐπιστήμη suggests the insight that private (not events, but) states require non-private criteria. For there is some way of deciding between conflicting judgements, opinions, or claims - i.e. δόξαι. The man who has ἐπιστήμη can decide between them. Ἐπιστήμη is not "explained" on the same level as δόξα, for it reaches the standard, and an "explanation" of this would only be a paraphrase of what it is to reach the standard. To grasp what the success is, one must already have the insight. Plato emphasises this with regard to teaching: teaching is not inculcating formulae, but rather getting one to grasp the natures expressed in the formulae. (We might paraphrase this by saying that learning is coming to be able to use the formulae.)

It also appears that Plato had the insight that much of our knowledge is tacit. Plato came to think of the forms as an objective structure. This is most clearly expressed in the Sophistes, where he presents a doctrine of "greatest kinds"[159] (or highest Forms): motion, rest, existence, sameness, and being; these are held to form a system. The Forms being, sameness, and difference, predicable of all Forms, as such connect all Forms. Difference, by its special nature, also separates all Forms[160]. The science which discovers these uniting and separating Forms is dialectic; it is pursued by the true philosopher, who has and gains the requisite insights[161]. The apprehension of the nature of goodness is the culmination of dialectic; "goodness provides the light in which we see whatever we are able to see 'in the intelligible realm'". Crombie thinks this means

> that as we make philosophical progress we get nearer to grasping as a coherent whole the system of universal natures, from which are in some way derived the conceptions that we use and the distinctions that we draw in abstract thought. Therefore in doing dialectic we are advancing towards an explicit grasp of the system of intelligible natures an implicit awareness of which has guided our progress[162].

Furthermore, what Plato is interested in are cases of what we have called rational essential knowledge and their inter-relation. In the Phaedrus, "Plato's point is that the true understanding of a single generic Form requires us not only to see that somehow it embraces a number of specific Forms, but also to see precisely what the articulations within it are"[163]. Generally, Plato speaks in terms of essential, not propositional or practical, knowledge; e.g. he speaks of knowing triangles and numbers[164]. Learning is construed as the acquisition of part of the objective world. The mathematician who knows all about triangles (who "knows the triangle") has acquired triangularity - this has become part of his mental equipment. On the other hand, the schoolboy who can assert only some truths about triangles and these only with a measure of understanding, has acquired a likeness of triangularity - he has only δοξα.

Yet Plato's position is presented as an ontological position; and here, in particular, Forms or Ideas come in. The objects of ἐπιστημη are held to be Forms. Ἐπιστημη of the Forms is supposed to guide our δοξα about things in re. This is part of what is intended by saying that changing things are "copies" of Forms. But, then, this leaves Plato open to the third-man argument (which is akin to the sorts of arguments we have frequently used, that introducing further terms fails to explain our knowledge or leads to an infinite regress). For the Form and its copies must agree in something, which requires us to posit a third term; but, then, the third term, the Form, and its copies require a fourth term to explain their agreement; and so on[165]. Plato never met this argument[166].

We might suggest that the third-man problem arises because competences, cases of practical knowledge - such as a geometer's when he constructs triangles and theorems about them - are reified. In the cases under consideration, the temptation to reify is evident, for the standards are due neither to the individual nor to his natural environment.

Still, Plato seems to be committed to objects; for one thing, the principle distinction between δοξα and ἐπιστημη is in terms of their different objects. Particularly from the Republic until a rather different account is given in the Sophistes, Plato disparages particulars in the supposed interest of Forms. Ἐπιστημη is distinguished, as mentioned, by the directness of its objects. In the Republic (476 d 3 ff.) its objects are characterized as completely real and those of nescience as unreal; so, it is maintained, the objects of δοξα - e.g. sights and sounds - are "between being and not-being"[167].

However, Crombie explains the difference in object in terms of the different sorts of knowledge one can have. The important distinction is between having an image and acquiring an objective nature[168]. Now, e.g., the road to Larisa (Plato's example in the Meno) is a stretch of earth, rocks, and trees, not a system of logical necessities. So a man cannot literally have it in his mind, but only an εἰκων - an image - of reality. On the other hand, triangularity is something like a system of logical necessities, so a νοητων - an intelligible entity - acquired by the mind. It is perfectly intelligible to say that a local inhabitant knows the road to Larisa without an image, while a visitor who has been given a description relies on an image. But from Plato's point of view, the road to Larisa is only a complex empirical object; to be familiar with it is not to be familiar with something ultimate, but with something "in flux". This view receives a means of expression by reserving "ὤν", indicating an ultimate reality, for what determines what form the flux takes in particular cases. The road to Larisa itself is then seen as an image and "it will not surprise us if we find Plato using a strict sense of ἐπιστασθαι in which we cannot be said to know physical objects and a relaxed sense in which, under favourable conditions, we can"[169].

It remains to be seen what the relation between Forms and images is, and how one is to advance from δοξα to ἐπιστημη ; we should also like to clarify what the Forms themselves are. Generally, a form is an object of ἐπιστημη and is an objective nature absorbed into the mind. One sort of form is indicated by the two hierarchically arranged triads in the tenth book of the Republic[170]. There is the triad of makers (596-598): God, who makes the Form of an object; the craftsman, who makes the object, "looking towards the Form"; and the artist, who makes an image of the object. And there is the triad of skills (600-602): the skill which consists in using an object; the skill which consists in making it; and the skill which consists in imitating it. Crombie maintains thatthe point is that the orderliness and purposefulness of physical things are knowable, so are absorbable by minds without remainder; their brute physical existence is not.

In the Divided Line (the discussion of which culminates the sixth and seventh books of the Republic), Plato distinguishes four sorts of cognition. The second highest is διάνοια, which concerns mathematics. Διάνοια is characterized as proceeding from unexamined hypotheses. Plato thought of the procedure of geometry, not as deduction from axioms, but as apprehending the implications of the figures we draw, although the figures are only approximations of what the reasoning is about[171]. The method of arithmetic is similarly described[172]. So mathematics involves images. But the highest member of the line, νόησις, involves only forms. Crombie feels that Plato's view was

> that the form, structure, principle or what you will which constitutes a mathematical entity such as a circle has no essential application to space. Such principles can be expressed in spatial embodiments, but in themselves they are prior to such embodiments and in no way dependent on them. Furthermore they are capable of other embodiments which are not spatial in kind. The spatial embodiments of the forms have the advantage over all other embodiments that they are especially close to the originals in that the "matter" of the embodiment - space - is something abstract, something having no properties of its own which might compromise the purity of the embodiment or distract from it[173].

There appears to be a relation suggested between mathematical objects and ethical virtues, such as justice and goodness. Crombie conjectures that underlying the Pythagorean definition of justice as the number four is the notion of justice as reciprocity and the fact that four, the first square, is two times two, where it is seen that the first factor does to the second - double it - what the second does to it. I.e. there is a structural identity between squaring and retaliation (and a geometrical square). Perhaps Plato thought along the same lines, for he

> stresses that the man who is to do dialectic must bring his mathematical studies together and see their kinship (531 d), and it may be that he thought that it was when we could see the identity of structure between an equal-sided rectangle and a number whose factors are n x n that we should be ready to detach the structure from its embodiments and entertain the notion that it might have other, non-mathematical embodiments[174].

Crombie further suggests that the existence of structures neutral between their mathematical and non-mathematical embodiments might confirm the notion that "in themselves" these structures are independent of all embodiment. Thus Plato maintains (Republic 534 b 3) that by trying to give account of the entities which mathematicians hypothesise, we come to know the Forms[175]. Crombie holds that all Forms have their mathematical embodiments. Plato tended to regard "adjectival" Forms (e.g. equality) as more important than "substantival" Forms (e.g. bed-hood). And, although he speaks of Forms such as that of bed (Republic, Bk. X), this could be a complex function of the properties beds must exhibit[176].

Plato dedicates a great deal of space to discussing how individuals acquire Forms. He has a great deal to say about teaching; Forms are not taught the way, e.g., multiplication tables or conjugation paradigms are taught. Rather, the explicit acquisition of a Form presupposes some readiness on the part of the learner. The importance of dialectic[177] is that it gives us an explicit grasp of the system of intelligible natures, an implicit knowledge of which has guided our progress; that is, it allows us to formulate the objective structure to which we are subject. Plato's discussion of how we come to an explicit knowledge of the Forms indicates clearly that he had the insights that much of our knowledge is tacit and that the knower makes a contribution to what is known. When asked, further, for the source of what the knower tacitly contributes, Plato's answer was in terms of recapturing a memory which we hazily retain: his doctrine of recollection (αναμνησις). The most famous presentation of the doctrine of recollection is in the Meno (80-86). This was cited a number of times by Leibniz and generally by those non-Cartesians in the seventeenth century who held innatist positions (e.g. the Cambridge Platonists). The passage from Malebranche we have just discussed, on the usefulness of the senses in science, even bears a resemblance to Platonic recollection.

The Meno interweaves two strands: one leading to religious notions about pre-existence, the other to logical notions about the status of necessary truths[178]. Socrates, by asking the right questions in the right order, elicits from an untutored slave what is essentially a proof of the Pythagorean theorem. Socrates' account is that the slave's true beliefs (not knowledge, for they had to be elicited) were activated, enabling him to "recover knowledge from his own resources - which is what we call recollecting" (85 d). The purported fact that the true beliefs were not acquired during the slave's lifetime offers Socrates his proof for immortality (86 a 6 - b 2). Crombie feels[179] that Plato's point is "that a soul is at every moment of its existence capable of reasoning, and thus capable of arriving at all necessary truths out of its own resources ...". He suggests[180] that, when Socrates says that all natures are akin, he includes the soul. Saying that universal natures are akin with each other would express that they form a coherent system.

> That they are akin to the soul would mean that the concepts which we are naturally prone to form, and the inferences which we are naturally prove to make with these concepts, correspond to these universal natures and to the relations between them. The proof of immortality would lie ... in the presumption (explicitly stated in the Phaedo 77-80) that if the soul is akin to eternal entities such as universal natures it too must be eternal.

For example,

> our natural tendency to classify things as round or square corresponds to the difference which obtains between roundness or squareness as they are in themselves; our tendency to infer that a round thing will roll corresponds to the fact that circularity entails equidistance of every point on the circumference from the centre.

The Meno is brought into line with the Phaedo by thinking of the former as maintaining a kinship of the soul to universal natures because the way the mind works corresponds to the way things are[181].

Plato's notion of αναμνησις is perhaps the most glaring similarity between Plato and the seventeenth century positions we have presented in this chapter. At the foundation of this similarity are the shared insight that much of our knowledge is tacit and the shared importance given to the contribution of the knower to what is known. The Platonic connection was recognised by Leibniz[182]. Indeed, as we have seen, Leibniz holds that simple natures are what are real in things and are also constitutive of human thought; and he attributes this position to Plato. However, he also attributes it to Aristotle; the opposition is between Aristotle and Plato, with whom Leibniz sides, and the atomists, whose decendants were represented by the updated nominalism of Gassendi and Hobbes' "plusquamnominalismus". Although Leibniz sometimes characterizes his position as siding with Plato against Aristotle (as in the Preface to the _Nouveaux Essais_), such a characterization was a simple, familiar way of expressing a complex opposition. Leibniz was more concerned to interpret and defend Aristotle than to solidify a connection with Plato. In his correspondence with his former teacher Thomasius in the early 1670s, Leibniz attempts to explicate the Aristotelian notion of substantial form mechanically. This was one step on his way to re-introducing the Aristotelian notion of entelechy. This continues the tradition of Kenelm Digby, whom the young Leibniz greatly admired. Digby was both Cartesian and Aristotelian; he attempted to explicate Aristotelian notions such as rarity and density in terms of mechanical, Cartesian notions, and he centered his account of knowledge (viz. _scientia_) on the view that a "notion" is the thing itself in the mind of the knower. Conflation of Platonic and Aristotelian positions was almost inevitable. In fact, such an association is not without foundation. What Aristotle says about forms approaches at times what Plato said about Ideas and both see definitions as capturing our knowledge of forms. Such forms are along the lines of Cartesian true and immutable natures or objective realities. Again, the _intellectus agens_ was often regarded as a Platonic element in Aristotelian thought; and it was a new attempt to capture the functions of the _intellectus agens_ which led to the accounts of knowledge (viz. _scientia_) and its application which are peculiar to seventeenth century rationalism.

Still, there was a considerable change in the view of _scientia_ or _philosophia_, and so of _prima philosophia_, in the two millenia between Plato and Aristotle and the seventeenth century. For the rationalists, mathematics was not a step to ultimate knowledge, but rather was the paradigm of clarity and provided the most distinct concepts possible. On the other hand, moral and political notions, such as justice and goodness, were entrenched in a religious position. Furthermore, physiological investigation had, it appeared, reached the point where the processes of one aspect of a person could be described in a way satisfying mathematical demands of clarity and distinctness.

Despite the insights we have granted Plato, it is questionable whether his account can be thought of as modelled on rule-governed activity to any significant extent. One reason rationalism can be so interpreted is that it was concerned with the application of science, which involves activity (however subliminal and due to the interpretation of the physiological observer). Plato, on the other hand, is largely concerned with the acquisition of ἐπιστημη; the application of ἐπιστημη is largely in running the state. The Form of good is given much more than ethical significance. In the Republic (508 e 1–3) it is described as "giving to (all) the objects of ἐπιστημη their truth, and to him who knows them his power of knowing". The apprehension of goodness is the culmination of dialectic and allows us to justify our earlier dialectical achievements. Plato's educational proposals give a unique position to mathematics. But the goal is the grasp of goodness and an understadning of justice in those responsible for a just state. This indicates a view of the relation between mathematics and morality different from that suggested by the rationalists. Knowledge is acquired in mathematics, or, rather, in passing beyond mathematics. The grasp, the success, is not displayed in an activity; rather, it is a sort of purely intellectual grasp. The application, the activity, comes in directing the state. What argues against attributing Plato with the insight that private <u>events</u> need public criteria is that he is not concerend with events.

Still, Plato makes use of the position in the <u>Republic</u> that it is easier to get a view of the state than a view of the mind; viewing the public entity allows one to say something about the private entity. The features of the state are internalized in the individual; the individual is held to instantiate, e.g., the justice of the state. This leads to one of the (sets of) "problems" we saw arise from the upward deflection of insights: the "problems" of perception. For public endeavours and features of the world are mapped into the individual. Thus Plato thinks not only of the multifarious δοξαι held by different individuals, but also of the fickleness of δοξα of the same individual. Convention drops out, because there are multifarious conventions. Yet ἐπιστημη is very close to knowledge of terms, as long as one knows how to use the terms. For ordinary language is underdetermined by environmental factors and is learned non-inductively.

It might be maintained that Plato allows for activity within the individual similar to that postulated in rationalist theories of vision. For (as we have seen) he speaks of sensory activity - αἰσθησις - related to δοξα , which itself is sometimes construed as mental activity. But the notion of αἰσθησις is relatively peripheral for Plato, especially when he has reached the level of ἐπιστημη. Furthermore, when he discusses αἰσθησις, it is in so far as δοξα results from it, not as it is an application of δοξα , let alone of ἐπιστημη. Admittedly, he speaks of right δοξα leading to right action and distinguishes ἐπιστημη as it persistently leads to right action. Still, the sort of action which is of primary concern for Plato is moral (or political) action. Finally, the relation between αἰσθησις and δοξα seems to be modelled on the realtion between διανοια and νοησις (and so might reflect Plato's internalization of the state). The lowest member in the Divided Line is εἰκασια , which is similar to αἰσθησις , since it means conjecturing or representing by a likeness. Above this is πιστις, which is like δοξα as a settled judgment, since it means trust or confidence. Διανοια is said to stand to νοησις as εἰκασια to πιστις .

Plato is interested particularly in justice, seen to be a balance in the state. Individual activity - especially mathematical activity - is largely lost. The most important mathematical features for Plato, reflecting political ideals,[183] are static and semi-aesthetic - harmony, proportion, and so on.[184]

The seventeenth century view of mathematics was different. An important application of mathematics was in change and the determination of change. Mathematics was seen to be carried out in constructing. The mathematization of physics also changed the position of mathematics. Harmony was explained in terms of what foes on in re, which instantiates mathematical features throughout. The Forms which Plato considered most general - being, sameness, differences, etc - were regarded in the Cartesian tradition as "obscure and general" notions arrived at from confused experience; they did not satisfy mathematical criteria of clarity and exactness. God was regarded by the rationalists as primarily a mathematician; His immanence allowed that He always judges our actions, including supposedly insignificant judgments about the mathematically describable distributions of things.

The mathematical description of the human physiology, hence our minute actions, was a goal for rationalism; it was not even thought of by Plato. Hence mind-body correlation was an important "problem" for rationalism, but did not exist for Plato. This, the lack of empirical knowledge about the functioning of the body, and the fact that knowledge rather than cognition is primary allowed Plato to get by without notions corresponding to the seventeenth century notion of consciousness.

Kant has been credited with being the first philosopher to maintain that the mind contributes the rules in cognition. He is principally concerned with cognition ("Erkenntnis"). Cognition is seen as an activity; e.g. he speaks of the coneptual conditions which must be satisfied in drawing a line (which counts as cognition).[185] Furthermore, he is concerned with the cognitive presuppositions of the physics and mathematics of his day, so with the conditions of their applicability.[186]

Kant is particularly clear on the contribution of the cogniser to what is cognised. In the Preface to the second edition of the Critique of Pure Reason,[187] he states that, so far, it has been accepted that all our cognition conforms to ("sich richtet nach") objects; but this cannot explain the part of our a priori concepts ("Begriffe") in extending our cognition. He refers to Copernicus' revolution, having the observer revolve and the stars stand still. Kant proposes a similar revolution in metaphysics concerning intuition ("Anschauung"). For, if objects ("Gegenstände"), as the object ("Objekt") of sense, conform to our faculty of intuition, the possibility of knowing something a priori about them becomes intelligible. To account for a priori knowledge, one must accept that the objects or (what is the same) the experience ("Erfahrung"), in which alone they are cognised, conform to the concepts. For experience is a sort of cognition which requires the understanding ("Verstand"), whose rule I must provide in myself, also before objects are given to me, and so a priori ("dessen Regel ich in mir, noch ehe mir Gegenstände gegeben werden, mithin a priori voraussetzen muss"). The rule is expressed in a priori concepts, to which all objects of experience necessarily conform.[188]

Kant begins his account in the Critique with the "Transcendental Aesthetic", which treats intuitions. He draws the distinction, invoked throughout the Critique, between what is empirical - roughly, what is give in sensation, is contingent, lacks strict generality, and is a posteriori - and what is pure - what is a priori and supplied by the cogniser. The "pure forms of intuition" are space and time. These are conditions for any intuition. Space in particular is the subject of geometry. The propositions of Euclidean geometry are held to be a priori synthetic judgments involved in pure spatial intuitions.

However, for the account of the Aesthetic to be correct, a number of other conditions must hold. In fact, cognition does not properly arise until account is taken of the understanding, and so also of concepts.[189] In the "Transcendental Analytic", Kant sets out to show that some non-mathematic concepts are a priori and how they can nevertheless refer to objects.[190] He eventually arrives at twelve primitive pure concepts of the understanding, called Categories. For Kant there are two aspects to every judgment: the application of specific concepts and the manner of their connection in the judgment, i.e. the logical form of the judgment. Kant argues that the objectivity and generality of any judgment in general is due to the Category embodied in its form; so there is one Category for every way objectivity and generality are conferred on perceptual judgments, in which specific, empirical concepts are applied.[191]

Kant saw that he needed a priori concepts to account for the objectivity and generality of judgements; this insight was based on the realization that to apply concepts is to unify representations.[192]

> The same function which in a judgment gives unity to the various representations, also gives unity to the mere synthesis of various representations in an intuition which, generally expressed, is called the pure concept of the understanding.[193]

It remains for Kant to show the validity of the Categories. That is, he must show that without them experience is impossible; and, from the side of the objects, that the Categories are necessary for experience of them as they are thinkable.[194] This is done in the "Transcendental Deduction of the Categories". Thinking involves connecting, and Kant holds that

> ... all connection whether or not we become conscious of it ... is an act of the understanding which we might call by the general name of synthesis in order to indicate thereby ... that we cannot represent to ourselves as connected in the manifold anything which we have not, ourselves, previously connected ...[195]

Kant finds the basis for this synthesis in "pure apperception", or the "transcendental unity of self-consciousness", expressed by the representation "I think".[196] Through this unity, "all the manifold which is given in intuition is united into a concept of an object. It is therefore called objective ..."[197]

To guarantee that the Categories have objects, and are not of "a merely logical significance of the mere unity of intuitions", Kant introduces the "schema": "the phenomenon, or the sensitive ("sinnliche") concept of an object in agreement with the category.[198] But a schema is not an image. No image would be adequate for, e.g., the concept of a triangle in general. Rather, a schema is "the representation of a general procedure of the imagination in procuring an image for a concept" or "a rule for the synthesis of the imagination".[199] Since theonly feature common to every object of experience (including ourselves) is temporal succession, schemata are "temporal determinations a priori in accordance with rules ..."[200]

Kant looks on the contribution of the cogniser as a system. First of all, there are systems of synthetic a priori judgments. These are distinct from analytic judgments (also a priori), for they are more than explicative of the subject; they state something substantive about the objects of intuition or cognition. They differ from a posteriori judgments (also synthetic) in that they are thought as having necessity and are thought in strict universality; these marks indicate that they are not derived from experience, but are a priori valid.

Kant sees the task of pure reason as contained in the question "How are synthetic a priori judgments possible?" He attributes the uncertain, contradiction-ridden state of metaphysics to the neglect of this task and even of the distinction between analytic and synthetic.[201] He allies this question with the question of the possibility of the pure use of reason in all sciences which include a theoretical a priori cognition of objects, thus with the questions "How is pure mathematics possible?" and "How is pure natural science possible?" There must be some sort of answer to these questions, since there are such sciences, hence they are possible.[202] Next arises the question "How is metaphysics as a natural disposition ("Naturanlage") possible?", for certain questions arise from the nature of human reason which go beyond the employment of understanding in experience.[203] But contradictions arise in such "dogmatic" use of reason; and this leads to scepticism. So he proposes to consider the limits of the power of reason by asking the question "How is metaphysics as a science possible?"[204] And the answer to this must present synthetic a priori judgments of this science, metaphysical judgments stating something substantive about the objects (and so the powers) of human cognition.

The first system of synthetic a priori judgments Kant arrives at (in the Transcendental Aesthetic) are the propositions of Euclidean geometry, which must apply to any object of spatial intuition. Intuition demands a further account, and the Categories embodied in judgments confer on them objectivity and generality. Here again he finds a system, for "if we can list all the forms of objective empirical judgment that are possible we can produce a complete list of the Categories. So Kant 'has found a clue'..."[205] - the propositional forms of traditional logic need only slight modification to supply Kant's Table of Categories.[206] There are four classes of three Categories each. Kant claims that the third Category arises from a connection of the second and the first of its class (e.g. totality is plurality regarded as unity). Kant adds[207] that he here has the principles of a system; it is not his purpose to show the completeness of this system, but he does not doubt that, with requisite application of the principles, the system would be complete in the sense that it captures the contribution of the human cogniser in the judgments we make about the world. Kant holds that "The table of Categories quite naturally gives us a lead in constructing the table of principles, because the latter are after all nothing but rules for the objective use of the former".[208] These principles include general synthetic a priori judgments - such as the principle of causality or the principle of substantial permanence in the manifold of intuition - which state something substantive about the objects and powers of human cognition. They are also the foundations of a system of synthetic a priori judgments.

With these, Kant has the conditions which make pure natural science possible. He also has the metaphysical foundations of natural science (Newtonian mechanics), and so has supposedly shown how a scientific metaphysics is possible. The system of concepts, or of synthetic _a priori_ judgments, forms what we have called an objective structure.

Kant clearly displays the insight that our cognition involves tacit knowledge. His method is to find what we must be held to tacitly know. This is called a transcendental exposition ("Erörterung"), by which Kant understands "the explanation of a concept as being a principle from which the possibility of other _a priori_ cognitions can be seen to follow".[209] His whole philosophy is called transcendental because it is "concerned not so much with objects, as with the manner of our cognition of objects, in so far as it is _a priori_ possible".[210]

However, in uncovering our hidden resources, we arrive at principles which we naturally follow, but which do not apply to any possible object of intuition. Kant discusses the illegitimate claims of reason ("Vernunft") in the narrow sense in the "Transcendental Dialectic". This is directed against the claims of dogmatic metaphysics, which lead to contradictions, and so to scepticism.[211]

For Kant, it is fundamental that "All thought must, whether directly or indirectly ... relate to intuitions, so, with us, to sensibility ("Sinnlichkeit") ..."[212] Speculative reason violates this principle; in particular, Kant speaks of "Ideas" of reason, which have no application to objects given in intuition. To the transition in the Analytic from the Categories to the synthetic _a priori_ principles of pure understanding there corresponds in the Dialectic the transition from the Ideas to the _a priori_ principles of reason - certain absolute metaphysical principles.[213] Reason (in the narrow sense) is held to be the power of mediate, i.e., syllogistic inference.[214]

Kant asks whether pure reason contains synthetic a priori principles and rules and wherein these principles can consist. The logical procedure of reason in inference, he suggests, indicates the answer.

> Firstly, the inference of reason is not concerned with intuitions by bringing them under rules (as is the understanding with its Categories), but with concepts and judgments. So when pure reason also turns to objects, it has no direct relation to them and their intuition, but only to the understanding and its judgments, which then relate to sense and its intuition to determine their object.[215]

E.g. the judgment that everything which happens has a cause is cognised by understanding and makes the unity of experience possible, but derives nothing from reason.[216] Secondly,[217] reason achieves its unity, which is systematic, by arranging judgments syllogisitcally.[218] In giving this unity, reason tries to find a more general major premise for syllogisms, generating chains of syllogisms and eventually arriving at ultimate principles.

> ... the proper principle of reason in general (in its logical use) is: for the conditioned ("bedingten") cognitions of understanding to find what is unconditioned, by which the unity of the former is made complete.

Syllogistic arrangement is certainly not despised by Kant, who suggests a maxim to the effect that systematic unity is conferred on our judgments by syllogistic arrangement in the search for more ultimate premises.[219] This maxim does not imply that there is an ultimate, unconditioned premise or condition. But the so-called fundamental principle of pure reason assumes this and thus that the chain of syllogisms can be completed.[220]

The criticism of the use of pure reason is apparently directed against rationalists (although much of the detail of the target is

Scholastic). Yet, for the rationalists, experience was essential for the use of all our concepts. Experience (occurrences in the mind) was held to be essential for the application of concepts and (vaguely) to awake ideas or faculties individuating ideas. More importantly, experience was thought to be necessary to show the possibility of ideas or concepts. Indeed, the Cartesian thouchstone of clear and distinct perception, although it is not determined by experience, is elicited or instantiated in experience - observing obvious geometrical figures or numerical groups, imagining them, or using a perspicuous mathematical language. The central problem for Cartesianism as well was how our ("a priori") science is applicable to things. The rationalists did not see reason as establishing general facts about the world, but rather thought of mathesis universalis as systematically and with optimum simplicity and clarity exhibiting concepts which could or must be instantiated in re.

Ideas (objective realities or "natural geomtery") for the rationalists act as their own schemata. This becomes apparent in their theories of vision. In these accounts, ideas act as rules governing judgments, which are acts made on the occasion of experience. The notion of being conscious of ... concerns what occurs in the mind, the occasions of judging, and is held to correlate with what takes place in the body and (mediately) in re. Kant is not concerned with physiology, does not have a theory of the correspondence between the mind and the body in the rationalist sense, and lacks their notions of judgment and of being conscious of ... The rationalists also have an equivalent of the unity of apperception. This is the thing in re or our imagining as instantiating a number of concepts which could be isolated by analysis.[221] (The co-instantiation of concepts in a particular case corresponds to the Thomist conversio ad phantasmata.)

Kant in a sense presents two objective structures: that of the conepts of pure understanding and that of the Ideas of pure reason. (Geometry, concerned with the pure forms of intuition, could be counted as a third.) The second is allowed only a regulative use. But why draw a sharp line between the two? Similarly, understanding furnishes synthetic a priori judgments telling us something about our cognitive powers and their objects, while reason is a source of only analytic judgments, which are simply explicative of our terms. However, the same judgments or propositions which are immune to conter-instance sometimes seem to express something substantive, while other times they seem to merely explicate terms. For instance, "F = ma" could be taken as a definition of "force"; yet it expresses an important conceptual relation between three fundamental concepts of physics, each of which has some conceptual life beyond the company of the others. We have a stock of terms and concepts which are systematically connected and allow distinctions and appropriate applications of individual terms or concepts. To teach someone a given purely conceptual statement could count as explicating the terms involved; but it might count as teaching him something substantive about the discipline. Normally, if the person in fact learns that such-and-such, then he has both learned how to use the terms and has learned something about the discipline. Again, to separate concepts into those which could be instantiated in things (Kant's concepts) and those which are further removed from description ("Ideas") is to decapacitate both sides of the division. For all the concepts are determined by their relations in the same system and the use of any given concept supposes these relations.[222]

Kant relies on the fact that some concepts are more evidently instantiated in things or are involved in the objects of intuition. But despite his reliance on construction in geometry, Kant fails to consider what Leibniz calls sensible signs when he insists that concepts must be certified by their relation to experience. Yet the most important way in which our concepts are certified is through established linguistic usage - this shows that they occupy a consistent conceptual niche and are not idle. Reason, for seventeenth century rationalism, was mathesis universalis. Kant, on the other hand, feels that mathematics can supply its own objects because it constructs its concepts, but that the methods of mathematics (construction in particular) are inapplicable in philosophy.[223] But the term "construction" can be applied to strings of signs and their sequences in much the same sense it is applied to a diagram. In short, Kant's views of the methods of mathematics and the use of token are too narrow. Finally, some of the concepts whose relations to intuitions Kant relies on most - e.g. cause (not as explicated as mechanical activity) and substance (not as essence) - were considered, at least by Malebranche, as confused concepts. Different aspects are taken as important by Kant and Malebranche. Still, Malebranche's concern is also with what is applicable in experience; he goes on to emphasise what is theoretically fruitful by mathematical criteria.

Kant's view of the fundamental principle of pure reason (considering chains of syllogisms as completable with ultimate premises) could well be explicitly directed at Leibniz's position we presented earlier in this chapter. Leibniz certainly did at times talk of arranging all knowledge in grand syllogistic systems. But his immediate point was often that a particular discourse can be analysed in a definite context as involving a definite (and, for the context , complete) set of implicit principles. Still, the major part of our knowledge which we should like to capture with a logical system is our use of certain verbal forms, and a desideratum of such a system is that it be complete and be formulated with the smallest number of ("ultimate") axioms and rules of inference. Kant felt that the principles of formal logic are so general that they are indifferent to the relationship our thinking has to intuition.[224] But, when one considers that the application of concepts often is the application of terms and that logic is inherent in this application, these principles, though very general, are seen to have an intimate relation to "intuition".

According to Kant, then, reason as well as understanding supplies an objective structure; but the one supplied by reason is illegitimate as a source of substantive judgments about the objects of cognition. Kant distinguishes three sorts of "inferences of reason": that in which the major premise is always a categorical, that in which it is a hypothetical, and that in which it is a disjunctive judgment.[225] We can imagine three types of completed sequences corresponding to these three forms. So the principle that, if the condition is given, the whole sequence of subordinate conditions is also given leads to three sources of fallacy.[226] To these correspond three kinds of unconditioned unity - three "Transcendental Ideas" - and three speculative disciplines.[227]

The disjunctive form of syllogism leads to an unconditioned as the aggregate of the members of the complete disjunctive division of the concept, "the highest condition of the possibility of everything whcih can be thought (the entity of entities)", the subject of theology, viz. God. The account of God which Kant considers is essentially Scholastic: God is an individual, the bearer of all possible perfections, and known by analogy.[228]

Kant shows the invalidity of the three most important arguments for the existence of God; he also thinks he has shown that they exhaust the possibilities. At any rate, the general principles of the Transcendental Logic imply the impossibility that God (the "Transcendental Ideal") should be an object of experience.[229] Still, when looking for synthetic a priori judgments as the metaphysical foundations of science, Kant is concerned with things as they are possible objects of experience - i.e. phenomena; he is not concerned with things in themselves independent of our cognition - i.e. noumena. Thus

> ... the same grounds on which the inability of human reason to assert the existence (of a supreme being) has been demonstrated, are necessarily sufficient to demonstrate also the invalidity of any conter-assertion.[230]

An important difference between the rationalist positions and Kant's is that the rationalists held that all possible things are subject to and knowable through our science, which is also divine science.[231] That is, they do not admit noumena in Kant's sense. The discrepencies are significant with regard to God and minds. In the case of God, the rationalist position tends to reduce Him to a super-concept embracing the whole objective structure.

The distinction between phenomena and noumena lies behind Kant's transcendental idealism. Kant can be credited with the insight that private events (intuitions, cognitions, etc) need non-private criteria: we have seen the function of the Categories in conferring objectivity on our judgments; "objectivity" is meant to involve communality with other persons.[232] Holding transcendental idealism allows Kant to maintain that the contribution of the understanding - e.g. the principle of causality and substance as a permanent subject in experience distinct from the perceiver - in fact applies to the objects of cognition. This is behind his proof that "the mere, but empirically determined, consciousness of my own existence proves the existence of objects in space beyond me".[233]

For Kant, something can be experienced as external only because it is intuited in space. But space itself is a pure form of intuition. According to Kant, space is empirically real - it is real "with respect to everything which can be given to us as an external object" - and it is transcendentally ideal - it is not real "with respect to things ... considered in themselves".[234] (The same applies to time.) Briefly, objects can be intuited only "through" space and time, so they can never be cognised in themselves.

But the realism one would like to establish relates to things in themselves, noumena. Kant's empirical realism and transcendental idealism are tightly bound to the cogniser, and, as far as the existence of things is concerned, go beyond him only if there is some systematic relation between noumena and phenomena. But here Kant encounters a problem (which, in fact, was mentioned to him in correspondence[235]) to which he never gave a solution.

In Korner's words,

> Kant assumes without qualification that perception is in part caused by the action of things in themselves on the perceiving self. Now causation, in the ordinary meaning of the term, presupposes that cause and effect are located in space and time, whereas according to Kant things in themselves are not so located. The assumption that the things in themselves act upon the senses is thus contradictory.[236]

The problem is that Kant's realism is about phenomena, which are transcendentally ideal; and it is not evident that this does not simply mean ideal simpliciter, though subject to rules of the mind.

Kant's noumena have been compared with Leibniz's monads (which perhaps are their historical antecedents). Leibniz likewise held that monads do not instantiate geometrical concepts (yet they instantiate arithmetical concepts and are substances, not only in Leibniz's sense, but also in Kant's sense of something perservering through time). But Leibniz gives us a story of how phenomena relate to things in themselves. For he holds that spatial displays - phenomena - are well founded by monads, a monad expresses the body founded on the monads it dominates, and the monad's activities are a non-spatial analysis of the spatial display.

A large part of the difference between Kant and Leibniz rests on their positions on sensation and what is empirical. The irreducible difference between judging and intuition is fundamental to Kant.[237] Much the same distinction is summarized in Leibniz's distinction between truths of fact and truths of reason. Yet Kant maintains that Leibniz "intellectualized" appearances.[238] Indeed (although Kant does not mention this), Leibniz explicitly held that occurrences in the mind ("sensible qualities") are analysable as intricate instantiations of concepts.

Still, if the question is about the application of the descriptive part of our vocabulary and descriptive rules and concepts, then some "intellectualization" is in place (but not, of course, to the extent Leibniz carries it). And, in this case, we should not want to say that empirical cognition is given, but rather that there is a suitable relation between what we do and the circumstances we are in. On the other hand, what is given by sense might be taken to be mere occurrences in the mind (perhaps establishing dispositions); such occurrences are our (or any other higher animal's) being alive to features in our environment. But this does not give Kant the relation he needs between what is given by sense and the contribution of the cogniser; otherwise we could demand an explanation why other mammals have not produced systems of dogmatic metaphysics.

The reason Kant gives for maintaining that Leibniz intellectualized appearances is that he compares the objects of sense with one another as if they were things-in-general in the understanding. For the understanding regards only their concepts, and not their place ("Stelle") in intuition, wherein alone objects can be given.[239] Kant thinks that this necessarily led to the extension of the principle of the identity of indiscernables (valid only for things-in-general) to the objects of sense (the "mundus phenomenon").[240] Generally, Kant objects to Leibniz's attempt to get behind phenomena, to understand (the workings of) things independent of, yet conformable with, our understanding. Leibniz, according to him, bypasses conditions on our cognition of objects, conditions on appearances in space and time more specifically, the pure form of external intuition - space - in particular.

Kant thought the presuppositions of Newtonian mechanics were part of the natural cognitive machinery of humans. He sides with Clarke aginst Leibniz on the question of absolute space; but his Copernican revolution makes absolute space a contribution of the cogniser. Leibniz, Kant states, thought of space as a certain order in the community of substances, while what is peculiar to this order and independent of the things ordered he wrote off as due to the confusion of this concept. So space was regarded as an intelligible form of the connection of things in themselves, i.e. intelligible substances. At the same time, however (Kant continues), Leibniz wanted this concept to be valid for appearances. For "he sought everything, even the empirical representation of objects, in the understanding and left the senses the contemptuous business of confusing and disfiguring these representations".[241]

Kant asserts against the principle of the identity of indiscernables that the diversity of positions ("Orter") is the foundation of plurality and difference of objects (as appearances) without further conditions.[242] And he argues for the principle that "space is a necessary a priori representation, which founds ("zum Grunde liegt") all external intuitions" as follows. We could never form a representation of the case in which there is no space. Yet we can think the case in which there are no objects in space. So space is the condition of the possibility of appearances.[243]

Kant is correct that Leibniz focuses on things in themselves as concepts. The Cartesians did so even more blatantly; substance was tought of in terms of its essence, e.g. extension. But then there is the problem of individuation; Spinoza in many ways was the most straightforward Cartesian. Leibniz thought he avoided this problem in a number of ways with the notion of monad.[244] But when Leibniz discusses basics, the notion of individual concepts dominates, and conatus is interpreted as conceptual succession (inferences or calculations) - for Leibniz, the logical "must" is not only compelling, but also propelling. Kant is also correct that there is a connection between the status of space and the principle of the identity of indiscernables.

Leibniz and Kant both have insights, and both mis important points. Thre are a number of ways in which we could think of an (pure form of) intuition or concept of space or spatial intuitions or concepts; correspondingly, there are a number of ways one might hold that spatio-temporally distinct individuals are discernable. Now our ordinary concepts of living things and much else are about things whose activities are spatially complex. (But if rational agents - the concepts of which likewise involve a spatial element - are not noumena, then nothing is.) Furthermore, our ordinary concepts of the circumstances in which various forms of behaviour are appropriate and the elements of these circumstances also have irreducible spatially complex features. Concerning the identity of indiscernables, ordinary language would break down if there were no general terms; and it would be unusable if we had to give unique descriptions of every individual. So, considering the common, basic cases of cognition, one must allow that cognition presupposes spatial discrimination. But whether this implies that the cogniser has a pure intuition or concept of space is another question.

However, the situation is different if we consider only concepts within a discipline with a certain degree of sophistication, when only conventional sortals are involved. To arrive at a picture involving spatial distinctions of some part of the universe, there must be a sortal - unit - of distance (or length). There are a number of theoretical reasons suggesting which paramters and constants are relevant, while the magnitude of the unit is largely a matter of scientific tradition. Theoretical considerations suggest the conceptual salience of the transmission of light and suggest the speed of light times elapsed time as a measure of distance. Not only distances, but also spatial properties involving more than dimension(e.g. the sum of the internal angles of a right triangle) are determined by the application of the metric. This application presupposes that "things" (e.g. observers or natural bodies which emit, absorb, or reflect light) have been picked out; they must be picked out independently of the picture arrived at by applying the metric.

Kant's space as a pure form of intuition is at this level - he holds that it instantiates Euclidean geometry. He is wrong in holding that space in this sense would have an application even whenthere are no objects which are spatially related. His Copernican revolution assigns these sophisticated concepts to our natural endowment. It might be suggested that our behaviour is naturally in accordance with Euclidean concepts and that we visually pick out Euclidean triangles, etc.; so our behavioural and visual spaces are the same and a natural Euclidean endowment explains this coincidence. But the evidence that something is picked out visually (and not just that, e.g., certain optical patterns form on the retina) is behavioural. And behaviour is described in Euclidean terms because (when the dimensions are not too large) this is the simplest way to exactly describe things and their activity. It is correct that the application of concepts to things presupposes spatial discrimination, for the sophisticated endeavour referred to presupposes less sophisticated competences. But the presupposition relates to experience, in the sense of an on-going sequence of trials, errors, and successes, of the person who eventually acquires the concepts.

So Kant also deflects the insights. In this case, the notion of an individual soul , a cognitive agent which displays no behaviour, is still present. This leaves Kant with the "problems" of perception. He is also faced with further "problems". The rationalists thought of our science as the same as divine science and as applicable to whatever there is. One result was that both finite things and God were thought of in much the same manner as concepts. However, they were able to preserve the insight that non-private criteria are common criteria, for all rational agents were held to be subject to divine science; as this is perspicuous, so (to that extent) is God. However, Kant places God beyond our scientific knowledge, as a noumenon. While he insists that the contribution of the understanding accounts for objectivity in the sense that there is a factor in our judgments which we share with others, he has nothing to account for this communality.

Still, Kant finds reason to maintain a communality of the principles of rational agents in his moral philosophy. This is another instance of his transcendental method, for, without this communality, an essential feature of moral behaviour would be missing. Kant again has the escape of noumena, this time in the form of (finite) rational agents. In moving to noumena, however, he moves beyond the realm of applicability of our science. There is an essential difference for Kant between the way we know the rules governing our scientific activity and the way we know the rules governing our moral activity.[245] Kant must maintain, with regard to noumena, that either we do things without knowledge or else there is tacit knowledge which cannot be made explicit.

Still, Kant holds that moral laws are the province of reason; so these laws are known. What is unknowable is how the moral agent, the thing in itself, operates. To allow for moral activity, Kant holds that we must move beyond phenomena. The reason appears in the Third Antinomy. The thesis is

> causality according to laws of nature is not the only kind of causality from which the phenomena of the world can be derived. It is necessary, in order to explain them, to assume a causality through freedom.[246]

The antithesis is

> There is no freedom; everything in the world takes place solely in accordance with laws of nature.[247]

The second sort of causality mentioned in the thesis is only an Idea - the Idea of freedom. This Idea, Kant feels, is necessary in order to account for the experience of moral obligation, which is different from any objective experience within the scope of science, so of the <u>Critique of Pure Reason</u>.[248] A fundamental principle of this work is that all phenomenal events are causally necessary. In the discussion of the Third Antinomy, Kant states that it is possible for man to be both a phenomenon and a noumenon. Beyond the possibility, that man as noumenon exists is held to be shown by the fact that we apprehend the moral law and our subjection to it.[249] In the Critique of Practical Reason it is clear that what he holds to be unknowable is moral freedom, which is an Idea.[250] This suggests that there is something - moral freedom - which is beyond our cognitive faculties, yet manifests itself in its effects. It seems to suggest that some other rational being might be endowed in such a way as to apprehend this elusive feature.

But there is no further element beyond our moral behaviour; there is nothing for us to be ignorant of. Saying that someone's act was not free is a way of removing that act from moral consideration (except, perhaps, as the fact that it was not free is due to some other act by himself or another). Behaviour, in the full sense, would not be behaviour unless it were free, i.e. the action of an agent, and not, e.g., a mere physiological response. Moral behaviour is underdetermined by environmental factors; it is governed by moral rules, which are cultural. A free act ("free" being largely redundant) is one by which the agent has got it right or got it wrong; if he acted correctly, he could have acted incorrectly, and vice versa. What is correct in given circumstances depends on the moral rules. If we engage in an activity which is evaluated by these rules, then we are generally attributed with knowledge of these rules (even when we cannot formulate the knowledge).[251] We need know nothing other than these rules and the features of particular circumstnces, where behaviour in accordance with the rules is appropriate or inappropriate. There are no unknowable sequences of events or activities.[252]

Generally, we need not draw a distinction such as that between phenomena and noumena. To evaluate an agent morally, we must pick out what displays the behaviour in question. Furthermore, our knowledge of moral rules and moral acts is no less obvioulsy displayed than our knowledge of geometry and geometrical constructions. Kant, with the distinction between phenomena and noumena, parallels the Scholastic distinction between the realms of nature and grace. But he keeps the noumenal, moral, "spiritual" side hidden and severs the rationalists' union of mathematical and moral rules under "science".

The "problems" introduced by the framework of God and the immaterial soul remain for Kant. If he were to consider the question of freedom with regard to acts of cognition, he also would face the problem of the attribution of cognition to individuals. Both the rationalists and Kant miss out overt behaviour and convention. In the case of the rationalists, this tends to make agents into concepts. In the case of Kant (and here he has something in common with Locke), agents become unknowable authors of acts.

Kant still struggles with the functions which were assigned to the intellectus agens. He is unable to see objective structures as conventional. And he misses the advantage which the rationalists had in considering the supposedly unique objective structure as reified in something distinct from individuals. The advantage is that there is then a bridge between individuals and a bridge between the cogniser and what is cognised in re. God enters most spectacularly in the Third Meditation, where He allows Descartes to get beyond the ego. But He is continually on the scene in rationalism, whether in the foreground or the background. And the framework of God and the immaterial soul was common property. Furthermore, even though the major figures have departed, this framework still exercises a good deal of influence. The only way these positions can be properly assessed is to determine what role God, divine science, and related notions play, what insights are enshrined in them, and what "problems" they introduce.

Chapter XII.

Locke

Locke's account of knowledge is indebted to the Cartesian revolution, but it also owes a debt to his medical empiricism and has much in common with the nominalist and Gassendist accounts. A great deal of the Cartesian revolution either did not affect Locke or was rejected by him. In particular, his account greatly restricts the perspicuity the Cartesians sought. Locke accepts the mechanical philosophy in so far as the operations of all inanimate things are held to require no properties independent of the cognition of a sentient being other than formal features and solidity. Yet, in keeping with his particular medical background, mechanical physiology is not used in explaining animate things. In addition to animal thought, Locke restricts Cartesian mechanism in rejecting the position that extension alone is the essence of body, which also requires solidity, and in accepting corpuscles as fundamental physical units. His position on all three of these issues places limits on perspicuity. The divergence between Locke and the Cartesians and Leibniz in their accounts of knowledge is much more radical, for he emphasises the narrow compass of the human understanding. Locke's account is fundamentally causal and a major theme of it is that the materials of knowledge are admitted by the few and narrow inlets of sensation and reflection. These materials themselves are largely opaque. Furthermore, from these materials our science must be made by ourselves. Generally, there are two strands to Locke's account: his acceptance of a mechanical foundation for inanimate things, in which he has something in common with Leibniz and the Cartesians, and his emphasis on the narrow compass of the understanding, in which he rejects the goal of their accounts of our knowledge.

Locke, criticised by Norris, Sergeant and others for not stating what ideas are, always replied to the effect that we need not be able to say what they are; it suffices for the historical plain method that we can give an account of their origin and how all knowledge is built from them. Yet he characterises ideas in a number of ways, the two most distinctive of which are as sign and as perceptions. The signs nature of ideas is emphasised in Locke's division of the sciences in the last chapter of the Essay. Here he suggests that an understanding of the function of ideas can furnish us with a new logic, i.e. a method for the reformulation, direction and augmentation of the body of empirical and rational knowledge we have. Locke classifies ideas with words in this chapter as signs; with words, ideas are classified as the subject of the science of signs or semiotics. In a great deal of what Locke says about ideas, ideas are naturally interpreted as signs. This distinguishes Locke's notion of ideas from the Cartesian notion of ideas as objective realities. Occurrences in the mind, for the Cartesians, are signs of the state of the body and so of the body's relations to things in its environment. Yet they are not the materials of knowledge. For Locke, the occurrences of ideas are not conditions for the application of our knowledge, but are the materials of it. Furthermore, these materials are not perspicuous, for by having them we do not thereby cognise a configuration or other relation. As signs, ideas (as Locke considers them) are like scholastic species, for the Scholastics as well maintained that there are two sorts of signs, species and words ("voces").

Locke also calls ideas perceptions; the thesis he maintains against Malebranche is that ideas are only perceptions. He shares this view of ideas with Arnauld, but makes no attempt to introduce objective realities. It is sometimes stated that having an idea is having a perception and that a perception is having an idea. "Have" in these cases is used as in "have fear" and adds nothing to the occurrence sense of "idea". This sense of "have an idea" is particularly important in the fourth book of the Essay, where he correlates having an idea with the existence of its cause in our environment. "Have an idea" is used by Locke in a different sense when he is concerned with having ideas because they are got from experience. In this sense, to have an idea is to have a disposition for an occurrence in the mind. This sense of "have an idea" is essential in his rejection of innatism. An idea, then, can be either an occurrence or a disposition. In either case, an idea is said to be in the mind.

Both empirical and rational cognition are asymmetric for Locke, who is fully committed to a causal or genetic account. The inception of an idea as a disposition is in a perception which is caused by a configuration in re. This causal connection is the thread in Locke's account which holds our knowledge to the world. In the Examination of P. Malebranche's Opinion he states with no indication of disapproval that his position has been compared with Aristotle's and replies to Malebranche's criticism of the intellectus agens. Locke is not willing to accept the physical side of the Scholastic account which involves intensional species. But he insists that ideas (whether occurrences or dispositions) must be caused by what they are of, while admitting that we cannot comprehend how they are caused. Nothing is ever said of the disproportion between material cognising faculties, which we share with animals, and spiritual faculties, for with Locke as well, the mystery has moved to the gap between what is insensible and what is sensible.

The disagreement between Locke and Malebranche is on a more fundamental level than that of the relation between occurrences *in re* and occurrences in the mind. Throughout the *Examination* Locke misrepresents Malebranche's position by implying that he and Malebranche use "idea" in much the same sense. In fact, what Locke means by "idea" is much the same as what Malebranche means by "sentiment", although ideas according to Locke can be indifferent to judgement and are inceptions or exercises of dispositions in the mind. To Malebranche's claim that reason is immutable, Locke replies that reason is only the relation between ideas, i.e. occurrences in the mind and dispositions for them. As long as the ideas are the same, he adds, their relations, and so reason, will be the same.

Locke never gives a satisfactory answer to the question, how we determine that the same occurrence in the mind is the same idea as a previous occurrence. If the roles ideas fulfil which are specified by rules and concepts are ruled out as a means of individuating ideas, then a behavioural criterion or perhaps one in terms of memory is to be looked for. A behavioural criterion is ruled out. Memory, as Locke characterises it, will not do either. In the first edition of the *Essay* he styled memory the storehouse of our ideas. But this is not sufficient for individuating ideas, for his positions on our acquisition of knowledge and formulation of rational knowledge depend on what is in the mind in the sense of what we are conscious of. Locke holds that only that is in the mind which we are conscious of, or, having been conscious of, can be revived as an actual perception. To be conscious of something, for Locke, implies that we can state what we are conscious of or lack only the requisite vocabulary to do so. In the second edition of the Essay Locke clarified the metaphor of the memory as a storehouse by adding that he means only that we can have the same idea again with the additional perception that we have had it before. But the additional perception presupposes that it is the same idea which is had again and gives no criterion of success for reviving the same occurrence in the mind.

Locke holds that reason is the relation of ideas because he maintains that the materials of knowledge, and so of reason, are got from sensation and reflection. Ideas as occurrences inceptive of dispositions take place in roles, which (at least in the case of ideas got by sensation) are determined by their causes.

The reliance on materials received in sensation (we leave reflection for later) exhibits Locke's affinity with nominalism. The first step of his plain historical method is the outfitting of the mind with these materials. And he says very little about the correspondence between mind and body; the only point at which their relation is of interest is in the reception of ideas. The mind, as related to the body by Locke, has much in common with Suarez's intellectus possibilis. Further, as the immediate object of the understanding when a man thinks, an idea as an occurrence is reminiscent of Suarez's conceptus formalis. But Locke does not distinguish a class of ideas which are the meanings of words: all ideas are said to be the significations of words, simple ideas being the significations of indefinable words.

What Locke means by "mind" is close to what Gassendi suggested: the understanding and the material cognising faculties in so far as they are the faculties in which sensation and imagination take place. There is a tacit distinction between soul and mind in the Essay. Locke objects to the Cartesian notion of a soul which secures no dispositions. The soul in Locke's account is indifferent to matter except in those causal relations which establish dispositions in it. He also objects to the notion that the soul always thinks; thought, he maintains, is the activity, not the essence, of the soul. On the one hand, the soul is a spiritual substance, a substratum veiled by its activity. On the other hand, thought and perception are tied to consciousness and are placed in the mind by Locke, who writes that only that is in the mind which we are conscious of or, having been conscious of, can revive. Mind is related to person, for personal identity is determined by the same consciousness. And personal identity is independent of the identity of the soul. By this tacit distinction between mind, which ideas are in, and soul, Locke can include the sensitive faculties within the mind without allowing that these faculties are spiritual; ideas as dispositions need not be those dispositions which are in the mind.

Yet the sensitive faculties are not regarded by Locke as corporeal or material, but are indifferent to matter once dispositions have been established. Locke's distinction between mind and body is different from that drawn by the Cartesians. Likewise, his notion of consciousness is different from theirs, for it is tied to memory. "Person" is held to be a forensic term, but personal identity depends in the same consciousness in the sense that the person in question alone can acknowledge responsibility. Furthermore, we are held to be conscious of occurrences in the mind which are indifferent to judgement. What we are conscious of is independent of the body once dispositions are established because memory is independent of the body. The independence of the sensitive faculties from the body can be maintained by Locke because he rejects physiological explanations in the Cartesian fashion, particularly those regarding judgements we naturally make.

Ideas as the immediate objects of the understanding when a man thinks, are what Locke's predecessors called objects in sensitive faculties. Locke holds that ideas are not only in the mind, but also in the understanding, and are not just the objects of the understanding. "Understanding" retains some connection with meanings of words, as ideas are signs. But "understand" does not have its ordinary meaning for Locke since some of these signs are shared with animals.

Locke's central conception is that no knowledge is innate. As he does not admit a correspondence between the mind and the body, one support for innatism is removed from the start. Innatism of one form or another was common in the seventeenth century. Any account, such as those given by Thomism and Cartesianism, which maintains that there is a symmetry between inceptive and exercisive cognition and does not attribute non-descriptive rules and concepts to convention must hold that our knowledge of these is to some extent innate. Furthermore, Suarez's account of the illumination by the <u>intellectus possibilis</u>, according to which species "flow out" from it when it has once been presented with a phantasm as an exemplar, suggests that the immediate objects of knowledge are not got from experience. Generally, any position which gives some part to spiritual objects to that extent holds that our knowledge is not got from experience. Locke's arguments touch all these positions, but are particularly directed against an account such as Herbert's. Again, however, because of the causal gap Locke admits between what is corporeal and sensation, Herbert's analogy between the body and the world is ruled out. The appeal to universal consent in support of certain universal maxims flourished in England in Locke's day. But Locke interprets "consent" as referring to a speech act. Consent as the tacit acceptance of a principle of action can have no part for Locke in an account of knowledge, which for him is an account of what is in the mind, for what is in the mind is tied to what we are or have been conscious of and to be conscious of something for him implies that we can say what it is or only lack the terms to do so. In concentrating on universal consent as a speech act, Locke writes as if we must have the use of terms to be said to know what is in question; but this is contrary to his own position, according to which we first have ideas from experience as the materials of knowledge, and then associate terms with them. The emphasis he places on the knowledge of the terms in the first book, however, is due to the fact that innatism was appealed to for our knowledge of general maxims, which for Locke involve those complex ideas whose formation depends on the use of words.

Universal consent concerns the particular form of innatism on which Locke concentrates. Yet his strongest argument questions whether any form of innatism which is not obviously false in effect maintains anything other than that we can have ideas or know certain maxims. The sort of innatism which is obviously false is that which maintains that at birth we can apply certain maxims by explicitly following the same steps followed in applying them when they are formulated. In Locke's language, this view holds that at birth we actually have the ideas constituting the maxims. The alternative for those who accept that we have ideas at birth is that we have ideas potentially, i.e. given the requisite conditions, we come to have the ideas actually, and so can formulate the maxim in question. Locke's criticism is that if all that is maintained is that we could have certain ideas, then all ideas are innate. This in itself is not an objection to those who hold that ideas are innate, when "innate idea" is restricted to what is of particular features or aspects and is or has an objective reality. Locke here does not take account of criteria distinguishing innate ideas from other sorts of ideas. To this extent his argument must rely on his other claims, that all knowledge begins with particulars and from experience. Again, he does not consider the sense in which an idea is said to be innate in that ideas are not like what purportedly causes them, as Descartes maintained in the Notae in Programma. Still, what is it to have an idea, any idea, potentially? Knowledge is having ideas in the sense of dispositions for occurrences and there is the particular connection between "know" and "learn", which we discussed at the end of Chapter V, which supports Locke's general point.

We have basic sorts of practical knowledge because we have tried to do certain activities even though innate dispositions may be required. Gaining knowledge in this way is learning by trial and error, or learning by experience and extends beyond basic practical knowledge. Locke maintains against innatism that all knowledge is from experience. However, there are three senses of "experience" and Locke's use of the term generally is not the one we have been concerned with. In this sense, "experience" is related not only by etymology, but also by meaning to "expert". It also relates to "empirical" and "experience" as these regard trials made to gain knowledge of nature. To have experience in this sense suggests success and gives a gauge of one's qualifications. A second sense of "experience" is as it is used for what befalls us, as when we say that the accident was a real experience. "Experience" in this sense has no connection with "try" and we gain facilities by living through experiences only to the extent that learning depends on confronting novel situations. "Experience" in its third sense is somewhat of a technical term and is particularly frequent in philosophical contexts. In this sense, experience is the course of private happenings or mental occurrences.

Most references to experience in the seventeenth century were to experience as the course of mental occurrences. Still, the first sense had some currency, for this related to the Aristotelian sense of "experience" ("experientia"), in which it is said to come from much memory. Both Suarez and Hobbes used "experience" in this sense. Suarez also uses "experience" for the course of mental occurrences, as when he appeals to experience to support his positions on the actions and dispositions of cognising faculties. In this sense, the Cartesians regarded experience as a source of obscurity and confusion and as veiling the structure of things in re and the rational activities of the mind. Experience is the source of deviations from the norms of action and judgement in both cognitive and moral contexts, as it includes both material features and the passions. "Experience" and its translations also referred to experiments in the seventeenth century and in this sense of "experience" the Cartesians appealed to experiences. But experience as the course of occurrences in the mind was held to be due to the union of the mind with the body and to the accidents of our size and other biological restrictions.

Locke generally uses "experience" in this sense. He, however, regards it as the end on the side of the cogniser of the causal thread which ties our knowledge to things. There are three occasions on which Locke's writings suggest the sense of "experience" in which it is connected with trial and success. The discussion of the remedies of the abuses of words at the end of the third book of the Essay is reminiscent of the project on a universal character undertaken by Wilkins for the Royal Society in the 1660's. Indeed, much of what Locke writes about the accuracy of words and the relation between their definitions and natural sorts and bulks suggests improvements of language for those engaged in empirical inquiry. Language evolves through the experience of those who use it, particularly in a disciplined inquiry, where suitable terms are needed for a grip on the body of knowledge. Yet throughout this discussion, Locke speaks of making words signify ideas in the mind. The second occasion on which Locke writes of experience as it is connected with trial and success is in Of the Conduct of the Understanding in the discussion on practice and habit. Here, writing against Scholastic logic and rules, he states that use and exercise and the consequent acquisition of facilities accounts for what is thought to be natural. But this is immediately followed by a statement about the need to have clear and determined ideas.

The most important occasion on which Locke uses "experience" for something other than the course of mental occurrences is in his solution of the problem proposed by his friend, William Molyneux. The question is whether a man born blind, who can distinguish a sphere from a cube by touch, could distinguish them by sight on being made to see. Locke's answer is that this would require experience. The relation between feeling with one's hands and vision was used by Descartes in the "Dioptrics" to reject intensional species and support innatism. A blind man's judgement of distance and position by means of two canes is presented in analogy with our judgement by vision. The blind man is assumed to have such facility with the canes that he as a matter of course judges the distance and position of objects which come in contact with them. As nothing other than the shock is transmitted by the canes, vision in a similar manner does not require images communicated from the objects seen. Depending on how "judgement" is used, two things (other than Descartes' conclusion) could be gathered from the blind man's facility to judge the formal features in his environment. If "judgement" is taken for a verbal report or a shadow thereof, then this case shows that words relating to formal features have an independence from our biological condition not shared by words for material features. If "judgement" is taken for a natural reaction appropriate to the configuration of things in one's environment, then this case shows that practical cognition, as the cogniser and his environment are described in terms of formal features alone, does not require occurrences physically in the mind as images of things in the cogniser's environment; it suffices that the cogniser has certain facilities from the successes and failures he has had in getting about. Descartes thinks of the case as characterised by making judgements as verbal reports, but applies it to natural reactions appropriate to the configuration of things, taking the cognition to be the performance of a judgement or a number of judgements. A description of the cognition is given in terms of formal features and this cognition is held to be rational practical cognition performed in accordance with the natural geometry. Similarly, Leibniz, in discussing the Molyneux problem in the Nouveaux Essais, states that the blind man on being made to see could immediately distinguish by sight the sphere from the cube by a sort of common sense or natural geometry. But if the situation is to be described in terms of formal features alone, we should rather begin with the facilities the person has which are similar to those an animal exercises in getting from place to place and then move to practical cognition involving conventional rules to which the cogniser is subject. Locke, however, does not give the whole answer, for as Molyneux sets up the problem, it involves an application of rational knowledge since "sphere" and "cube" are terms for formal features. Thus there is something more than experience involved.

Again, the blind man does not necessarily see when the defect in his visual faculties is corrected. Rather, he sees when he can discern things by virtue of having sound visual faculties; whether he can apply the concepts of sphere and square could be a test to determine whether he sees. Still, experience in the sense of trial and error is required for one to be able to discern things.

The solution to the Molyneux problem is an exception to Locke's normal use of "experience", which is for the course of occurrences in the mind. He states that the account of knowledge he gives after the first book constitutes an argument against innatism since he shows how all knowledge is derived from sensation and reflection. The programme is completed with the discussion of maxims, which are replaced by the perception of the agreement or disagreement of ideas, which ultimately derive from simple ideas got from experience. Locke must maintain some form of terminalism, for ideas are got successively from experience and it is the same idea which is received in experience as is later exercised when there are further ideas in the mind. Simple ideas are usually not held to be defined by their relations to one another or to propositions, for it is as if the materials of knowledge are painted on a <u>tabula rasa</u> or, as Locke writes, a dark room with few entries for ideas. Locke's historical plain method describes the illustration or formulation of rules by means of ideas whose roles are ultimately determined by what causes them, for (according to Locke) we have a rule only once we have perceived the connection of ideas which have been sufficiently refined from the materials received from experience.

A causal account such as Locke's was the major alternative to an account in terms of innate ideas and related accounts (such as the vision in God). Part of the appeal of innatism was that it avoids accounting for the roles of occurrences in the mind by their causes and appeals to rules to account for our practical knowledge not directly dependent on our history in our environment. Innatism (which was rarely a thesis on development) accounts for knowing what we have never attended to and the fact that there are certain standards independent of our histories. Again, as it does not depend on the acquisition of discrete materials of knowledge, innatism avoids Locke's terminalism.

Part of the appeal of Cartesian innatism was the fact that it held that the science we follow is displayed in our own thought and no explanation (only a justification) is sought for our rational knowledge. By having the mind a perspicuous substance, Descartes was able to avoid the evil demon in the sense of something veiled in us causing the appearance that we follow a set of rules and concepts, while we do not in fact follow them. The perspicuity of _res cogitans_ also minimises the part of occurrences we have by virtue of the union of the mind with the body, rules out vicarious representatives distinct from the thing which thinks and is allied with the perspicuity of extended substance.

Locke does not give an account of Descartes' perspicuous _res cogitans_. The historical plain method is descriptive. There is a problem with what is in the mind because the mind is held to be a thing, but is initially a _tabula rasa_ and is indifferent to matter except for the reception of ideas. Again, "in the mind" allows of a dispositional sense; but then, it appears, we could initially have ideas in the sense of dispositions. This is Leibniz's point when he states that Locke does not refute Platonic reminiscence. A refutation of this is consistent with Leibniz's position because he maintains that apperception results from a concourse of _petites perceptions_ which instantiate the same innate science and differ by only more or less from what is perceived. Platonic reminiscence, he holds, accomplishes nothing because we are faced with the same problem of initial acquisition in the previous life, or the one previous to that, etc. Locke's reliance on initial consciousness does not expose the part of rules and concepts in the inception of knowledge. Locke in fact mitigates his position on the _tabula rasa_ by admitting at the end of the first book that we have innate faculties. But restricting his account to occurrences in the mind which we have been conscious of precludes these from entering into the account of how we know.

The major departure Locke makes from previous causal or genetic accounts is his introduction of reflection. Leibniz conjectured that Locke's ideas of reflection are innate ideas under another name. But sensation for Locke is a separate source of materials of knowledge, complementing reflection. Locke uses "reflection" in a novel sense, although his use bears some relation to the Scholastic use of the term for considering the principles - faculties and species - of our knowledge. Locke holds that we reflect on the operations of the mind, generally perception - thought - and willing, but including any occurrence in the mind. Reflection for Locke, is not our attending to concepts independent of their application as it is for the Cartesians. Spiritual substance is a veiled substratum; conscious operations are the source of ideas of reflection and even then attention is required. Nevertheless, ideas are a source of knowledge about operations other than those of our own mind. Locke maintains that reflection is the source of the knowledge we have of other minds, including angels and (removing all limitation) God. Furthermore, some ideas of reflection are materials of our knowledge of what does not think. The idea of active power is said to be got from reflection, as is to a large extent that of cause. And ideas of infinite number, extent and time are held to be got by reflecting on the power we have of indefinitely continuing a series of ideas.

If reflection for Locke was similar to Cartesian reflection, which is largely intransitive self-teaching, then there would be no problem about knowledge of things distinct from our mind gained from reflection. But ideas,for Locke, are not concepts, but occurrences or dispositions physically in the mind. Ideas of reflection in particular are got by attending to occurrences in the mind, which are particular things. How, then, can these ideas be applied to what is distinct from our own mind? It might be replied that ideas as signs can constitute the vocabulary by which we frame our knowledge about things distinct from these signs. But this severs the causal thread by which our knowledge is tied to the owrld. The origin of the ideas of infinite quantities also poses problems. Attending to the power we have of indefinitely continuing a series of ideas is attending to a series whose members are physically in the mind. But this does not give us the rule for generating such a series any more than attending to a series of things <u>in re</u>.

According to Locke, reflection furnishes knowledge of the operations of the mind. But it does not furnish us with knowledge of the soul or spiritual substance, for it remains at the level of what we are conscious of. Our ignorance of that whose activity is thought is paralleled in Locke by our ignorance of material substance as the substratum of the qualities corresponding to ideas of sensation. The substratum view of substance, however, although consistently maintained for spiritual substance, is not the only position on substnace presented in the Essay. Locke uses "substance" in three senses, one of which is for substrata. Secondly, when he speaks of ideas of substances, he means complex ideas under which we classify natural things. There is no question here of the idea being of something behind the qualities, which is ruled out by what he writes about real essences. Ideas of substances are made by us, according to Locke, althought they must have an archetype in things, i.e. the simple ideas must occur together. "Sortal", a term introduced by Locke, is used as a synonym for "substance" by him. However, "sortal" is used for both what we have called sortals and for bulks (e.g. gold). (He states that "sortal" is related to the English "sort" as "general" is related to the Latin "genus".) Substances, in so far as we have ideas of them are universals made by the mind. Locke sometimes gives examples of individuals (e.g. a cherry), but in that he speaks of our ideas of them, they can be considered more specific universals.

Locke uses "substance" in a third way when he considers identity. Only three sorts of substance are admitted: God, finite spirits and particles of matter or atoms. God is briefly discussed and the identity of spirits, each having its determinate time and place of beginning, is assumed and plays no further part since the identity of persons (who are not substances) rests on consciousness. Particles have a theoretical role, for the identity of masses or bodies is held to consist in the identity of the particles comprising them. Furthermore, living things, although their identity is held to consist in the same organisation of parts, are composed of particles, albeit in flux. Positing particles as determining the identity of bodies and as constituents of living things allows Locke to by-pass the question of a basic sortal, while maintaining that the individuation of things has a foundation beyond our knowledge. The individuation of things was a problem for the Cartesians because the basic sortal is a unit for them. What Locke writes of atoms as substances is beyond his account of knowledge and serves only an ad hoc role for identity, for the only ideas which are concerned are those of primary qualities. But when Locke discusses modes of simple ideas, he joins the Cartesians with units as basic sortals.

The sense of "substance" which is distinctive to Locke's account in opposition to that of the Cartesians is that of substance as a substratum, which accounts neither for identity nor for the classification of natural bulks and sortals. This is the central issue of Locke's general defence of his account of knowledge against Stillingfleet. He admits we have a confused comparative idea of substance as what supports accidents, which was Suarez's position (using "notio" instead of "idea") on both our knowledge of substance and and our knowledge of matter. With a notion of substance different from that of the Cartesians, there arises the problem of the applicability of our science to things. Indeed, Locke holds that empirical inquiry is largely not the application of science, but is concerned with ideas of substances (as universals). Substance as substratum is left veiled by our ideas with the exception of ideas of primary qualities, most of which are formal features. Mathematics has a special position in Locke's view of our knowledge of things because it allows us to say how things must be. Yet ideas of substances as

Locke discusses them have little to do with mathematics. That strain of Locke's thought which emphasises the narrow compass of human understanding dominates at the expense of Locke the mechanist when he is concerned with the knowledge of natural sortals and bulks with which we must be satisfied, as is consonant with his medical empiricism. Locke here is not concerned with the structure of things, but with their classification. Ideas of substances are held to need an archetype in the sense that the collection of simple ideas comprised in them is due to the understanding only in so far as some may be left out and others included. Thus they involve a restriction due to things. Yet one cannot get beyond these ideas - nominal essences - to what causes the coherence of their constituent ideas - real essences. Locke usually characterises real essences not as mechanical systems, but as Scholastic substantial forms. He sometimes writes about them as what is held to account for the similarity of things in natural generation, but he is unwilling to analyse generation mechanically with the Cartesians.

Still, Locke holds that we can say what qualities all things must have and that nothing more than these qualities need be assumed for the variety of natural things. Mathematics allows us to say how things must be. Mathematical propositions are held to be capable of certitude or, in Locke's language, mathematics is a science because it is concerned with modes and ideas of modes (given simple ideas) are of our own making. Not having archetypes in things, mathematical ideas are of substances as universals only as they happen to be included in ideas of substances, and so mathematics does not let us say what qualities the nominal essences causing their constituent must have. Locke sometimes speaks of nominal essences as if they are mathematical concepts instantiated in things, for he states that if we knew the real essences of things, we would know that from which all their qualities flow. But he never identifies real essences with mathematical concepts and generally is not concerned whether the ideas which go together in nominal essences ultimately have a mechanical or some other cause of their union. Ideas of substances are concerned with classification and the mystery is why a collection of ideas of secondary qualities should go together. Mathematics is concerned with modes and neither helps in classification nor explains the co-occurrence of ideas of secondary qualities. Thus it would take something more than mathematical knowledge to have essential knowledge of real essences. Likewise, substance as an unknowable substratum is not eliminated by the fact that mathematical knowledge allows us to say how things must be, for mathematical ideas are of modes and do not explain what supports collections of accidents. Locke opposes the utility of both real essences and substance as a substratum in an account of knowledge. But both notions have a part in his account because this account is largely concerned with ideas which are signs of their causes, but do not reveal them. Locke's account is not of our application of science to things, but of the formation of our knowledge from materials got from experience, which furnish restrictions on it.

One group of simple ideas - ideas of primary qualities - allow us to say what the real natures of things must be. But, again, these ideas do not allow us to explain why a collection of ideas of secondary qualities should go together and their part in classification is subsidiary to that of ideas of secondary qualities. Primary qualities are those qualities, such as size, figure, motion

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and bulk or solidity, which any portion of matter must have. Ideas of primary qualities are said to be like these qualities. Secondary qualities are powers - mechanical configurations - producing ideas of secondary qualities. When Locke presents the distinction between primary and secondary qualities in Book II, Chapter VIII, of the Essay he uses the term "idea of secondary quality" as most seventeenth century philosophers used "sensible quality", which has led to great confusion. Secondary qualities themselves are in things. Later, in the third and fourth books, where he is concerned with ideas of secondary qualities as they are comprised in ideas of substances, he calls such dispositions as malleability and solubility secondary qualities. The reason for this discrepancy is that Locke has different purposes in the two contexts. When he draws the distinction, as when he assumes atoms or particles as basic sortals, he wishes to determine what qualities alone need be attributed to things. Primary qualities for the most part are formal features and in his account of the universal qualities of body, he sides with the Cartesians (with the exception of bulk or solidity). The application of the notion of idea of secondary quality in the third and fourth books emphasises our lack of knowledge of the cause of their co-occurrences and the need to form determinate collections of these ideas as ideas of substances. Here he is not concerned with ultimate qualities of matter, however portions of it may be classified by us; rather, he is concerned with the classification, which is by means of what is apparent to the senses. Both material features and dispositions are signs of the internal constitution of things and are signs by which we classify things.

Locke's distinction between primary and secondary qualities is not to be found in Cartesianism or Scholasticism. The Scholastic term "sensible quality", used for proper sensibles, was accepted into Cartesianism for the same qualities, but with an account which denied their intensional identity with accidents in re. The Scholastic common sensibles correspond largely to Cartesian modes of extension or what we have called formal features. In the first book of the Essay, ideas of secondary qualities are material features, but primary qualities include bulk or solidity, but not time. Locke includes solidity because it, as well as extension (he holds in opposition to the Cartesians), is the essence of body and the distinction as drawn here is concerned with the nature of things, more so than the Scholastic and even Cartesian distinctions. His distinction rests on the fact that any portion of matter, including particles, must have bulk or solidity and a determinate under the determinables which are the other primary qualities. Ideas of secondary qualities are determinables as well, but there are (it is held) systems so small that they lack the required complexity to cause colours sounds, etc., and so cannot be attributed with secondary qualities.

Ideas of primary qualities are said to be like what causes them. This is not a thesis about incorrigibility, for primary qualities are usually taken as determinables. Nor is it a thesis about the regularity and coherence of our reports about formal as opposed to material features, for he speculates that all people have the same ideas of secondary qualities and their regularity is essential for what is said of ideas of substances. Rather, as the cause of all simple ideas are various mechanical systems whose only qualities are primary qualities, knowledge based on ideas of primary qualities, unlike that based on ideas of secondary qualities, is knowledge about the causes of the ideas themselves.

Within Locke's programme to exhibit how all our knowledge derives from simple ideas of sensation and reflection, ideas of primary qualities, like ideas of secondary qualities, are signs. Ideas of primary qualities are distinguished from those of secondary qualities only by their external relations: they are ideas of qualities whose determinables are common to all bodies or they are the ideas of these determinables themselves and we can know necessary connections between them. Locke's distinction between ideas of primary and secondary qualities differs from both the Scholastic distinction between common and proper sensibles and the Cartesian distinction between modes of extension and sensible qualities in that ideas of both primary and secondary qualities are said to be caused. All simple ideas, as the end of the causal relation on the side of the cogniser, are signs. As the simple signs from which the understanding forms complex signs and eventually our whole body of knowledge, all simple ideas are distinct, real, adequate and true, as Locke maintains in the closing chapters of the second book.

Locke did not follow Descartes in his criticism of the Scholastic theory of signs, according to which a verbal token ("vox") is the sign of a concept as an occurrence in the mind (*conceptus mentis*), which is the sign of a thing or feature *in re*. Locke maintained that two perceptions are involved in our linguistic cognition, a view questioned by Leibniz, who maintained there is only one. We first perceive the word (as a verbal token), Locke states, and then the idea (as an occurrence in the mind) which it signifies. Words as types on Locke's account are associated with ideas as dispositions. Occurrences in the mind were not only signs of things _in re_ according to the Scholastics, but were also images of them; yet the images need not share any qualities with that of which they are qualities and ideas of primary qualities are like that of which they are images only by virtue of their external relations. The only further agreement between the image and that which it is of added in complex ideas is an agreement in structure. Still, this theory of meaning has the role of verbal tokens depend on the role of occurrences in the mind caused by things _in re_. Furthermore, it has the unhappy consequence that when we hear, e.g., "green", it is as if we see, e.g., grass in summer.

As signs, both ideas of primary qualities and those of secondary qualities are the significations of words which cannot be defined. Locke has no equivalent of objective realities, which are the meanings of words and specify the roles of verbal tokens and shadows of them. Rather, for him, occurrences in the mind which have established dispositions determine the roles in which verbal tokens can occur. The roles of these occurrences are determined by that which causes them, which is that of which they are signs. In his criticism of Malebranche, Locke rejects Malebranche's distinction between idea and sentiment; only occurrences in the mind and dispositions for them are of interest to Locke. He rejects the foundation for this distinction, i.e. that ideas can be expressed by definitions and are what demonstration is about. Locke maintains instead that we can define, e.g. "square" since the idea (as an occurrence in the mind) of a square so frequently presents itself to us because of the frequency with which figured things strike the senses.

Locke not only lacks a notion corresponding to that of objective reality, but also characterises the clarity and distinctness of ideas in a non-Cartesian fashion, as he insists to Stillingfleet. Clear and distinct ideas are associated with objective realities for the Cartesians, and so with the meanings of words. They are also connected with words for Locke, but words are taken as types of marks or sounds to which ideas as occurrences are bound. The remedy for confusion suggested by Locke is the association and parts of ideas with words. In the fourth edition of the Essay, he substitutes "determined" or "determinate" for a number of occurrences of "distinct", explaining a determined idea by its association with a word.

Given simple ideas as materials, Locke's programme progresses with the formation of other ideas from this basic vocabulary with the aid of words as types of marks or sounds. Locke distinguishes three sorts of complex ideas: those of modes, of relations and of substances. Given the materials furnished by experience, the formation of ideas of modes is restricted only by the condition that the combination of ideas be consistent. The materials already occur in the roles by which they are fit to enter into various combinations. Words are of greatest importance in the formation of these ideas.

Ideas of relations are a special case and are particularly significant for Locke's empiricism. Relations are of greatest theoretical interest to Locke for the science of morality, which he was urged a number of times to develop, but never did. Morality (as concerned with natural law) was also his early interest which led him to articulate his position against innatism. Ideas of relations, however, are of more general interest, for according to his terminalism, which follows from his empiricism, we receive discrete signs of the qualities of things. Neither simple ideas nor ideas of modes and substances considered as single ideas include ideas of relations according to Locke. Yet these ideas somehow found relations and have what Locke calls respects. Thus the only operations of the intellect needed to form ideas of relations are the bringing together of two or more ideas and the attention given them. There need not be ideas of relations as dispositions, for the ideas related suffice.

On Locke's position, ideas, even those received in sensation, are in roles determining all their possible relations and the same relation is founded by a multitude of different ideas. But, then, how far would Locke depart from his position if he maintained that ideas of relations are in the mind and determine the roles of occurrences? Digby states that all notions but that of being are respects and Malebranche held that all ideas are relations. Generally, objective realities or their equivalents were largely relational concepts. Against Malebranche, Locke asserted that the immutability of reason is the immutability of the relations of the same ideas, but we have already discussed the difficulty which Locke has in individuating ideas. Indeed, Locke holds that relations are often clearer than what is related.

There is a suggestion in the chapters on modes of simple ideas (not ideas of simple modes) in the Essay, that the mathematical ideas of primary qualities are ideas of relations. Here Locke, in Cartesian fashion, takes units of distance and especially what he calls the simple idea of unity, as basic sortals and generates ideas of quantities from them. These ideas of units are more fundamentally simple than the ideas of shape, figure and number as determinables or determinates under them which are contrasted with ideas of secondary qualities. In these chapters, formal features are treated as considerably different from material features. Ideas of distances, etc. as generated from a unit are not caused or received in sensation, while ideas of colours, etc. are not generated. Indeed, the relevance of ideas of primary qualities in Locke's account of knowledge is due largely to the fact that, with the exception of solidity, primary qualities are formal features, for the connections between ideas of primary qualities, unlike those between ideas of secondary qualities, are necessary. The causal thread is lost in the chapters on modes of simple ideas, yet Locke's strongest arguments for the special status of ideas of primary qualities does not rely on causation, for they appeal to unobservables. If ideas of primary qualities are really relational and relations at any rate are often clearer than what is related, then the confusion in our cognition of material things and the veil of the real natures of things are due to the causal relations between ideas of secondary qualities and mechanical configurations _in re_. Still, Locke could not maintain this position and retain his empiricism, for ideas of relations are due to the mind and causal relations are held to guarantee that ideas are of the features of things.

Locke's empiricism appears most strongly in his account of the formation of ideas of substance, which is the major topic of the discussion of words in the third book of the _Essay_. Furthermore, our knowledge of substance was the major concern of the first two drafts of the _Essay_. Locke relates the formation of ideas of substances to two sorts of abstraction, although the second sort concerns simple ideas as well. One form of abstraction, if it can be called that, is the formation of nominal essences from simple ideas. This is similar to the formation of ideas of mixed modes except that the constituent ideas must be observed to go together and are largely ideas of secondary qualities and signs of powers in things. Locke contrasts the immutability of the nominal essence with the changes which particular substances undergo, and states that nominal essences are established in the mind with names annexed to them. Apparently, the immutability of nominal essences is due to the immutability of the same word since Locke suggests that the constituent ideas be put together under a name for our own recollection. Also, the ideas constituting nominal essences are to be given names to declare the significations of our names of substances to others. In maintaining this, Locke supposes that the use of a word is determined by the role of an idea caused by something _in re_. Conventions are replaced by roles established in experience, which must be assumed similar in different persons. The only way we have to check the rectitude of clustering certain simple ideas together under a name is by the roles the simple ideas fulfil. But these roles themselves cannot be checked since they are given. The formation of nominal essences is like the formation of complex terms from simple terms, as is reflected by Locke's discussion of the definition of hames of substances. As ideas are in the mind, we have them only when we are or could be conscious of them. However, it is not clear how we are first conscious of simple ideas, which evidently are always received in clusters. Likewise, it is not clear how simple ideas and their roles are given.

Locke accepts a second sort of abstraction, which is properly abstraction, as it is an elevating operation. Words are not appealed to, for the generality of words is explained by the fact that they are signs of general ideas. Ideas are made general (Locke states) by separating from them ideas (such as the circumstances of times and places) by which they are made to be of one individual. Other individuals are then represented by the abstract idea as they conform to it. This is similar to Suarez's account of the cognition of a universal by the cognition of a material singular except no spiritual object is involved. Locke stays on the level of forming a mental vocabulary.

Abstraction in this sense avoids the problem of how we are conscious of simple ideas, for it does not begin with simple ideas, but particular ideas. There are two very different movements in the Essay, which are never clearly distinguished. One is the movement from simple ideas to complex ideas, which dominates Locke's attempts in the second book to show how our knowledge can be accounted for without innate ideas. The other movement is from particular ideas or propositions to general ideas or propositions. Abstraction in this second way is a movement from particular to general. Simple ideas are abstract or general for Locke, and thus capable of being components of complex signs. The second sort of abstraction could (as it does for Suarez) cover the case in which an occurrence of a material feature (or any simple idea) becomes treated as a token of a type which then enters the vocabulary of signs. More likely, this sort of abstraction is a separation of one or more simple ideas from a cluster in which they are given. Locke holds that abstraction requires some pains, illustrating this with the difficulty of forming the idea of a triangle in general, which is no particular sort of triangle. This is generally taken as a difficulty with abstraction. Yet triangularity in general is no worse than shape in general or the simple idea of unity. Simple ideas, especially those of primary qualities, and related ideas are open to the same problems as abstraction if they are held to be got from sensation.

Locke, from the time his philosophical thought first became original, held that sense (later adding reflection) and reasoning suffice to explain our knowledge, and so there is no need to rely on innate principles. Yet the materials got from sensation, as Locke describes them, not only already found relations which we later attend to, but also already instantiate the reason we later formulate. The fourth book of the Essay, is dovoted to knowledge. Locke uses "knowledge" in a restricted sense for what we are certain of. It has much the same sense as "science" has for the Scholastics and Cartesians - except it refers to cognition. When he wishes to refer to certain knowledge, he speaks of habitual, as opposed to actual knowledge. "Knowledge" also covers the present perception of things and the co-occurrence of qualities in particular substances, as we have certitude about these.

The sort of knowledge which is of interest is that which is the perception of the agreement or disagreement of ideas, also called "truth" and "certitude". Locke dismisses what he calls trifling propositions, in which an idea or a part of an idea is affirmed of itself. Both Leibniz and Sergeant supported identical propositions against Locke's rejection of trifling propositions. But Locke in fact accepts intensional identities; because of the part he gives to initial consciousness, what he rejects are only shadows of subject-predicate sentences in which either the subject term is the same as the predicate term or the predicate merely repeats one or more of the terms in the subject.

The foundation of science and reason for Locke is the perception of the agreement or disagreement of ideas or intuition in cases in which this does not concern the identity or diversity of ideas. Locke's notion of intuition is different from Descartes' notion of clear and distinct perception or intuition, for what is intuited is always the relation of ideas and never ideas themselves. Ideas for Locke are received discreetly without judgement. This terminalism, which is an essential part of his empiricism, is a dominant theme of the fourth book, for his account of intuition eliminates the rules to which we are subject, but have not attended to. Locke is particularly concerned to reject the part in our knowledge assigned to syllogistic reasoning and maxims or praecognita, which he regards as innate principles. He has in mind the pedantic methods and systems of rules which went under the name of logic in the seventeenth century and were inculcated in youth in their early 'teens. But what Locke rejects goes beyond these. He rejects maxims because he holds that knowledge, in this case, propositional knowledge, begins with what is particular. He rejects syllogistic reasoning because he holds that it requires justification by intuition. Inference, in Locke's view, is a chain of intuitions, the steps being between ideas, not propositions. On Locke's position, we have no rules until we have intuited the connection of the terms. This intuition is another case of initial consciousness and is a shadow of the verbal formulation of propositions.

Locke's rejection of maxims met with considerable opposition.

Leibniz and Sergeant insisted that assertions which are less general are justified by more general propositions, which are more evident in that they make explicit what is assumed in their applications. Indeed, we are subject to rules before we can formulate them, for formulation itself is a rule-governed activity. Because of Locke's reliance on initial consciousness, we cannot be allowed, on his position, to know the majority of rules we in fact follow. Finally, his terminalism is untenable, for, as Leibniz points out, inference as a chain of ideas is at best an ideal since we must rely on such propositions as Euclid's axioms.

A science for Locke is a body of knowledge comprising only general propostions known with certitude. He admits a science of mathematics and a science of morality, but he holds that natural philosophy, which is concerned with ideas of substances, will never be a science. He holds this because ideas of substances are largely composed of ideas of secondary qualities. While we can perceive the connection of ideas of primary qualities and we know that two ideas of secondary qualities under the same determinable cannot be of the same subject, we cannot perceive any other relation between ideas of secondary qualities by virtue of which they must or cannot be of the same subject. If we knew the connection between ideas of secondary qualities and the primary qualities of the systems which cause them, he adds, we could know these relations. But we cannot know the real constitutions of things, whether or not they are describable in terms of primary qualities. Our science - mathematics, in particular - is inapplicable to the real natures of things not because we cannot say what determinables must apply to any particle of matter, but because our knowledge of natural kinds largely depends on ideas of secondary qualities. Yet there is no guarantee that mathematics and, in general, the rules and concepts we follow, are instantiated or founded in things. Indeed, Locke treats the corpuscular picture of the world as an hypothesis.

Leibniz objects to Locke's position that natural philosophy or physics will never be a science, for he is in agreement with the Cartesians on the application of our science to things. Physics was a science for the Cartesians because they held that it is applied mathematics. It is only in the application that empirical propositions are introduced. A fundamental part of the Cartesian programme is the establishment of extensional identities between material features and concepts involving only formal features. This is to free the investigator from the prejudices of the senses. Locke, on the other hand, does not mention prejudices of the senses; his only equivalent is the abuse of words. For Locke, it is not a question of the application of science, but of its formulation. In keeping with his medical empiricism, he considers as important the organisation and direction of our observations by properly constituted ideas of substances, which involve signs and their co-occurrences.

Locke's account includes no equivalent of <u>conversio ad phantasmata</u>, and omits analysis and synthesis. There is a great deal in Locke about separating and combining ideas. But this is not within the context of a particular problem, situation or state of affairs. Rather, it is the formation of dispositions which again can be exercised in conscious acts. Locke writes very sensible things about judgement and degree of assent, but not as they concern probable assertions within a context of explanation and prediction.

Locke also lacks an equivalent of the hypothetico-deductive method.

These differences between Locke and our other philosophers stem from the fact that Locke's concern is the formulation of our knowledge, given its materials and their roles. They are allied to Locke's lack of a notion equivalent to that of objective reality and to his distinction between ideas of primary qualities and those of secondary qualities by the external relations alone of the latter. The thread which ties our knowledge to the world is causality, which relates systems _in re_ with occurrences in the mind. These occurrences are signs of features _in re_ and establish dispositions for the re-occurrence of the same sign, making part of our basic vocabulary for the formation of our knowledge and science. The signs and the dispositions for them are physically in the mind and ultimately owe their roles to the causes of the initial occurrences. Taking into account only what is physically in the mind or what is parasitic on it (e.g. the use of words), Locke has no check on the roles of the initial occurrences, the identity of signs or the rectitude of the formation of complex signs. Furthermore, Locke distinguishes imagination from sensing (as a success) by the properties of what is physically in the mind, by its vividness or occurrence with pain in particular. But if one's science is made by oneself, it cannot perform its regulative function and the cause, which ties knowledge to the world for Locke, cannot be checked.

The common source of these difficulties is the fact that ideas are caused in roles for Locke, but we cannot say more about their causes than that they are productive of ideas in such roles because our knowledge is restricted by the few and narrow inlets of sensation and reflection. Locke's causal account relies on the fact that things *in re* instantiate an objective structure in their causal relations with us and to this extent are like artifacts. Furthermore, he must assume that they have the same causal relations with those with whom we communicate. Indeed, the artifacts perhaps could be only diagrams or the utterances of some being.

Footnotes

Chapter I

1. This paragraph and the next are taken from Vendler, Z., Res Cogitans: An Essay in Rational Psychology, Ithaca, 1972, Chap. 5, sect. 4 (pp 94-97).

2. ibid., sect. 6 (pp 99-105).

3. ibid.

4. Chess, as well as played on a board, can be played by post or (if one has an outstanding memory) verbally; fractions can be added and Latin verbs conjugated verbally or on paper. (This is not to say that one can perform these activities without some movement or other of the body.)

5. Imagine a child who was taught only to play chess.

6. ibid. Vendler's analysis of knowledge of the meaning of a word (ibid., Chap. VI, sect, 6 (pp 130-132)) in fact agrees with what we say of essential knowledge, of which it is a special case. He states that "our knowledge of what a word means is a function of, and is to be explained in terms of, certain incomplete propositions." To know what "bottle" means presupposes knowledge of what a bottle is, and likewise for parts of speech other than nouns. What is known in knowing words of different grammatical categories is exhibited as follows:

Nouns: what (kind of thing) is a bottle
what it is (for something) to be a bottle
Verbs: what it is (for somebody or something) to sit down
what is is (for somebody or something) to push (something)
Adverbs: what it is (for somebody or something) (to do something) deliberately.

These (he continues) are nominalised sentences in which all slots but the one occupied by the word in question are filled by dummy words. Thus the essential prerequisite of knowing the meaning of a word is given by stipulating a minimum environment ("kernel" frame). These frames, for all but nouns, are:

N sits down.
N pushes N.
N is fat.
NV (N) deliberately.

Nouns have many possible positions in kernel frames:

N V.
N V N.
N is N.
N is A.

That nouns are peculiar in having no definite kernel-type might (Vendler suggests) account for the feeling of "saturation" with respect to substantive concepts. A concept is taken (ibid., sect.7 (pp. 132-134)) to be an open proposition; as the linguistic expression of a proposition is a sentence, the linguistic expression of a concept is an open sentence. As the sentences fill up, the concepts become more and more complex. Contents are said (ibid., sect. 8 (pp 134-135)) to show concepts. Thus dictionary definitions either summarise syntactical constraints and co-occurrence restrictions by means of such syntactic and semantic markers as "transitive verb"; "animate" and "human" or display them in typical contexts; further distinguishing marks and presuppositions are needed to round out the definition.

Essential knowledge or knowledge of a concept, however, is not just knowing an open proposition, for concepts apply to things and are related to practical as well as propositional knowledge. We shall have more to say about concepts and words shortly.

Vendler maintains that prepositions, articles, quantifiers, pronouns, auxiliaries, connectives, etc. do not connote any specific kernel frame, nor do they suggest specific co-occurrence restrictions; thus we do not speak of knowing the concepts of these. Such words, he adds, are only grammatical constants or limguistic dummies, so their "concepts" amount to mere empty frames. However, speech is a rational activity which in part is described by how purely grammatical words are used. E.g. we pick out a speaker's performance of conjunction in particular by picking out his use of "and"; in this way we can be said to have a concept of conjunction, i.e. of the use of "and". We shall associate concepts associated with purely grammatical terms, arithmetical and geometrical terms together as non-descriptive concepts. Geometrical concepts correspond usually to nouns, arithmetical concepts to adjectives; so both would be admitted as concepts by Vendler.

7. Knowing something about the person in question or the sort of person in question generally suffices.

Chapter II

1. Actually "a formation of a law" or "a purported law" is more fundamental for our purposes.
2. It is particularly these descriptive concepts which we eliminated in the endeavour to describe everything with maximum simplicity and exactness. We shall initially refer to these concepts as "material features". Later, we shall reserve this term for processes described in the mechanical description of sensation. Later still, we shall also use the term for the immanent act by which spatio-temporal portions are picked out.
3. We assume that there are no words for parts and that "this" must serve the function of distinguishing parts.
4. Even if one could not pick out a circular thing and a square thing one could still be said to be able to tell a square from a circle if one has the concepts of these two, for one would then know, e.g. that a square has four corners, while a circle has not.
5. This is not to say that the rules governing the use of these terms are not among those rules which govern the uses of various sortal terms. They can be used with property terms to form pseudo-sortal terms (e.g. "the square one" or "a red thing") where the sortal in question is understood or where only a partial description can be or need be given, without specifying the sortal.
6. This programme does not try to put one into a picture to feel things as they are, which would be contrary to its purpose. (Such pictures may be heuristic or memory aids, however.) Rather it seeks a description in terms of formal features and their relations. The fact that we cannot construct a macroscopic model whose history would be similar to the systems invoked in the explanation is no objection.

Chapter III

1. We could speak of occurrences in the rational soul or in the intellect in addition to occurrences in the mind.
2. We here ignore nominalist positions which sometimes maintained that there are no dispositions in the rational soul.
3. Leibniz uses "mv^2"; other basic quantities should then differ from their usual description by a factor of two - e.g. momentum should be expressed by "2mv".
4. If one were to look for a dominant monad it could be momentary, for if the concept displayed is described with exactness (as is consonant with the endeavour with which we are now concerned), it is displayed only momentarily.
5. Leibniz suggests that only two "concepts" are simple: God, taken as the objective structure, and nothing, taken as restrictions in general on the objective structure. How these can be said to be simple is not evident.
6. There are of course non-philosophical reasons for postulating unextended substances. Also, there was a rather general view that substances are incorruptible and that only what is extended is corruptible.

Chapter IV

1. This is to be compared with the fact that under normal conditions a cry displays pain; one askes what the point of the insincerity or whatever was.
2. Actually, behaviour displaying pain is usually due to the manner in which something comes in contact with the animal.

FOOTNOTES CHAPTER V

1. Cf, Malcolm, Norman, "The Myth of Cognitive Processes and Structures", in Mischel, T., Cognitive Development and Epistemology, New York and London, Academic Press, 1971, pp 385-392.

2. E.g. Aspects of the Theory of Syntax, Cambridge, Mass., MIT Press, 1965, p. 25.

3. Chomsky (Reflections on Language, London, Temple Smith, 1976, p. 5) takes this to be a case of the general problem formulated by Russell (Human Knowledge: Its Scope and Limits, New York, 1958): "How comes it that human beings, whose contacts with the world are brief and personal and limited, are nevertheless able to know as much as they do know?" In his own words (ibid.), this is: "How can we gain such rich systems of knowledge, given our fragmentary and impoverished experience?".

4. E.g. Aspects, p. 47, and Reflections on Language, pp. 146 and 148.

5. Reflections on Language, p. 10: "I dismiss without further comment the exotic though influential view that 'internal states' should not be considered in the study of behavior".

6. ibid., pp. 16-17.

7. ibid.

8. Language and Mind (enlarged edition), New York, Harcourt Brace Jovanovich, 1972, pp 141-143.

9. ibid., p. 117.

10. Reflections on Language, p. 14.

11. ibid. Cf. ibid., p. 18 for a defence of this assumption.

12. ibid., p. 15.

13. The other three steps are (ibid.):

    "1. Set the cognitive domain D.

    2. Determine how O characterises data in D 'pretheoretically'."

    (Recall the assumption that learning is instantaneous.)

"4. Determine LT(O,D), the system that relates experience to what is learned."

14. <u>ibid.</u>, p. 16.

15. <u>ibid.</u>, p. 20.

16. Cf. <u>Language and Mind</u>, p. 119 and "Explanatory Models in Linguistics" (in Nagel, E., Suppes, P., and Tarski, A. (eds.), <u>Logic, Methodology, and Philosophy of Science</u>, Stanford, Stanford UP, 1962), p. 530. This diagram is an adaptation of those presented in these works. Note that the latter was published before Chomsky's innatist views were well known.

17. <u>Reflections on Language</u>, p. 147.

18. <u>ibid.</u>, p. 145.

19. <u>Aspects</u>, p. 25.

20. <u>ibid.</u>, p. 47

21. <u>ibid.</u>, p. 31. These conditions are that the theory contain:

    (i) a universal phonetic theory defining an enumeration of the class of possible sentences,

    (ii) an enumeration of the class of possible structural descriptions,

    (iii) an enumeration of the class of possible generative grammars,

    (iv) a method for determining the strucurral description of a sentence, given a grammar, and

    (v) a way of evaluating alternative proposed grammar.

22. <u>ibid.</u>, p. 30. A child must have

    (i) a technique for representing input signals,

    (ii) a way of representing structural information about these signals,

    (iii) some initial delimitation of the class of possible hypotheses about language structure,

(iv) a method for determining what each such hypothesis imp lies with respect to each sentence, and

(v) a method for selecting one of the (infinitely many) hypotheses allowed by (iii) and compatible with the given linguistic data.

23. ibid., p. 32:

"A language acquisition device that meets conditions (i)-(iv) is capable of utilizing such primary linguistic data (i.e. the corpus) as the empirical basis for language learning. This device must search through the set of possible hypotheses G_1, G_2, ..., which are available to it by virtue of condition (iii), and must select grammars that are compatible with the primary linguistic data, represented in terms of (i) and (ii). It is possible to test compatibility by virtue of the fact that the device meets condition (iv). The device would then select one of these potential grammars by the evaluation measure guaranteed by (v)".

24. ibid., p. 47

25. ibid., p. 48

26. Reflections on Language, p. 141.

27. Language and Mind, p. 117.

28. Reflections on Language, p. 141.

29. ibid., p. 39

30. ibid., p. 38.

31. The Psychology of Communication, Harmondsworth, Penguin Books, 1967, pp. 106-109.

32. More often, Miller states, we must settle for a set of distinct types which anything performing a certain function must fall under.

33. Cf. "Formal Properties of Grammars" in Luce, R.D., Bush, RR. , and

Galanter, E. (eds.), Handbook of Mathematical Psychology, Vol. II, New York, Wiley, 1963, pp. 325-418. This incorporates the results of his original work on automata (cf. "Three Models for the Description of Language", IRE Transactions on Information Theory, IT-2, 1956, pp. 113-124), the results of which supported the theory presented in Syntactic Structures (1957). The following presentation is largely taken from this and Miller, G.A. and Chomsky, N., "Finitary Models of Language Users", ibid., pp. 419-491.

34. It is also necessary that the device be in designated states before and after the string is accepted.

35. Here "a" and "b" are symbols of the vocubulary and the exponents denote how many times the symbol "a" or "b" is concatenated.

36. Personal communication to J. Lyons, reported in Lyons, J., Chomsky, London, Fonatan/Collins, 1970, ch. 6, ftnt. 2 (p. 67).

37. ibid., p. 42.

38. "Formal Properties ... " , p. 328.

39. The first point is shared with the Bloomfieldian tradition (cf. Lyons, op.cit., p. 34). The second point is made in Structures as well (cf. ibid., p. 38). It has been seen to have structuralist origins; D. Hymes writes (Review of Noam Chomsky (J. Lyons), in Harman, F. (ed.), On Noam Chomsky: Critical Essays, Garden City, N.Y., Anchor Books, 1974, p. 323):

> In Chomsky's successful introduction of the goal of generating all and only the grammatical sentences of a language, we can see the completion, or carrying through to syntax, of structuralist principle. It was just such a criterion of relevance and goal

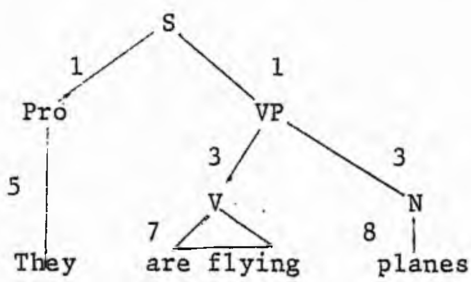
that made phonology (the forte of structuralist linguistics) a new field, ... and it was inconsistent and incomplete for linguists not to establish the corresponding principle in the rest of grammar.

40. *ibid.*, p. 325.

41. "Formal Properties ...", p. 42.

42. Other orders are possible.

43. Take the rules in the order: 1, 5, 3, 7, 8. This gives



44. S_0 is the initial and final state. When the automaton is in this state, it has accepted a string and is ready to begin accepting another. The arc labelled "b" is called a loop.

45. E.g., Miller, G.A. and Chomsky, N., "Finitary Models of Language Users", in Luce, Bush and Galanter (eds.), *op.cit.*, pp. 476-477, 480.

46. Competence in general can be represented by a state diagram, since the rules (more naturally presented here as instructions, so involving the adaptations mentioned above) specify the states, permissible state transitions, and which symbols are accepted at each transition. These structural aspects are all internal to the language user on Chomsky's account.

47. Among them were Zellig Harris, under whom Chomsky worked at MIT, and Chomsky himself. Cf. Lyons, *op.cit.*, p. 43.

48. E.g., *Cartesian Linguistics*, New York and London, Harper and Row, 1966, pp. 3-13, where he presents, with apparent approval, the Cartesian position that, although "animal behavior can be explained on the assumption that an animal is an automaton, ... man has unique abilities that can-

not be accounted for on purely mechanistic grounds" (p.3; but cf. p.65). Cf. *Language and Mind*, pp.3-5, where he states that "the early euphoria about cybernetic and automaton models has largely been spent.

. At each epoch - the minimum unit of time - there is a set of alternative conditions to choose from. In the case of telegraphy, the members are mark and space. Letters are represented by combinations of five units, so there are 25 possible letters. If the code employs words of only six letters, there will be $(2^5)^6$ possible words. Notice that the number of combinations grows exponentially. But one's intuition is that the information transmitted is proportional to time. This suggests that the amount of information equals a constant times the number of epochs times the *logarithm* of the number of alternatives at each epoch (assumed to be a characteritstic constant of the channel). In practice, the constant is set equal to unity and the logarithms are in base two. The unit is called a bit. In our example, each letter has five bits of information, each word thirty.

50. When the number of alternatives is not equal to two to some whole power, one would have to think of the decisions as independent sets of decisions over a number of epochs; the greater the number of epochs, the more nearly the number of decisions approximates the information in the signal.

51. For example, if the signal is an AM radio wave, the alternatives could be taken as the set of distinguishable amplitudes between the maximum and minimum amplitudes of the wave.

52. The level of the word probably comes to mind first. But because of the difficulty in specifying what a word is, the oppositions are usually taken to be between functional units called morphemes (e.g. *liked* is composed of the morpheme *like* and the morpheme Past Tense).

However, this has led to much debate about how abstract these units are. E.g. are there two past tense units, -ed and -n, or one abstract unit, Past Tense, which is realized in at least two different phonemic strings?

53. E.g. th both in this and think is classed as the same phoneme, since no words are distinguished by whether this (range of) sound is aspirated or unaspirated, while for Arabic these are two phonemes.

54. Negentropy is capable of handling signals describable as continuous functions; but any such signals can be specified by a finite number of values. Furthermore, the formula for amount of information as negentropy differs from that for amount of information in bits only in that the logarithm is base e and the unit, called a natural unit, equals 1.443 bits. So, although the mathematics is more complex for negentropy, the two interpretations amount to the same theory; in particular, amount of information as negentropy can still be thought of in terms of the alternatives one has to decide between.

To take an example, consider strings of Hs and Ts generated by repeatedly manipulating a coin and recording whether this results in heads (H) or tails(T). Two possible four-symbol strings are HTHT and THHT. Since the probability of a sequence is a function of the probability of its subsequences, the first string is more probable than the second. For the sequence HH is realized in only one of four possible outcomes of two tosses of a coin, while the sequences HT and TH are each realized in two. So the second sequence has more negentropy or amount of information; it is more likely in the case of the second string than in the case of the first that the manipulations were intentional positionings of the coin rather than tosses.

A language generated sequentially, such as that containing strings of Hs and Ts, is a "regular language". Which symbol occupies a given position might (unlike in this case) depend on some number of preceding symbols.

55. The internal information, as considered by cybernetic theory, cannot be utilized in transmitting information, for it is shared by the source and the receiver. It, or something like it, has been

called redundancy. The redundancy of natural languages is high (about 50 per cent in English). It has been suggested that this overcomes noise introduced into the channel; for example, it allows us to correct spelling error; cf. Weaver, W., "The Mathematics of Communication", Scientific American, July, 1949, reprinted in Messick, D.M. (ed.), Readings from Scientific American: Mathematical Thinking in Behavioral Sciences, Freeman, San Francisco and London, 1968, pp. 47-51. Weaver collaborated with Shannon.

56. Op. cit. This is a collection of articles; the chapters (articles) of interest here are the following, all originally published in 1956:

Chapter 1: "Information and Memory", pp. 11-21;

Chapter 2: "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information", pp. 21-50;

Chapter 3: "The Human Link in Communication Systems", pp. 51-60.

57. For example, in unidimensional absolute judgement experiments, the subject is asked to judge a stimulus from one dimension - e.g. pitch - operationally defineable by physical means. It has been found that the channel capacity for man for pitches is about 2.5 bits (ibid., pp. 24-26). This means that we can quite confidently distinguish six pitches, but given any more and we almost certainly confuse some of them. Put another way, no matter how many alternative pitches we try to distinguish, the best we can do is assign them to about six different classes without error. Similar results are obtained for judgements of loudness, degree of salinity, etc. (ibid., pp. 26-32).

58. The same comments apply to methods which purportedly measure the strength or distinguishability of sensations to find functional

relations with the intensity of the stimulus. These include Weber's and Fechner's formulation of a law based on so-called just noticeable differences in the middle of last century; theirs was the pioneering work in quantitative methods in cognitive psychology. These also include work on the measurement of sensations in the 1950s by S.S. Stevens, who did much to clarify the notion of measurement in psychology. In all cases, the experimenter relies on the subject's reports or formulates his own.

59. Cf. Wiener, N., "Cybernetics", Scientific American, Nov. 1948; reprinted in Messick, *op. cit.*, pp. 40-46. Wiener, an applied mathematician, can be given the credit of founding cybernetics. In this article he relates how he was given the war-time project of producing an automatic tracking system for anti-aircraft batteries. He decided to model this on the human operator, paying particular attention to the role of feedback, presumably involving the CNS. He enlisted the aid of a physiologist, and the project soon became interdisciplinary. Thus cybernetics actually began with the CNS in view. (However, Shannon and his colleagues at the Bell Laboratories were working independently in the same direction with applications to communications systems.)

60. The experimental utility of the notion of man as a communication channel is limited. When we move to more than one dimension which is physically defined, the channel capacity increases, but not as much as would be expected, given that these dimensions are independent (Miller, *op. cit.*, pp. 32-37). Yet the channel capacity can be increased by taking relative judgements and by arranging tasks sequentially. The notion of channel capacity breaks down completely for short-term memory, where the way the information is presented, and not the amount of information, determines how much

can be remembered (ibid., pp. 38-43).

61. A Gestalt is a minimum or near-minimum unit of perception and explains our perception of contours, objects in motion, and other multidimensional or many-faceted structures. Gestalt theory also claims to explain why certain line patterns are or are not perceptually ambiguous in terms of certain principles of arrangement, such as the principle of simplicity.

62. Cf. note 54.

63. Shannon, C.E., "A Mathematical Theory of Communication", The Bell System Technical Journal, July 1948, pp. 379-423.

64. These automata are also called k-limited Markov sources because the probabilities of state transitions depend on previous state transitions. They are also a species of stochastic sources, so called because the D^k different probabilities are independent.

65. A 0-order approximation uses the letters equiprobably. A first-order approximation uses letters independently, but with the frequency of their occurrence in the corpus. The symbols of the vocabulary can be words (involving the calculation of more probabilities). An example of a first-order word approximation is (Miller and Chomsky, "Finitary Models of Language Users", p. 428)

representing and speedily is an good or came can different

and so on. A second-order approximation uses the characters with the probabilities appropriate to the context of the immediately preceding letter (or word); and so on.

66. ibid., p. 429.

67. ibid., p. 430.

68. To indicate how large k must be, Chomsky (ibid.) considers

The people who called and wanted to rent your house when you go away next year are from California.

In this sentence, there is a grammatical dependency extending from the second word (the plural subject "people") to the seventeenth word (the plural verb "are"). So the value for k must be at least fifteen. A conservative estimate for D is 10^3, giving a value for D^k of 10^{45}. This number could be reduced by eliminating redundancies and allowing that we learn admissible strings, not of words, but of syntactic categories, and that we recognise that not all sequences of categories are equiprobable. A conservative estimate is that on average there are about four alternative categories that might follow in a given context, so D could perhaps be reduced to as little as four. D^k is then $4^{15} = 10^9$.

69. This is one of the two main themes of Cartesian Linguistics (the other being the creative use of language); cf. p. 29. Historically, it is most obviously present in the work of von Humboldt. On p. 41 he claims to identify the use of recursive devices in the Grammaire générale et raisonnée.

70. E.g. *ibid.*, p. 65 and *Language and Mind*, p. 78. Drawing these two points, and also the creative use of language, together, Chomsky writes (*Language and Mind*, p. 100) that the "core problem of human language" is

> having mastered a language, one is able to understand an indefinite number of expressions that are new to one's experience, that bear no simple physical resemblance and are in no simple way analogous to the expressions that constitute one's linguistic experience; and one is able, with greater or less facility, to produce such expressions on an appropriate occasion, despite their novelty and independently of detectable stimulus configurations, and to be understood by others who share this still mysterious

ability. The normal use of language is, in this sense, a creative activity.

71. Cf. note 54.

72. We can think of the "behaviour" of the automaton which accepts our example as follows. It enters state S, then (Def)Det, where it reads "The" and goes to state N, reading "people". It could then re-enter state NP and proceed to state VP. But there is a further node dominated by NP, so it proceeds to it. It is then in state S. If this were not dominated by a node, the machine would be in a final configuration and complete its scanning. But it is so dominated, so it scans "The people ... year" (which, of course, has its own structure, not represented here), leaves S, and, as it has been in all the states corresponding to the nodes determined by NP, it proceeds to VP. Cf. Chomsky, "Formal Properties of Grammars", pp. 342-344.

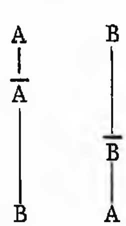
73. <u>ibid</u>., pp. 360-362.

74. <u>ibid</u>., p. 363.

75. As an illustration, consider the rules

$$AB \rightarrow \bar{A}B$$
$$\bar{A}B \rightarrow \bar{A}\bar{B}$$
$$\bar{A}\bar{B} \rightarrow B\bar{B}$$
$$B\bar{B} \rightarrow BA$$

It is easily seen that these rules generate "P-markers" such as



Lexical items dominated by either of these paths would be assigned to two grammatical categories. Cf. <u>ibid</u>., pp. 363, 365-366.

76. ibid., p. 366.

77. ibid., p. 337-338.

78. ibid., pp. 338-339.

79. ibid., pp. 346-347.

80. An example of a transducer is a compiler for a computer; this accepts a language which is convenient for theprogammer and transduces it into the computing language.

81. ibid., pp. 339-342.

82. In following down the paths of a P-marker, the label of each node is entered on the memory tape, which moves, say, to the right. The label correpsonds to the state of the automaton at the node. The automaton can trace up an edge only if the label of the next node occupies the square to the right of the one presently scanned on the memory tape. Cf. ibid., pp. 342, 345.

83. ibid., pp. 366-367.

84. ibid., p. 367.

85. ibid., pp. 374-376.

86. The question is the source and extent of the excess generative power of the context-free grammar or pushdown storage automaton (competence) over that of the finite automaton (performance). It is to be noticed, firstly, that languages generated by a non-self-embedding context-free grammar can be accepted (generated) by (some) finite automata. A transducer accepts a string in the manner of a finite automaton with no output; but it maps the string into a structural description (e.g. a bracket labelling) given by a context-free grammar. The source of the excess generative power of the context-free grammar is self-embedding. The degree of this excess is due to the degree of self-embedding. A simple, intuitive example of the degree of self-embedding is the number of relative clauses in a sentence, as long as each clause

is within the context of another (except the "shallowest", which is in the context of the sentence itself). E.g. "The man who the boy who the students recognized pointed out is a friend of mine" has a degree two of self-embedding. Cf. ibid., pp. 390, 394-395, 400; Miller and Chomsky, op.cit., pp. 467-468.

87. This is because the effect of amny transformations is to reduce the computing space required for grammatical analysis of the sentence.

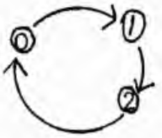
88. Miller and Chomsky, op.cit., pp. 465-466.

89. ibid., pp. 476-477.

90. pp. 10-15.

91. Reich, P.A., "The Finiteness of Natural Language", Language, 1968. pp. 831-843; reprinted in Householder, F.W. (ed.), Syntactic Theory 1 Structuralist, Harmondsworth, Penguin, 1972, pp. 258-272.

92. This is called relational network theory. Where the sumbols are accepted at the states (nodes, vertices) and "O" represents the initial and terminal state, concatenation can be represented by the state diagram



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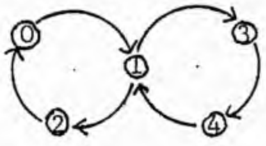
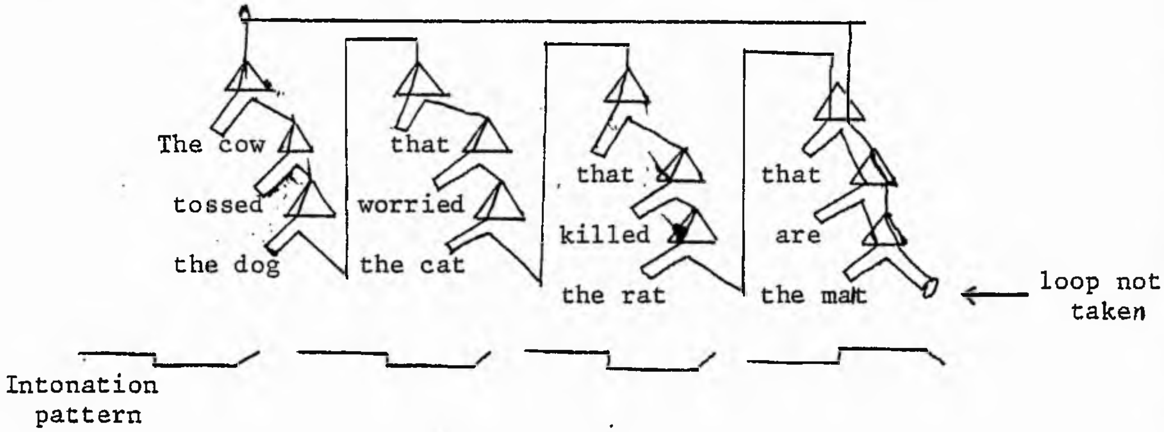
Embedding of degree one is accomplished by adjoining a circuit ("loop") with, e.g., two additional states in the concatenation pattern for subject and predicate of the embedded sentence.



Reich finds evidence for his position in intonation patterns (which Chomsky also uses for evidence). The intonation pattern is indicated beneath the following state diagram; notice that taking a loop corresponds to the distinctive rising of the nonterminal contour (p. 268)



Notice that the structure of the network is a circuit; there is no need for the device to "remember" how "deep" it is. Cf. p. 270: "... this model represents memory as storabel to a depth of one, all-over linguistic structure. Thus, rather than charaterizing memory as narrow and deep, this model characterizes memory as broad and shallow: we might call it a BREADTH HYPOTHESIS of language memory structure." Reich's theory has consequences which are different from those of Chomsky's.

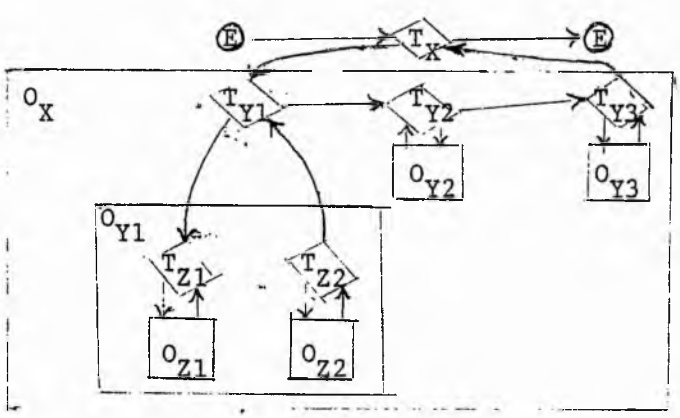
93. <u>Reflection on Language</u>, p. 82.

94. Chomsky notes ("Formal Properties of Grammar", pp. 376-377) that the strings of regular languages are basically periodic, while those of context-free languages are structurally symmetric. So an organism is essentially a finite automaton in so far as an aspect of its behaviour is determined by conditions on contiguous parts (e.g. associative linkage); it is essentially a pushdown storage automaton in so far as its behaviour exhibits hierarchical organization and symmetries. This latter sort of behaviour is given the title "complicated behaviour" and is distinguished by its ability to interrupt one part of theperformance until some other part has been

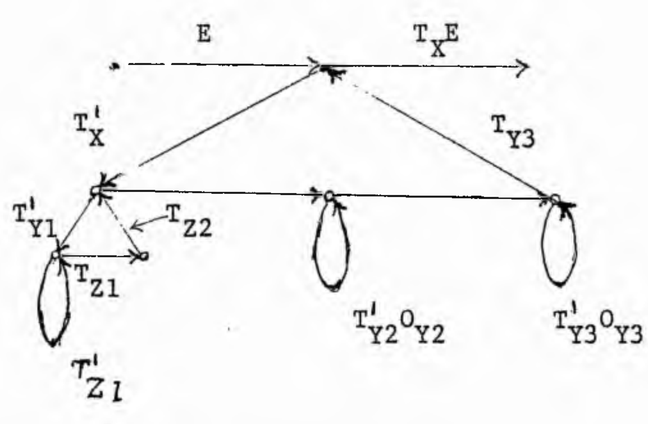
completed (Miller and Chomsky, op.cit., pp. 483-484). He also formulates indices of complexity borrowed from rewriting grammars to apply to a psychological theory once it is expressed in terms of a computer programme for simulating behaviour (ibid., pp. 484-485).

95. Miller, G.A., Galanter, E., Pribram, K., Plans and the Structure of Behaviour, New York, Holt, 1960.

96. In the following flow chart, $T_{\alpha i}$ is the test corresponding to operation $O_{\alpha i}$. If $\alpha = \beta$, then T_α and T_β are at the same level. A box labelled $O_{\alpha i}$ enclosing two or more tote units represents the operation of a higher-level tote unit.



This flow chart can be represented as the state diagram of an automaton as follows

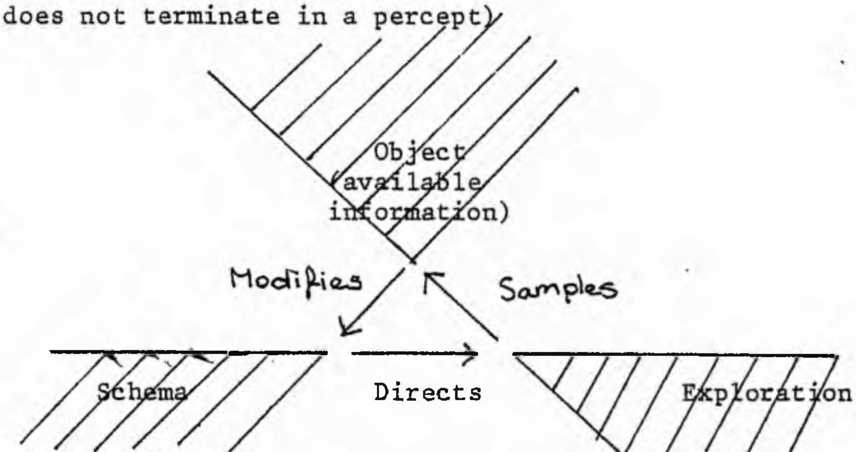


97. Miller and Chomsky, op.cit., pp 487-488.

98. New York, Meredith.

99. Cognition and Reality, Freeman, San Francisco, 1976, pp. 20 and 58.

100. Schemata and the information actually available determine what is perceived because we can see, he claims, only what we know how to look for. The schemata assure continuity in perception because the information already acquired determines what will be picked up next and because some schemata are temporal by nature, e.g. those of motion. The function of a schema is illustrated as follows (ibid., p. 21), where "perception" applies to the whole cycle (which does not terminate in a percept):



Neisser maintains that cognitive psychology became important only in the 1960's because of the advent of computers, whose activities seemed akin to cognitive processes and promised a model of the flow of information through the mind (ibid., pp. 4-6). It is no surprise, then, when he states (ibid., p. 58) that a schema is like a "plan" (in the sense of Miller, Galanter, and Pribram referred to above) for obtaining more information to fill in the format. But

> The information that fills in the format at one moment in the cyclic processes becomes a part of the format in the next, determining how further information is accepted.

Furthermore, a schema is not only the plan, but also the executor of the plan. Biologically, he adds (ibid., p. 54), a schema

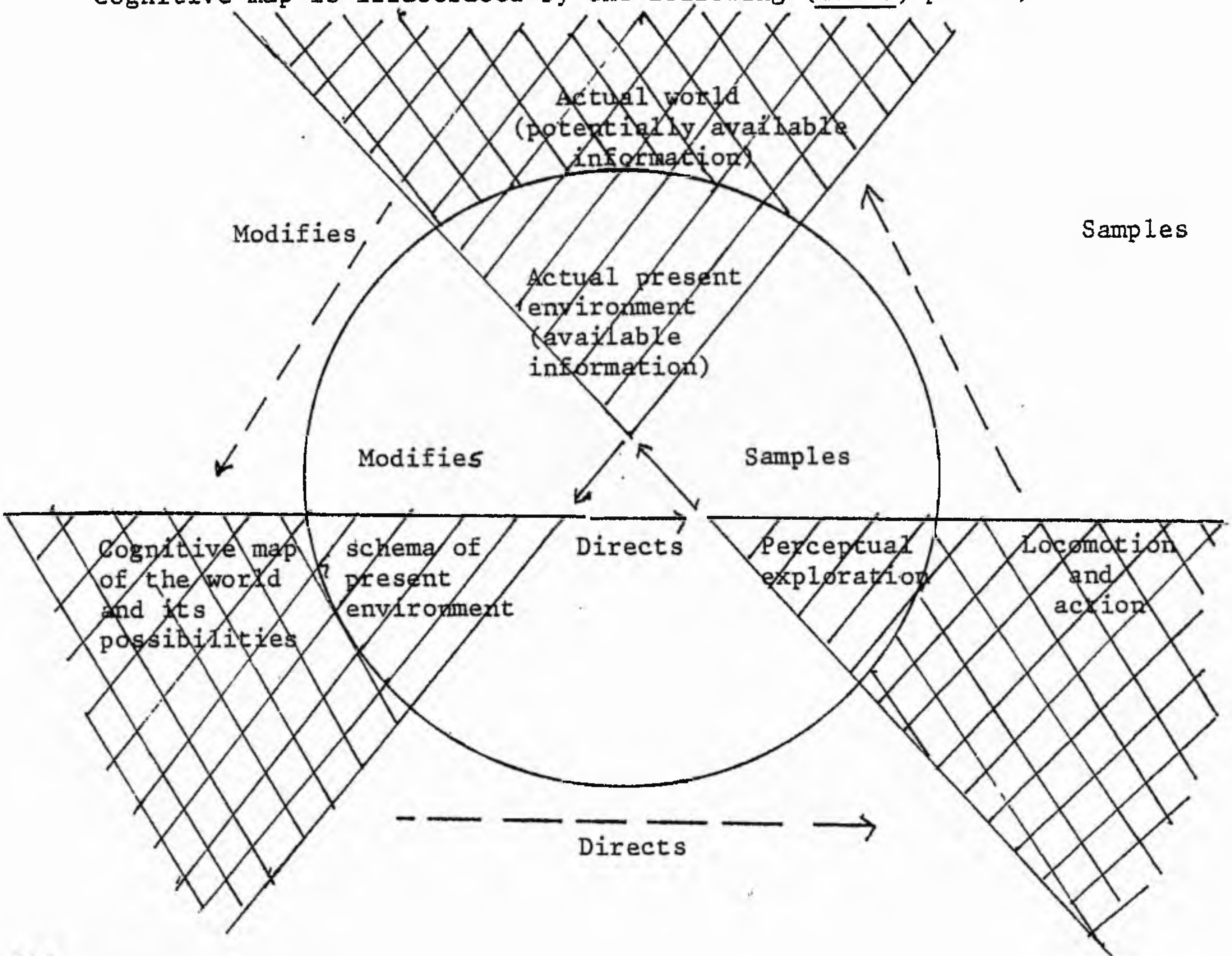
> is some active array of physiological structures and processes: not a center in the brain, but an entire system that includes receptors and afferents and feed-foreward units and efferents.

101. ibid., p. 110.

102. ibid., p. 111.

103. ibid., pp. 111-112.

104. ibid., p. 113. A schema embedded in a rather large schema or cognitive map is illustrated by the following (ibid., p. 112):



105. ibid., p. 170.

106. Neisser maintains that most ways of detachment depend on culture (ibid., p. 134). For example, when the child begins to learn his first words, it is held (ibid., p. 169), the schema of the referant includes schemata for vocalization. However, detachment also occurs in locomotion. Now orienting schemata or cognitive maps are sustained over the long periods of time it takes to carry out locomotive tasks (ibid., 134). During this time, the moving person (or animal) anticipates objects, so he often sustains schemata inapporpriate to

his immediate environment. Thus a detached use of orienting schemata is common place, and so they can be used for purposes other than locomotion.

107. The Logic of Modern Physics, New York, Macmillan, 1927, p. 5.

108. For example, an operational definition of "acid" is the positive result in a test to determine whether a sample turns blue litmus paper red. Of more theoretical interest are operational definitions which specify a procedure for determining the numerical value of the given quantity in particular cases; rules of spatial measurement are a good example.

109. The laws for the intensity of sensation formulated by Fechner, Stevens, and others are applied by means of operational tests. The usual tests of intelligence, emotional stability, mathematical ability, etc. are operational. The ontological paucity typical of behaviouralism arises only when one adds the theoretical requirement that, assuming our terms are to be univocal, and refer to things, their features, etc., one scientific term should correspond to one and only one operational test, or (in this case)definition.

110. A "drive" is defined in terms of hours of deprivation; a "respondent" as a purely reflex response elicited by particular stimuli; "operants" (Skinner's major concern) as responses with no obvious stimuli; a "reinforcer" as what increases the strength of an operant; and "strength" in terms of the number of hours an operant takes to become extinct. These terms are largely familiar from such illustrations as a rat pressing a bar to release a food pellet. For this terminology, see Chomsky, "A Review of B.F. Skinner's Verbal Behavior, Language, 1959; reprinted in Fodor, J.A. and Katz, J.J. (eds.) The Structure of Language, Englewood Cliffs, N.J., Prentice-Hall, 1964, p.550.

111. ibid., p. 551.

112. _Verbal Behavior_, p. 28 (cf. p. 22), quoted in _ibid._, p. 555.

113. _Verbal Behavior_, p. 115, quoted in _ibid._, p. 554.

114. _ibid._, p. 551.

115. _ibid._, p. 553.

16. _ibid._, pp. 551-552.

117. _Verbal Behavior_, p. 108, quoted in _ibid._, p. 552.

118. _ibid._, p. 554, Cf. p. 553:

> Since properties are free for the asking (we have as many of them as we have nonsynonymous descriptive expressions in our language), we can account for a wide class of responses in terms of Skinnerian functional analysis by identifying the _controlling_ stimuli. But the word _stimulus_ has lost all objectivity in this .usage.

119. _Verbal Behavior_, p. 441, quoted in _ibid._, p. 554. Skinner defines (_VB_, p. 201, _ibid._) the unit of verbal behaviour - the verbal operant - as a class of responses of identifiable form functionally related to one or more controlling variables. But as Chomsky notes (_ibid._, p. 556), he makes no attempt to specify what similarity in form or control is required for two physical events to be instances of the same operant. Recourse to the language of probability to explicate response strength does not help, for this is

> nothing more than a decision to use the word _probability_, with its favorable connotations of objectivity, as a cover term to paraphrase such low-status words as _interest_, _intention_, _belief_, and the li ke. (ibid., '. 556).

Again, in the case of language, the phrase "X is reinforced by Y (stimulus, state of affairs, event, etc)", Chomsky suggests

> is being used as a cover term for "X wants Y", "X likes Y", "X wishes that Y were the case", etc. (_ibid._, p. 558).

Skinner divides verbal operants into three classes: mands, tacts, and autoclitics. A mand is a speech act and defined as

> a verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation. (VB, p. 35, ibid., p. 566).

Since aversive control is explained in terms of previous injury, it appears that we could not respond appropriately to the mand "Your money or your life" unless we had a past history of being killed (ibid.). A "tact" is defined as

> a verbal operant in which a response of given form is evoked (or at least strengthened) by a particular object or event or property of an object or event (VB, p. 81, ibid., p. 568).

As Chomsky points out (ibid., p. 569), this results merely in a paraphrase of such notions as reference and meaning "in terms of the vague concept stimulus control".

120. VB., p. 336, ibid., p. 573.

121. ibid.

122. VB, p. 346, ibid., p. 574.

123. For example, transitive verbs are followed by nouns, intransitive verbs are not. A verb is indicated as transitive (intransitive) by including "+___N" ("-___N") in its complex symbol.

124. E.g. Cartesian Linguistics, p. 65 and Language and Mind, p. 112.

125. "A Review of B.G. Skinner's Verbal Behavior", p. 576.

126. ibid., p. 577.

127. ibid., p. 549. The general principle applies to any form of complex behaviour.

128. Cartesian Linguistics, p. 4.

129. E.g. ibid., pp. 3, 6, 9, 29, passim.

130. "A Review of B.F. Skinner's Verbal Behavior", p. 564.

131. ibid., p. 564.

132. ibid., p. 576.

133. Reflections on Language, pp. 137-138.

134. Cf. Malcolm, op.cit., and Hockett, C.F., The State of the Art, Mouton, The Hague, 1968.

135. On the subject of phonology, see Fudge, E.C., "Phonology", in Lyons, J. (ed.), New Horizons in Linguistics, Harmondsworth, Penguin, 1970, pp. 76-95.

136. E.g., Aspects, p. 47, Language and Mind, pp. 19, 25.

137. Lyons, Chomsky, pp. 27-35.

138. ibid., p. 31.

139. The German-American linguist E. Sapir (to whom Chomsky refers approvingly) maintained a "mentalist" view: a phoneme is an ideal sound at which the speaker aims.

140. The first of two non-phonetic criteria accepted by the Copenhagen School is that sounds, however disparate, are realizations of the same phoneme if they are involved in morphological significant alterations. On this criterion, the short and long forms of English vowels (generally quite disparate phonetically) are classed under the same phonemes; a morphologically significant alteration involving one of these is the present-past alteration between "bite" and "bit". The second criterion is distributional similarity in syllables and words. For example, English consonants can be classified on the basis of which of the sounds corresponding to w, l, and r, can occur after them when they are in initial position. Glossematics, the method of the Copenhagen School, goes so far as to ignore phonetic properties in the specification of phonemes and does not insist on

bi-uniqueness. The advantage of this is that it allows dialects with quite different pronunciations to be classified under the same language.

141. E.g., Bach, E., Syntactic Theory, New York, Holt, Rinehart and Winston, 1974, pp. 15-18.

142. Cf. Lyons, op.cit., pp. 34, 40, 42.

143. "Explanatory Models in Linguistics", p. 538.

144. Aspects, p. 24.

145. ibid., pp. 25-46.

146. ibid., pp. 25-26:

> To the extent that a linsuitic theory succeeds in selecting a descriptively adequate grammar on the basis of primary linguistic data (i.e. the corpus), we can say that it meets the condition of explanatory adequacy. That is, to this extent, it offers an explanation for the intuition of the native speaker on the basis of an empricial hypothesis concerning the innate predisposition of the child to develop a certain kind of theory to deal with the evidence presented to him. Any such hypothesis can be falsified ... by showing that it fails to provide a descriptively adequate grammar for primary linguistic data for some other language ...

147. ibid., p. 46.

148. This was the primary justification for transformations in early transformational theory. For example, neither of these sentences are well-formed

    * The boy gave the girl to the book.

    * The girl was given to the book by the boy.

Without a transformation by which a passive form is derived from an active, one would have to give two statements about the relation of give to nouns in its environment. But, given a passive transformation, it suffices that the grammar state once that in most sentences, give must occur with animate subjects and indirect objects, but with possibly inanimate direct objects. Bach, op.cit., pp. 169-170.

149. Of course, such generalizations must be made with an eye to other rules which are applied in the same instances and the order of the application of the rules. Otherwise their application may be blocked. One accepted way of arguing for a syntactic rule is to show that it allows the application of another rule in a given set of rules. Cf. Bach, op.cit., pp. 166-177 and Aspects, p. 44.

150. In Structures, rejecting the discovery procedures of the Bloomfieldians, Chomsky states that

> a linguistic theory should not be identified with a manual of useful procedures, nor should it be expected to provide mechanical procedures for the discovery of grammars. (p. 55, n. 6; quoted in Lyons, op.cit., p. 40.)

Chomsky had concluded before Structures that the supposed discovery procedures gave only evaluation procedures (ibid., p. 42).

151. Aspects, p. 42:

> The major problem in constructing an evaluation measure for grammars is that of determining which generalizations about a language are significant ones; an evaluation measure must be selected in such a way as to favor these. We have a generalization when a set of rules about distinct items can be replaced by a single rule ... about the whole set, or when it can be shown that a "natural class" of items undergoes a certain process or set of similar processes. Thus, choice of an evaluation measure constitutes a decision as to what are "similar processes" and

"natural classes" - in short, what are significant generalizations. The problem is to devise a procedure that will assign a numerical measure of valuation to a grammar in terms of the degree of linguistically significant generalization that this grammar achieves. The obvious numerical measure to be applied to a grammar is length, in terms of number of symbols. But if this is to be a meaningful measure, it is necessary to devise notations and to restrict the form of rules in such a way that significant considerations of complexity and generality are converted into considerations of length, so that real generalizations shorten the grammar and spurious ones do not. Thus it is the notational conventions used in presenting a grammar that define "significant generalization", if the evaluation measure is taken as length.

152. Summing up a discussion of the ordering of phonological rules, Chomsky states:

> It is noteworthy that the devices used in defining ordering ... are just those that were developed, quite independently, in the study of evaluation of grammars. ... a natural approach to the problem of evaluation ... is to measure the value of a grammar as inversely proportional to the number of symbols in the sequence of schemata that results when certain notational operations are applied to the rules of the grammar. These notational devices define what counts as "linguistically significant generalization"; they provide an empirical hypothesis as to the kind of regularities that the language learner seeks in attempting to organize data presented to him, and that the

linguist uses in jsutifying a particular formaltion of grammatical rules for a certain language. ("Some General Properties of Phonological Rules", _Language_, 1967, pp. 123-124.)

153. _Language and Mind_, p. 134. He is here concerned with the cyclical application of the following two rules of stress, which explain stress contours in English.

Assign primary stress to the left-most primary stressed vowels, in nouns.

Assign primary stress to the right-most stress-peak, where a vowel V is a stress-peak in a certain domain if this domain contains no vowel more heavily stressed than V. (p. 131)

These rules are applied first to the innermost units, then to the next innermost, etc., until the stress-pattern of the whole phrase is generated. (pp. 131-132). The principle of the cycle is said to be a part of universal grammar (p. 133).

154. Cf. Bach, _op.cit._, p. 245.

155. Cf., _Aspects_, p. 45.

156. _Reflections on Language_, p. 148.

157. _Language and Mind_, p. 22. Structural linguists, he writes, "for the first time formulated in a clear and intelligible way" "the basic question in the study of language", showing "that there are structural relations in language that can be studied abstractly".

158. _Aspects_, p.67

159. _Reflections on Language_, p. 148.

160. Cavell, S., "Must We Mean What We Say?", in Chappell, V.C., Ordinary Language, Englewood Cliffs, N.J., Prentice-Hall, 1964, pp. 75-112.

161. ibid., p. 93. Cavell adds (p. 94):

> Descriptive statements ... are not opposed to ones which are normative, but in fact presuppose them: we could not do the thing we call describing if language did not provide ... ways normative for describing ... (But) if a normative utterance is one used to create or institute rules or standards, then prescriptive utterances are not examples of normative rules.

162. The Idea of a Social Science, Routledge and Kegan Paul, London, 1958 (ninth impression, 1976).

163. Reported in Bach, op. cit., p. 251.

164. ibid., p. 252.

165. "Methodological Reflections on Current Linguistic Theory", in Davidson, D. and Harman, G. (eds.), Semantics of Natural Language, Reidel, Dordrecht, 1972, p. 451.

166. ibid., p. 453.

167. ibid., p. 442.

168. ibid.

169. ibid., p. 446.

170. ibid., p. 452.

171. ibid., p. 453.

172. Reflections on Language, p. 181.

173. The remainder of this paragraph and the next are taken largely from Partee, B.H., "Linguistic Metatheory", reprinted in Harman, G. (ed.), On Noam Chomsky: Critical Essays, Anchor, Garden City, N.Y., pp. 303-315. Cf. also Fodor, J.D., "Formal

Linguistics and Formal Logic", in Lyons, op. cit., pp. 198-214.

174. Reflections on Language. Chomsky holds that all semantic interpretation is determined by the surface structure (p. 82), although this is somewhat enriched, for the initial (his new term for "deep") P-markers enter indirectly into semantic interpretation and the theory of performance (p. 83). His "trace theory" explains how initial (deep) structure is still relevant. The initial subcategorization rule for sentences ($S \rightarrow COMP\ S_{red}$) states that the sentence consists of a "complementizer" - such as the conjunction "that" - and a "reduced sentence" (p. 88). Transformations such as wh-movement (Relativization) place the wh-word in the complementizer position (p. 89), where it acts as a sort of quantifier (p. 94). For example (p. 94), the "logical form" of

(1) The police know who the FBI discovered that Bill shot

is

(2) The police know for which person x, the FBI discovered that Bill shot x

where the variable x is bound by the quantifier "for which x". Identifying x with the trace t left by the movement rule gives as the surface structure of (1)

(3) $[_S$ The police know $[_S$ who the FBI discovered $[_S$ that Bill shot t$]]]$

the logical form of which is given, given that "who" is a quantifier binding t and meaning "for which person t". Independent motivation for the trace theory comes from active-passive pairs (pp. 97-98), such as

(4) Beavers build dams

(5) Dams are built by beavers.

The role of "dams" in the surface structure is important, because

(5) says something about dams and is false (since some dams are not built by beavers), while (4) says something about beavers and is true. But we must also know that in (5) "dams", while the subject in one sense, is the direct object in another. This information is supplied in the enriched surface structure

(6) Dams are $[_{VP}$ built t by beavers$]$

where the direct object function is indicated by the position of the trace bound by "dams". (Chomsky admits this quantification is "of an unconventional sort".) Other independent motivation is supplied by anaphoric relations within the sentence, i.e. occurrences of pronouns such as "he", "each other", etc. which are bound by an antecedent in the sentence (pp. 99 ff.).

The motivation for the standard theory, he states (p. 96), was that information about grammatical functions in embedded sentences is provided by initial (deep) P-markers alone. But this motivation disappears under the trace theory, which gives a simple way to derive "logical form" from surface structures in which t appears.

> When a transformation moves a phrase P from position X to position Y it leaves in position X a trace bound by P (p. 95).

Chomsky as well doubts whether there is any clear criterion determining in general whether ungrammaticality in particular cases is syntactic or semantic (p. 95). A borderline case is the difference in grammaticality between (1) and

(7) The police think who the FBI discovered that Bill shot.

The difference is accounted for by the fact that questions

> have a complementizer distinct from the one that appears with declarative structures, and that verbs are marked in the lexicon as to whether they may or may not appear with sentential complements containing this complementizer (p. 94).

175. Generative semantics solves the ambiguity of scope in the example given in the text by indicating scope structurally, attaching quantifiers higher or lower on the tree. This had been done with adverbs in the standard theory and accomplishes what the PM notation accomplishes with brackets; the insufficiency of the context-free grammar is made up by lexical insertion. Lakoff, the principal exponent of generative semantics, postulates two deep structures where a single deep structure in the standard theory is associated with two different meanings as revealed in the surface structure. In some cases his transformations allow either deep structure to become the other; to prevent this, he introduces derivational constraints. Still, not all of semantics is captured by semantic trees accommodated to the predicate calculus, for, e.g., "the glass is half empty" entails "the glass is half full".

Both generative and interpretive semantics can be designed to capture the fact that the relative scope of logical elements depends on at least four surface factors: word order (compare "Many men read few books" and "Few books are read by many men"), stress (compare "John and Mary can't come to the party" and "John AND Mary can't come to the party"), subordination (compare "To please everyone is hard" and "Everyone is hard to please"), and differences among quantifiers themselves (compare the ambiguity of scope in "Several soldiers shot three students" and the lack thereof in "Every soldier shot three students").

176. Davidson, D. and Harman, G. (eds.) The Logic of Grammar, Dickenson, Encino and Belmont, 1975, "Introduction", p. 4.

177. Davidson's illustration, which we present schematically, is of the form "a and b are Ø". Grammar assigns this the logical form

"Øa and Øb". The theory of truth then gives truth conditions for "p and q", showing that any conjunction is true iff both its conjuncts are true; this shows that any argument of the form $\frac{p \;\&\; q}{p}$ is valid. So logic should contain this rule, which, in fact, shows that a valid argument leads from "a and b are Ø" to "Øa" (ibid.).

178. ibid., p. 3.

179. ibid., p. 4.

180. Cf. Harman, G., "Logical Form", in Davidson and Harman (1975), pp. 289-307. His major thesis is that a theory of logical form must be compatible with syntax. Logical forms assigned to sentences by the grammar should be the same as (at least part of) the underlying structures assigned to sentences by a transformational grammar. A good grammar can be incorporated into a good theory of logical form as the device that assigns logical forms to sentences.

181. See the excerpt from Tarski's The Concept of Truth for Formalized Languages in Davidson and Harman (1975), pp. 25-49.
An essential aspect of Tarski's semantics is the distinction between an object language and a metalanguage; this avoids paradoxes of self-reference. The metalanguage alone contains a truth predicate; for object language L, it gives a definition of "is true-in-L" which has as a consequence every sentence of the form

s is true-in-L iff p

where "s" is replaced by a standardized description of a sentence of L and "p" is replaced by a translation of "s" into the metalanguage (s itself in the simplest case). But this is not of interest without further conditions on the theory of truth (cf.

Davidson and Harman (1975), "Introduction", p. 19). Firstly, the theory must account for the truth conditions of every sentence by analysing it as composed, in truth-relevant ways, of elements drawn from a finite stock, e.g. truth-functional connectives, names designating individuals, and n-place predicates designating n-tuples of individuals. Tarski expressed this condition by saying that the theory must give a structural definition of "true sentence". Secondly, the theory must give a way of deciding by recursive means the truth conditions of any given sentence. Finally, the statements of truth conditions must draw upon the same concepts as the sentence whose truth conditions they state (most simply when the meta-language contains the object language).

Tarski himself, to accommodate sentences with quantifiers, had to introduce the notion of a sentential function. So he did not directly state definitions of truth - i.e. give truth conditions - for them, but introduced as an intermediary the notion of the satisfaction of a given sentential function by given objects.

182. That is, the designation of terms is extended to domains with different individuals which may or may not exist (this roughly explicates "meaning"), and "true-in-L" is defined as before, but taking into account domains having a certain relation to that identified with the actual world.

183. "On Saying That", reprinted in Davidson and Harman (1975), pp. 143-152.

184. The variance of truth-value of sentences depending on the context of utterance can be accommodated by declaring utterances to be the bearers of truth values or by making truth a relation between a sentence, a speaker, and a time. The first course is adopted,

e.g., by Weinstein ("Truth and Demonstratives", in Davidson and Harman (1972), pp. 60-63) in his extension of Tarskian semantics to cover indexical items ("indicator words" in his terminology). The second course is adopted, e.g., by Montague (e.g. "Pragmatics and Intensional Logic", op. cit., pp. 142-168), who introduces into a possible-worlds semantics the notion of points of reference: complexes of relevant aspects of possible contexts of use. For example, a point of reference for indexical aspects might be specified by giving an ordered pair of a person (the utterer) and a real number indicating the moment of utterance. D. K. Lewis (Convention: A Philosophical Study, Harvard U.P., Cambridge, Mass., 1969) gives a similar treatment of lexical items. He wants to retain the syntactic descriptions because he wants his account to cover both logical treatments of formalized languages and transformational grammars for natural languages. He rejects the semantic component of transformational grammar in favour of a possible-worlds semantics involving an account of indexical items. Cf. his account of "analytic", "contradictory" and "synthetic" involving indexical items on pp. 174-177.

185. op. cit. Harman wishes to capture entailments involving complex (but not conjoint) predicates such as the entailment from "x walks slowly" to "x walks"; this is extended to relative modifiers (e.g. "large"). He applies Chomsky's position on nominalizations of the sort that can refer to events in discussing ontological commitment to events. Finally, he extends Tarskian semantics by first analysing "that"-clauses as embedded structures in such a way as to account for opacity. But to do so he must introduce a logical operator "#" such that, where e is a part of a logical structure, #e# is the corresponding structural name of a proposition; this operator is motivated by considerations within Tarskian semantics.

186. "Semantics for a Natural Language", in Davidson and Harman (1975), p. 23. Chomsky distinguishes sentences such as

(1) I persuaded John to examine Bill

(2) I expected John to examine Bill

by the fact that when the embedded sentence in (2) is transformed to the passive, the result is "cognitively synonymous" with the active form, which is not the case with (1). But in fact, Davidson asserts, we need do no more than ask about the semantic role of "John", which occurs in a referentially transparent context in (1), but in an opaque context in (2). This requires no appeal to "the speaker's tacit knowledge of the grammar", but rather rests on the explicit knowledge any speaker of English has of the way in which (1) and (2) may vary in truth under substitutions for the word "John".

187. Lewis (op. cit., pp. 160-173) introduces mood - identifying the sort of speech act - into this sort of analysis by extending the notion of truth condition.

188. Reflections on Language. The rules to do with traces are seen as part of universal grammar, constraining the set of learnable grammars and contributing to explanatory adequacy (p. 111). He now envisages the distant goal for transformational grammar of reducing the rules to ones of the form "Move NP", subject to constraints from universal grammar which are expressed either (i) as general conditions on rules, or (ii) as properties of initial (base) P-markers, or (iii) as properties of surface structure (p. 112). The fact that transformational grammar properly deals only with sentences and not their linguistic and non-linguistic contexts is circumvented by bringing in other systems (p. 104). What he calls sentence grammar deals with some cases of anaphora - essentially

pronominal reference - for it assigns antecedents to reciprocals (e.g. "each other") and to necessarily bound anaphors (e.g. "his" in "John lost his way", not in "John lost his (perhaps another's) book"). Sentence grammar is said to result in logical form. Beyond sentence grammar, there are other semantic rules and rules belonging to other cognitive structures. He does not distinguish what belongs to which system, but together they account for reference and are said to involve discourse properties and considerations relating to situation, communicative intention, etc. and to result in "fuller representations of 'meaning' (in some sense)".

189. ibid., p. 41. Cf. pp. 42-26. Included in the common stock would be concepts of natural kinds in particular, which constrain the linguistic categories to which names must belong. This would affect the operations of grammatical rules, which are partially determined by the semantic properties of the lexical items.

190. ibid., pp. 119-121.

191. op. cit., p. 138. Vendler identifies this as Wittgenstein's insight.

192. ibid., pp. 139-140, 126-127.

193. ibid., pp. 127-130 for the objection and Vendler's reply.

194. Cf. Katz, J. J., The Philosophy of Language, Harper and Row, New York, 1966, and Bierwisch, M., "Semantics", in Lyons, J., op. cit., pp. 116-184. On this view, an essential part of the syntactic behaviour of a lexical item can be derived from the semantic representation.

195. Cf. Bierwisch, op. cit., pp. 180-183. Bierwisch maintains that semantic features represent, not external physical properties, but "the psychological conditions according to which human beings process their physical and social environment". So semantic structures

are reducible to our basic cognitive and perceptual dispositions. E.g. X GREATER Y might represent the general ability to compare. X DIMENSION OF Y, the three-dimensional space orientation, etc. These "concepts" are not learned; only their combinations, phonetic forms and morphological properties are. Our perceptual and cognitive equipment mediates between semantic structures and the world; thus we can form concepts of non-existents. Semantic components are "abstract theoretical entities representing complex psychological structures and mechanisms, not lexical entries of any natural language".

Componential analysis is remarkably similar to the method of dichotomy of Ramus (sixteenth century), which almost obliterated serious logical work for three centuries. It is also similar to the gross simplification which hid much of Aristotle's logical work from Dark-Age Europe, not inappropriately known as the Tree of Porphyry.

196. op. cit., pp. 130-132.

197. ibid., pp. 135-138.

198. Cf. "Some General Properties of Phonological Rules". An example of an innate principle is the following principle of the cyclical application of rules, concerned mostly with stress.

> (1) Each phonological rule is applied to a string bounded by paired brackets of the surface structure and containing no internal brackets; after the last rule of the sequence has applied in this way, innermost brackets are erased and the sequence of rules re-applies as before (p. 115).

Rules are applied according to this principle to structures such as

$$[_N [_A [_N \text{theatr}]_N \text{ic} + \text{al}]_A \text{ i} + \text{ly}]_N$$

where N = noun, A = adjective. The rules first assign stress to $[_N \text{theatr}]_N$; when no more rules can apply, the brackets are removed and the same rules apply in the same order to $[_A \text{theatric} + \text{al}]_A$; and so on. But sometimes two rules must be disjunctively ordered; R_1 and R_2, linearly ordered so that R_1 precedes R_2, are disjunctively ordered if R_2 cannot apply to a given string at a certain stage of the cycle if R_1 has already applied to this string at this stage of the cycle (p. 120). Rules of stress can be stated by simply giving the relevant phonetic item or category, Y, in the context of the assignment of stress, X__Y. Now the rules XYZ and XWZ can be abbreviated as $X\begin{Bmatrix}Y\\W\end{Bmatrix}Z$ and the rules XYZ and XZ as X(Y)Z. It is a general principle that two successive rules are disjunctively ordered if they can be abbreviated by a schema involving parentheses; and this principle must be allowed to apply recursively (p. 121). So the general principle is

> (2) Let S be a schema X(Y)Z. Then all rules derived by expanding XYZ (or XYZ itself, if it is a rule) are disjunctively ordered with respect to each of the rules derived by expanding XZ (or XZ itself, if it is a rule) (pp. 121-122).

Given (2), there is empirical evidence suggesting

> (3) The underlying representational schema is selected in such a way as to maximize disjunctive ordering (p. 124).

And there is empirical evidence for

> (4) Two successive lines of a derivation can differ by at most one feature specification (p. 125).

Chomsky concludes this article by stating that the establishment of deep and general principles of phonology "will be a result of considerable importance not only for general linguistics, but for psychology as well" (p. 127).

199. Sampson, Geoffrey, "Linguistic Universals as Evidence for Empiricism", Journal of Linguistics, Sept. 1978, pp. 183-206. It is suggested that a high degree of survival value goes with self-embedding. For units at any one level are not all interdependent, thus the structure as a whole can survive the breakdown of one or more of its subunits. Syntactically, this means that an utterance can still largely succeed even when one of its components is ungrammatical or not properly integrated.
We have already noted the general applicability of tree graphs and the general appeal to self-embedding organization in psychology and computer science.

200. ibid. E.g. it was suggested (Berline, B. and Kay, P., Basic Color Terms, Berkeley and New York, 1969) on considerable evidence that the colour vocabulary of languages differ in a very systematic way: all languages have words for black and white; if they have a third term, it is for red; if a fourth, it is for green or yellow, the fifth being the other alternative; etc. But it has been shown that the original categorization of Japanese does not fit this schema; the fact that the contemporary classification does is attributed to Western influence, particularly industrial pigments.

201. Martinet, Andrew, Elements of Linguistics, translated by E. Palmer, Faber, London, 1960, pp. 186-187. To take Partinet's example, when steamers were first developed, one could refer to a particular boat and say: "That boat is powered by steam". Thanks to the relative clause, one could also say: "The boat which is powered by steam is late". The relative clause and the noun it modifies are eventually replaced by a noun referring to the artifact, "steamer".

202. Campbell, R. and Wales, R., "The Study of Language Acquisition", in

Lyons, J., <u>op. cit</u>., pp. 243-260.

203. Cf. <u>ibid</u>., pp. 255-256.

204. <u>op. cit</u>., p. 35. Miller holds that we recode information from observation into language. But we very rarely call reporting what is seen thinking. If reporting were recoding or even translating, then what is sensed would be in a language or code.

205. Dodwell, P. C., "Is a Theory of Conceptual Development Necessary?", in Mischel, <u>op. cit</u>., pp. 372-373 for the remainder of this paragraph.

206. The executive programme gives the overall flow of the computation, specifying entry to and exit from subroutines. The subroutines are the routine calculations. The example in note 96 of a tote unit with embedded tote units presents an example of an executive programme with several levels of subroutines. In humans, the subroutines are the performance of routine tasks such as adding single-digit numbers; the executive routine is the complex task - e.g. balancing an account - which makes use of these results.

207. <u>The Language of Thought</u>, Harvester, Hassocks, 1976 (first published 1975), pp. 52-53.

208. Cattell, R. B., <u>The Scientific Use of Factor Analysis in Behavioral and Life Science</u>, Plenum, New York and London, 1978, p. 16; cf. p. 5.

In algebraic terms, factor analysis arranges the statistical results found for each experimental variable so that they are listed in the same order in both the rows and the columns. The entry in the i^{th} row j^{th} column is r_{ij}, the correlation between the i^{th} and j^{th} variables, call them i and j. When there are elements g common to i and j, $r_{ij} = r_{ig}.r_{jg}$. The value of g can be found by taking all correlations into account.

Geometrically, i (or j, or k, ...) is represented by a vector whose length is $\sqrt{r_{ig}}$; r_{ij} is represented by the angle between the vectors representing i and j. Full correlation (+1.0) is indicated by coincidence; full negative correlation (-1.0), by vectors in opposite directions from the origin; independence (zero correlation), by a right angle between the vectors. Since each factor is independent of the rest, the number of dimensions in the geometric representation is generally greater than three, i.e. the factors and variables are represented in a hyperspace.

209. ibid., p. 5.

210. Cf. Hamlyn, D. W., "Epistemology and Conceptual Development", in Mischel, op. cit., pp. 3-24. This is directed against Piaget's claims for genetic epistemology, that epistemology must be based on empirical, psychological research to be relevant to how and what we in fact know. The psychological foundation Piaget gives is his developmental psychology, involving a natural progression founded on the mind in its relation to the world.

Hamlyn holds (pp. 3-5) that a study of the general conditions normally necessary for a given form of understanding concern the criteria for having the concept in question, not how individuals acquire it. Further (pp. 6-11), we cannot know what is involved in the acquisition of a concept unless we know what it is to have that concept, which is something objective, involving a common norm. Epistemological priorities, he continues (pp. 19-23), are not temporal, but logical. One cannot understand "red" without understanding "colour". But we do not teach someone "colour", then "red"; nor "red", then "colour". To understand "red", one must understand a nexus of surrounding concepts. There is no general rule determining how far the nexus extends; this is decided only in particular cases. Again, a condition for understanding a concept is the ability to apply it, and, again, there is no general rule for when and to what extent the application of a concept or its nexus should come into consideration. The very general picture given by Piaget's three stages - from concrete to abstract - is and must be our normal picture, for understanding develops through experience, which confronts particulars. Any attempt to see the progression in a different order leads to unintelligibility, for, "given our understanding of normal human experience, learning and knowledge, we cannot conceive of how it might be otherwise. For this is an understanding of the norms which provide the criteria of application for the concepts of experience, learning, and knowledge" (p.22).

211. Objective Knowledge, Oxford, Clarendon, 1972, p. 6 passim.

212. An example of "psychology" is presented by L. Kohlberg's studies of moral development (cf. "From Is to Ought: How to Commit the Naturalistic Fallacy and Get Away With It", in Mischel, op. cit., pp. 151-235). Kohlberg states that no observation and categorization of behaviour "behaviouristically" can define its moral status. Yet behaviour can be consistent with one's moral principles. Before we can know anything about such behaviour, however, we must first know what a man's moral judgements or principles are (pp. 226-232).

His psychological theory, he adds (pp. 180-195), is supposed to explain why there are culturally universal elements to morality at every stage (he distinguishes three levels, each with two stages - cf. pp. 164-165) and why movement is in an invariant upward sequence. He does not commit the naturalistic fallacy, he states, for he explains ontogenesis of idea systems by their philosophical adequacy and does not infer philosophical adequacy from temporal order. On the other hand, most of the reasons advanced for cultural relativity (cf. pp. 155-180) can be seen to commit the naturalistic fallacy.

Kohlberg sees his theory as combining Piaget's developmental psychology with Hare's prescriptivism and Rawl's theory of justice. The debt to Piaget is not always obvious. He avoids the objectionable aspects of Piaget's theory - e.g. attributing knowledge of group theory to infants on the basis of the fact that they can manipulate a pivoting pointer through 360° and cancel movements in one direction with movements in the other - by considering social activity. Being a metaethical formalist, he states (pp. 213-218) that he defines morality's uniqueness, not in terms of content, but in terms of the formal character of moral judgement, method, or point of view, best seen in reasons given for a moral judgement - impersonality, universalizibility, etc. This is purely metaethical, and, indeed, stage six ("the universal ethical principle orientation") principles of justice do not directly obligate us to blame or punish. An implication of his psychology is that arguments for a normative ethic must be stepwise. He cites (p. 225) Rawls (Justice as Fairness) assuming a stage five ("the social-contract legalistic orientation") society and showing how this must be based on stage six principles. The moral judgements involved are not about "knowledge" of rules (i.e. being able to state them, which children can do from about age six), but about "active judgement" (pp. 185-188). Moral concepts are essentially concepts of social relationships (pp. 190-191); moral development depends on the amount of opportunity for "role-taking" (pp. 191-195). I.e. moral development is a case of cultural learning-how. This is borne out by his data. Children are classed into stages according to their justifications of their decisions on prepared moral problems. They are also asked to put prepared arguments pro and con a certain action into their own words; their restatements show distortions down to their own stage and only transitional cases give restatements from a stage higher than their own (pp. 163-180). Data on middle-class urban boys at ages ten, thirteen and sixteen from the U.S., Taiwan and Mexico show that level one initially dominates; stage five comes to dominate in the U.S., level two in the other two countries. Similar data from isolated villages show stage one dominating throughout, with varying increases in the other stages (p. 172).

Summarizing his position, Kohlberg states (pp. 222-226) that

(1) the facts show a universal moral form centering on principles of justice as the last stage;

(2) this form assumes the fact-value distinction;

(3) yet science can test whether it fits the psychological facts;

(4) conversely, analysis can point out why a higher stage can handle problems a lower stage acknowledges, but cannot resolve.

Points (1)-(4), he claims, show that moral psychology and philosophy can work hand in hand.

(5) the scientific theory as to why people do move to and prefer a higher stage is broadly similar to the moral theory as to why they should.

His findings indicate that

(i) philosophical analysts are justified in asserting universal features;

(ii) the philosopher's task cannot merely be to analyse moral language, for there are six such systems;

(iii) since the highest stage includes the basic positive features of lower stages, an adequate normative ethics must include all these features.

Much of the detail and even outline of Kohlberg's method can be questioned (cf. Alston, W. P., "Comments on Kohlberg's 'From Is to Ought'", op. cit., pp. 269-284, especially pp. 270-277). Why is there this particular sequence of stages, or, indeed, any one sequence? Why are there six stages, and are they as distinct as he implies? Does his prescriptivism imply his theory of justice? Still, prescriptivism seems to be the best candidate, because it accounts for a more sophisticated handling of moral argument. Much of what Kohlberg finds is that, as people gain more experience in various social roles which require moral judgement and argument, they know better how to perform as moral agents. The experience available to the agent depends on his society; the cultural aspect we call morality is really quite sophisticated in our culture, even though everyone is involved.

213. Cf. Toulmin, S., "The Concept of 'Stages' in Psychological Development", in Mischel, op. cit., pp. 25-60; this is a reply to Hamlyn, op. cit.

Toulmin disagrees with Hamlyn more on method - some blend of the empirical and the conceptual is unavoidable (cf. pp. 25-26) - than on substance - Piaget underestimates the social, educational, and ethical aspects of child development (pp. 54-57). His position is not of direct concern to us insofar as it relates to procedure within a science.

However, concerning developmental psychology, Toulmin's point (pp. 37-41) seems to be this. We could not say what learning a concept, C, is unless we could say what it is for a person, P, to have C; but equally we could not say what having C is unless we could say what it is for P to learn C. The heart of the problem, he states, is that criteria of cognitive grasp are complex and content-dependent and vary with different stages of life. So one task of studies in cognitive development is "to map the changing constellations of skills in terms of which we are to apply cognitive terms to human beings at different ages and stages of intellectual development".

Toulmin's claim that there are different constellations of skills at different stages is largely acceptable. Ordinary language has a stock of terms referring to stages (e.g. "childhood", "adolescence", etc.), but is somewhat lacking in terms for activities and skills peculiar to stages and draws much coarser distinctions than are drawn in developmental psychology. It is quite possible that finer distinctions with a (perhaps remote) biological foundation and labels for activities peculiar to stages should be a welcome addition.

But it is misleading to call the activities skills and even worse to suggest knowledge peculiar to each stage. There is not an adult skill and a childhood skill, but rather, perhaps, a way a child can get by in a certain endeavour until he has mastered the skill. And there is not an adult, e.g., mathematics and a childhood mathematics, but rather conceptually less difficult branches and techniques of mathematics which the child must first master.

214. For example, classical mechanics gives predictions very close to those of relativistic mechanics for velocities small in comparison to c. Similarly, phenomenal thermodynamics gives predictions very

close to those of statistical thermodynamics if one considers only large systems in which local variations are very improbable.

215. Cf. Popper, op. cit., Chapter 6, "Of Clouds and Clocks", pp. 206-255. Popper's point is that some concepts are "cloud-like" - the sort of precision envisaged in the Laplacean universe does not fit - while others are "clock-like".

216. Reflections on Language, pp. 72 (referring to Strawson) and 73 (referring to Searle and Grice). Searle, J., "Chomsky's Revolution in Linguistics" (originally published in The New York Review of Books, 1972), in Harman, op. cit., p. 31: "The study of speech acts is indeed the study of a certain kind of human behavior, but for that reason it is in conflict with any form of behaviorism, which is conceptually incapable of studying human behavior".

217. "Some Empirical Assumptions in Modern Philosophy of Language", in Morgenbesser, S., Suppes, P. and White, M. (eds.), Essays in Honor of Ernest Nagel, Philosophy, Science and Method, New York, St. Marin's Press, 1969, pp. 275, 279, 281.

218. Reflections on Language, pp. 179-186.

219. ibid., pp. 200-201. "Some Empirical Assumptions in Modern Philosophy of Language", pp. 264-265.

220. Reflections on Language, pp. 166-171.

221. Language and Mind, pp. 190-191.

222. ibid., pp. 191-192.

223. Searle, op. cit., pp. 24-26.

224. ibid., p. 29.

225. Reflections on Language, pp. 64-67 (directed at Strawson, Meaning and Truth, London, O.U.P., 1970), pp. 67-71 (directed at Grice, "Utterer's Meaning and Intentions", Philosophical Review, 1969, pp. 147-177) and pp. 73-76 (directed at Grice, "Utterer's Meaning,

Sentence-Meaning and Word-Meaning", _Foundations of Language_, 1968, pp. 225-242).

226. _ibid._, p. 60.

227. _A Materialist Theory of the Mind_, London, Routledge and Kegan Paul, 1968, p. 2.

228. _op. cit._, pp. vii-ix.

229. E.g. _Reflections on Language_, pp. 24, 35; _Language and Mind_, pp. 73-74, 168.

230. E.g. _Language and Mind_, pp. 27, 45; _Reflections on Language_, pp. 30-33.

231. _op. cit._, p. 73.

232. _ibid._, p. 20.

233. _ibid._, pp. 71-72.

234. _ibid._, p. 88.

235. _ibid._, pp. 339-340.

236. _ibid._, p. 209. In _Belief, Truth and Knowledge_ (Cambridge, C.U.P., 1973, p. 3) he claims that a belief is "literally a map in the believer's head" by which he steers and the totality of his beliefs is a great map with his present self as reference point. This requires qualification (p. 5): firstly, general beliefs are habits of inference and involve no spatial reference; secondly, beliefs, unlike other maps, are intrinsically representative - they need no interpretation and cannot be misread.

237. Armstrong holds that deep structure is not specifically linguistic, but rather a belief to be expressed in words (_ibid._, p. 34). Indeed, no conceptual tie between beliefs and their expressions is admitted (_ibid._, p. 25; _Materialist Theory_, pp. 340-341); he even conceives it possible that a dog should believe that Goldbach's conjecture is true (_Belief, Knowledge and Truth_, p. 32).

238. <u>Materalist Theory</u>, pp. 138-141. Human devices require concepts, for we can acquire information, that is (sic), beliefs about objects, events, etc., only as they are brought under concepts. But concepts are simply capacities for acquiring capacities for selective behaviour towards particular objects on particular occasions (<u>ibid</u>., pp. 339-340).

239. If A perceives an x, then that x must be the cause of A's perception, but further, there must be some resemblance between what the perception is taken to be and what causes it (<u>ibid</u>., p. 230). And if a true belief acquired in perception is reliable in the sense that the existence of the cause is a strong condition for acquiring the belief, then that belief constitutes knowledge (<u>ibid</u>., pp. 237-238).

240. <u>ibid</u>., pp. 115, 231-232. Indeed, Armstrong states that we "must see our cognitive relation to our own mind as like our cognitive relation to anything else in nature" (<u>ibid</u>., p. 115).

241. <u>ibid</u>., p. 324.

242. <u>ibid</u>., p. 326. Introspection is needed to appraise feedback (in perception) and our current mental stage (as when we do a calculation in our head) (<u>ibid</u>., p. 367). Also, since secondary qualities (colours, sounds, etc.) are explained away by physicists, they can be neither in the objects nor, since the mind is a physical object, in the mind; so they must be properties of physical objects or processes as described by physicists (<u>ibid</u>., pp. 272-273).

243. <u>Belief, Knowledge and Truth</u>, pp. 204-205.

244. Armstrong states that attributions of belief such as in the truth of Goldbach's conjecture to a dog are usually taken to be idle without linguistic criteria (<u>ibid</u>., p. 33). But, he claims (<u>ibid</u>., p. 34), neurophysiology can supply the criteria.

245. <u>op. cit</u>., pp. 9-16.

246. He thus avoids the behaviourist commitment, due to restriction to actual inputs, to deny "that we sometimes act the way we do because that seems the best way to act given what we take to be the options" (*ibid.*, p. 31).

247. *ibid.*, pp. 31-32.

248. *ibid.*, pp. 28-29.

249. *ibid.*, pp. 34-41.

250. *ibid.*, pp. 42-51.

251. *ibid.*, p. 50.

252. *ibid.*, p. 118.

253. *ibid.*, p. 117; cf. p. 110.

254. *ibid.*, pp. 73-78.

255. *ibid.*, pp. 52-53.

256. *ibid.*, p. 71.

257. It is noteworthy that when Fodor calls on syntax for the language of thought (when discussing concept formation and perception in terms of the simplicity metric) he must rely solely on linguistic data.

258. *ibid.*, pp. 65-67.

259. *ibid.*, pp. 65-68. The fact that the machine is built to use the

> machine language guarantees that the sequence of states and operations it runs through in the course of its computations respect the semantic constraints on formulae in its internal language. What takes the place of a truth definition for the machine language is simply the engineering principles which guarantee this correspondence.

The human case is treated similarly, where the CNS takes the place of the computer's hardware (we can imagine an organism "born speaking whatever language its nervous system uses for computing") and the compiler uses biconditionals of the form

'y is a chair' is true iff x is G,

where "G" is in the machine language. To the objection that we could stop sooner and use the predicates of the natural language, he simply replies that 'is a chair' is learned, G is not.

260. *ibid*., p. 79.

261. Fodor shows the misconception of Wittgenstein's position typical of Chomsky and his followers, viz. that Wittgenstein, like Skinner, holds that language use is determined by environmental factors. For he states that Wittgenstein's picture of coherence is that "a term is coherently employed when its use is controlled ... by the facts about the world" (*ibid*., p. 71). This ignores very central aspects of Wittgenstein's position, such as the view that many of our words do not pick out properties "in the world" but are applied in a spectrum of cases which have only a "family resemblance"; it also ignores the difficulties Wittgenstein points out in the notion of the same use or application of a word or rule (cf. the article by Norman Malcolm reprinted in Jones, D. R. (ed.) *The Private Language Argument*, pp. 45-47. I found this article (pp. 33 ff.) helpful for the following paragraph).

262. *Philosophical Investigations*, p. 258.

263. *ibid*., 265.

264. *ibid*., 56.

265. *ibid*., 259.

266. *Materialist Theory*, p. 86.

267. "Are Dispositions Causes?", *Analysis*, October 1968, p. 45.

268. *op. cit*., p. 87.

269. *op. cit*., p. 46.

270. "Dispositions are Causes", *Analysis*, October 1969, pp. 233-234.

271. "Are Dispositions Lost Causes?", Analysis, October 1970, p. 17.

272. "On One's Mind", Philosophical Quarterly, October 1970, p. 353.

273. ibid., p. 355.

274. Byrne, R. W., "Memory for Urban Geography", Quarterly Journal for Experimental Psychology, 1979, pp. 47-54.

275. ibid., p. 53.

276. E.g. "From the T-junction, there are two intersections to which one could go: a T-junction and an intersection with roads leading in four directions". This could be represented as: T → TS.

277. To account for the cases where an agency is located along a path to another, one could introduce rules telling one, e.g., to turn to the left and enter.

278. Notice that any general properties are due to the fact that no spatial or temporal context is specified; any time in A's life, if we put him, e.g., in a sufficiently large playing field and present him with an empty milk bottle, he will go through his paces.

279. This holds only in the context of the error in question. We might blame him for, e.g., not eating properly if this is seen to have led to his blindness.

280. For example, if overshooting the turn caused a traffic accident, A might be charged with negligence. He would not be held responsible for going blind; indeed, the charge might be dismissed when his behaviour - his error - is accounted for by his sudden blindness.

281. If internal structures "malfunctioned" in the majority of cases, they would not be the sort of things which perform the sort of functions attributed to them. A prototype aeroplane might malfunction in the majority of cases; this is because it does not perform its intended function. But natural things do not have

intended functions.

282. A species of bird is sensitive to the earth's magnetic field, an adaption exploited in migration. This fact is sometimes stated by saying that the birds use an internal compass. But they cannot make errors in simply reading the compass, nor do they learn to use the compass. We can explain their migration by their sensitivity to the earth's magnetic field, but they do not know how to use their compass in migration (or anything else). Arthritics' sensitivity to changes in barometric pressure is similar. We can imagine the case in which physiology certifies the appropriateness of a certain sort of behaviour by relating it to the functioning of an internal structure which comes into play under certain sorts of environmental circumstances in which this behaviour typically occurs. But we would not use that structure and its malfunctions would not count as errors.

283. Cf. Kohlberg, op. cit., pp. 226-232 for this instanced in the case of morality. E.g. subjects at his highest level of development cheat less, although they are no more opposed to cheating than others, who as well can recite the relevant rules. Kohlberg's explanation is that the more advanced are "sensitive to new aspects of the moral situation" - e.g. they count it as cheating even when the adult leaves the room. Thus the more advanced more easily deal with situations which are socially ambiguous (e.g. as portrayed in Lord of the Flies) or when moral expectations break down.

284. Miller and Chomsky, "Finitary Models of Language Users", p. 485.

285. E.g. Reflections on Language, p. 12 and many other places.

286. This view is presented in Reflections on Language, pp. 24-27. It is implicit in his programme from the start. He comes close to

formulating it in Aspects, p. 25, but appears to back down on p. 26. But the example used here - ability to play chess - is presented in the later work (p. 27) as lying on the boundary of cognitive capacity.

287. Reflections on Language, p. 35; cf. p. 139.

288. ibid., p. 21; cf. p. 35.

289. I am supposing here that we learn the Martians' language, and so are in their presence. We might instead attempt to establish communication with extraterrestrial intelligence by sending out radio signals with high negentropy relative to our background radiation and encoding distributions mi micking structures (e.g. of silicon or carbon based molecules) we have reason to think are common where life might have arisen. What we would communicate in, however, would be very different from a natural language. Here we would begin with an exchange of esoteric knowledge; the basic vocabularies would still remain mutually unintelligible.

290. This is also the case when we say an object can do something or other; e.g. a heating system can turn itself off in response to an increase in ambient temperature.

291. There are two exceptions to this. Firstly, we sometimes personify species and treat their various capacities as developments from a common nature. Secondly, when an animal has been injured and has lost an ability it has had from birth, we sometimes say that it knows how to do the activity in question when it regains this ability. For example, a person who has had a lung injury and requires an external assistance for breathing is said to know how to breathe when he has made the sufficient adjustments to get by without the assistance; development occurs here also.

292. Reflections on Language, p. 4, passim. And when he speaks of innate

structures, these are held not to come into play until triggered by environmental conditions; this is his major point in Cartesian Linguistics, pp. 59-72, where he rightly insists that seventeenth century innatist theories were dispositional.

293. Popper (Objective Knowledge) has suggested that the eye from birth incorporates a theory. He also maintains that this knowledge is the result of trial and error. In this case, the trials are mutations and the errors are biological forms which fail to survive. However, species-specific equipment resulting from evolution does not count as knowledge, for the species-as-a-whole, let alone its evolutionary sequence, cannot display behaviour. To be fair, I must add that this is what Popper calls subjective knowledge, which is not of great interest for his general account.

294. Peter Abell ("Mathematical Sociology and Sociological Theory", in Rex, J., Approaches to Sociology, Routledge and Kegan Paul, London, 1974, pp. 92-93) gives the following summary of what the mathematization of a discipline does not imply as a way of showing the applicability of mathematics to sociology.

> First, the use of mathematics does not necessarily rest upon ideas of quantity and measurement unless we use the last term in the broadest possible sense. Many - perhaps most - mathematical systems are essentially qualitative in nature and, if the expression will be permitted, it is qualitative mathematics that will be emphasised ... Second, and in a similar vein, mathematics does not imply "exactness" or "precision" in the phenomenon it is supposed to reflect; one can "build in" imprecision into the mathematics one uses if the phenomena warrant it. In fact, ... we often have to be imprecise in our theoretical analyses, since the full

microstructural complexity of social phenomena is not open to systematic theoretical treatment at a sociological level of analysis. This being the case, it is only by the use of a disciplined theory (and technique) of "information surrender" that a programme of a genuine theoretical nature can be established. Third, there is no necessary connection between the use of mathematics and determinism. Fourth, despite many claims to the contrary, mathematical systems can be devised for handling the realm of "meaningful social action". "Meaning", "verstehen", "situational logic" and so on are not exclusive of formal treatment. Fifth, the complexity of phenomena, far from ruling out the use of mathematical formulations, often necessitates it; though the triumphs of mathematics in the physical sciences ... should not be taken as in any way paradigmatic. And on the sixth count, there is, thus, no simple equation between the use of mathematical thinking and what is loosely termed positivism.

294! D. K. Lewis, op. cit., explicates the notion of convention in terms of games of pure coordination, in which the agents' interests coincide perfectly.

295. In Essays in Sociological Theory (Free Press, 1949) he analyses professional rules. These define conditions of entry, demarcate the boundaries of the profession, prescribe the rights and obligations of practitioners in relation to the society, etc. But they also establish relations between the professional practitioner and his client, e.g. opening channels of information.

295! Cohen, P. S., Modern Social Theory, London, Heinemann, 1968, p. 65.

296. Doreian, P., Mathematics and the Study of Social Relations, London, Weidenfield and Nicholson, 1970, p. 39.

298. *ibid.*, p. 52.

299. *ibid.*, p. 90.

300. *ibid.*, p. 99.

301. For the relation of action theory to functionalism, cf. Cohen, *op. cit.*, pp. 93-94.

302. *ibid.*, p. 69.

303. *The Social System*, The Free Press, 1951.

304. Cohen, *op. cit.*, p. 126.

305. Cohen (*op. cit.*, p. 26) calls this "one of the greatest contributions to the development of social theory".

306. *ibid.*, p. 151.

307. *ibid.*, p. 153.

308. *ibid.*, p. 154.

309. Purely in terms of social institutions, Cohen (*ibid.*, pp. 151-152) gives three ways components can be related relevant to their integration. Firstly, there is the degree to which one social process contributes to the operation of others. For example, education differentials buttress those of wealth, power and prestige. Secondly, there is the way "in which, and degree to which, different features of social life can coexist without obstructing one another's operations". For example, certain features of Japanese family life apparently coexist with historically superimposed industrial conditions. Finally, there is a "psychological correspondence between different ideas, norms and symbols of a culture, so that they constitute a consistent pattern".

Cohen adds (*ibid.*, p. 152) three ways in which sets of norms are integrated and modified in the process. Two correspond, respectively, to the first and the last ways listed in which components are related relevant to their integration: if different sets of norms affect the same persons interacting with one another and these norms govern activities which assist one another, then there will be pressure to make the norms mutually reinforcing; and if different sets of norms have meaningful connections for those who share them and they are internalized by the same people who commonly interact, then individuals will tend to produce some correspondence between them. The third way Cohen lists in which norms are integrated and thereby modified is, if different sets of norms separately elicit conflicting interests and also affect the same person, then there is pressure to resolve the conflicts by adapting the norms.

310. Parsons and his followers maintain that there are "functional prerequisites" - conditions necessary for the operation of a social system - one of which is that a social system must socialize the young so they develop either specific motivations to conform to specific norms or a general need to conform to norms.

311. ibid., pp. 91-92.

312. Homans, G. C., "Bringing Men Back In", American Sociological Review, 1964, pp. 809-818; reprinted in Ryan, A. (ed.), The Philosophy of Social Explanation, London, O.U.P., pp. 50-64.

313. An example given (ibid., p. 62) of such a proposition is: "Men are more likely to perform an activity, the more valuable they perceive that activity to be".

314. Chomsky points this out in Reflections on Language, p. 218.

315. Cartesian Linguistics, pp. 3-5.

316. ibid., p. 103.

317. ibid., pp. 3-13.

318. ibid., pp. 59-72.

319. Reflections on Language, pp. 217-220.

320. Language and Mind, pp. 7-8.

321. Cartesian Linguistics, pp. 31-51. Cf. p. 103:

> The Cartesian origins of the concern for a "grammaire générale" (expressing what is a common human possession) and a "grammaire raisonnée" (which will explain facts instead of merely listing them) are too obvious to require discussion.

322. Review of Brekle's edition of Grammaire générale et raisonnée, Language, 1969, pp. 343-364.

323. p. 33; cf. Language and Mind, p. 18.

324. Language and Mind, pp. 15-16.

325. Cartesian Linguistics, p. 2.

326. "The History of Linguistics and Professor Chomsky", Language, 1970, pp. 576-585.

327. Review of Language and Mind, Language, 1973, 453-464; reprinted in Harman, op. cit., pp. 201-218. Cf. p. 205:

> ... Locke is clearly Cartesian in all relevant respects ... unlike Descartes, he went on to develop a theory of mind that was independent of physical theory.

328. Cartesian Linguistics, pp. 7-9.

329. "On the Non-Existence of Cartesian Linguistics", in Butler, R. J. (ed.), Cartesian Studies, Oxford, Blackwells, 1972, p. 144.

330. op. cit., pp. 67-69. On p. 27 he quotes from Passmore, Ralph Cudworth, C.U.P., New York, 1951, p. 8: "it is still not misleading to call Cudworth a Cartesian, so great was their agreement in so many vital issues".

331. op. cit., pp. 60-62.

332. For biographical material, an analysis of De Veritate and a view on its influence, see the Introduction (pp. 9-66) to M. Carré's translation, Bristol, 1937. We follow the third edition, 1646,

including _De Causis Errorum_ (separately paginated), lacking a place of publication. Carré's translation is also of the third edition, London, 1645 (_De Causis Errorum_ is a later work and considerably clearer than _De Veritate_; unfortunately, there is much in the latter not covered in the former). For the point in the text, cf. _De Veritate_, p. 61.

333. See the Fourth Meditation, where human error is explained by his theory of judgement, hence not only exonerating God, but also putting the will at the centre of the account of human activity.

334. _op. cit._, p. 72.

335. _ibid._, pp. 3-4, 16, 34, 38.

336. _ibid._, p. 39.

337. _ibid._, pp. 113-114.

338. _ibid._, pp. 111-113.

339. _ibid._, pp. 114-116.

340. _ibid._, pp. 37, 61.

341. _ibid._, p. 72.

342. _ibid._, pp. 37, 60.

343. _ibid._, p. 62.

344. _ibid._, pp. 113-114.

345. _ibid._, pp. 47, 97.

346. _Œuvres de Descartes_, Adam, C. and Tannery, P. (eds.), Paris, 1897-1910 (henceforth "AT"), T.II, pp. 56, 570-571, 596-599.

347. "Ad Librum D. Edoardi Herberti Angli, Epistola", _Petri Gassendi (Opera)_, T.III: _Opuscula_, 1658, pp. 411-419.

348. _De Causis Errorum_, p. 5; _De Veritate_, p. 38.

349. _Aspects_, pp. 49-50. _Reflections on Language_, p. 219, where he states that he agrees with Leibniz on innate and unconscious principles and ideas. _Cartesian Linguistics_, note 111 (to p. 62),

which indicates the standard of some of Chomsky's interpretation:

> Leibniz's view (_Discourse on Metaphysics_, 26) that "the mind at every moment expresses all its future thoughts and already thinks confusedly of all that of which it will ever think distinctly" might be regarded as suggesting the fundamental insight regarding language (and thought)

on which generative grammar is based.

350. In _Language and Mind_, p. 120, he suggests that Wilkin's _Essay Towards a Real Character and a Philosophical Language_ (1668) is an attempt "to develop a universal phonetic alphabet and a universal catalogue of concepts in terms of which, respectively, the signals and semantic interpretation for any language can be represented". In fact, this says nothing about innate components. It involves such for Leibniz, but the reasons he gives are conceptual, not biological.

351. Cf. Couturat, L., _La Logique de Leibniz_, Paris, Alcan, 1901, pp. 33-50.

352. Herbert's version was held to generate questions.

353. Cf. Zirngibl, R., "Die Idee einer formalen Grammatik in der _Dissertatio de arte combinatoria_ von G. W. Leibniz (1666)", _Studia Leibnitiana_, 1973, pp. 102-114.

354. Brekle, H. E., "Die Idee einer generativen Grammatik in Leibnizens Fragmenten zur Logik", _Studia Leibnitiana_, 1971, pp. 141-149. Brekle reads a great deal into the text. When Leibniz speaks of the derivation of one expression from another by substitution of identicals (Couturat, _Opuscules_ ..., 326 ff.), Brekle takes the derivation or transformation to be a transformation in Chomsky's sense (p. 144). For a criticism of Brekle's use of texts, cf. Dascal, Marcelo, "About the Idea of a Generative Grammar in

Leibniz", Studia Leibnitiana, 1971, pp. 272-290. Dascal, however, admits that Leibniz does distinguish generative and transformational components and, in general, is keenly aware of syntactic considerations in a formal way reminiscent of contemporary generative grammar. What he questions is how the texts are to be interpreted. One of the more significant passages quoted by Brekle (pp. 146-147) is from Gerh. Phil., VII, 724-727, in which Leibniz unambiguously discusses embedding: given three sentences ab, cd and ef, we can form a sentence of the form acebdf.

355. Loemker, L., "Leibniz and the Herborn Encyclopedists", Journal of the History of Ideas, 1961, p. 323.

356. Die Philosophischen Schriften von G. W. Leibniz, Gerhardt, C. I. (ed.), Berlin, 1875-1890, B.VII, p. 67 (written in May 1686).

357. The book entitled "Grammatica" (pp. 265-372) contains grammars for Hebrew, Syriac, Greek and Latin; it is introduced by a section entitled "Grammatica Generalis" (pp. 265-279) and concluded with a tract called "Delineatio Grammaticae Germanicae" (pp. 371-372), a rarity for its day. The ars magna is presented in the section entitled "Cyclognomica, et imprimus ars Lulliana" (pp. 2328-2337); related subjects are presented in sections "Ars Copiae Rerum" (pp. 2338-2340) and "Analytica" (pp. 2341-2344); more distantly related are "Ars Copiae Verborum" (p. 2338) and "Polygraphia" (pp. 2340-2341). The art of memory was highly developed in Alsted's day, and is presented in the section "Mnemonica" (pp. 1959-1978). Alsted presents the Kabbala as a rule-governed, symbolic ars (pp. 2270-2273).

358. Language and Mind, p. 5.

359. Cf. Robinet, A., "Leibniz, l'automate et la pensée", Studia Leibnitiana, 1972, pp. 285-290.

360. Leibniz in effect reverses the relation of hardware to software, having extended things founded on monads.

361. Cf. Cooper, D. E., "Innateness: Old and New", The Philosophical Review, 1972, p. 473. On p. 466 he states that his "aim in this paper is to show that Chomsky and Katz considerably exaggerate the similarities between their hypothesis and the old one ...". On p. 483 he states that "the basic difference behind different innateness hypotheses" largely explains the lack of affinity between old and new innatism.

362. ibid., pp. 474-475. I change Cooper's point some.

363. ibid., pp. 476-482. Again I change the points somewhat.

364. Reflections on Language, p. 218.

365. ibid., p. 224.

366. ibid., p. 226.

367. ibid., p. 166. He speaks of Leibniz holding that knowledge is "accessible to consciousness". In the same passage he refers to Hume on instincts as another precedent.

Replying to the charge that his position is incompatible with Descartes' because the latter does not allow for the possibility of unconscious knowledge he states (p. 217)

> ... the notion "unconscious cognization" is crucial to my system ..., but I am not at all sure that Descartes would disallow this notion, though I recall taking no stand on the matter. True, Descartes seems to insist that knowledge is accessible to consciousness, but on this entirely different point I have explained repeatedly that I think we must depart from the classical traditions.

Chomsky also states on pp. 162-163 that the system of rules and principles is unconscious and inaccessible to introspection. He adds here that it must be finite, since the subject is a physical organism. This illustrates perfectly the difference between Chomsky and the rationalists. Descartes' key move in the Third Meditation depends on the fact that God (he is here talking about divine science) is infinite, while we are finite; yet he holds that we share the same vis cogitandi. Malebranche's most frequent argument against the view that ideas are in us is that the "system of rules and principles" "present to" us is infinite. Leibniz must allow monads to be infinitely complex to accommodate this. The rationalists were not concerned with the knowledge of a "physical organism".

368. Thus Descartes does not conclude that the mind is distinct from the body until he has clear and distinct notions of body. Similarly, Malebranche's proof for the distinctness of the soul is that thought cannot be explained by mechanical activity.

CHAPTER VI

1. For biographical material see the Dictionnaire de Theologie Catholique.
2. Mora, J.F., "Suarez and Modern Philosophy", Journ. Hist. Ideas, XIV, 1953, pp. 536-537.
3. IV, CC; OEuvres de Descartes, Adam, C. and Tannery, P. (ed.), Paris 1897-1910 (henceforth "AT") VIII[1], P.323.
4. to Père (Charlet?), October 1644; AT IV, p. 141.
5. 1/8/1638; AT II, p. 287.
6. to ***; 12/9/1638; AT II, p. 378.
7. They were neutral with regard to Locke and on good terms with Leibniz. cf. Allard, E., Die Angriffe gegen Descartes und Malebranche im Journal de Trévoux 1701-1715, Abhandlung zur Philosophie und ihre Geschichte, 43, Halle, 1947 and Desautels, A.R., S.J., Les Mèmoires de Trevoux et le Mouvement des Idées aux XVIII^{e} siècle, Roma, 1956.
8. Expressing his apprehension of the attacks of Bourdin, Descartes states his desire to re-read some of the Jesuit philosophy for the first time in twenty years; he remembers only Toletus, Rubius and the Coimbrians and inquires about more recent works (30/9/1640; AT III, p. 185). Six weeks later, he feels that a refutation of Scholastic philosophy is not difficult because of the diversity of opinions, for one need only overthrow the foundations on which there is agreement. He adds that he has bought the philosophy of Eustachio à Sto. Paulo and will look at that of the Jesuit de Raconis, intending to take the best as representative. (11/11/1640; AT III, pp. 751-252). Three weeks later he expresses regret that the commentaries of the Coimbrians are too long, for he would like to carry on the affair with the whole society. (3/12/1640; AT III, p. 251). But after another three weeks he drops his design to refute the Jesuit philosophy because he feels it is completely destroyed simply by the establishment of his own (22/12/1641; AT III, p. 470).
9. AT VII, p. 235.

10./

10. OEuvres Complètes, Rodis-Lewis, G. (ed.), Paris, 1958-1970 (henceforth "O.C."), pp. 203-252. Fonseca and the Coïmbrians are also cited. The editors state (ibid., notes 105 ff.) that he borrows many of his other references from Suarez.

11. O.C. XVI, pp. 165-171. The passage is from De Incarnatione Verbi and contains many patristic references. Cf. O.C. VIII, p. 837, where the same work is cited against Arnauld.

12. On this subject, see Mora, op. cit.; Wundt, M., Die deutsche Schulmetaphysik der 17 Jahrhunderts, Tübingen, 1939; Meshard, P., "Comment Leibniz se trouva place dans le sillage de Suarez", Archives de Philosophie; vol. XVIII, cahier 1949; Eschweiler, Karl, "Die Philosophie des spanischen Spätscholastik auf der deutschen Universitäten des siebzehnten Jahrhunderts" Spanische Forschung der Görres-Gesellschaft, Reihe I, 1929

13. Eschweiler, op.cit. p. 294.

14. Mesnard, op.cit., pp. 540-541. Cf. Wundt, op.cit. pp. 120-121, who claims that Scheibler does not slavishly follow Suarez. Scheibler's other works were the Synopsis Methodica Philosophicae (1611) and the Epitome Primae Philosophiae, a series of disputations (1614-1615) gathered under this title in 1616.

15. Wundt, op.cit., p. 87.

16. Siegmund, Georg, "Die Lehre von Individuationsprinzip bei Suarez", Philosophisches Jahrbuch, 1928, p. 191.

17. op.cit. pp. 255-261.

18. von Nostiz-Rieneck, Robert, S.J., "Leibniz und die Scholastik", Philosophisches Jahrbuch, 7. Band I, 1894, pp. 54-67

19. op. cit., pp. 309-311.

20. ibid., pp. 253-261.

21. "Vita Leibnitii a se ipso breviter delineata", in Foucher de Careil, A. (ed.) Nouvelles Lettres et Opuscul Inédits de Leibniz, Paris, Auguste Durand, 1857, pp 382-383.

22. Leibniz's mature view on Scholasticism is indicated by the description he/

he gives of his spokesman in "L'Entretien de Philarète et d'Ariste" (1712-1714), directed against Malebranche's <u>Entretiens sur la Métaphysique</u>:

> ... Docteur de Sorbonne fort estimé, qui avait enseigné autres fois la Philosophie et la Theologie à la mode de l'Ecole, et ne méprisoit pas dependant les découvertes des modernes: mais il y alloit avec beaucoup de circomspection et d'exactitude... (Robinet, A, <u>Malebranche et Leibniz</u>: <u>Relations Personnelles</u>, Paris, 1955, p. 439.

23. Cf. Loemker, Leroy, "Leibniz and the Herborn Encyclopedists", <u>Journal of the History of Ideas</u>, 1961, p. 332.

24. Johannis-Henrici Alstedii <u>Encyclopaedia</u> septem tomis distincta, Herbornae Nossoviorum, Hulsius, 1630, p. 332. Alsted is wont to use "mens" instead of "anima", which might be thought an anticipation of Cartesianism.

25. <u>op.cit.</u>, p. 327.

26. <u>op.cit.</u>, p. 541.

27. Lady Masham wrote to Jean LeClerc after Locke's death that "Mr. Tyrrell ... tells me that <u>Mr. Locke was then</u> (i.e. at Oxford) <u>looked upon as one of the most learned and ingenious young men in the college he was of</u>..." Still, she continues, "I have often heard him say, in reference to his first years spent in the University, that he had so small satisfaction there from his studies (as finding very little light brought thereby to his understanding) that he became discontented with his manner of life ..." (Cranston, M., <u>John Locke: A Biography</u>, London, 1957 p. 38.)

28. Bentham, Edward, <u>Reflexions upon Logick</u>, The Second Edition, Oxford, 1755, p.7.

29. <u>ibid</u>., p. 46.

30. Kenney, <u>op.cit</u>. pp. 31-32. The <u>Manuductio</u> went through numerous editions on the continent and was published a number of times at Oxford until 1826.

31. <u>The Works of John Locke</u>, 11th ed., London 1812, Vol. IX, p. 86.

32. Kenney, W., "John Locke and the Oxford training in logic and metaphysics", St. Louis University Ph.D. thesis, St. Louis, 1959, pp. 31-32.

33. One is a notebook of a person who received his B.A. the year before Locke (<u>ibid</u>.,/

(ibid., p. 23). The other is a catalogue of "Books for a young Divine to make use of" compiled by Timothy Halton, a don at Queen's College, in 1652 (the year Locke entered Christ Church) (ibid., pp. 31-32).

34. Thesaurus Philosophorum seu Distinctiones et Axiomata Philosophica. A. Georgio Reeb S.J. Proposita a J.M. Cornelli ejusdem societatis. Recognita et XXVII Scholiis aucta. Editio Nova. Parisiis. Lethielleux, 1875. This was first published in Ingolstadt in 1629 and published in Oxford in 1657. It draws almost exclusively from Jesuit sources, the Disputationes Metaphysicae in particular. The scholia, appended by the editors to the articles, are almost all from Aquinas.

35. This source is Halton (cf. Kenney, op.cit., pp. 34-37). Halton adds that students must be warned of certain parts of the works of Catholic authors, especially where they defend transubstantiation, which leads them "to maintain many universally inconsistent assertions in Logique especially about the nature of proprium & accidens & qualities ..."

Boyle (writing in 1666, fourteen years after Halton compiled his list) asssociated the view (which he claimed was a logician's view) that qualities are real entities distinct from matter with the theological tenets of Catholicism ("On the Origins of Forms and Qualities", Works, London, 1744, vol. II, p. 455). Boyle exhibits his familiarity with Suarez by supporting this claim with three references to the Disputationes Metaphysicae (ibid., p. 465). In later editions he adds a footnote to another passage (ibid.) concerning the futility of defining "quality" as "that, by which a thing is said to be qualis..." Since he has written this passage, Boyle states, he has found "that some of the eminentest of the modern Schoolmen" are dissatisfied with this definition. Of the three quotations given here, one is from "the famous Jesuit Suarez". He mentions Ruvius, "a learned Protestant annotator upon Suarez". According to Eschweiler (op.cit., pp. 295-296), Ruvius' commentary on the Disputationes Metaphysicae is one of the two important texts (Burgersdijk's metaphysics being the other) in the dominance of the Jesuit philosophy in the Netherlands.

36./

36. Cf. Yates, Frances, The Rosicrucian Enlightnment, London/Boston, 1972.

37. Yolton, John, Locke and the Compass of Human Understanding. Cambridge, C.U.P., 1970, pp. 201 ff.

38. "Vita Leibnitii a se ipso breviter delineata", in Fonder de Car il (d), loc cit.

39. Ulich, R. "Commenius, John Amos", in the Encyclopedia of Philosophy.

40. Yolton, loc. cit.

41. In the Fourth Objections, Arnauld points out the similarity between Augustine and Descartes on the method of doubt (AT VII, pp. 197-198) and the innateness of geometry (ibid., p. 205; cf. also Arnauld to Descartes, July 1648, AT V, p. 186). For a recent emphasis of the similarity between Descartes and Augustine, see Abercrombie, Nigel, St. Augustine and French Classical Thought, Oxford, 1938.

42. There was a sort of natural inclination to Augustine in Cartesianism. The Cartesian Louis de la Forge, who consecrated more than fifty pages (in Traité de L'esprit de l'homme, 1666) to showing the accord between Descartes and Augustine on the soul, claimed that it would take entire books to cite the passages from Augustine confirming Descartes on various points (cf. Gouhier, H., La vocation de Malebranche, Paris, 1926, pp. 75-76 and 78). Poisson insists on almost every page of his Remarques sur la methode de Mr. Descartes (1671) on the accord between Descartes and Augustine. It is worth mentioning that both de la Forge and Poisson see Augustine as supporting the beast-machine hypothesis.

43. Cf. to [illegible], November 1640; AT III, p. 247. This is for a reference to De Civitate Dei, Lib. XI, cap. 26, which relates to the cogito. Descartes states that he read it that day in the municipal library. Cf. also to a Jesuit (P. Mesland?), 2/5/1644, where he writes;

> je ne suis nullement de l'humeur de ceux qui desirent que leurs opinions paroissent nouvelles; au contraire j'accomode les miennes à celles des autres, autant que la verité me le permet.

A coincidence with the principal Church Father would have been very convenient for Descartes at this stage in his career.

44./

44. Gilson, E. Etudes sur la role de la pensée mediėvale dans la formation du systėme cartésien, 2nd ed., Paris, 1951, p. 28.

45. ibid., p. 29.

46. ibid., p. 32.

47. Martin used the pseudonymn "Ambrosius Victor". The Philosophia Christiana, which had a Cartesian bias, began appearing in fragments in 1653. Gouhier (ibid., p. 77) quotes Batterel (Mémoires, III, p. 518) as follows:

> C'est par (Martin) que le cartesianisme, joint aux principes de la philosophie de Saint Augustin, a commencé à être enseigné publiquement à l'Oratoire.

48. O.C. VI, p. 199. Cf. all of this passage (pp. 198-201).

49. The Vision in God. Malebranche's Scholastic Sources, Louvain and Paris, 1967 p. 358.

50. Gouhier, op.cit., p. 76

51. His "Cursory Reflections upon a book called An Essay Concerning Understanding" (published as an appendix to his Christian Blessedness, London 1690) was the first published criticism of Locke's Essay. The general criticism is that Locke ignores the nature of ideas, which vitiates what he says of their origin; Norris himself supported, not innatism, but Malebranche's vision in God. Locke's friend Jean Le Clerc replied in a review in his Bibliothèque Universelle and Historique (de l'Année 1691), pp. 65-73 (in the republication of 1702). He accuses Norris of misinterpreting Locke and claims that an account of the nature of ideas is not necessary.

> Il ne s'agit pas en cette occasion, de savoir comment il arrive que nos sens étans frappés, notre esprit apperçoit les objets, qui sont hors de nous; il suffit que ce soit là un fait incontestable, au de là duquel on n'a que faire d'aller lors qu'on n'entreprend pas de traiter de la nature des Esprits, ni de la maniere dont se font nos perceptions (p. 7).

Norris replied with a short tract appended to "Cursory Reflections" in the second edition of Christian Blessedness (1692). Norris' magnum opus was: An Essay Towards the Theory of the Ideal or Intelligible World. Designated for Two parts. The First considering it absolutely in itself, and the Second in Relation to Human Understanding. London, 1701 and 1704. We/

We hereafter refer to this work simply as Theory.

52. Theory, vol. I, "Preface", p. XV and p. 182.

53. ibid., vol. I, p. 162, where he says of Scheibler that "he deserves to be read (as well as some others) with more consideration than we commonly use" at the time of our "younger studies".

54. ibid., p. 228.

55. ibid., vol. II, pp. 519-520.

56. ibid., pp. 520-522.

57. ibid., p.525.

58. ibid., p. 527.

59. ibid., pp.520-521

60. We use the edition of 1684, "augmentée, Lyon, Mission".

61. Cavendish, attempting to reconcile Descartes and Hobbes in 1646, discovered that Hobbes "n'aimoit pas du tout le dernier ouvrage de Des Cartes" (viz. the Principia) and was "lié à Gassendi par une grande amitié". (Laird, J., "L'influence de Descartes sur la philosophie anglaise du XVII^e^ siècle", Receuil publié par La Revue Philosophique", Paris, 1937, p. 231.

62. To Mersenne, 21/1/1641; AT III, p. 283.

63. Cf. Huber, Kurt, Leibniz, München, 1951 (ed. by I. Köck in collaboration with C. Huber), p. 61.

64. Witness his desire to include Hobbes' De Corpore and De Cive in his proposed renovation of Alsted's Enclyclopaedia.

65. J.W.M. Watkins (Hobbes' System of Ideas, London, 3rd ed., 1973, pp. 87-94) on the strength of their shared notion of conatus, contends "that Leibniz's fundamental idea, the idea that the world is a concourse of monads, was derived from Hobbes". Noting that conatus plays a part for both in the relation between what is taken as real (what is spiritual for Leibniz and and what is material for Hobbes) and what is taken as derivitive, Watkins suggests the following model: Hobbes differentiates over bodies to derive minds, while Leibniz integrates over minds to get bodies.

66. Aaron, R.I., John Locke, 3rd ed., London, O.U.P., 1921, pp. 31-35, Fox-Bourne,/

Bourne, op. cit., vol. II, pp. 92-93.

67. Nouveaux Essais; Introduction to LI, c. I.

68. Fox-Bourne, op.cit., vol. I, p. 162. F. Duchesneau (L'Empirisme de Locke (Archives Internationales d'Histoire des Idées, 57 , La Haye, 1973 p. 21) maintains that the Essay exhibits a greater debt to Gassendi tha to Hobbes, although Hobbes' more profound critique of perception and knowledge (he continues) is a necessary background for Locke's empiricism.

69. Nicholson, M., "The Early Stages of Cartesianism in England", Studies in Philology, 1929, XXVI, pp. 356-374; Lamprecht, S.P., "The Role of Descartes in Seventeenth Century England", Studies in the History of Ideas, New York, 1935, iii, pp. 181 ff; Laird, J., op.cit., Anderson, P.R., "Descartes' Influence in Seventeenth Century England", Travaux du IX^e Congrès Internationales de Philosophie, 1-3, Etudes Cartesiennes, Paris 1937, pp. 113 ff, and Armitage, A., "Réné Descartes and Early Royal Society, Notes and Records of the Royal Society," Oct. 1950, VIII, I, pp. 7-19.

70. Ware, C. "The Influence of Descartes on Lock. A Bibliographical Study", Revue Internationale de Philosophie, IV, 1950, pp. 221-222.

71. Cranston, op.cit., p. 100. This is placed in the winter of 1666/7.

72. Aaron, R.I. and Gibbs, J., An Early Draft of Locke's Essay, Oxford, 1936 pp. 105-111.

73. Ware, op.cit., p. 228. One reader, however, thought that Locke took "all that was good in (the Essay) from Des Cartes (and) divers... moderne French Authors..." (ibid., p. 210).

74. Duchesneau, op.cit., pp. 1-2.

75. Iatrochemistry was in the tradition of Paracelsus and van Helmont. It was particularly stimulated by the latter's exploration of digestion and and his followers attempted a universal physiological theory in terms of acidity and alkalinity.

76. Willis and Goddard, K. Dewhurst states (John Locke (1632-1704): Physician and Philosopher, A Medical Biography, London, The Wellcome Historical Medical/

Medical Library, 1963, p. 5), like Boyle, "adhered to mechanistic theory, whilst constantly using chemical remedy in practice."

77. ibid., pp. 6-7.

78. Duchesneau, op.cit., p. 89.

79. ibid., pp. 40 and 61-62.

80. ibid., pp. 11-12 and 65.

81. ibid., P. 10.

82. ibid., p. 26.

83. cf. ibid., pp. 80-82.

84. ibid., pp. 66-67.

85. Romanell, "Locke and Sydenham", Bull. Hist. Med., vol. XXXII, p. 314. Duchesneau (op. cit., p. 137) does not fully agree.

86. Duchesneau, op.cit., p. 91.

87. Suarez, De Anima, IV, I, 7; cf. C.C., De Anima, Cap. VIII, Q. III, Art. II. We shall use "C.C." as an abbreviation for "Collegium Conimbricense". We shall refer to their commentary In tres Libros de Anima Aristotelis Stagiritae, Coloniae, Zetareri, 1600 as "De Anima" and to their commentary In universam dialecticam Aristotelis Stagiritae, Coloniae, Gualtherium, 1607 as "In Univ. Dial." The edition of Suarez's works we shall refer to for all but the Disputationes Metaphysicae is: Opera Omnia, Moguntiae, 1621. This contains: De Anima (T. III),

Commentaria ac Disputationes in Primam Partem Divi Thomae,

Pars I: De Deo Uno et Trino (T.I.)

Part II, Tractatus Primus: De Angelis (T.I.).

88. Suarez, Disputaciones Metafisicas, Romeo, S., Sanchez, S., and Zanon, A. (ed.) (Spanish, with Latin Text beneath), Madrid, 1960 (henceforth "Disp. Meta."), XLIX, 8, 3. "Habitus" as used here does not refer to the habitus which is a species (in the logical sense) of quality.

89. Suarez, De Anima; III, I, 4.

90. ibid., III, I, 7.

91./

91. *ibid.*, III, I, 4.

92. *ibid.*, III, II, 9.

93. *ibid.*, 12.

94. cf. Cubells S.C., *Die Anthropologie des Suarez*, Freiburg/München, Albert, 1962, pp. 112-113.

95. Suarez, *loc cit.*, 2.

96. *ibid.*, 5-6. These articles are directed against Cajetan, who maintains that this union is closer than that between matter and form.

97. *ibid.*, 1.

98. *ibid.*, 7. The accidental being of the species is said to be bestowed to the power by a real adherence to it. This is again against Cajetan, who maintained that the intensional species is the *Actus secundus* or exercise as opposed to disposition of the cognizing power. Suarez states that there is no word for the denomination a species gives to the subject. The act of cognition, he adds, is separable from the intensional species (i.e. a cognising power could be informed by an intensional species and not exercise the disposition is thereby has), therefore the act of cognition is not the form of the intensional species.

99. Suarez, *De Angelis*, all I, I^{I}, cop. III.

100. *Les Principes de la Philosophie, contre les nouveaux Philosophes Descartes, Rohault, Regius, Gassendi, le P. Maignan*, *etc.* A Paris, Josse, 1675.

101. cf. *ibid.*, p. 43: "... je pretends seulement dans cet Ouvrage, prouver les principes de la philosophie que L'on enseigne depuis six cent ans dans toutes les Academies de l'Europe, et montrer la faussetó des opinions de Descartes et de Gassendi: j'examine toutes les qualities spirituelles et sensibles, dont on peut disputer en Philosophie, et pretends faire voir que ce sont des Estres entierement distingués, et differentes de la substance dans laquelle ils se trouvent; parce qu'on ne peut pas raisonnablement les expliquer d'une autre manière."

102. *ibid.*, pp. 40-41.

103. *ibid.*, p. 611.

104./

104. _ibid._, p. 606. In being specified by a _species impressa_, the cognising power is said to be in _actu primo_ and to be effective of an _actus secundus_ or an exercise (in this case, the act of cognition) of the disposition by virtue of which it is in _actu primo_. Cf. Suarez, _De Anima_, VI, VII, 7 and VI, VIII, 4.

105. _ibid._, IV, II, 1.

106. _ibid._, III, II, 20.

107. _ibid._, 23.

108. Suarez, _Disputationes Metaphysicae_, XXV, I, 27.

109. Suarez, _De Anima_, III, II, 25-26.

110. Suarez, _Disputationes Metaphysicae_, Intro. to Disp. VIII: "...supponimus ex communi omnium consensu, veritatem realem consistere in adaequatione quadam seu conformitate inter rem et intellectum, sive sit conformitas intellectus ad rem, sive rei ad intellectum ... (V)eritas rationis seu significationis consistit in adaequatione inter propositionem significantem et rem significatam."

111. cf. _ibid._, II, I, 2 for the identification of the _conceptus (formalis)_ and the _verbum mentis_. Cf. C.C., _op.cit._, Cap.VII, Q.III, Art.II for the identification of the _verbum mentis_ with both the _species expressa_ and the _conceptus_ and _ibid._, Art.IV for its identification with the _expressa imago rei_.

112. _A Treatise of Human Nature_, L.A. Selby-Bigge (ed.), Oxford, 1968, p.2f: "Mr. Locke...perverted(the word "idea"), in making it stand for all our perceptions."

113. _ibid._ "By the term of impression I would not be understood to express the manner, in which our lively perceptions are produced in the soul, but merely the perceptions themselves; for which there is no particular name either in the _English_ or any other language, that I know of." Cf. _ibid._, p. 1: "All the perceptions of the human mind resolve themselves into two distinct kinds, which I shall call IMPRESSIONS and IDEAS. The difference betwixt these consists in the degrees of force and liveliness with/

with which they strike upon the mind... By ideas I mean the faint images of (impressions) in thinking and reasoning..."

114. Exercitationum physicarum Decima Quarta, De Anima Sensitiva ...., Praeside M.J. Francis: Respondente J. Sculteto, Francofurti 1624, art. xxiii.

115. De Anima, Cap. II, Q. III, Art. I.

116. They support the need for a common sense, even though there are no sensibles proper to it, with three arguments (ibid). Firstly, nature is wont to reduce a multitude to a unity. Secondly, not only men, but also beasts cognise that they hear, see, etc., so this reflective faculty must be referred to some higher, but still material faculty. Finally, since each external sense is concerned only with its own proper sensibles, there must be some sensitive appraiser and arbiter which discerns and distinguishes the objects of the diverse senses and (appealing to diseases and other physical disruptions which interfere with the function of external senses) which governs the communication of animal spirits.

117. ibid.

118. ibid. Art. V.

119. ibid., art. II and Encyclopaedia, Physicae Pars VI, Cap. II (pp. 738-739).

120. ibid. Some held that the Facultas cogitativa (aestimativa in brutes) is distinct from the phantasy. The Coimbrians (C.C. De Anima, op.cit., Art III, following Cajetan and Fonseca) rejects this third faculty. A division is made by the Coimbrians (ibid., Art. II), Alsted (op.cit.), and Scultetus (op.cit., artt. XXXIV and XXXV) between the common sense and the phantasy in its judicative function on the one hand and the facultus conservans or memory on the other.

121. op.cit., Art. II. Cf. Harris, John, F.R.S., Lexicon Techicum: or, an Universal English Dictionary of Arts and Sciences..., London, 1704, article "memory". "Memory is the Faculty of the Soul, which repeats things perceived by former sensations ... and is as it were the Store-house of our Ideas."

122. Alsted, ibid., Scultetus, ibid.

123./

123. De Anima, III, IX, 8. His reasons are as follows (ibid., 10): Species of external sense, but not of internal sense depend on their objects both as processes of sensation ("in fieri") and as products ("in facto esse"). Species are proportionate to their powers and internal and external senses are two different powers. Internal species differ from external sensations because the actus vitalis is different from the species as a disposition ("constituens potentiam in actu primo"): there is not a quality - e.g., specie - produced in the cognition of external species distinct from the cognition of these senses itself. (ibid., 10) If there is a species as a disposition produced in a power, it is produced per actionem cognoscendi; so species of internal sense are from external sense by a mediating act of cognition ("medio actu cognitionis") and are not got from the external object by the mediation of species. (ibid.) External sensation ("sensatio") produces a species in internal sense as a perfect similitude of itself and this is conserved in the internal sense. (ibid).

124. ibid.

125. ibid.

126. Language and Logic in the Post-Mediaeval Period, Dordrecht, 1974, p. 28.

127. Harris, op.cit., article "Conception":

> CONCEPTION, is the simple Apprehension, Perception or Idea that we have of anything, without proceeding to affirm or deny anything about it.

128. op.cit., T.VI, p. 218.

129. Historia Philosophica Doctrinae de Ideis ..., Augustae Vindelicorum, apud D.R. Mertz et I.I. Mayer, 1723, pp. 236-237.

130. De Anima, III, VI, i. An orthodox summary of the position on the three operations of the intellect in seventeenth-century Scholasticism is provided by the Coimbrians (In Univ. Dial. Cap.I, Q.V., Art. II). Simple apprehension is simply conceiving the thing without negating or attributing anything to it; proposition ("propositio", the second operation)/

operation) is attributing something to something or removing something from it; and in _discursus_ or _ratiocinatio_ we not only cognise and attribute something to the thing, but we also infer ("colligimus") one proposition from one or more others by means of logical particles ("interposita particula illativa" , e.g. "ergo" and "igitur"). Not the distinction between what is immediately and mediately apprehended (i.e. nöetic and dianöetic), but the distinction between what is simple and complex is of importance for the orthodox Scholastic association of the second two operations of the intellect in opposition to the first. Burgersdijk (Burgerdicius, Fr., _Institutionum Logicarum_ ..., Cantabrigiae, Ex Academiae celeberrimae typographo, 1637 p. 7) states that a _thema_, which is verbal, is what can be proposed to the intellect to be cognised. To cognise is to form a concept ("conceptus") or notion ("notio") of a thing. Simple _themata_ (e.g. "homo", "currit") are apprehended without a complexity ("complexione") of notions; complex _themata_ are apprehended by two or more notions conjoined ("copulatis") by an affirmation or negation.

131. Suarez, _loc. cit._, 4.

132. _ibid._, 4 and 5

133. _ibid._, III, VII, 6.

134. _ibid._, 7. He claims this to be the common view.

135. _De Anima_, Cap. III, Q. II, Art. II.

136. _op.cit._, Physicae Pars VI, Cap. II, Reg. VIII.

137. _De Anima_, III, VII, 10.; cf. _ibid._, 6.

138. LIV, II, 18.

139. III, XII, 8.

140. LX, I, 16; cf. _ibid._, Index Locupletissimus in Metaphysicam Aristotelis, L. VI, Cap. II, Q.3.

141. _De Anima_, III, VII, 6.

142. _ibid._

143. _op.cit._ T.VI, pp. 229-232.

144. Bernier analyses phrases of the form "l'homme juste" as "l'homme qui est juste/

juste". cf. <u>ibid</u>., pp. 231-232.

145. <u>ibid</u>., p. 241.

146. <u>ibid</u>., pp.233-241.

Chapter VII

1. Ross, W.D. Aristotle, 4th ed., London, Methuen, 1945, pp. 148-153
I draw heavily from Ross for this paragraph.

2. The term νοῦς πάντικος occurs nowhere in the writings of Aristotle, but the equivalent is given in τὸ ποιητικόν and τὸ ποιεῖν πάντα and by implication in the contrast with νοῦς παθητικός . Cf. De Anima 426 a 4, 430 a 12, and 430 a 24 and Hammond, .W.A., Aristotle's Psychology, New York, Macmillan, 1907, p. lxxii.

3. Ross' explanation of this analogy is as follows:

> ...active reason is a third thing, besides passive reason and the object, which has to be taken account of if we would understand the fact of knowledge, as light is the third thing, besides the eye and the object, which we must take account of if we would understand the fact of sight.

4. Ross finds that the passage after Aristotle's statement that active reason is separable clearly implies

> that active reason, though it is in the soul, goes beyond the individual: we may fairly suppose Aristotle to mean that it is identical in all individuals.

The passage after this is held to imply that the true nature of active reason

> is obscured during its association with the body, but exists in its purity when this association is over.

And, from the next passage, considered in conjunction with an earlier one, Ross concludes that for Aristotle memory and passive intellect in general, unlike active intellect, do not survive death.

5. Very briefly: the Nicomachean Ethics makes reference to an aspect of man

by which he has a plan or rule; in the Politics man is seen to differ from other animals in that the State, which exists for moral and intellectual activity, is seen to exist by his nature; and a foothold in the Organon is gained by man qua social by the fact that rhetoric has aspects of dialectic (especially the topics) and politics.

6. I take most of the following history from Hammond, op. cit., pp. lxxi-lxxiv.

7. This is reported by Thermistius, Paraphrasis liborum de anima, on De Anima, III, 5.

8. Comm. in Arist. lib. de anima, fol. 21 b.

9. Ross feels that such an interpretation is ruled out by the contrast Aristotle makes between the state of active reason during the life of the individual and its state after the death of the individual. God is discussed as transcendent in Metaphysics Λ ; it seems (Ross concludes) that Aristotle thought of active reason in man as one of the highest members of a hierarchy, with God at the summit, but not as high as certain intelligences.

10. Avicenna interpreted the doctrine of active reason in terms of an emanation theory of the world, akin to Neo-Platonism. Intelligible forms are endowed with immaterial pre-existence in pure spirits, the highest created intelligences. From these, they are passed rung-by-rung to the last - active reason ("intelligentia agens"). Forms from the latter, which alone is immortal, combine qua intelligible forms with the sensible forms in individual passive intellects; they are also passed, as substantial forms, into material things. This dual filiation guarantees the success of cognition. Averroës (the fore-most Arab exegete and very influential in the west) regarded both active (intellectus agens) and passive (intellectus materialis)reason as spiritual entities distinct from the body and each other. Active reason makes phantasmata intelligible; these are then received by passive reason. Both reasons are the same throughout.

11. Cf. Knowles, David, The Evolution of Medieval Thought, London, Longmans, 1962.

12. Aquinas' view of Augustinianism as elements of Neo-Platonism compatible with Christianity is generally accepted as a broad outline. Still, Knowles (op.cit., pp. 24-26) feels that Plotinus (the most important Neo-Platonist, especially for Augustine) drew some from Aristotle. And Knowles claims (ibid., p. 214) that

> Augustine's divine illumination of the intellect..., though embedded in an essentially Platonic noetic, recalls immediately the divine agent intellect of Aphrodisias...

13. Knowles, ibid., p. 218.

14. De Rebus Naturalibus, de mente agente, capp. 12, 13. Cf. Ross, op.cit., p. 152,

15.a. The Scholar in question is a certain Renan. He is mentioned in Hammond, op. cit., p. lxxv, referring to Brentano, Die Psychologie des Aristoteles, Mainz, 1867, p. 34.

15b *ibid.*, 14-18; cf. C.C, *loc.cit.*, Art's I and II, and Alsted, *op. cit.*, Lib. XIII Physicae, Pars VI, Cap VII, Reg. II (p 764).

16 Suarez, *De Anima*, IV, VIII, I; cf. C.C., *op. cit.*, Q.II, Art. II.

17 Suarez, *ibid.*, C.C., *ibid.*, Q.III, Art.I.

18 Suarez, *ibid.*, 2.

19 *ibid.*, 1.

20 C:C. *Loc. cit.* Q I, Art.II.

21 For Aquinas position, cf. *De Verito*, I 4, ad 5; XI, 3 ad Resp. ; and XI, 1, ad "Et ideo...".

22 *De Anima*, III, I, 1.

23 *ibid.*, 5-6.

24 *ibid.*, 2.

25 *ibid.*, 7 for the remainder of this paragraph.

26 *ibid.*, 7.

27 *De Divinis Nominibus*, cap. 7.

28 *Super Genesim*, 2, ad literam.

29 *op. cit.*, Cap. V, Q.I, Art. I, reporting Durandus, I sect., dist. 3, quaest. 5.

30 *op. cit.*, T. VI, p 329.

31 *ibid.*, pp 329-330.

32 *ibid.*, p 330.

33 *ibid.*

34 ibid., pp 330 and 334.

35 ibid., pp 330 and 335.

36 ibid., p 359

37 ibid.

38 ibid., pp 359-360.

39 ibid., p 361.

40 ibid., pp 361-362.

41 ibid., pp 290-291.

42 ibid., p 331.

43 ~~G.C.~~ loc. cit.

44 loc. cit., p 334.

45 ibid., p 30.

46 ibid., p 43.

47 ibid., pp 32-53.

48 ibid., p 47.

49 Leviathan, pp 15-16.

50 The English Works, London, 1839-1845, vol. I, p 5.

51 ibid., Vol. I, p 5 and vol. LV, p 10 and Opera Philosophica (Molesworth, ed.), London, 1839, T II, p 5.

52. One text (In Univ. Dial., In Praefationem Porphyrii, Q.V., Art. II.) concerned with the intelligible species as produced by the concourse of the phantasm with the intellectus agens is in their commentaries on Aristotle's dialectic. The other two texts are in their commentary on De Anima, one concerned with the intelligible species (De Anima, Cap. II, Q. III, Art.'s I-III.) the other with the concept (conceptus mentis). (ibid., Cap. VIII, Q.V, Art's I-II.) In the commentary on dialectic Scotus (maintaining singularity) is opposed to Aquinas (maintaining universality). In the two texts in the De Anima, nominalists (e.g., Durandus, Burleigh and Richard) are added to Scotus and various Thomists (e.g., Cajetan, Capreolus, Farrariensis and Aureolus) are added to Aquinas. In the commentary on dialectic they state that they find these positions equally probable, which they state again in the text on intelligible species in the De Anima, adding, however, that they prefer the Thomist position as more Peripatetic. In fact, in the text on concepts they include Aristotle, Alexander, Themistius and Averroës under those holding the Thomist position.

53. The intellectus possibilis distinguishes common natures by forming concepts proper to them in exercising singular dispositions or species. This is done (the position continues) either by cognising one singular, attending ("intendendo") only to the common nature and ignoring the individuating differences, or by cognising a number of singulars together, separating and forming a concept of that in which they agree. Thus concepts representing universals on this position are due to the exercise, not the inception, of cognitive dispositions. The intellectus agens here performs only the ad hoc function of bridging the material and spiritual faculties. Appeal is made to the eminence of the intellect to support the position that there

are concepts of individuals in the intellect (ibid. Art. II.). There must be concepts of singulars, this position runs (ibid.), because the intellect posits an agreement or disagreement between a singular and a universal by virtue of their own principles ("rationes") and infers ("colligit") a universal proposition from a number of singular propositions.

54. ibid., Cap. VIII, Q.V. Art. I.

55. ibid., Cap. V, Q. III, Art. I.

56. ibid.

57. ibid., Cap. V. Q. III, Art. II.

58. ibid., Cap. V. Q. III, Art. II.

59. De Anima, IV, III, 2-8.

60. ibid., IV, X, 1-4.

61. De Angelis, VI, VIII, 3-4.

62. De Anima, IV, III, 2-8.

63. ibid., IV, VIII, 3. He mentions only Theophrastus and Themistius and suggests that the Arabs Avempace and Averroës held something similar.

64. ibid., 4. He agrees with Aquinas that Avicenna takes the ideas of Plato as intelligible species.

65. S. T., I, I, Cap. XI.

66. De Anima, loc. cit., 7.

67. ibid., IV, VIII, 9.

68. ibid., 10; cf. C.C. De Anima, Cap V, Q. III, Art. I, "De alio..."

69. S. T. I, 84, 3; cf. C.C. De Anima, Cap V, Q. I. Art. II.

70. De Anima, IV, VIII, 9.

71. ibid., 10.

72. ibid.

73.a. De Angelis, II, II, 14.

73.b. ibid., 9.

74.a. ibid., 14-15.

74.b. S. T., I, 77, 2, ad Resp.

75.a. ibid., 16.

75.b. Aquinas, De Anima, I, ad 18m, Etienne Gilson (Etudes sur le rôle de la pensée mediévale dans la formation du système cartésien, 2nd ed., Paris, Libraire Philosophique J. Vrin, 1951, pp. 23-25) holds that this is coherent, but that, as Aquinas realised, lacks physical or physiological support. His successors tended to look for simple and gross solutions. If they did not reject the intensional species (Ockham), they transformed it into a material vehicle for a spiritual quality. Eustochio à St° Paulo (1609) accepted the intensional species, but could not understand how something inhering in a corporeal subject could represent in a spiritual way.

76.a. De Anima, IV. VIII. 12.

76.b. De Anima, I, V, 4-5.

77.a. ibid., 15.

77.b. ibid., IV, II, 9-10. Cf. ibid., IV, VIII, 9, where he maintains the intellectus agens does not produce a light ("lumen") in the phantasm, but only in the intellectus possibilitis in producing the intelligible species. Cf. Cronin. T.J. Objective Being in Descartes and in Suarez, Typis Pontificae Universitatis Gregorianae, Romae, 1966, pp. 78-84, where he presents an analysis of Suarez' De Anima, concluding that the whole theory emphasizes the gap between the phantasm and the intellectus agens.

78 *De Angelis*, II, VI, 9-10 and 12-13.

79 *De Anima*, IV, II, 10-13.

80 *ibid.*, IV, VIII, 13.

81 Cubells, S. C., *Die Anthropologie des Suarez*, Freiburg & München, 1962, pp 190-193.

82 *De Anima*, IV, III, 12.

83 *ibid.*, 15.

84 *ibid.*, 12.

85 *ibid.*, 13.

86 *ibid.*, 14.

87 VI, VI, 6.

88 *ibid.*, 2.

89 *ibid.*, 1.

90 *ibid.*, 4.

91 Cf. *ibid.*, art. 7. The universal nature (Suarez states) cannot be made by the *intellectus agens* because a *species impressa* is not a formal image and in no way formally represents, but is a seed or instrument of the object for effecting the formal intensional representation made by the *conceptus mentis*.

92 *ibid.*, 3.

93 *ibid.*, 5.

94 *ibid.*, 11.

95 *ibid.*

96 *ibid.*, 4.

97 C.C. *De Anima*, Cap. V, Q. V, Art. II.

98 Cf. *De Anima*, III, II, 17, where he states that there is always a real relation between what represents and what is represented. Thus impossibles are cognised by species representing possible parts, *entia rationis* are framed finguntur") and cognised by species of

the things in which they are founded (given discourse and reflection of the intellect) and privations are known by the species of their positives, in the absence of which, the acts are locking.

99 _ibid._, IV, III, 4.

100 _ibid._, IV, Iv, 1-2.

101 _ibid._, 1.

102 _ibid._, 3.

103 _ibid._, 2.

104 _ibid._, 3; cf. ibid., 2.

105 _ibid._, 4.

Chapter VIII

1. I, IX, 32.
2. _ibid._, The Scholastic transcendentals - _ens_, _unum_, _verum_ and _bonum_ - are so called because they are not restricted to any of the ten categories.
3. _ibid._, 33.
4. _ibid._, 34.
5. For bio-bibliographical material, see Landes, M. W., _The Philosophical Writings of Richard Burthogge_, Chicago and London, 1921, Introduction.
6. _ibid._, pp. 62-64, from _An Essay upon Reason_. Burthogge, a physician trained at Leyden, addressed his last published work (1699) to Locke, Landes (pp. xiii-xxiv) describes his method as uncritical Platonism except in his _Organum Vetus & Novum_ and _An Essay upon Reason_ (1694), which Landes describes as an empiricism between Locke's and Kant's.
7. _ibid._, p. 4, from _Organum Vetus & Novum_. To illustrate this distinction, he states that we can recollect words either by sense, in retrieving the figures or images, or by reason or understanding, in recalling the sense or meaning of words.
8. _ibid._, pp. 11-12 and 14-16, from _Organum Vetus & Novum_, and pp. 66 and 68-70, from _An Essay upon Reason_.
9. _ibid._, p. 4, from _Organum Vetus & Novum_.
10. White had the pseudonyms Albius, Anglus, Blacke and Blacklow.
11. Digby was in Mersenne's entourage in Paris when the _Discourse_ was published in 1637, when he sent a copy to Hobbes. Cf. Nicholson, M. H., "The Early Stages of Cartesianism in England", Studies in Philology, vol. 26, 1929. Digby and White often "wrangled" with Hobbes: cf. the articles on them in _The Dictionary of National Biography_. Digby's work of note is _Of Bodies and of Man's Soul_ (i.e. _Two Treatises_, Paris, 1644), an attempt to prove the immortality of the soul from its

operations. The first treatise is a broad attempt to explain the corporeal world.

12. When Leibniz later related the decision he made in his fifteenth year to follow the moderns, he referred to Digby, as he did throughout his life, most frequently in the late 1660's in conjunction with White: cf. Couturat, L., La logique de Leibniz, Paris, 1901, pp. 539-541. (Couturat confuses White with a certain Thomas Barton.) Leibniz listed Digby's work as a supplement to Hobbes' De Corpore in the proposal to revise Alsted's Encyclopaedia. It is not unlikely that Leibniz got the notion (expressed in his correspondence with Thomasius) of considering Aristotalian substantial forms as the mechanical activities of bodies from Digby's Two Treatises.

13. For Descartes' relations with Digby, cf. AT III, p. 590; IV, pp. 209 and 572; XI, pp. 35-37. Descartes, commenting on White's De Mundo (AT III, p. 582), praised his metaphysics, although he disagreed fundamentally on certain physical matters.

14. Cf. J.S., Non Ultra: or, a letter to a learned Cartesian; settling the Rule of Truth and First Principles, Upon their Deepest Grounds, London, 1698. He is here particularly opposed to the Cartesian criterion of clear and distinct perception. For information on Sergeant, see: Bradish, Norman, C., Introduction (pp. 571-593) to his reprint of Non Ultra (pp. 593-628), The Monist, Oct. 1929. Any references are to the original edition of Non Ultra.

15. Cf. ibid., "Dedication" and p. 1 and Solid Philosophy Asserted Against the Fancies of the Ideists, London, Clevil, 1697, "Epistle Dedicatory".

16. Sold Philosophy is largely a chapter-by-chapter criticism of Locke's Essay.

17. Cf. ibid., "Preliminary Fourth":

Now these Ideas of yours are the mind itself; and not the Immediate

Work of the First Cause, on which (as had been shown) our Rule is built: which gives ours and Infinite Advantage, above yours, as to the stability of its Ground: Ours having, for its Solid Foundation, the Ideas in the Divine Understanding; whence are unquestionably Deriv'd, and by which are Establish'd the Essences of things, on which ours is Immediately Grounded ...

18. Cf. Non Ultra, "Dedication" and p. 1 and Solid Philosophy, "Epistle Dedicatory".

19. Digby, Of Man's Soul, pp. 7 and 16.

20. Ibid., p. 55; cf. his definition of "universal notion", ibid., pp. 11-12 and White, T., Institutionum Peripateticum ad Mentem Summi Viri, Clarrissimique Philosophi Kenelmi Equitis Digbaei, Parisiis, Federicum Leonard, 1655, p. 81.

21. Sergeant claims (Solid Philosophy, p. 27) that this is a Peripatetic concept perhaps paradoxical to a non-Peripatetic.

22. Op. cit., p. 3. It is agreed, he claims, that there must be some likeness or image of the thing in the mind of the apprehender; but a perfect likeness is the thing itself. Cf. White, op. cit., p. 1.

23. ibid., pp 17-18. To deem a thing such, he states, requires more than just compositions of apprehensions. When we deem and proceed upon reason, the nature conceived becomes an active principle in us. Thus settled judgment becomes a part of the soul.

24. ibid., pp 1-3. When a thing is rightly apprehended, the apprehender can thereby make it as nature would.

25 ibid., pp 17-18. When our apprehensions are rightly ordered in a discourse (syllogism or science), he writes, then they are ordered as they are in the thing.

26. Ibid., p. 30.

27. Ibid., p. 50.

28. Digby states that "nihil est in intellectu quod fuit prius in sensu";

this is to show that our soul is of an extremely different nature from our senses and imagination and to show how things are "so much changed by coming into the understanding and into the soul, that, although, on the one side, they be the very saim things, on the other side, there remains no likeness at all between them in themselves and as they are in the understanding" (op. cit., p. 54).

29 Cf. the fifth chapter of On Mans Soul.

30 op. cit., p 107, from An Essay upon Reason:

> ...Mind, even the human, is not so properly said to be an idea, as to be the principle ... of Ideas ... Thus it is in our Refracted, Inadequate, Real-Notional way of conceiving; and for an Adequate and just one, as it is above our faculties, so I do not find that Spinosa; or Mal. Branche after all their ambitious Researches in the higher way have edified the World thereby to any great Degree. This way of seeing all things in God, and in their own proper Realities, is a way much out of the way. Otherwise, when they keep the lower way of sense, many of their thoughts are surprizing and excellent.

31 op. cit., T. VI, pp 286-287

32 ibid., p 284.

33\. Ibid., p. 284-285.

34\. Ibid., p. 338. E.g. the essence of man is "ce qui fait que l'homme est homme".

35 ibid., p 286.

36 De Anima, I, IX, 31

37 ibid., 35.

38 De Deo Uno et Trino, Tract. I, L. III, Cap. X, 2.

39 ibid., 7.

40 ibid., L. III, Cap. X, 2.

41 ibid., L. III, Cap. III, 13-16.

42 ibid., L. III, Cap. V, 8.

43. Ibid., 14.

44. Ibid., Tract. II, Lit. I, Cap. IX, 2-3; ibid., Lib. IX, Cap. II, 4 and 12-16.

45 ibid., Tract. I, Lib. III. Cap V, 8.

46 ibid., Tract. II, Lib. IX, Cap. VI, 1-4, 8, and 21-22.

47 From Beast-Machine to Man-Machine, Rosenfield, L., New York, 1940, pp 19-

48 ibid., p 19.

49 De Anima, I, V, 3. He speaks of an opinion held "nostra aetate", speaking in the plural of those who hold it.

50 op. cit., p 80.

51 ibid., p 75. She maintains (ibid., p 76) that the predominant thought of the eighteenth century was that the animal soul is non-spiritual, but thinking. On pp 75-79 she presents J.P. Crousaz's De Mente Humana (1726) and D.R. Boulier's Essai philosophique sur l'Âme des Bêtes (1728), from which the article "Âme des Bêtes" in the Encyclopédie was adopted, as compromises vindicating the popular belief that animals are not automata without introducing theological problems about immortality. Both maintain that the animal soul is spiritual, but has only those ideas necessary for the conservation of the body.

52 op. cit., Vol. II. pp 57-65. The second chapter of the second volume of the Theory is a classical presentation in English of animal mechanism.

53. Sergeant distinguishes phantasms and notions by the fact that animals do not have notions (Solid Philosophy, "Preface", 22). He emphasises the spirituality of notions (cf. ibid., p. 39) and states (ibid., pp. 24-27) that he uses "notion" instead of "idea" because "it is universal and always signifies our simple Apprehensions, or the first operation of our understanding ..."; "idea", on the other hand, signifies a bare

resemblance or similitude and does not involve knowledge. Seargeant, by the way, was not opposed to the new science; cf. Non Ultra, "Dedication":

> The Noble Sir Kenelm Digby, the Honourable Mr. Boyle, and some few others have rescu'd the university of their Peers from the imputation (of the neglect of learning)".

54 ibid., "Preliminary First", 22.

55 ibid., 4.

56 ibid., "Preface", 12.

57 op. cit., 2.

58 op. cit., pp 21-22.

59 op. cit., T. VI, pp 312-318. This is a section entitled "Si les Brutes sont des pures machines"; it was written before the publication of Bayle's Dictionaire and its article on Pereira.

60 op. cit., Vol. II, pp 63 and 30-81.

61 loc. cit., 2.

62 Cf. Entretiens sur la Métaphysique, XIV, XVII, Théodore's speech on pp 246-247 of O.C. XII.

63 loc. cit., 2.

64 If the souls of beasts were immaterial, Norris writes, op. cit., vol.II pp 60-61 and 67 ff.), they would be immortal. But how could souls made for bodies, being innocent, be in a state of happiness or misery after death? (ibid., pp 69-73) Transmigration only introduces additional problems (ibid., pp 71-73). If we accept that beasts have mortal souls, we cannot prove our own immortality (ibid., p 68) or must accept the bizarre view that they are annihilated by God immediately on quitting the body (ibid., pp 73-74).

65 loc. cit.,

66 op. cit., Vol. II, pp 81-93.

67. op. cit., pp. 5-19.

68. op. cit., pp. 60-61 and "Preliminary Fourth".

69. Norris (op. cit., vol. II, pp. 520-525) thinks it is a simpler hypothesis to have the divine ideas as the immediate objects of thought rather than multiplying ideas, inventing intensional species, and introducing the intellectus agens (called a "Romantik Revery") to spiritualize what is supplied by the body. The Scholastics themselves, he continues, maintain that science is of necessaries and immutables; but only the divine ideas are such and nothing could be more representative. We see things in their eternal reason, Norris claims, because that intellectual light which is in us is nothing but a certain participated similitude of the uncreated light, wherein the eternal Reasons are contained.

70. Disputationes Metaphysicae, Intro. to Disp. XXV.

71. ibid., XXV, I, 1.

72. ibid., Intro. to Disp. XXV.

73. De Deo Uno et Trino, Tract. I, Lib. III, Cap. V, 8.

74. S.T., I, 15, 1.

75. op. cit., Vol. I, pp 136-137 and 182-183.

76. ibid., pp 16-17.

77. ibid., p 16.

78. Cf. op. cit., p 31: "...if any man ... should imagine (the belief that knowledge has no limit) is but a Poetick Idea of Science, that never was nor will be in act..."; cf. ibid., pp 35, 52 and 89.

79. Ducange, C., Glossarium mediae et infimae latinitatis, editio nova, Niort, 1883.

80. op. cit., pp 74 ff.

81. Agnellus, S., Disceptationes de ideis in tres libros distributae ..., Venetiis, 1615.

82 Cf. *op. cit.*, p 85, where the following is quoted:

> Idea est forma substantifica, divinae menti objecta, quam agens per imitationem exprimit, et intuetur, quatenus rerum omnium exemplar et originem.

83 *op. cit.*, Intro. to Disp XXV and *ibid.*, XXV, I, 1; the references are respectively to lib. LXXXIII *Quaestionum*, in 46 and Metaph., c. 7.

84 London, I. Legatt. Reprinted by English Linguistics, 1500-1800, selected and edited by R.C. Alston, no.11, Leeds, 1967.

85 Gilson, E., *René Descartes: Discours de la méthode; texte et commentaire*, Paris 1925.

86 Blake, Ralph M., "Note on the Use of the Term *Idée* Prior to Descartes", *The Philosophical Review*, Sept. 1939, p 532. The work is: *L'Incredulité et mescréance du sortilège pleinement convaincue*... Par P. de L'Ancre... Paris, Chez N.Bvon, 1622.

87 *ibid.*, p 534.

88 *ibid.*, p 532.

89 *op. cit.*, XXV,I, 25-26. The argument for the position that ideas are formally or physically, not objectively, in the intellect is in *ibid.*, 5-25. Articles 17-25 argue for the position with regard to created intellects, viz. that exemplars of artifacts are formally not objectively, in them; articles 11-16 argue for it in the divine case, viz. that the divine ideas are the divine uncreated essence. An idea, Suarez writes (*ibid.*, 10), is not the thing known (taking "thing" broadly) as an *objectum quod*, so it is not an *ens rationis* or a universal or abstract from; nor can it be something *in re*, for it is only accidental to the causality of the artisan that what he intends to produce is a copy of something.

90 Cf. *ibid.*, VIII, VII, 25: "...quia conceptus objectivus nihil praeter rem addit nisi denominationem termini conceptus formalis, ideo non recte explicatur conformitas inter rem et conceptum objectivum, sed

inter rem potius et conceptum formalem seu ideam."

91 Cf. ibid., XXV, I. 17.

92 ibid.

93 op. cit., Metaphysicae Pars I, Cap. XXXII, Reg. III (p 609):

> Est autem conceptus formalis ipsa intentio mentis sive actus intelligendi, quo quis rem intelligit, ut est cognitio hominis: seu, est idea et species, quae in mente effigiat ipsam rem cognitam. Conceptus objectivus est res, quae immediate concipitur, et est objectum conceptus formalis. Dicitur conceptus primus et notio prima: ut est homo cognitus.

94 Wundt (op. cit., pp 24-25) relates the position of Gutke (a Lutheran), presented in his Disputationes practicae (1615). Gutke maintained that an idea, a signum formale or a signum conceptus, presents what is in the concept. It is held that we cannot know things in individuals but must abstract "è statu singularis in statum ideae". With contents from the senses, we are held to accomplish per actum reflexum what angels do intuitively. A.C. Schubartus ("Disputatio de Abstractione", sub praesidio D. N. Paulislevagti, Jenae, C. Freyschmid, 1652) presents the same position, referring to J. Martini and Fonseca's metaphysics (p 11). One sort of abstraction (p 9) is "deductio rei sive objecti ex statu singularitatis sive objectivo fundamentali, in statum universalem sive ideae..." The status singularitatis is also called "objectivus fundamentalis" in so far as things are founded, are rooted ("radicantur") and exist in individuals.

> Sic considerare aliquid in statu universali, est in idea seu definitive considerare et vice versa: cum idea hoc sensu nihil aliud sit, quam ratio ab intellectu concepta in intellectu aliquid multis commune sistens.

He suggests calling this sort of abstraction "liberato rei a differentiis singularizantibus seu conditionibus ... individuantibus" because

> res sint liberandae a conditionibus individuantibus, ac è statu individuali in statum idealem mente deducendae...

For the other sort of abstraction (p 10) - "praecisio rei ab alia" -

it does not suffice to know ("nosse"), e.g. the nature of man "in idea seu universaliter", but one must consider the essence of man, prescinding from all attributed to it beyond <u>esse</u> to arrive at a distinct conception of the thing.

95 Cf. <u>op. cit.</u>, Logicae Sect. II, Cap. VI, Reg. I and II (p 432), where he states that "indefinite axioms", i.e. those without a sign of quantity or a quantifier, play an important part in definitions, where they are called "propositiones de idea". We do not say, he adds, "Omnis homo est animal rationale" in giving a definition, but "Homo est animal rationale".

96 Cf. <u>ibid.</u>, Sect. III, Cap. V (p 448), where he calls an argument form "a causâ exemplari seu paradigmaticâ"

> cum ex qualitate ideae colligitur qualite ideati; ut, Idea est bona. E. ideatum bonum est. Vel ex ideae existentiâ actuali concluditur ideati existentia potentialis: ut, Idea est. Ergò ideatum esse potest.

Cf. <u>ibid.</u>, Technologia, Reg. XVII (p 63), where he states that every discipline is considered either <u>in ideâ</u> or <u>in subjecto</u>. A discipline is considered either formaliter, as it simply is by its nature and genus, or as it is subjectively or compositively ("composite"). What is by nature or in genus or idea is called "abstract", otherwise it is concrete.

97 AT VII, pp 38-37.

98 <u>ibid.</u>, pp ;79-180.

99 <u>op. cit.</u>, T. III (<u>Opuscula Philosophica</u>) Opusculum IV, <u>Disquisitio Metaphysica adversus Cartesium</u> (pp 269-410), p 322.

100 AT VII, p 72.

101 <u>op. cit.</u>, p 380.

102 <u>ibid.</u>, pp 324-326.

103 AT VII, p 273.

104 *op. cit.*, pp 7 and 606-607.

105 *ibid.*, pp 606-607.

106 *op. cit.*, T. I, p 8.

107 AT VII, p 181.

108 AT VII, pp 160-161.

109 At VII, p 181.

110 Arnauld, A. and Nicole, P., *La Logique ou l'Art de Penser*, Edition critique par Clair, P. and Girbal, F., Paris, 1965, p 37.

111 Paris, Thierry, 1690. pp 169-170 and 188.

112 *Réponse aux Reflexions Critiques de M. du Hamel*, Paris 1692, pp 14-16.

113 *ibid.*, pp 17-18.

114 *ibid.*, pp 8-11.

115 Editio quarta, Paris, 1694, pp 99-100.

116 *op. cit.*, pp 323-333.

117 *ibid.*, p 386.

118 *** to Mersenne for Descartes, 19/3/1641, AT III, p 376.

119 *ibid.*

120 *ibid.*, pp 376-377.

121 *Ethices*, Pars II, Prop. XLIX, Dem., Cor., and Schol.; *Opera*, Gebhardt (ed.), Heidelberg, Winter, Vol. II, pp 130-135.

122 *ibid.*, Schol to Prop. XLIII; p 124.

123 *op. cit.*, p 387.

124 To Mersenne fo ***, July 1641; At III, p 392.

125 *ibid.*, p 393.

126 *ibid.*, p 395.

127 *ibid.*

CHAPTER XI

1. Cf. Hintikka, J., " 'Cogito, Ergo Sum': Inference or Performance,", Philosophical Review, 1962, pp 3-32; reprinted in Hintikka, Knowledge and the Known, Dordrecht, Reidel, 1974, pp 98-125. Hintikka maintains that the *cogito* is a special sort of performative: it is existentially self-verifying. Thus Descartes establishes his existence in the Second Meditation without drawing an inference, but by pointing out a peculiarity of a speech act. (In these contexts, even while doubting whether he has a body, Descartes often uses locutions such as "profero" and "tanquam dicerem".) Hobbes' "Ambulo, ergo sum" is not parallel. Hobbes suggested that one could as well establish *sum res ambulans* as Descartes' *sum res cogitans* Hintikka indeed feels that it is illicit to infer from the self-verifying performative to "sum res cogitans". Still, what Descartes usually meant by "res" was not particularly capable of standing on its own and "substantia" referred to waht are more like concepts than separately operating things. *Res cogitans* sometimes resembles a bundle or sequence of speech acts and, as being conscious is like acknowledging one's own speech act, Descartes' position that we are conscious of all that is in the mind seems to exclude anything tying the bundle together. Descartes, however, associates *res cogitans* with the traditional mind or rational soul, so he must think there is more to it; in which case, Hintikka is quite correct.

Hintikka maintains (pp 119-120) that the performative interpretation ap lies to any "verb of intellection" - e.g. "cogito", but also "volo", "dubito", etc. - but that Descartes illicitly extends "cogitans" to cover *sentiens*, etc., and "sentio ergo sum", etc. do not support the performative interpretation. He cites (p 119) Koyré to the effect that "cogitare" was traditionally applied very widely, to cover will, feeling, judgment, percpetion, etc.

But "cogitare" and its derivatives were used very sparingly in the philosophical literature before Descartes. The most significant example is the Scholastic "facultas cogitatrix", said to be an _imago voluntatis_ and the highest material faculty. It was held to judge about what is good and bad in what is sensed. The close correspondence both to what happens in the body and the powers of the intellect are salient aspects of Descartes' _cogitatio_ as well. Furthermore, Descartes is very clear and definite that the essence of his nature (qua _res cogitans_) is reason and that _cogitatio_ is a rational activity. Sensing, imagining, and the "passions" in general, on the other hand, while still in the mind, are due to its union with the body. This suggests that "sentio", etc. are also verbs of intellection as used by Descartes, but require particular sorts of occasions.

Bernard Williams (_Descartes_, 1978, p 95-101) is concerned with "the relation between the 'I think' in the context of thought, and what is objectively involved in the state of affairs which constitute its being thought". (p 100) He considers the objection that the _cogito_ with more justice would be called the _cogitatus_, and that one should speak of thought happenings. But "_some_ concrete realization is needed, and even if it could fall short of requiring a subject who has the thoughts, it has to exist in the form of something outside pure thought itself". (p 100).

> If we have no help from anything except the pure point of view of consciousness, the only coherent way of conceiving a thought happening it to conceive of thinking it. So, sticking solely to the point of view of consciousness, we are forced back to a position in which there is, in effect, only one such point: events either happen for it, or they do not happen, and there is no way of conceiving of such events happening, but happening (so to speak)

elsewhere. But this is what the objector, as much as Descartes, must need. (pp 100-101).

A. Kenny (Descartes, New York, Random House, 1968, p 62), after mentioning Hintikka (op.cit.), adds: Is not Descartes rash in christening ... the substance in which the doubts of the Meditations inhere 'ego'?" But neither Kenny nor Hintikka mention the part played by consciousness, especially as this in effect attributes the agent with the responsibility. Of course, something more is needed to pick out the thing we hold responsible.

2. We have already mentioned that both Malebranche and the Colmbrians explain error in terms of original sin; that Locke holds that persons are individuated by "the same consciousness" and that "person" is a forensic term; and that Leibniz holds that the level of moral responsibility is reached when and only when the level of consciousness is reached. We can add that Suarez states that the root cause ("ratio radicalis") of error is original sin.

The connection between consciousness and responsibility is established in Rodis-Lewis, G., Le problème de l'inconscient et le cartésianisme, Paris, Presses Universitaires de France, 1950. Cf. also Gibson, A.B., The Philosophy of Descartes, London, Methuen, 1932, pp 64ff. M.D. Wilson states (Descartes, London, Routledge and K. Paul, 1978, p 139) that Descartes exonerates God from our errors "in a way that follows ... the traditional Christian solution to the problem of evil".

3. This is somewhat of an anachronism; he actually speaks of assymptotes.

4. Descartes invoked divine simplicity in presenting his conservation laws in Le monde and the Principia. Malebranche questioned these in Book VI of the Recherche; he still saw it as a question about divine

simplicity, but states that the question can be decided only by analysing particular cases. Later, Malebranche and Leibniz, in an exchange in the 1690s in the Journal des Sçavans, disputed whether the fundamental quantity conserved is mv (regarded as a scalar quantity) or $(\frac{1}{2})mv^2$. It was agreed that the manifestation of divine simplicity was in question, but the arguments all concerned the analysis of dynamic situations.

5. This is seen to be so in the case of Descartes mostly in the Regulae, it is explicit throughout Malebranche, especially in the sixth book of the Recherche, and it was often insisted on by Leibniz.

5'. Cf. Trois Lettres, O.C. TT. VI-IX, p. 217, where he states that Descartes held that ideas are modalities (modifications) of the soul, but only because "il ne prends pas comme moi le mot d'idée, pour signifier uniquement la réalité objective ..." Descartes took "idée" "pour la perception, non entant simplement que modalité de l'âme, mais entant que renfermant la réalité objective ..."

6. Cf. Robinet, A., Malebranche et Leibniz: Relations Personnelles, Paris, Libraire Philosophique J. Vrin, 1955. Leibniz followed the Malebranche-Arnauld polemic during the years 1684-1686 (cf. the editor's introduction to Leibniz's interest in this polemic, pp. 133-136, and Leibniz's notes and comments on it, pp. 194-224). This occasioned two thorough readings of Recherche, probably in 1685, following a superficial reading in 1675 (pp. 136-137). At this time, Leibniz lacked a precise understanding of the points involved (p. 137), but by this reading he became familiar with Malebranche's thought (ibid.), the originality of which he had first recognised in reading the Conversations Chrétiennes in 1679 (p. 77).

Leibniz's criticisms of Malebranche were above all directed against his occasionalism in favour of his own system of pre-established harmony, resting on his fundamental notion of monad. But the initial formulation of his own system in the work given the title Discourse on Metaphysics by Gerhardt was composed with an eye on Malebranche's Traité de la Nature et de la Grace. Four series of articles of the Discourse followed step by step four series of the Traite (p. 139; cf. p. 140 for a table correlating these and p. 142, where it is stated that "la métaphysique de Malebranche, telle qu'elle se présente dans les articles du traité est la canvas général, la cause informatrice qui permet à Leibniz d'édifier la première expression de son système ..."). With the publication of the "Système Nouveau de la Nature" (Journal des Sçavans, 1695), Leibniz's philosophy became public; it was expressly regarded as in competition with and an improvement on Malebranche's system (pp. 309-311). The period from 1700 to 1711 was characterised by systematic criticisms of occasionalism (p. 352). From then until his death (1716), occasionalism was regarded as the chief competitor with Leibniz's mature system because of certain fundamental affinities.

7. The text of L.III, P.II of the Recherche can be divided into a number of separate proofs, some against alternatives, some for his own position or parts of it. Chapters II-V are presented as one large proof, eliminating the alternatives, then arguing directly for his own position. I divide this into component arguments. I shall indicate the arguments or proofs by the chapters in which they occur, referred to with Roman numerals, and, if necessary, their sequence within the chapters, referred to with Arabic numerals. The proof in Eclaircissement X will be indicated by "E" and the summary at the beginning of Chapter VI will be referred to as "the resumé". We thus distinguish the following

First proof	II (O.C. T.I, pp. 418-421)	
	III (pp. 422-431)	
	IV-1 (pp. 429-431)	
	IV-2 (p. 431)	
	IV-3 (p. 432)	
	IV-4 (p. 433)	
	V (pp. 433-436)	

Resumé at the beginning of Chapter VI (pp. 437-438)

Second proof	VI-1 (pp. 438-439)
Third proof	VI-2 (pp. 439-440)
Fourth proof	VI-3 (pp. 440-441)
Fifth proof	VI-4 (pp. 441-442)
Sixth proof	VI-5 (p. 442)
Seventh proof	VI-6 (pp. 442-443)
Eighth proof	E (T.III, pp. 144-151)

8. II.

9. III.

10. Cf. Méditation I, §13; O.C. T.X, p. 15. If there are corporeal images, he states, they are not intelligible. "Agiras-tu sur ce qui t'est inconnu? Mais qui t'avertira d'agir, qui reglera ton action?"

11. ibid., §14.

12. ibid., §15.

13. ibid., §16. These pretended powers, he writes, "ne sont point en ton pouvoir, si elles agissent en toi malgré toi. Ce n'est point toi qui agis par elles, ... puis qu'elles agissent sans que tu y penses".

14. ibid., §12, pp. 14-15; cf. §11, p. 14.

15. ibid., §7, p. 13.

16. III.

17. <u>Examination</u>, § 14; cf. § 9.

18. <u>ibid</u>., §§ 14, 9.

19. <u>ibid</u>., § 9.

20. <u>ibid</u>., § 10.

21. Both these premises are explicitly used in IV-1, IV-4 and E, and also in what he claims in the sixth chapter to be his strongest proof for his thesis, viz. VI-3.

22. Establishing this premise alone is held to be sufficient for establishing his position in V.

23. This proof (VI-4, "de l'idée que nous avons de l'infini"), he states, is "la plus belle, la plus relevée, la plus solide, et la première, ou celle qui suppose la moins de choses ...".

24. VI-3.

25. O.C. T.III, p. 129:

> Les Philosophes mêmes les moins éclairez, demeurent d'accord que l'homme participe à une certaine Raison qu'ils ne déterminent pas. C'est pourquoi ils le definissent <u>animal</u> RATIONIS <u>particeps</u>: car il n'y a personne qui ne scache du moins confusement, que la difference essentielle de l'homme consiste dans l'union necessaire qu'il a avec La Raison universelle ...

26. <u>ibid</u>., p. 130.

27. <u>ibid</u>., p. 129.

28. <u>ibid</u>., p. 130.

29. <u>ibid</u>., pp. 130, 133, 143.

30. <u>op. cit</u>., 51.

31. <u>ibid</u>., 31.

32. "C'est ... par une idée claire que l'esprit voit les essences des

choses, les nombres et l'étendue. C'est ... par sentiment, qu'il juge de l'existence des créatures, et qu'il connoit la sienne propre" (O.C. T.III, p. 142). Furthermore, "il y a toujours idee pure et sentiment confus dans la connoissance que nous avons de l'existence des êtres", except that of God, which is known by pure idea, and of our soul, known by sentiment intérieur (ibid., p. 143).

33. Leibniz, commenting on the Examination (Robinet, op. cit., p. 399), wrote: "Je remarque que certains gens tachent d'éluder ce qu'on leur dit par cette affection d'ignorance ...". The "certains gens" replaces the suppressed "M. Lock et autres" in the manuscript.

34. op. cit., § 51.

35. ibid., § 52.

36. ibid., § 45.

37. O.C. T.III, p. 130. In the Recherche, Malebranche simply states (IV-1 and IV-4) or is satisfied to show merely that there is nothing in us which is infinite. The issue of the fourth alternative (which he attributes to the Scholastics, that the soul, being more noble than other things, contains them eminently) vis-à-vis his own position is said to be whether ideas (which represent something outside the soul) are only modifications of the soul. This is settled by stating that the soul is not infinite or capable of infinite modifications and cannot see in itself what is not there. (In VI-3 he speaks of modifications in general, rather than infinite modifications.)

38. In E, Malebranche immediately concludes (from the above) that Reason is God Himself, for only the universal and infinite being contains universal and infinite reason in Himself; furthermore, only He, as is this Reason, is universal. In VI-3 (the proof in the Recherche most similar to E), he immediately concludes that these ideas must

be in an infinite spiritual being; and this description fits God alone. And, in VI-4 (his version of Descartes' first proof for the existence of God) he states that the mind has the idea of the infinite "before" those of finite things; so all particular ideas are only participations in the general idea of the infinite; thus, he concludes, the mind apperceives everything in the idea it has of the infinite, which idea is God Himself.

39. O.C. T.III, pp. 131-132.

40. <u>op. cit</u>., §23.

41. Cf. Eclaircissement X; O.C. T.III, p. 132:

> Certainement si les veritez et les loix eternelles dependoient de Dieu, si elles avoient été établies par une volonté libre du Créateur, en un mot si la Raison que nous consultons n'était pas necessaire et independante: il me paroît évident qu'il n'y auroit plus de science véritable, et qu'on pourroit bien se trompet si l'on assuroit que l'Arithmétique ou la Géometrie des Chinois est semblable à la nôtre ... voit-on clairement que Dieu n'a pas pu vouloir certaines choses pour un certain tems, pour on certain leu, pour certaines personnes, ou pour certains genres d'êtres; suppose, comme on le veut, qu'il ait été entierement libre et indifferent dans cette volonté? Pour moi je ne puis concevoir de necessité dans l'indifference, je ne puis accorder ensemble deux chose si opposées.

42. Resumé (Chapter VI).

43. <u>L'Ordre</u> includes what Malebranche calls the general laws according to which God rules the ordinary course of providence. In the Entretiens sur la Métaphysique (XIII, IX; O.C. T.XII-XII, pp. 319-320) these are given as: I. the general laws of the communication of motions, where occasional or natural causes are the shock

of bodies ("... c'est en obéissant à ses propres loix que Dieu fait tout ce que font les causes secondes"); II. the laws of the union of the soul and the body (by which one is integrated with one's environment and led to judge of the existence of things), "dont les modalitez sont reciproquement causes occasionelles de leurs changemens" ("C'est par ces loix que Dieu m'unit à tous ses ouvrages"); III. the laws of the union of the soul with God ("la substance intelligible de la Raison universelle"), of which our attention is the occasional cause. (By these laws, "l'esprit a le pouvoir de penser à ce qu'il veut, et de decouvrir la vérité", and so these are the laws which are involved directly in the vision in God as this involves knowing things.) Reason and experience, Malebranche continues, teach us only these three general (sorts of) laws, but the authority of Scripture (which for Malebranche fulfils the role of experience in matters of faith) shows us two others: IV. the general laws (operative in the Old Testament) giving good and evil angels power over bodies, the occasional causes of which are their practical desires; V. the laws (superceding IV since the New Testament) by which Christ received the sovereign power in heaven and earth not only over bodies (to distribute temporal goods, as do angels), but also over minds (to extend to hearts internal grace, giving the right to eternal goods).

44. Cf. Chapter VII (of L.III, P.II), where he states that it is not difficult to conceive that particular beings could be represented by the infinite being who contains them in His substance; this substance is said to be, _inter al._, very efficacious.

45. _ibid_.

46. Resumé. In Chapter VII this is seen to be a consequence of ii). Malebranche here argues that only God is known by Himself; he states

that God alone acts in the mind and can reveal to it Himself (i.e. ideas or reason, as this is the vision in, not of God).

47. Cf. Furetière, Antoine, Dictionaire Universel, The Hague and Rotterdam, Annout and Reiner Leers, 1690, whose only entry for "voir" states that "se dit figurement des choses spirituelles", giving a number of non-ocular examples, including the beatific vision of God.

48. Malebranche generally uses the double-"p" spelling; the modern spelling had not yet become standard.

49. Cf. Furetière, op. cit. The firstof two senses of "appercevoir" given is "descouvrir de loin, reconnoistre". Cf. the entry for "appercevable": "Qui peut être apperçu dans la veuë".

50. Cf. Dubois, J. et Lagave, R., Dictionnaire de la langue francaise classique, Paris, Libraire Classique Eugene Belin, 1960. They say of "appercevoir": "Pouvait se construire avec une proposition infinitive, comme aujourd'hui encore le verbe 'voir'". As an example, they quote from Cyrano, Etats et empires de la lune: "Il aperçut entrer ... deux grands vieillards".

51. Cf. Furetière, op. cit., second sense of "appercevoir": "Remarquer quelque chose par le moyen de quelque attention, reflexion ou examen; et se dit souvent avec le pronom personnel (i.e. reflex.: "s'appercevoir")".

52. This is the sort of apperception for which "c'est une même chose à l'âme d'appercevoir un objet, que de recevoir l'idée qui le represente". (Recherche I, I; O.C. T.I, p. 43; cf. ibid., p. 41).

53. Cf. ibid., p. 43. The distinction between these sorts or ways of apperceiving is emphasised in the Recherche III, P.II, where he wishes to show that, unlike what is in the soul, what is outside the soul could be apperceived only by ideas (Chapter I; p. 415) which

are the immediate objects intimately united to or present to the soul (*ibid*., pp. 413-414).

54. *Recherche* VI, P.II, II; O.C. T.II, p. 249. Cf. I, II, §I; T.I, pp. 49-50.

55. O.C. T.II, p. 250.

56. *ibid*., p. 249. Cf. I, II, §I; T.I, pp. 49-50.

57. Cf. *ibid*., p. 251.

58. *ibid*., p. 250.

59. For Malebranche, "apperceive" is, with some qualifications, opposed to "perceive" as a success verb to a verb expressing an activity. He speaks of three ways ("manières") *by which* the soul apperceives things; these are collectively called "perceptions", "manières de penser", or "modifications de l'âme" (*Recherche* I, III, I; O.C. T.I, p. 66).

60. IV-2.

61. V.

62. See note 39.

63. To Mersenne, 5/6/1630; AT I, pp. 149-150.

64. *Disp. Meta*. XXXI, XII, 40.

65. Descartes repeated his position in three other letters to Mersenne, two in the same year (15/4/1630; AT I, pp. 145-146; and 27/5/1630(?); *ibid*., pp. 151-153) and one in 1638 (27/5/1638; AT II, p. 138). But his position did not become public until, in the Fifth Replies (AT VII, p. 380), he corrected Gassendi, who attributed (Fifth Objections; *ibid*., p. 319) the opposing view to him. His statement was picked up by the theologian authors of the Sixth Objections (*ibid*., p. 417) whereupon he replied more fully (*ibid*., pp. 432 and 435-436), and part of this position was later incorporated into the *Principia* (I, XXIII; AT VIII, pp. 13-14).

66. Sixth Replies; AT VII, pp. 435-436. If, for example (the passage continues), the foundation of what is good came before God, He would be determined to make what is best. The truth is, rather, that because He determined Himself to those things which are to be made, they are good.

67. _Principia_ I, X; AT VIII, p. 14; to Mersenne, 27/5/1630(?); AT I, pp. 151-153.

68. To Mersenne, _ibid_.

69. _ibid_.

70. I, XXVI; AT VIII, pp. 14-15. Cf. also _ibid_. art. XXIV and XXV; _ibid_., p. 14.

71. AT X, p. 373.

72. AT VII, p. 436.

73. Cf. to Mersenne, _ibid_.; AT I, p. 152: "ces veritez eternelles, lesquelles je ne conçoy point émaner de Dieu, comme les rayons du Soleil ...".

74. The issue, however, is complicated, since Descartes seems to suggest that God has the option of combining the same natures or objective realities to create different eternal truths. There are two passages in which he states that God could have allowed contradictories to go together, or (what is not the same, but he gives no examples of the first) contradictories of what is in fact necessarily true to be true (to Mesland, 2/5/1644; AT IV, pp. 118-119; and to Arnauld, 29/7/1648; AT V, p. 224). In both passages we are held to conceive certain things or propositions as possible (hence, by implication, others as necessary) only because God made our minds as He did. This has suggested to L. G. Miller ("Descartes, Mathematics and God", _The Philosophical Review_, Oct. 1957, p. 463; for an influential seventeenth century version of this, cf. Huet, P.-D., _Censura_

Philosophiae Cartesianae, fourth edition, 1694 (first edition: 1689), pp. 74-75) that God, as portrayed by Descartes, must be a deceiver, for God can conceive alternatives to what I conceive as necessary.

But in both passages it is not God's reason and science, but His power or immensity which is compared with our reason and science. Descartes writes to Arnauld that we can only say that God gave ("indidisse") me such a mind that a mountain without a valley or an aggregate of one thing and two things which is not three things cannot be conceived by me: "... talia implicare contradictionem in meo conceptu". What we dare not say, on the other hand, is that God could not make it that a mountain is without a valley or that one plus two do not equal three. Descartes writes to Mesland that our mind is finite and created of such a nature that it cannot conceive as possible what God could have made possible, but wanted to make impossible. Considering God's power ("puissance"), he continues, we see that God could not have been determined to make it true that contradictories cannot go together; this he thinks is equivalent to saying that God could have made the contradictories of necessary truths true. For Descartes, the only reason or science there is, displayed both to God and to us, is that comprising the laws and rules God institutes in creating, since creating, willing, and understanding are not distinct for God. Even for God, these rules or necessary truths have some ontological import - that some creature exists; and this in turn depends on God.

75. See the discussion to Reg. XII (AT X, p. 421), where Descartes writes that, if Socrates says he doubts of all, he thus knows that something can be true or false; truth and falsity are thus conceptually connected to the nature of doubt.

76. *Petites perceptions*, of course, need not involve language.

77. Couturat, L. (ed.), *Opuscules et Fragments Inédits de Leibniz*, 1903, p. 176.

78. *ibid.*, p. 338.

79. *ibid.*, pp. 177, 340.

80. *ibid.*, p. 343.

81. *ibid.*, p. 339.

82. *N.E.*, III, VII, 6.

83. Gerhardt, C. I. (ed.), *Die Philosophischen Schriften*, B.I, p. 56.

84. Couturat, *op. cit.*, pp. 338-339.

85. *ibid.*, pp. 36, 338.

86. *ibid.*, p. 36.

87. Leibniz proposed to revise Alsted's *Encyclopaedia*. This had been organized for pedagogical expediency. The first volume ("Quatuor Praecognita Disciplinarum") contained pedagogical prolegomena; the second volume, the subjects of the trivium; the third, those of the quadrivium; and so on. Leibniz's proposed arrangement follows a different principle. The first subject (Couturat, *op. cit.*, p. 35) is grammar "seu *ars* intelligendi"; one is to begin with "Grammatica rationalis" ("rationalis" substituted for "universalis" in the text). After grammar comes "*Logica*" (*ibid.*, p. 36); next is "*Mnemonica*", simply a part of heuristics; then "*Topica* seu ars inveniendi", including the *ars magna*, but above all algebra as a source of more universal rules; from this point, the orientation becomes more mathematical. The movement (ignoring *mnemonica*) is from the logically most basic to the more specific. *Grammatica rationalis* explicates grammatical forms and words - inflexions and particles - by more simple and general particles, until one has arrived at what cannot be eliminated (*ibid.*, p. 35). This is the analysis of the

characters employed by all men in speaking and thinking; its task is primarily the accurate analysis of words, and only secondarily the teaching of languages (*ibid*., p. 36).

88. Couturat, *op. cit*., p. 36.

89. How Leibniz proposes to arrive at the rules or principles lying behind ordinary usage and supposedly common to all mankind is indicated by his reply to the following view. (The text for this is in Couturat, *op. cit*., pp. 183-184 and was written no earlier than 1679.) All evidence is referred to authority, the view maintains. For if something is proved from what is evident, that which is evident demands a proof. To avoid an infinite regress, one must arrive at what is evident *per se*. But we know that something is evident *per se* only by the consensus of all men. "Consensus" here is taken as explicit agreement.

The problem is located by Leibniz as that of determining how we are certain of rules of inference (*principia* "ex quibus demonstrationes ducuntur"). His answer is that demonstrations proceed not from what is (explicitly) assumed or asserted - "principia directa" - but from what is (implicitly) conceded ("concessionibus") - "principia reflexa seu indirecta". *Principia reflexa* act as rules of inference and are "formalia"; *principia directa* act as premises and are "materialia seu materiae demonstrationis". (Cf. *N.E.* IV, VII, §11 for a similar presentation.) The procedure is (explicitly) to assume the propositions (implicitly) conceded by one's adversary and to conclude in legitimate form the contradictory of one of the propositions he asserted. Thus Leibniz states that every demonstration is a *reductio ad absurdum*. There is a presumption that what has not been proven false is true. Hence Leibniz admits that most (if not all) men are led by authority in most cases and that common opinion is often the ultimate arbitor of our practical judgement. (Compare this with N.E. IV, XX, § 17.) Thus in some way all demonstration is *ad hominem*, because every step and the rules must be conceded. In brief, purported inferences are checked by formulating what is tacit in them. Likewise, a purported formulation of a tacitly followed rule is certified by its explicit inclusion in inferences in which the rule functions implicitly. Leibniz holds that the deeper rules are a common stock.

90. *Essay* IV, XVII, § 4.

91. *ibid*.

92. *ibid*., § 6.

93. *ibid*., IV, VII, §§ 1, 8.

94. *ibid*., § 3.

95. *ibid*., § 2.

96. *ibid*., § 9.

97. *ibid*., IV, XII, § 3.

98. *ibid*., IV, VII, § 6.

99. *ibid*., § 8.

100. The term "praecognitum" is attributed by Alsted (*op. cit*., Lib. I, "Hexilogia", Cap. I, Reg. II, p. 50) to Vives, Zabarella, and Keckermann. He cites (*ibid*.) Aristotle where he states that every discursive discipline proceeds "ex anticipatâ ... cognitione" (*Ethics* VI, Chap. 4 and *Posterior Analytics* I). J. A. Quenstadt (*Disputatio Philosophica de Virtutibus Dianoeticis seu Habitibus Mentis*, sub praesidio H. J. Scheurl: Helmstadt, H. Mullerus, 1640) again cites Aristotle (*Posterior Analytics* I, Chap. I and *Ethics* VI, Chap. 3) and states that all science is acquired by learning ("per doctrinam et disciplinam"), from some antecedent knowledge. Not that every part of the science must be known ("nota") (demonstration

does this), but something of the subject ("de re illa") must already be known, for every subject ("doctrina") which is taught and learned "fit ex praecognitis principiis". Alsted presents *praecognita* as having pedagogical and logical functions, and as especially important in settling what is given before an academic dispute ("disputatio" in the technical sense). (Cf. especially *op. cit.*, "Praefatio in Quatuor Libros Praecognitorum" and Lib. I, "Hexilogia", Cap. I, Reg. II.)

However, some condition was seen to be required on the part of the individual to be able to learn sciences which are taught. Quenstadt states (*op. cit.*, art. xvii) that there is one *habitus* concerning first principles, which require no argumentation, viz. "νους" or "intellectus". Although such principles as "every whole is greater than its part" and "parents are to be honoured" are understood "ex ipsorum terminorum perceptione" such that the intellect must assent to them, there must be such a *habitus* to account for the increased facility with which this occurs, given previous exercise. This is still considering *praecognita* pedagogically. But it is only a few steps from the view that *praecognita* must be supposed on the part of the individual (although not articulated) for any learning whatsoever. These steps were taken by H. Wedemannus in a *disputatio* (*Disputatio Philosophica de Primo Cognito* ..., Giessen, Hampelius) *sub praesidio* of Scheibler in 1623, a year before the suspension of the academy at Giessen and the end of Scheibler's academic career.

101. *N.E.* I, I, § 20.

102. *ibid.*

103. *ibid.*, IV, XII, §§ 1, 2.

104. *ibid.*

105. *ibid.*, IV, XI, §§ 1-10.

106. *ibid.*

107. Couturat, *op. cit.*, p. 183.

108. *N.E.* IV, XVII, § 4.

109. *ibid.*

110. *ibid.*

111. *ibid.*

112. *ibid.*, IV, XVII, § 4.

113. *ibid.*

114. *ibid.*

115. The texts in which Leibniz discusses this are in a letter to Conring $\frac{19}{29}$/3/1678 (*Sämtliche Schriften und Briefe*, herausgegeben von der deutschen Akademie der Wissenschaften ("*Akademie*" for short), I^te Reihe, II^ter Band, pp. 397-399) a later letter to the same (*ibid.*, pp. 456-458) and the *Nouveaux Essais* IV, XII, § 4 and IV, XVII, § 6.

116. *N.E.* IV, XII, § 4.

117. *ibid.* and *ibid.*, IV, XVII, § 6.

118. *ibid.*, IV, XII, 4 and Conring to Leibniz, $\frac{26/2}{8/3}$/1678 (*Akademie*, *loc. cit.*, p. 395).

119. *Akademie*, *loc. cit.*, p. 398.

120. *N.E.* IV, XXI, §§ 1-4.

121. *Akademie*, *loc. cit.*

122. *N.E.* IV, XII, §§ 4-5.

123. *Akademie*, *loc. cit.*, p. 399; *N.E.* IV, VI, § 10.

124. *ibid.*, p. 398.

125. *ibid.*, p. 399.

126. *ibid.*

127. *ibid.*

128. *ibid.*, p. 457.

129. *N.E.* IV, XII, § 4.

130. Couturat, *op. cit.*, p. 341.

131. *N.E.* II, III, § 15.

132. *ibid.*, § 18.

133. II^{e} Partie, § 214; Gerhardt, *Philosophische Schriften* B.VI, p. 246.

134. The work itself (Rostock and Hamburg, 1630 (n. pub.)) is divided into two sections, each introduced by a list of definitions, some illustrated by figures which can be folded over on the page, others illustrated by more conventional diagrams. These are followed by "problemata", in which one is given a problem (and the requisite information) and asked to construct a figure. These results are used to prove theorems (and corollaries). The work is concluded (pp. 57 ff. - the copy in the British Library stops in mid-sentence) by a denunciation of Ramus' geometry in favour of Euclid.

135. It is tempting to construe Leibniz's views on mathematical knowledge in terms of one of the "-isms" of contemporary philosophy of mathematics. (The validity of this is questionable, since Leibniz (despite the central part infinity played in both his mathematics and philosophy) had no suspicion of the problems introduced by infinite sets and transfinite numbers; indeed, he states that the arithmetic of transfinite numbers is the same as the arithmetic of finite numbers. Yet the three predominant "-isms" arose largely in response to such problems.) Leibniz is generally regarded as a logicist because he talks about deducing mathematics from logic. But the seventeenth century sense of "deduce" is different from the contemporary sense, being more similar to the contemporary sense of "generate". Further, the aspect of "logic" which is generative is something like the *ars combinatoria*. In brief, a

difference in conceptual divisions precludes reading Leibniz's remarks in a logicist fashion.

With more justice, he has been seen as a formalist. Doing mathematics for Leibniz is above all else working with "sensible signs". Furthermore, "scientific" disciplines, though infinite in detail, are held to be formulated by reflection; this is possible because reflection relies on "sensible signs", of which there need be only a finite number.

However, much of what Leibniz says (such as what we have just considered) suggests an intuitionist approach (but without the mentalist aspects). For constructing a diagram can be a proof and Leibniz emphasises the need to certify our concepts with constructions. But, in Leibniz's case, there appears to be little difference between a formalist and an intuitionist position, for diagrams fall under "sensible sign", things are treated like diagrams, and he insists that all mathematical statements have non-private criteria.

(Leibniz is, of course, a Platonist of sorts; but this is because he reifies conventional rules. Indeed, it is questionable whether on Leibniz's principles a person can be much more than a privileged concept in the divine mind.)

136. O.C. T.XII, p. 110.

137. <u>ibid</u>., p. 111.

138. <u>ibid</u>., p. 112.

139. <u>ibid</u>., pp. 112-113.

140. <u>ibid</u>., p. 114.

141. <u>ibid</u>., pp. 115-116.

142. <u>ibid</u>., p. 118.

143. <u>ibid</u>., p. 116.

144. <u>ibid</u>., p. 118.

145. <u>ibid</u>., p. 125.

146. London, Routledge & K.Paul, 1963.

147. Oxford, Clarendon, second edition, 1953.

148. Cf. Ross, p.24, referring to the *Phaedo* 75 c 10 - d 3, 76 d 7 - 9, 78 d 3 - 7, 100 b 3 - 7. These passages show that Plato has reached his generalized theory of Ideas. They also give a list of Ideas - moral and aesthetic values and mathematical qualities and relations - which remained much the same throughout his writings (although mathematical Ideas became more important later).

149. 454, 462-5, 501. Cf. Crombie, p. 35.

150. Crombie, pp. 13-14.

151. *ibid*., p.51.

152. *ibid*., pp. 51-52.

153. *ibid*., p.82.

154. *ibid*., p.135.

155. Crombie (p.128), discussing the Seventh Letter, distinguishes an inductive approach - e.g. picking out instances of beauty and saying what is beautiful about each - which is peculiar to δοξα and a counter-inductive approach - grasping what beauty (or "the beautiful") is (which also involves the ability to pick out instances) - which is peculiar to ἐπιστημη. He adds that the distinction Plato really wanted to draw between these two approaches

is a matter of degree with regard to the use of the senses; it is not a question of whether you use them, but of the point at which you use them, how critically, and so on, Perhaps ..., realising that the senses make a contribution to every degree of enlightenment, however lofty, (Plato) saw that old distinction between ἐπιστήμη and δόξα was not a hard and fast distinction, and that the important distinction depended simply on whether what existed in a man's mind was the actual thing which he claimed to know, or merely a correct account of it in terms of propositions and the ability to produce instances.

Cf. Phaedo 74 b 4 – c 6. Ross, pp.22-24: This is the earliest passage in which Ideas are regarded, not as universals manifested in particulars, but "as ideals, standards, or limits to which individual things only approximate." (He here speaks of sensible things - bits of wood, stones, etc., which remain the same, but appear equal to some and not equal to others - necessarily only approximating to equality.) "For the first time, the relation of sensible things to Ideas is thought of as imitation rather than as sharing ..." Ross claims (p.25) that Plato never "made a complete bifurcation of the universe into Ideas and sensible things."

156. Crombie, pp. 37-38.

157. Cf. Meno 97: one can believe or know a proposition. Theaetetus 201: an eye-witness may be the only one who can know the facts, but a court may be induced to believe them.

158. In the Teaetetus (208-9) Plato speaks of knowing who Theaetetus is as opposed to knowing only what sort of man he is (cf. Seventh Letter 342-3).

159. Cf. Ross, pp.114-116.

160. _Sophistes_ 252 e 9 - 253 c 5; cf. Ross, p 113.

161. _Sophistes_ 253 c 6 - 254 b 6; Ross, _ibid_. The notion of a system of Forms, or the participation of one Form in another, was already present in the _Phaedo_. (Ross, p. 37.) Plato here holds that the Form of three imports into particular groups of three the Form of oddness, because it shares in this Form itself.) In the _Republic_, Plato moves beyond the opposition between Forms and changing things; Ross sees the advance as a recognition of "a hierarchy reaching from the narrowest of the Forms to the highest and widest of them." (_Ibid_., p. 80; the hierarchy of Forms is also presented in the _Philebus_ 16 c 5 - 17 a 5, after the _Sophistes_.)

162. p. 136.

163. Ross, p. 82.

164. _Theaetetus_ 198; cf. Crombie, pp 41-42 for this and the remainder of the paragraph.

165. The third-man argument is presented in the _Parmenides_, where the solution is tried, that each Idea is a thought found only in souls (132 b 3, cf. Ross pp. 88-89). But, then (holds the counter-reply), if things share in Forms, they share in thoughts, and so all things are composed of thoughts and either themselves think or there are thoughts which do not think (132 c 9 - 11). Plato never comes back to this interpretation, and accepts that the objective nature thought of, not the thought, is the Form.

166. Parmenides (133 a 5) objects to two Platonic formulations of a Form in general - as "the X itself" and the description of particulars as resembling it. But he does not object to the formulation in terms of sharing, but states that we must find another account of sharing.

167. Ross maintains (p. 103) that Plato's theory of Ideas "rests on the belief that there is a complete difference between sensation and knowledge, and that knowledge demands as its objects entities not perceived by sense, and it is in Theaetetus (151 d 7 - 186 e 12) that he gives his final and most elaborate proof of the difference between sensation and knowledge." Ross adds (cf. Timaeus 51 d 3 - e 6) that it also rests on the complete difference between knowledge and true opinion and that the most elaborate proof of this is again in the Theaetetus (187 a 1 - 210 b 3). Again, in the Timaeus (27 d 5 - 28 a 4) (cf. Ross, pp. 120ff), Plato distinguishes between "that which is always real and has no becoming" and is "apprehensible by thought with a rational account" (Forms) and "that which is always becoming and never real" and is "the object of δοξα together with unreasoning sensation" (sensible things).

168. pp. 49-50.

169. In the Republic, Plato states that νοησις – roughly, understanding, ἐπιστημη from a faculty point of view – is concerned with οὐσια (being) and δοξα with γενεσις (becoming). Crombie (p. 98) feels that Plato is not primarily concerned with a distinction in subject matter (e.g. justice versus empirical observation), but rather with the point that "in so far as we achieve any success in understanding abstract principles we do so by proceeding counter-inductively, and that in so far as our conceptions are formed inductively they count as δοξαι, because they are very indirect and inexplicit apprehensions ..." Plato adds that νοησις is to δοξα as οὐσια is to γενεσις. Crombie feels that this expresses the point that

> the principles which constitute οὐσια are changeless whereas the events which constitute γενεσις are changeable, and similarly νοησις is stable while δοξα must fluctuate. ... γενεσις is an image of οὐσια in the sense that the course of nature reflects the principles whose imposition on chaos renders it nature. (ibid).

At the end of the fifth book of the Republic (474-80), Socrates calls the thought of the philosopher, dealing with realities, ἐπιστημη and that of ordinary men, dealing with images, δοξα; he then offers proof that the unphilosophical cannot be allowed to claim ἐπιστημη (cf. Crombie, pp. 56-57). This argument tries to establish a logical chasm between ἐπιστημη and δοξα by assuming that, since ἐπιστημη is infallible and δοξα is not, ἐπιστημη and δοξα must be different δυναμεις - "functions" - and so must have different "objects". He also assumes that only what is fully ὤν - "that which is" - is fully knowable and what is totally μη ὤν is totally unknowable. The object of δοξα is placed between ὤν and μη ὤν - the object of αγνοια (nescience or ignorance); it cannot be μη ὤν, for someone who belives must believe something. The final move considers the multifarious changing things the unphilosophical take to be the sole realities. Now for any predicate P and its opposite $\overline{P}$ (e.g. "beautiful" and "ugly"), what one has reason to call P could always be found to be $\overline{P}$, and so is between ὤν and μη ὤν. "Therefore the multifarious conventional opinions of ordinary men about beauty and other such things roll about between ὤν and μη ὤν", so these must be the objects of belief.

For Plato (cf. Republic, 447 d) two functions are the same if they do the same thing to the same object. But what of two functions - e.g. sight and smell - which do different things to the same objects - e.g. apples? It seems that the "object" of a function for Plato is an internal accusative, as "sights" is to "see"; so, by the (implicit) definition of "object", there cannot be different functions with the same objects. This suggests to Crombie (p. 58) that what is between ὤν and μη ὤν are mental correlates to δοξα; likewise there are mental correlates of ἐπιστημη - realities. He suggests (p. 60) that the verbal form of δοξα - δοξαζειν is taken in the sense of "represent something to oneself as". And to say that δοξα is between ἐπιστημη and ἄγνοια and that its object is between τὸ ὤν and τὸ μη ὤν is simply to say that δόξα is not quite ignorance and that its object is not quite non-existent (ibid., p. 64)

Consider now the last and crucial step of the argument; in what sense do the multifarious conventional opinions of ordinary men about, e.g. beauty "roll about between ὤν and μη ὤν"? Crombie suggests the following (pp. 67-68) The plain man, asked (in Greek construction) "What is the beautiful?", will say, e.g., "Regency furniture". Asked for a reason, he will give, e.g., its delicacy, and perhaps hold that delicacy is beautiful. The plain man grasps enough of "the beautiful" for his answers to be at least not inapposite; so he is not ignorant of the beautiful. Yet the man who identifies P-hood with the various properties which make us attribute P-hood to things cannot be said to know P-hood, for a thing which is P can always be shown to be in some way $\overline{P}$. This provides a link between the premise that every one of the multifarious beautifuls can seem ugly and the conclusion that the opinions of plain men about beauty fall between knowledge and ignorance of it. This link is the way plain men form their ideas of general terms, viz. by identifying the multifarious beautifuls with beauty. But Plato uses a different link: from the premise he infers that each of the multifarious beautifuls is between being and not being (479 c 6), whence he draws the conclusion. This link has been taken to show that Plato denied the real existence of the physical world. But Crombie holds (p. 68) that, while he denied physical things the status of ὄντα , he did not deny their real existence. For what is relevant is not that any given beautiful object is only a stable pattern manifested in flux, "but that it is the predicative and not the existential sense of 'to be' which is uppermost when Plato says that physical things are between being and not being." What they lack is simply existence-as-beautiful-things - they are and are not beautiful. Plato's purpose here, Crombie concludes (p. 69) "is to show that there are certain common states of mind which cannot be classed as knowledge" (i.e. ἐπιστήμη).

170. Crombie, p. 103.

171. Ross, p. 48.

172. Republic 510 c 2; cf. Ross, p. 49.

173. p. 80.

174. ibid. Furthermore (p. 81), Plato recognises distinct arithmetical and geometrical equalities and in the Gorgias (508 a) states that knowledge of mathmatics will help the politician distinguish the two kinds of equality in society. And in the Laws (897-8) he writes that the same principle of self-consistency which constitutes intelligence also expresses itself in spatial terms in the form of motion in a circle.

175. Crombie, p. 82.

176. p. 83.

177. Cf. Crombie, pp. 135-136.

178. Crombie, p. 138.

179. p. 139.

180. p. 140.

181. The doctrine of recollection is also presented in the <u>Phaedo</u> (72-77) and in the <u>Phaedrus</u> (247-250). In the <u>Phaedo</u> (cf. Crombie, pp. 141-142), Plato argues as follows. Equality is different from equal physical things, for physical things can seem equal to one man and unequal to another, whereas "the equals themselves can never seem unequal, or equality inequality." Our senses always tell us that physical instances of equality are imperfect; so we must have become aware of the standard before we received the use of our senses, i.e. before we were born. We have not retained ἐπιστήμη of equality, for we cannot give an account of it. So we must have forgotten this ἐπιστήμη on coming into the body. Yet we can be put in mind of - recollect - intelligible natures by experience.

(Crombie claims (p. 143) that "What experience does, strictly speaking, is to revive not our knowledge of equality, but the true belief which is all that we retain until it is converted into knowledge by philosophical methods." But this supposes an answer to the question, how broadly "ἐμπειρία" is to be taken; philosophical methods are a continuation of the "question and answer technique of Socratic definition". And is this technique not a controlled sort of ἐμπειρία ?)

A prima facie difference between the _Meno_ and the _Phaedo_ is that in the former propositions are remembered, while universals are in the latter. But Plato would say that to remember squareness is to remember the theorems flowing from it (cf. Crombie, _ibid._). "Recollect" seems to be used in a more dispositional sense in the _Phaedo_, where experience activates our implicitly retained true beliefs, while in the _Meno_ it is not the implicit retention, but the full understanding which counts as recollection; but this seems to make no substantial difference. Again, the _Phaedo_ insists that we have not regained ἐπιστήμη until we can "give account", while this condition is not mentioned in the _Meno_. Crombie states (p. 144) that this is only a difference in emphasis; the same difference in emphasis exists between the _Meno_ and the _Republic_, and the chronological order is _Meno_, _Phaedo_, _Republic_.

The doctrine of recollection in the _Phaedrus_ is simpler and bolder and perfunctory. From what is said about dialectic, one would expect common natures such as animality to be recollected as well. Crombie holds (p. 145) that, while Plato is interested in terms such as beauty, he might have defended a connection between the powers to generalize and to recollect. He earlier construed Platonic recollection as interpreting the point

> that the fundamental distinctions that common sense is inclined to draw correspond to real differences which reason recognises between general terms. Bearing in mind what the _Republic_ and the _Cratylus_ have to say about forms of artefacts one would expect Plato to argue that even such a concept as that of a helmet is a complex function of such fundamental distinctions. For he who separates off helmets from hats is drawing on notions such as rigidity, protection, and so on. Obviously it would seem possible to produce a kind of scale of general terms putting at the top those like equality and justice which it would be plausible to

say we "bring to experience" and at the bottom those like concepts of artefacts which it would be plausible to say we "get from experience"... (pp. 145-146).

182. There is no doubt that Leibniz had first-hand knowledge of Plato. While in Paris in the 1670s, he translated from Greek to Latin the Phaedo (Foucher de Careil, L.A., Nouvelles Lettres et Opuscules, Paris, 1857, pp. 44-97) and the Theaetetus (ibid., pp. 98-145).

183. Cf. Crombie, p. 84.

184. We can perhaps capture some of Plato's insight about goodness as follows. We cannot judge people, qualities, or instutions as good or bad - i.e. we cannot use the word "good" - unless we are capable of doing what is good or just. But if we are so capable, then the abnormal cases are the cases in which we act otherwise. The non-inductive nature of the insight into goodness was emphasised by Plato against the claims of the Sophists, that justice - acting justly - could be taught. Knowing what goodness is, or what justice is, is a cognitive feat; indeed, it is one of the highest cognitive feats and requires trained analytic powers, as are gained in doing mathematics. Conversely, having attained the feat, the sort of balance and proportion needed, not just to understand mathematics, but to be a (mathematically) good mathematician follow as a matter of course.

185. Kritik der reinen Vernunft, Schmidt, R. (Ed.), Hamburg, Meiner, 1956 (after the edition of 1926), B137-8:

> Um aber irgend etwas im Raume zu erkennen, z.B. eine Linie, muss ich sie ziehen, und also eine bestimmte Verbindung des gegebenen Mannigfaltigen synthetisch zustande bringen, so, dass die Einheit dieser Handlung zugleich die Einheit des Bewusstseins (im Begriffe einer Linie) ist, und dadurch allererst ein Objekt (ein bestimmter Raum) erkannt wird.

In the corresponding passage in A (102) he speaks of drawing a line in thought, thinking a passage of time, and imagining ("vorstellen") a certain number; his point is that theinitial portion must be reproducible for one to have the whole representation ("Vorstellung").

186. Cf. Körner, S., Kant, Harmondsworth, Penguin, 1960, p. 26, where he states that Kant "believes himself to have discovered all theabsolute synthetic presuppositions of arithmetic and Euclidean geometry, of Newtonian physics, and, in a sense, of the traditional logic".

I rely heavily on this work in the following.

187. Bxvi-xviii.

188. Kant states, in concluding this passage, that thought of objects by the understanding and with necessity ("notwendig") which cannot be given in experience is a touchstone that our a priori cognition of things is restricted to what we place in them ("wir ... von den Dingen das a priori ekennen, was wir selbst in sie legen").

189. B137:

> Verstand ist, allgemein zu reden, das Vermögen der Erkenntnisse. Diese bestehen in der bestimmten Beziehung gegebener Vorstellungen auf ein Objekt. Objekt aber ist das, in dessen Begriff das Mannigfaltige einer gegebenen Anschauung vereinigt ist.

190. A78, B81.

191. Cf. Körner, <u>op.cit.</u>, p. 49

192. <u>ibid.</u>, p. 31.

193. A79, B104-5. Körner, <u>op.cit.</u>, p. 54, calls this doctrine "the corner-stone of the Transcendental Analytic" and summarizes it as. "A Category refers to its bearer because in being apllied it produces it".

194. Körner, <u>op.cit.</u>, p. 57.

195. B130.

196. The "I think", he states (B132),

> must be capable of accompanying all my representations; otherwise ... (a) representation would be either impossible or at least nothing to me ... Conseuqently every manifold of intuition has a necessary relation to the "I think", in the same subject in which the manifold is found.

197. B139. Körner states in summary (p. 65), that

> The unity of pure apperception, the applicability of the Categories, the possible experience of objects mutually imply each other: this, I believe, is the essence of the Transcendental Deduction.

198. A146-7, B186.

199. A140-1, B179-80.

200. A138, B177. For example (A142-3, B182), the schema of quantity is number, which "is the unity of the synthesis of themanifold of a homogenous intuition in general ..." And (A144, B183) the schema of causality is "succession of a manifold in so far as it is subject to a rule".

201. B19.

202. B20.

203. B21-2.

204. B22-3.

205. Körner, <u>op.cit.</u>, p. 49.

206. A80, B106 (cf. Körner, p. 51). The Categories with the corresponding logical forms are as follows. (1) Categories of quantity: to universal judgments corresponds the Category of unity; to particular judgments, that of plurality; to singular judgments, that of totality. (2) Categories of quality: to affirmative judgments corresponds the Category of reality; to negative judgements, that of negation; to limitative judgments, that of limitation. (3) Categories of relation: to categorical judgments corresponds that Category of sub stance-and-accident; to hypothetical judgments that of causality and dependence; to disjunctive judgments that of community of interaction. (4) Categories of modality: to problematic judgments corresponds the Category of possibility-impossibility; to assertoric judgments, that of existence and non-existence; to apodictic judgments, that of necessity-contingency.

207. A82, B108.

208. A161, B200. The names of the four classes of the "principles of pure understanding" are (corresponding to the order of Categories in note 206): (1) "Axioms of intuition", (2) "Anticipation of perception (Wahrnehmung"), (3) "Analogies of experience", and (4) "Postulates of empirical thought in general".

209. A25, B40.

210. A12, B25; cf. A56, B80.

211. Cf. Kröner, op.cit., p. 105:

> The task of Kant's Transcendental Dialectic is (1) to show that belief in such absolute metaphysical principles arises from the very nature of our thinking about matters of fact; (2) to give a complete list of these principles and of the a priori notions which are involved in them; (3) to demonstrate that their claim to give us knowledge of matters of fact is

illegitimate; and lastly (4) to explain their proper and legitimate function in our theoretical endeavour.

212. A19, B33.

213. Cf. Körner, op.cit., p. 106.

214. ibid., p. 107.

215. A306, B363.

216. A306-7, B363-4.

217. I follow Körner, p. 108, in this difficult passage.

218. A307, B364: "... the conclusion given by reason ("Vernunftschluss") is itself nothing other than a judgment mediated by the subsumption of its condition under a general rule (major premise ("Obersatz"))".

219. Cf. Korner, op.cit., pp. 108-10.9

220. A307-9, B364-6:

> The logical maxim cannot become a fundamental principle of pure reason unless we assume that if the conditioned is given, the whole sequence of subordinate conditions, which consequently is itself unconditioned, is also given ... Whether this principle that the sequence of conditions ... reaches the unconditioned is or is not objectively valid, and what consequences follow from this for the empirical use of reason ... will be our business in the Transcendental dialectic ...

221. In Rule XII of the Regulae, Descartes emphasises the synthetic function of imagination as it presents a number of natures together and shows their mutual possibility.

222. In a context of justification, concepts which are not instantiated in objects become explicitly involved with our statements about objects. As Leibniz put it, truths of fact are justified or evaluated ("se justifient") by the truths of reason. The same point is behind Malebranche's demand in the first book of the Recherche that we check our judgments of features in re by explicit mathematical methods and

Descartes' distinction between experience while waking and while dreaming at the end of the Meditations.

223. Kant, in a context emphasising the fact that mathematics, unlike philosophy, can provide objects for its concepts because it constructs its concepts, states (A727, B755) that the thoroughness of mathematics is due to definitions, axioms, and demonstrations. But, he adds, these are inapplicable to philosophy in the sense they are used in mathematics; further more, "the mathematician, by employing his method in philosophy, can only produce so many houses of cards and the philosopher, by employing his method in mathematics, can but stimulate idle talk".

224. Cf. Kroner, op.cit., p. 44.

225. Ibid., p. 107.

226. A323, B379-80. The categorical form of syllogism leads to the unconditioned as "a subject which is not itself a predicate"; the hypothetical, to an ultimate "presupposition which itself presupposes nothing else"; and the disjunctive, to "an aggregate of the members of the (disjunctive) division, such as requires no more in order to complete the division of the concept".

227. The three Transcendental Ideas and the speculative disciplines concerned with them are (corresponding in order to the three sources of fallacy listed in note 226):

> ... first the absolute (unconditioned) unity of the thinking subject, second the absolute unity of the sequence of the conditions of the appearance, third the absolute unity of the condition of objects of thought in general. The thinking subject is the subject matter ("Gegenstand") of (speculative) psychology, the totality of appearances (the world) that of (speculative) cosmology, and the entity which contains the highest condition of the possibility of everything which can be thought (the entity of all entities), that of theology. (A334, B391)

228. It is held that a perfection is unlimited in the sense that it cannot be incompatible with any other positive predicate; so no empirical predicate can be a perfection - they are determinates incompatible with other determinates under the same determinable. So, Kant concludes, the perfections of God - the ens realissimum - can be grasped only by analogy (cf. Körner, op.cit., pp. 118-9). The notion of God involves not only the completion of an infinite aggregate of predicates, but also personality, so Kant calls it not only an Idea, but also an Ideal; as it contains no empirical element, Kant calls it the Ideal of pure reason or the transcendental Ideal (ibid., pp. 119-20).

229. Cf. Körner, op.cit., p. 222. Cf. p. 119:

> Since the completion of an infinite aggregate cannot be an object of experience, the assumption that there is such an object is logically impossible. The thesis (of speculative theology) that God can be an object of experience, in the sense in which objects which fall within the scope of natural science are, must therefore be rejected.

230. B668.

231. An exception must be made for God in the case of Descartes, Who is not thus subject and knowable in so far as He is free to create this science.

232. Cf. Prolegomena, 298 (quoted in Korner, op.cit., p. 48):

> All our judgments are first of all perceptual judgments: they have validity solely for us, i.e. our subjectivity, and only afterwards do we give them a new reference, reference to an object, and want them also to be valid for us at all times and equally so for everybody else ...

233. Kant's argument for this is (briefly) as follows (B275). I am conscious of my existence as determined in time and every temporal determination presupposes something perservering in perception which

cannot be something in me (for it determines my existence). So the perception of what perseveres is possible only because of an external thing, not its mere representation ("Vorstellung").

Transcendental idealism is not concerned with introspective ("empirical") self-consciousness in relation to the existence of external objects (ibid.). As regards this relation, Kant distinguishes between "material" or empirical idealism - that introspective self-consciousness "is the only immediate experience and that from it the existence of external things is only inferred" - from his own empirical realism - that "the experience of outer objects is truly immediate and that only by means of it ... inner experience is possible ..." (B276).

234. A28, B44.

235. Cf. the letter from his former pupil Beck, 20/6/1797.

236. Op.cit., p. 41.

237. A19, B33:

> By means of sense (or sensitivity: "Sinnlichkeit"), objects are given to us and sense alone provides us with intuitions; by means of the understanding, objects are thought and from it there arise concepts.

Cf. Körner, p. 27.

238. A271, B327:

> Leibniz intellectualized appearances ("Erscheinungen"), just as Locke ... sensualized the concepts of the understanding ... Instead of looking for two disparate sources of representations in the undersanding and sense, which, however, judge of things with objective validity only in conjunction, each of these great men kept to only one of the two ...

239. A271, B327.

240. A272, B328. Kant claims (A274, B330) that the foundation of the monadology is the fact that Leibniz represented the difference between internal and external as one of the understanding alone; that substance must have something internal, independent of every external relation; so what is simple is the foundation of what is internal to things in themselves. But, he continues, we can assign to substances only that internal accident by which we internally determine our sense itself, that is, the accident of representation. This, Kant claims (A274-5, B330), leads straightaway to pre-established harmony, and the view that there can be no physical influence. (Kant's term, translated "influence", is "Einfluss", a construction parallel to Leibniz's Latin term "influentia", referring to causality. The term is appropriate because, in the physics of late Scholasticism, causality was considered a process whereby accidents really distinct from their subjects flow from the cause (as subject) to the effect (another subject). This account is incompatible with a mechanical account (it would do for electric currents, however). Kant does not discuss this alternative, which Leibniz explicitly rejected. Rather, he is concerned with causality as it connects phenomenal events sequentially and makes experience intelligible. This is largely what Leibniz thought mechanical descriptions do.)

241. A275, B331.

242. A272, B328.

243. A24, B38-9.

244. Firstly, monads mirror the universe from their own point of view. Secondly, each monad has its own conatus, the expression of the physical quantity vis viva (kinetic energy). Finally, each monad is the instantiation of a unique individual concept (hence the identity of indiscernables).

245. The noumenon which is the moral agent first appears in the *Critique of Pure Reason* as the self of pure apperception. Concerning this self, Kant states (B157) that "I am conscious not of how I appear to myself, or of how I am in myself, but only *that* I am". The distinction between this self and the empirical self, which we may sometimes know as an object, is a consequence of Kant's fundamental assumptions (cf. Körner, *op.cit.*, p. 67). Only the former is the moral agent. "Conscious" here is being used in a way different from the way it is used by rationalists, where it concerns occurrences as they are subject to our science and what can be explicitly formulated.

246. A444, B472.

247. A445, B473.

248. Cf. Körner, p. 118.

249. *Ibid.*, pp. 152-154.

250. Cf. Körner, *op.cit.*, p. 154. He here quotes from the *Critique of Practical Reason*, 48:

> The moral law shows its reality, in a manner which is sufficient even from the point of view of the *critique* of theoretical reason, in adding a positive characteristic to a causality ... the possibility of which ... theoretical reason (had to assume). This positive characteristic is the conception of reason as immediately determining the will (through the condition that a universal *form* can be given to its maxim as laws).

251. An obvious situation in which this does not hold is when a person is learning a rule; his behaviour is evaluated according to the rule so that he might come to know the rule. Moral and legal cases are complicated by cases involving negligence and similar notions, cases in which we *should* have known a certain rule. (This also applies to circumstances.) We should have known the rule, because it is accessible to us; it is part of the general cultural stock. Moral (but not legal)

considerations are further complicated by the universalizability of moral judgments, bu virtue of which we evaluate the actions of persons by rules which are not even accessible to them.

252. It is tempting to think of a particular (covert) sequence of moral reasoning in silent deliberation as determining overt moral behaviour. But "determine" here, if it is used correctly, could also be used for the relation between premises and conclusion, by which the conclusion <u>can</u> be drawn, given the premises. A (rule-governed) moral act can be considered the conclusion of a (rule-governed) deliberation. Now some of the premises relate to the circumstnces of the act, which are particular, and the "conclusion" itself is public. If the deliberation favours non-action, the agents failure to act in a certain way in the given circumstnces (the "conclusion") is also public. Other premises will relate to possible consequences and other relevant considerations. These presuppose the agent's competence and relate to what would be public. So the competence and other factors involved are commonly known or could be so known. Further, possible consequences and other considerations have a function in so far as they could be relevant in a public justification of some act.

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