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Mind and the Inner-Outer Dichotomy

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LOYOLA UNIVERSITY CHICAGO

MIND AND THE
INNER-OUTER DICHOTOMY

A DISSERTATION SUBMITTED TO
THE FACULTY OF THE GRADUATE SCHOOL
IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

DEPARTMENT OF PHILOSOPHY

BY

RICHARD BALUCK

CHICAGO, ILLINOIS

MAY 1998

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PREFACE

This dissertation is the product of an evolutionary process that began in 1979 when I was an undergraduate student at Youngstown State University pursuing a dual major in English and Mathematics. During the Spring Semester of that year I was enrolled in two courses that had great influence on me—Professor Judith Knapp’s course on Linguistics and Professor Albert Klein’s course on Mathematical Logic. For Professor Knapp’s class I wrote a paper on two interrelated functions of language, the functions of naming and describing. The paper incorporated what I had learned about logical form in Professor Klein’s class. I based my essay on a view according to which we divide the world into various partitions and use linguistic statements to simultaneously refer to these partitions and describe the relations obtaining between them. Professor Knapp was encouraging of my paper and provided a class session for me to present my ideas, inviting other faculty members to attend. Over the years that followed I maintained interest in the ideas that germinated from these experiences. As my thought continued I found myself often returning to the theme of inner-outer relations.

Later I enrolled as a graduate student in the Department of Philosophy at Loyola University Chicago specifically to develop further what I had started several years prior. The Philosophy Department provided a rich environment for me to explore the many facets of the topic of my interest and to assimilate an abundance of relevant literature. During this time I worked extensively with Professor Suzanne Cunningham, the director

of this dissertation, who provided opportunities to do several independent studies on topics that were relevant to my pursuits and the guidance I needed to bring this project to fruition. I would like to extend my gratitude to Professor Cunningham and the other members of my dissertation committee, Professor Paul Moser and Professor Arnold vander Nat. The discussions and challenges that each of them engaged me in over the course of my work contribute immeasurably to the final product.

To My Parents James and Mary Alice Baluck

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- CHAPTER 1 -

INTRODUCTION, DEVELOPMENT OF THE THESIS AND PRELIMINARY ANALYSIS OF THE SUBJECT MATTER

A. INTRODUCTION

One of the central themes of Western philosophy concerns the nature of the mind-world relation. Through the long history of discourse on this theme, philosophers have developed various ways of describing this relation. One way of describing this relation that has maintained for many years is in terms of the “subject-object” distinction. This mode of description, however, has come under critical scrutiny in the twentieth century due to its purported theoretical implications and/or lack of clarity and/or lack of theoretical usefulness. Subsequently, there has been a tendency in twentieth century philosophy to avoid talk of the subject and object and to move to alternative forms of description. Thus, more recent philosophers tend to talk in such terms as ‘the public vs. the private’ or ‘the inner vs. the outer’ and so on as a means of describing the mind-world relation.

It is my feeling that, although some important progress has been made by considering these alternate means of looking at the subject matter, at the same time, some confusion has resulted. I believe that this confusion stems largely from the fact that in

describing the mind-world relation in terms of either the public-private distinction or the inner-outer distinction, we tend to take for granted what such description means.

Presumably, this happens because the terms 'public,' 'private,' 'inner' and 'outer' are familiar terms that we can use with mastery in common contexts and so we tend to suppose we have mastery over them in the more abstruse context of philosophy as well. This assumption, however, is problematic. The fact that we may have mastery over these terms in everyday contexts does not imply that we have a clear and explicit understanding of them. And it is possible that in using them in the context of discourse on the mind-world relation, we may convey aspects of their meaning that harbor theoretical confusion in the end.

Further, it often seems as though we take the public/private and inner/outer distinctions to do about the same job that the subject/object distinction once did—as if all three dichotomies somehow make the essential distinction needed, but that one or the other does so more coherently or more clearly or more usefully than the others. I would suggest, however, that this is not the case. I would suggest rather, that each of the above dichotomies has a meaning that is logically independent of the others. When we look at the mind-world relation in terms of the inner/outer dichotomy, for example, we are looking at that relation from a much different aspect than we do by looking at the same relation in terms of either the subject/object or public/private distinctions. It would follow from this consideration that what we can conclude about the mind-world relation by looking at it from one perspective does not necessarily imply anything about its nature when viewed from the other aspects.

The purpose of this dissertation is not to address directly the issue of the nature of the mind-world relation, nor to consider the appropriateness or inappropriateness of describing the mind-world relation in one or the other of the above modes. The purpose here is simply to begin to clarify the nature of the language we use to describe this relation and to discern some of the implications that such description has for theoretical contexts. Specifically, this dissertation is an attempt to clarify the meaning of the language that describes the mind-world relation in terms of the inner-outer dichotomy. I maintain that such clarification will show some of what is implied by the use of inner-outer language to describe the mind-world relation and also how such description is logically independent of other modes of description. Such analysis, I feel, will be helpful to better articulate our understanding of the larger issue of the nature of the mind-world relation itself.

B. DEVELOPMENT AND STATEMENT OF THE THESIS

Both philosophers and laypersons are seemingly compelled to talk about mental phenomena such as thoughts, sensations, desires, and so on, as being “internal” to the mind, and, correlatively, to talk about objects of the physical world as being “external” to the mind. Describing the mind-world relationship in terms of “inner-outer language” is a tradition that has endured at least since the time of the early Greek philosophers. In De Anima, for example, Aristotle makes the distinction between the “external” objects of sensation and the “inner” contents of mind (soul).

...the objects that excite the sensory powers to activity, the seen, the heard, etc., are outside. ...what actual sensation apprehends is individuals while what knowledge apprehends is universals, and these are in a sense within the soul.¹

Philosophers from the time of Aristotle have perpetuated this way of thinking.

By the time of the classical modern philosophers, Descartes, Locke, Kant, and others, this understanding of the mind-world relation in terms of the model of the inner-outer dichotomy becomes a cornerstone of epistemology. Locke, for example, takes as a starting point for his epistemology a distinction between “two Fountains of Knowledge,” “outer” physical Objects and “inner” Perceptions.² Similarly, Kant understands Space as the form of “Outer Sense”³ and Time as the form of “Inner Sense...that is, of ourselves and of our inner states.”⁴

Even the radical departures of early twentieth-century linguistic philosophy leave this model of the mind-world relation relatively unaltered. Gottlob Frege, one of the figureheads of linguistic philosophy, for example, writes in “The Thought; A Logical Enquiry”:

Even an unphilosophical person soon finds it necessary to recognize an inner world distinct from the outer world, a world of sense-impressions, of creations of his imagination, of sensations, of feelings and moods, a world of inclinations, wishes and decisions. For brevity I want to collect all these, with the exception of decisions, under the word ‘idea.’⁵

¹Aristotle, *De Anima*(417b,21), trans. J.A. Smith, in Richard McKeon,ed., *The Basic Works of Aristotle* (New York: Random House, 1941), 566.

²John Locke, *An Essay Concerning Human Understanding* (Bk.II,Ch.1,#1), ed. Peter H. Nidditch, (Oxford:Clarendon Press,1975),104.

³Immanuel Kant, *Critique of Pure Reason*, trans. Norman Kemp Smith (New York: St. Martin’s Press,1929),71.

⁴*Ibid.*,77.

⁵Gottlob Frege, “The Thought: A Logical Inquiry,” trans. M. Quinton and A.M. Quinton, in E.D. Klemke, ed., *Essays on Frege* (Urbana: Univ.of Ill.Pr., 1968), 519.

Theory of meaning, which then emerges as a main concern of twentieth-century linguistic philosophers, assimilates and perpetuates this understanding of the mind-world relation in terms of the inner-outer dichotomy. The following relatively recent passage from Jerrold Katz's Semantic Theory illustrates the continuing role of this model.

If we look at linguistic communication from an ordinary, common sense viewpoint, it is a process that involves the transmission of one person's thoughts to another by means of disturbances in the air which the first person creates for this purpose. Somehow the speaker encodes his inner thoughts in the form of external, observable acoustic events, and the hearer, perceiving these sounds, decodes them, thereby obtaining for himself his own inner representation of the speaker's thoughts. It is in this way that we use language to obtain knowledge of the contents of another's mind.⁶

This passage illustrates the persistence of "inner-outer language" in talk about the mind-world relationship initially established by the ancient Greek philosophers, and maintained by later generations of philosophers up to the present.

But although this tendency to describe the mind-world relation in terms of the inner-outer dichotomy has had a strong foothold in the mainstream of discourse on the mind, philosophers have given virtually no formal justification for this way of talking. Understanding the mind-world relation in terms of the "inner" versus the "outer" seems to have been taken quite simply as a matter of common sense. For example, when Frege says that "Even an unphilosophical person finds it necessary to recognize an inner world distinct from the outer world," he implies that the basis for making this distinction is simply pre-critical common sense. Katz makes the same point more explicitly in saying that the analysis he presents follows from looking at linguistic communication "from an ordinary common-sense viewpoint." Certainly we cannot fault such informal

justification *tout court*. For there does seem to be a certain irresistible and intuitively appealing sensibility to the notion - vague as it may be - that our thoughts and experiences occur “within” our minds and that the physical world is “out” there.

However, for a number of recent philosophers of mind and language this understanding of the mind-world relation in terms of the inner-outer dichotomy, notwithstanding its intuitive appeal, is rather dubious, if not objectionable. Their reasons for such misgivings seem to lie along two lines.

First, there are several who have voiced the criticism that for the context of philosophy of mind, “inner-outer language” is vague and obscure. If we are not able to understand with at least some degree of clarity what assertions about the mind-world relation mean when they are cast in the language of the inner-outer dichotomy, of what theoretical value could such description be. For example, in the first part of this century, in his essay, The Revolt Against Dualism, Arthur O. Lovejoy, made the following disparaging remark:

The traditional phrase...for describing the status or locus of sense-data and other ‘ideas’ was ‘in the mind’ - an expression devoid of any clear meaning, which is happily disappearing, though it has not yet quite wholly disappeared, from the vocabulary of philosophy and psychology.⁷

In a more recent text John Searle resounds Lovejoy’s sentiment. In Intentionality (1983) he writes:

Traditionally the ‘problem of perception’ has been the problem of how our internal perceptual experiences are related to the external world. I believe we ought to be very suspicious of this way of formulating the problem, since the spatial metaphor for internal and external, or inner and outer,

⁶ Jerrold Katz, *Semantic Theory* (New York: Harper & Row, 1972), 24.

⁷ Arthur O. Lovejoy, *The Revolt Against Dualism: An Inquiry Concerning the Existence of Ideas* (La Salle, IL),⁷

resists any clear interpretation. If my body including all of its internal parts is part of the external world, as it surely is, then where is the internal world supposed to be? In what space is it internal relative to the external world? In what sense exactly are my perceptual experiences 'in here' and the world 'out there'?⁸

Generally then, this kind of criticism views "inner-outer language" as a kind of obscure spatial metaphor which, for the context of philosophy of mind, is devoid of any clear literal or theoretical meaning.

A second line of criticism, and one that is perhaps of even greater theoretical consequence, is that which is expressed by philosophers such as Gilbert Ryle. In The Concept of Mind, Ryle urges that for the context of philosophy of mind, "inner-outer language" is not only couched in vague and obscure metaphor, but quite misleading. For, he maintains, to describe the mind-world relation in terms of the inner-outer relation is to implicitly subscribe to the basic tenets of Cartesian dualist ontology. He expresses this view in the opening chapter of The Concept of Mind as follows:

[According to the "official doctrine," a] person...lives through two collateral histories, one consisting of what happens in and to his body, the other consisting of what happens in and to his mind. The first is public, the second private. ...

It is customary to express this bifurcation of his two lives and of his two worlds by saying that the things and events which belong to the physical world, including his own body, are external, while the workings of his own mind are internal. This antithesis of outer and inner is of course meant to be construed as a metaphor, since minds, not being in space, could not be described as being spatially inside anything else, or as having things going on spatially inside themselves. But relapses from this good intention are common and theorists are found speculating how stimuli, the physical sources of which are yards or miles outside a person's skin, can generate mental responses inside his skull, or how decisions framed inside his cranium can set going movements of his extremities....

⁸John Searle, *Intentionality: An Essay in the Philosophy of Mind* (New York: Cambridge, 1983), 37.

Underlying this partly metaphorical representation of the bifurcation of a person's two lives there is a seemingly more profound and philosophical assumption. It is assumed that there are two different kinds of existence status. What exists or happens may have the status of physical existence, or it may have the status of mental existence.⁹

Thus, Ryle urge "The phrase 'in the mind' can and should always be dispensed with."¹⁰

Now, if this claim concerning description of the mind-world relation in terms of the inner-outer dichotomy is warranted, then, indeed Ryle has good reason to find such description to be objectionable. For it is one of his primary goals in The Concept of Mind to show that Cartesian dualism is fundamentally mistaken. For, he argues in general, dualism is itself founded on a misconceived metaphor - a metaphor that compares mind to physical substances, a metaphor he calls "The Ghost in the Machine." Likewise, since in the latter half of the present century, the sentiments of the general philosophical community have shifted dramatically in favor of monistic, materialist views concerning the mind-world relation, it would seem that, on Ryle's account, "inner-outer language" should present a problem for philosophy of mind in general.

In summary, a number of philosophers consider the use of "inner-outer language" to be a problem for philosophy of mind for these two main reasons: it is considered to be metaphorical language that is intrinsically vague and obscure, and, perhaps more importantly, it seems to support a dualist conception of the mind-world relation.

But surprisingly, despite the fact that these problems have been recognized, despite Lovejoy's forecast, and the urging of Ryle and other influential figures, use of "inner-outer language" has far from disappeared from use. Rather, such usage continues

⁹ Gilbert Ryle, *The Concept of Mind*, (Barnes and Noble, 1949), 11.

¹⁰ *Ibid.*, 40

to permeate the literature, much as it always has, thereby revealing an implicit ongoing resignation to the intuitive force of the inner-outer model of the mind-world relation.

Searle fittingly describes the situation. The passage from Intentionality quoted above continues:

...Nonetheless these metaphors are persistent and perhaps even inevitable, and for that reason they reveal certain underlying assumptions we will need to explore.¹¹

However, after making this proviso, Searle himself continues to develop his arguments in the same mode of description in terms of the “inner” and “outer” that has been around for centuries.

But though the use of “inner-outer language” has not been at all abandoned, what we do often see, expressed either explicitly or implicitly, in various places in the literature, is some measure of disquiet and caution over the use of “inner-outer language.” Thus, for example, “internalists” and “externalists” on various issues such as the issue of the fixation of meaning or the issue of what constitutes justification often find it important to specify what they mean by the “internal” and the “external.” For example in his recent book, Warrant: the Current Debate, Alvin Plantinga poses a question concerning the nature of the “internal” that follows from the observation that

The basic internalist idea, of course, is that what determines whether a belief is warranted for a person are factors or states in some sense internal to that person; warrant conferring properties are in some way internal to the subject or cognizer. But in what way?¹²

¹¹ John Searle, *Intentionality: An Essay in the Philosophy of Mind* (New York: Cambridge, 1983), 37.

¹² Alvin Plantinga, *Warrant: The Current Debate* (Oxford University Press, 1993), p.10.

Plantinga then goes on to identify the “internal” as “states or conditions of which the cognizer is or can be aware...states or properties to which he has cognitive or epistemic access.” Correlatively, then, the “external” would consist of states or conditions of which the cognizer cannot be aware or to which he has no epistemic access. More commonly, a number of recent philosophers stipulate that what they mean by the “internal” is that which is mind dependent and what they mean by the “external” is that which is mind independent.

Now, Plantinga’s account of the “internal” and “external” and the more general account that identifies the internal with the mind dependent and the external with the mind independent are cogent insofar as they identify certain features of a subject matter that are relevant to what the proponent wants to say concerning that subject matter. For example, Plantinga is concerned with the issue of what confers warrant upon a belief. The distinction he makes between that to which a subject has and that to which a subject does not have special epistemic access is a distinction that would be quite relevant to this question. It may be quite sufficient for Plantinga’s purposes that he has identified these relevant features of the subject matter.

However, we should not view these kinds of statements as intensional definitions of the terms “internal” and “external.” These statements do not explain the sense of “internal” and “external” that is being employed. Rather, these statements stipulate what their proponents count as belonging to the extension of the terms “the internal” and “the external.” These statements, then, are stipulative, extensional definitions, or material identity statements. In effect, relative to these statements, the terms “internal” and

“external” serve as no more than labels for the objects that the proponent wants to identify. It is fair enough for Plantinga to count as and label as “internal” that to which a subject has epistemic access. However, the question would remain, in what sense is that to which the subject has epistemic access “internal”? What does it mean for something to be “internal” to a subject or to a mind?

Analogously, one may ask of a land owner “What is it that is within the boundaries of your property?” To this the property owner may answer: “Those trees over there, the front of the hill, the near bank of the stream...” This answer, however, does not explain what it means to be something that is within the boundaries of the property; it merely reports what happens to be within the boundaries. But for this latter context, an account of what it means to be something that is within the boundaries would not seem to be either necessary or of any practical urgency. Everyone knows, of course, what it means for one spatial object to be within another. For this is a fundamental spatial relation that we are conditioned to understand on an ongoing daily basis from the time of infancy. A verbal interaction such as that just described would thus seem to presume that the conversants share mastery over this familiar sense. And so if the question of what it means for something to be within the boundaries of the property arose in this context one would most likely view it as peculiar.

The question of what it means for something to be “internal” or “external” to a subject or a mind, however, is quite different. For, as Ryle, Searle and others point out, the sense of this usage of “inner-outer language” remains quite obscure. This obscurity owes to the fact that the nature of mind and its relation to the world remains a rather deep

mystery. One way to avoid this obscurity is simply to stipulate what will count as the “internal” and what will count as the “external.” But this measure simply forestalls the question of what the senses of “internal” and “external” are for this context.

In principle, there is no reason to prohibit such stipulative, extensional definition. In practice, however, there is a hazard that comes along with such definition. For when a word that has been subject to wide usage is used in a new way, it is likely that the word will carry with it in its new usage at least some remnant of its old sense. We have seen that “inner-outer language” has experienced a long and varied history of usage within the context of discourse on mind. Furthermore, although such language is vaguely understood, there seems to be a strong pull to the intuition that such language is appropriate for this context. It is likely, then, that for the context of discourse on mind, “inner-outer language” is laden with some obscurely but intuitively felt sense that would be carried with it into any new use. Thus even though one may stipulate what the words ‘internal’ and ‘external’ shall refer to, it is likely that some of the old sense that we attach to “inner-outer language” will perhaps covertly bias our understanding of that to which we may attach these words. If Ryle is right in his assertion that use of “inner-outer language” carries with it an implicit subscription to Cartesian dualism, it would even follow that contemporary “internalist-externalist” conversations are prone to dualist tendencies.

So, the problems raised by Ryle and others have not been resolved in the contemporary literature, they have been simply avoided. “inner-outer language” thus poses something of an apparent dilemma for contemporary philosophy of mind. If we

deny that the mind-world relation can be described coherently in terms of the inner-outer dichotomy, then we deny what for common sense seems to be in some sense an intuitively obvious and unavoidable fact. On the other hand, if we accept such description we seem to be led to the kinds of problems that philosophers such as Lovejoy, Ryle and Searle have posed—problems concerning the obscurity and possible undesirable implications of the language we use.

The general goal of this dissertation is to alleviate the tension of this dilemma. To do this, I shall address the two main problems raised concerning description of the mind-world relation in terms of the inner-outer dichotomy. These problems are the sources of this dilemma.

The first problem is that “inner-outer language” seems to be vague and obscure metaphorical language. However, a survey of the ways in which we use “inner-outer language” in everyday discourse will show that “inner-outer language” is commonly used in a very wide variety of contexts. And although most of these wide ranging uses resist understanding in terms of “spatiality,” we nevertheless do understand these uses to convey very clear literal senses. When, for example, we say “The piano is in (or out of) tune,” or that “The machine is in (or out of) order,” these expressions usually have a sense that is quite as concrete, quite as accessible as that of an expression that predicates a spatial relation such as ‘The pen is in the drawer.’ Given the wide range and variety of non-spatial “inner-outer expressions” and given the fact that such expressions have pervaded linguistic usage for so long, there seems to be no obvious reason to assume that the senses of “inner-outer expressions” that do not purport to describe some spatial fact

somehow originate in our understanding of spatial relations. This consideration leads to some important questions regarding everyday uses of “inner-outer language” and the use of “inner-outer language” in the context of philosophy of mind as well. Is it really true that all “inner-outer language” is either literally or metaphorically spatial talk? Is it impossible to understand “inner-outer language” in a way that is not somehow essentially tied to spatial language? If not, what bearing would some other way of understanding “inner-outer language” then have on its use in philosophical discourse on the mind-world relation?

I shall address the first of these questions by arguing that it is possible to understand “inner-outer language”, from a wide range of contexts, both spatial and non-spatial, to have a clear literal sense that is logically independent of notions of spatial relations. Specifically, I shall advance an analysis of our ordinary usage of “inner-outer language” that does not construe such language as referring literally to some kind of first-order spatial relation or as a metaphor based on an implicit reference to first-order spatial relations. Rather, the analysis I shall advance will construe “inner-outer language” as referring to a more general second-order relation that applies equally to many different kinds of first-order relational systems. Indeed, one prime example of such a first-order relational system is a system of spatial distance relations, for example the system of spatial relations described by analytic geometry. However, there are many other kinds of relational systems that do not intrinsically involve spatiality, for example: the system of color relations described by color theory, the system of acoustic pitch relations described by a theory of acoustics, or even a system as abstract as a system of meanings as

described by a semantic theory and so on. These other kinds of relational systems are logically independent of spatial relations. And, likewise, on my analysis, inner-outer relations, construed as instances of a second-order relation that applies equally to each of these independent systems, obtain for these systems in a way that is logically independent of talk of spatial relations.

As a result of my analysis of “inner-outer language” as it occurs in a wide range of ordinary discourse, I shall establish a general model for understanding the meaning of “inner-outer language” for these ordinary contexts. Thus, any inner-outer expression that satisfies the criteria set forth by the model will count as having a literal meaning when interpreted in terms of the model and this meaning will, again, be independent of any notion of spatiality. On the other hand when inner-outer expressions fail to satisfy the criteria of the model, then, accordingly, whether such expressions have any literal meaning, or any meaning at all, will remain questionable.

The general analysis of “inner-outer language” will be the subject matter of the larger portion of this essay. Since very little has been said on the nature of “inner-outer language” *per se* in the literature, I shall proceed directly into my own original analysis, beginning in the second part of this chapter. The analysis of the nature of “inner-outer language” will conclude in Chapter V, where I shall inquire into the nature of “inner-outer language” for the context of discourse on mind. I shall conclude there that, contrary to the claims of Ryle and others, we can understand “inner-outer language” to have a literal sense for the context of discourse on mind. The model for “inner-outer language” provides an analysis of this sense.

The second problem mentioned above concerning “inner-outer language”—the problem raised by Ryle—is that using “inner-outer language” to describe the mind-world relation implicitly entails a Cartesian dualist ontology. In the last chapter of this essay, I shall argue to the contrary that understanding the mind-world relation in terms of the inner-outer dichotomy does not require the presupposition of a dualist ontology. Rather, the general model for the inner-outer dichotomy that will have been developed shows that the notion of the inner-outer dichotomy has the potential to be logically coherent with virtually any theoretical standpoint concerning the mind-world relation, so long as the theoretical framework in question satisfies the criteria of the model. In particular, I shall argue that “inner-outer language” is coherent with a dualist theory of mind; but such language is equally coherent with a monistic theory of mind such as functionalism. Since “inner-outer language” can be coherent with a variety of disparate theories of mind, it does not specifically entail a dualist theory of mind.

I believe that Ryle’s motivation for the claim that description of the mind-world relation in terms of the inner-outer dichotomy presupposes a dualist ontology arises from the fact that for many years philosophers have “associated” the notion of the inner-outer dichotomy with the dualist understanding of the mind-world relation. What permits and perhaps perpetuates this associative bond seems to be the fact that both the notion of the inner-outer dichotomy and the nature of the mind-world relation have been so vaguely understood. But a mere association of one theory with another does not constitute a logical relation between the two. Such association does not logically bind one kind of description with another. It may be the case that when we are in the habit of associating

one theory of one kind with another theory of another kind, acceptance of the claims of one theory may “influence” our susceptibility to accept the claims of the associated theory—if only implicitly. But so long as the first theory does not logically entail the second, acceptance of the first does not “require” us to accept the second. The analysis of the notion of the inner-outer dichotomy that I shall advance will reveal that the association between “inner-outer language” and dualism is no more than a mere association. What I shall attempt to do, then, is to disengage the long felt association that has been established between the inner-outer dichotomy and dualist ontology thus allowing the use of “inner-outer language” with equal meaningfulness and coherence in non-dualist theoretical contexts as well. To do so, would resolve the dilemma described above and dissolve the felt tensions that this dilemma produces.

C. PRELIMINARY CONSIDERATIONS FOR THE ANALYSIS

1. A Preliminary Analysis Of The Subject Matter

Terms such as ‘inner’ and ‘outer’ belong to a family of correlative terms of the English language. This family of terms includes: ‘in/out,’ ‘inside/outside,’ ‘interior/exterior,’ ‘input/output’ and other cognates. I shall refer to the terms that belong to this family as “inner-outer language.” I shall call any expression compounded from inner-outer language an “inner-outer expression.” Generally, sentences using inner-outer language seem to involve reference to some kind of relation, the nature of which remains to be analyzed. I shall call such a relation an “inner-outer relation.”

Typical patterns of uses of inner-outer language to make a statement seem to fall into two broad and perhaps overlapping grammatical categories. There may be other more peripheral cases as well, but I shall exclude these from the present analyses. The two broad categories consist of:

A) Expressions describing an action. For example:

Someone at the meeting handed out a bulletin.

The fire went out slowly.

He reeled in the (fishing) lines.

These expressions use words like 'in/out' to complete an action verb: 'to hand out,' 'to go out,' etc. The function of such uses of inner-outer language seems to be to indicate a direction of the action.

B) Expressions describing a state, property or relation. For example:

The book is in the drawer.

Jones is in (political) office.

That coat is out of style.

These expressions use inner-outer language to indicate a state or property of the subject or a relation in which the subject is involved.

I shall exclude the first category from the analysis to be developed, taking as subject matter only expressions of the second category. It may be the case that the two categories are closely related. Plausibly, the analysis of the second category will be extendable, *mutatis mutandis*, to the first. This, however, is matter for further investigation. In any event, my reason for confining my analyses to the second class is

that uses of inner-outer language in philosophical contexts usually fall into (or can be translated into sentences of) the second category. For example the slogan that 'Meanings are in (or alternately, external to) the head,' clearly falls into this second category.

For category B we can again discern two sub-categories. We can distinguish these two categories on the basis of whether or not a particular expression in question has a meaningful correlate. For many sensible inner-outer expressions involving either term of the inner-outer dichotomy (either a word such as 'in,' 'inner,' etc., or its counterpart, 'out' outer,' etc., respectively) substitution by the other term of the dichotomy will yield an equally sensible expression (though not necessarily true). For example, the expression 'The pen is in the drawer' would be a meaningful expression. Likewise, substituting 'out' for 'in' yields an equally sensible expression. For each such expression there is a complimentary expression. Together the two sentences would constitute a symmetrical pair.

There is, however, a sub-category of the symmetrically paired inner-outer expressions. Although the sentences of this sub-category are symmetrically paired, one of the expressions of the pair is subject to additional constraints, such as temporal constraints. For example the expression 'Adrean is in office as mayor' is an acceptable expression. The expression 'Adrean is out of office' is also acceptable, but only after she has been in office. It would not be an acceptable expression before she is in office. Thus, for the pair of expressions formed by using each term of the dichotomy, the 'inner' expression temporally precedes the 'outer' expression.

In contrast to symmetrically paired inner-outer expressions, there also exist a number of expressions whose correlates are not acceptable in use. For example, it would be acceptable to say ‘The decorations are all in blue’ but much less acceptable to say ‘The decorations are all out of blue’ in anything like the sense of the first statement.

But although the correlates of the acceptable expressions of these categories are not always accepted in practice, in principle we can comprehend what they might mean. To be ‘in blue’ means to have color properties of a definite kind. To this color there is a meaningful compliment—all other colors—and an expression using the correlative of ‘in’ (i.e. ‘out’) could plausibly refer to the colors of this compliment if this construction were accepted by convention. It is not conventionally accepted, but the reason that it is not does not seem to be that there is no available sense to such an expression. A more plausible reason might be that a blue color property is a rather definite property whereas a non-blue color property is not definite. A non-blue color property could be indefinitely any other color property. The ‘out’ form of the pair of expressions about color properties may not be used simply because it is not informative. Similarly, with regard to the subclass of temporally ordered symmetric expressions identified above, to say that someone is “in” political office is to say something rather definite about that person. Likewise, to say of a person who once was in office that she is now “out” of political office is again to say something definite, something to the effect that she was once in office, but is no longer in the office that she once held. But it is relatively uninformative to say that someone neither holds nor held an office, for this is not a point that really distinguishes a person, but rather applies trivially to the vast majority of people. It may then be that the

'out' expression is not used in these cases because it is uninformative. But as uninformative as the unacceptable forms might be, they would still have meaning. Again this point is matter for a separate investigation.

In general, for the present case, although one of the correlative pair of inner-outer expressions may lack communicative purpose, or not be conventionally accepted, still it need not lack a potential sense. Its sense would be to indicate the compliment of the meaning of the form that is acceptably used. Thus we may plausibly hold that these irregular forms are derivative of the symmetric forms. That is, the principles of meaning that apply to the symmetric forms would apply to the irregular forms, but there are additional conditions (perhaps pragmatic) that impose further restrictions on one or the other of the otherwise symmetric pair. Determination of these additional conditions would be an extension of the analysis, but one not required for the present purposes. I will generally attempt to avoid such irregular cases. In the event that such a case would be useful, I shall treat it as if its correlate has the sense that it logically does. I will ignore whatever pragmatic constraints may impinge upon such cases, since these will not be highly relevant to the purposes of the analyses. Again these kinds of cases do not seem to arise in the theoretical contexts at which my analyses are ultimately aimed. Theoretical uses of inner-outer expressions seem to be of the symmetric kind.

Finally, we may observe that there is a wide variety of what I shall consider to be idiomatic uses of inner-outer language. For example, expressions such as: 'in order to,' 'case in point,' 'out of the blue,' 'out of consideration for,' 'in the event that' and so on. Again we may observe that such expressions have no symmetrical counterparts.

However, it does not appear that the meaning of such expressions are based directly on what the inner-outer words mean in ordinary contexts. The present examples are rather idiomatic usages. Consequently, I shall not take such usages into consideration here.

2. Methodological Considerations

Focusing our attention now only upon expressions of category B, we may ask, What is the general literal meaning of an inner-outer expression of this type? Even with the restrictions that we have made so far, this is a large and complex question. We may appreciate its complexity by considering the great diversity found among instances of inner-outer expressions of this category. Let us consider, for example, the wide variety of meaning exhibited by the following series of expressions.

The pen is in the drawer

Jones is in office

The satellite is in orbit

The machine is out of order

The data is in the computer

That coat is in style

I'm in a good mood.

One of the first questions that arises for an analysis of such a divergent group of expressions is that motivated by a consideration of Wittgenstein's well known "Language-Game" thesis¹³. According to this thesis, natural language is not ordered by a single coherent set of principles, but consists of a variety of interrelated 'language-

games,' each with its own set of principles some of which overlap with the principles of other "language games." With respect to this thesis, we may begin our analysis by asking whether the diverse range of inner-outer expressions is governed by a single coherent set of principles or whether the various expressions of this range involve a number of distinct "language games."

To amplify this question, let us consider two expressions of the second category that we wish to analyze.

The car is in the garage.

The machine is in order.

With respect to surface grammar, these two sentences are somewhat similar.

With respect to their semantic content, however, they seem to differ sharply on first inspection. The first sentence seems to attribute a spatial relation between two concrete objects referred to by the terms 'car' and 'garage.' In contrast, the prepositional object-word of the second sentence apparently does not refer to an object of any kind, let alone a spatial object. Further, it is unclear what relation, if any, the second sentence might be attributing to the object referred to by the word 'machine' and whatever it is the word 'order' might express.

Though there are some grammatical similarities between these two sentences, consideration of their apparent semantic features suggests that they might each be used within different "language games." However, initial appearances are not always the best

¹³Ludwig Wittgenstein, *Philosophical Investigations*, G.E.M. Anscombe, Rush Rhees, and G.H. von Wright, eds., translated by G.E.M. Anscombe (Oxford, 1953).

indicators of the deeper meaning of an expression. Likewise, appearances do not offer a common standard for comparison of the meanings of these expressions.

In order to compare the meanings of these two kinds of expressions, I shall examine their respective truth-conditions. If the formulation of the truth-conditions of each of these kinds of expressions involves similar elements, similarly structured, then it would seem that, on some level, both kinds of expressions are instances of the same “language game.” If not, we cannot draw this conclusion, and perhaps should best consider them to be instances of different “games.”

I will begin this analyses of truth-conditions of various inner-outer expressions in the next chapter by considering the case of inner-outer expressions that predicate some kind of spatial relation between two spatial objects. This is the most concrete and most accessible case. The formulation of truth-conditions derived from that examination will involve a number of identifiable general principles that such inner-outer expressions entail. In Chapters III and IV, I shall argue that the principles in terms of which the truth-conditions of spatial inner-outer expressions can be formulated are specific instances of principles that are generalizable at a higher level of abstraction. I shall argue that on a more general level these principles extend equally to other cases of inner-outer expressions in question. In these chapters I shall examine in detail a number of these other cases. I shall finally conclude in Chapter V that the general model for truth-conditions of inner-outer expressions that will have been developed plausibly applies to virtually all inner-outer expressions of the category in question. I shall then consider how

this model would apply to uses of inner-outer language that occur in the context of theory of the mind-world relation.

Concerning the model for truth-conditions for inner-outer expressions advanced in this essay, I would like to make two points of clarification. First, the details of the general model of truth-conditions for inner-outer language developed here will be framed in terms of a number of technical concepts. This raises a question concerning the relationship between the technical analysis of inner-outer language advanced and what the competent ordinary language user understands about inner-outer language. To address this question, I would point to an important distinction between being competent in doing something and being able to explain the principles involved in what is done. This distinction is often referred to as the distinction between “knowledge how” and “knowledge that something is the case.” To illustrate this distinction, we may consider the fact that the average person is competently able to walk and perform a wide range of other highly complex physical activities. Few people, however, are able to explain in any great detail the physical and psychological principles involved in the performance of such activities. Chomsky and others make the important point that a young child instinctively learns very quickly how to competently use the native tongue, but presumably no young child could give a detailed explanation of the principles involved.¹⁴ Ryle¹⁵ makes this very distinction in the second chapter of The Concept of Mind, entitled “Knowledge How and Knowledge That.” To illustrate this distinction, he points to the fact that it is possible

¹⁴Chomsky, *Cartesian Linguistics* (New York: Harper & Row, 1966)

¹⁵ Gilbert Ryle, *The Concept of Mind* (Barnes and Noble, 1949), 41

for a person to learn how to play chess by watching the game being played and imitating what he sees without being able to cite in detail the various rules for chess.¹⁶

With regard to inner-outer language then, it would be fair to say that the ordinary language user becomes competent at using such language by training, example and perhaps certain native aptitudes. There is no reason, however, to suppose that the ordinary language user need or should be able to explain the fundamental principles involved in the ability to do so. The analysis of inner-outer language advanced here, however, is an analysis of some of the fundamental principles that are involved in using inner-outer language in everyday and theoretical contexts. It is an analysis of the conditions that would obtain in cases where such language is appropriately used. If the ordinary language user need not be overtly aware of the technical details of these conditions in order to use such language competently, then it would not seem to be a problem for the analysis that it doesn't reflect the ordinary language user's understanding of "inner-outer language." Rather, since presumably inner-outer language remains somewhat obscure to the ordinary language user, it would seem likely that any analysis of its meaning would not reflect the ordinary language users explicit understanding of such language.

The second comment I would like to make concerning the nature of the analysis concerns the distinction between lexical and stipulative definitions. Because of the technical language in which the following analyses of inner-outer language are framed, it may appear to be the case that these analyses constitute stipulative definitions for inner-outer language. However, it is not the nature of the language in terms of which a

definition is framed that determines whether it is a stipulative or lexical definition.

What determines this is the purpose of the definition. A stipulative definition is proactive. Its purpose is, in principle, to set out the conditions for the use of an expression before it is ever used. A lexical definition, however is re-active or responsive. Its purpose is to put into formal terms those conditions that do generally obtain whenever an expression is used, after it has already been in use. The intended purposes of these analyses fall into the latter category. These analyses involve observance and reflection upon a variety of cases of the use of inner-outer language, inductively abstracting a formal description of the most general conditions that obtain for these various uses.

Having made these comments, I shall now proceed in the next chapter to examine the most accessible case of inner-outer language usage—the case of inner-outer expressions that involve predication of a spatial relation.

- CHAPTER II -

ANALYSIS OF INNER-OUTER EXPRESSIONS CONCERNING SPATIAL OBJECTS AND RELATIONS

The first class of expressions examined consists of sentences such as 'The car is in the garage,' 'The pen is in the drawer,' 'The bird is out of its cage,' 'The Joneses are out of town' etc. Sentences such as these seem to ascribe a spatial relation between two physical objects. For example, the expression 'The car is in the garage' seems to tell us something about how one physical object, the car, is spatially related to another physical object, the garage. Thus, it appears that the essential content of such expressions has to do with spatial properties.

A. BASIC COMPONENTS OF MEANING OF SPATIAL INNER-OUTER EXPRESSIONS

In saying something like 'The car is in the garage,' the color or weight or shape of the car denoted in the expression have no direct bearing on what is expressed. What is being said is essentially about the spatial relations between the car and the garage and, in general, no more. These other non-spatial properties may, of course, be of relevance to the general meanings of the terms of the expression that refer to the physical objects in

question, and so may be involved in the general recognition of the objects to which the terms refer. But what the expression states concerns no more than something about the spatial relations between the two objects. Thus, we may simplify the analysis of these expressions by considering the physical objects referred to by these expressions only with respect to their spatial properties, abstracting these from the many other kinds of physical properties such objects might have.

We can describe such abstracted spatial properties with the language of Analytic Geometry. It will, then, further simplify the present analysis to consider simple cases of inner-outer expressions that refer to idealized geometric objects. Thus, I shall focus my considerations on what is entailed in the meaning of expressions that say, for example, that a point S is "inside" or "outside" a geometrical figure such as a square (or an interval on a line, or a solid, such as a cube). After deriving truth-conditions for these kinds of cases, we can then easily extend their truth-conditions to more complex geometric cases by a recursive procedure. Further discussion will show that the analyses of these idealized cases are easily extendable to real concrete objects as well.

On the model of Analytic Geometry, all spatial relations are reducible to constructions upon the fundamental relations of distance and direction. However, as it turns out we can formulate truth-conditions for spatial inner-outer expressions in terms that make explicit reference to distance relations only. Although such truth-conditions will entail implicit reference to direction, for the sake of simplicity I shall put aside further discussion of directional relations for the present, since it will not be necessary to take these relations into consideration.

To denote the distance relation, I will use the convention of describing the distance between two points \mathbf{p}_1 and \mathbf{p}_2 by using the notation $\mathbf{d}(\mathbf{p}_1, \mathbf{p}_2)$, where: \mathbf{p}_1 and \mathbf{p}_2 refer to points of an n -dimensional space that is defined by some n -dimensional reference frame, \mathbf{R}_n . The points \mathbf{p}_1 and \mathbf{p}_2 are identified by an ordered n -tuple (e.g. $\mathbf{p}_1 = (x_1, y_1, \dots)$), where x_1, y_1, \dots identify the projection of \mathbf{p}_1 onto each of the dimensional axes of \mathbf{R}_n ; and \mathbf{d} is a function defined by an operation upon \mathbf{p}_1 and \mathbf{p}_2 that produces the distance between the two. For example (see Figure 1), for a two-dimensional space, let $\mathbf{p}_1 = (1, 2)$ and $\mathbf{p}_2 = (4, 6)$, then $\mathbf{d}(\mathbf{p}_1, \mathbf{p}_2) = \text{square root}[(4-1)^2 + (3-2)^2] = 5$.

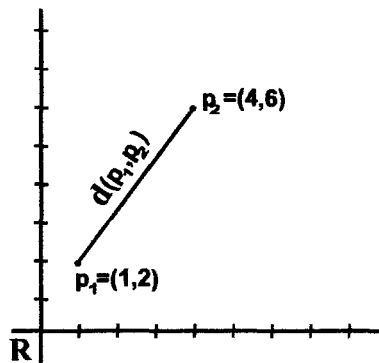


Figure 1

Note that in general, while (x_1, y_1, \dots) is an ordered n -tuple, $(\mathbf{p}_1, \mathbf{p}_2)$ is not. For $\mathbf{d}(\mathbf{p}_1, \mathbf{p}_2) = \mathbf{d}(\mathbf{p}_2, \mathbf{p}_1)$, which expresses the fact that the distance between \mathbf{p}_1 and \mathbf{p}_2 is the same regardless of which point is taken first.

As is clear from the above analysis, any description of a distance relation necessarily presupposes some frame of reference that provides both a basis of orientation for the specification of a directional relation, and also, more relevant to the present

analysis, standard units of measure.¹⁷ That it is necessary for the reference frame to provide standard units of measure is shown by the fact that in the absence of some standard units of measurement established by the reference frame, we would not know what a distance representation such as “3 units” would mean. The representation ‘3 units’ may be used to describe any possible distance, since for any possible distance, standard units may be selected according to which ‘3 units’ describes just that distance. The analysis of spatial relations into distance (and directional relations), then, also requires the presupposition of a frame of reference which grounds the meaning of any distance (or directional) description by providing directional orientation and units of distance measure that define such description.

A reference frame, say R_n (consisting of an original reference point, an original unit of distance and an original direction), is the essential basis for all description of all spatial properties and relations that are relevant to R_n . Thus, a given R_n provides a unified system of objects whose properties and the relations that obtain among them are all defined in reference to R_n . Let us call such a system of spatial objects (points) and relations between points described on the basis of some reference frame R_n , a “spatial relational system.”

¹⁷ The fact that description of distances entails reference to a reference frame, and the fact that a reference frame entails both distance and directional orientation provide the reason that we can formulate truth-conditions for spatial inner-outer expressions without making explicit reference to direction. Since in describing distance relations, we refer to the reference frame, we do make implicit reference to direction as well. Therefore, truth-conditions for spatial inner-outer relations framed in distance relations only, do entail an implicit directional component, which can be specified by making reference to the reference frame explicit.

For a given spatial relational system, all the objects of that system, are spatially related to each other. But not all such relations are inner-outer relations. The inner-outer relation is a unique kind of spatial relation that obviously not all spatially related objects share (as opposed to, for example, the more fundamental distance relation, which all spatial objects do share). For example in Figure 2, the point **S** is spatially, and thus distance-related, to the line \mathcal{L} , but, intuitively, we would not normally characterize this relation by saying that **S** is either “inside” or “outside” of \mathcal{L} .

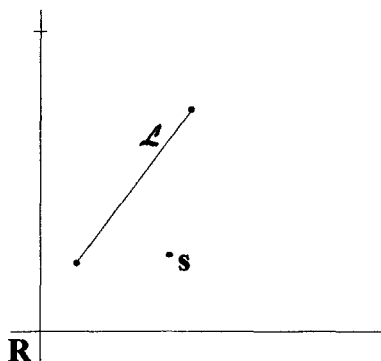


Figure 2

There are, then, specific conditions placed on the kind of distance relations **S** has to another object of the spatial relational system, according to which we would say that **S** is inside or outside of that object. An analysis of the inner-outer relation, then, would involve stating the necessary and sufficient conditions applicable to the distance relations between one object, call it **S**, and another object, call it **P**, of a given spatial relational

system, according to which we would say that **S** is inside or outside of **P** whenever the spatial relations between **S** and **P** satisfy those conditions.

We can refine the last point further. As Figure 2 above illustrates, in a two-dimensional context we would not normally say that a point **S** could be inside or outside a figure such as a line segment. Therefore, not just any figure (object) can serve as the object denoted by the partition term. The kind of object (**P**) that **S** could be inside or outside of is a particular kind of object. As part of the necessary and sufficient conditions for an inner-outer expression, then, it would be necessary to specify the kinds of properties that an appropriate object of the partition term should have. We would, of course, specify these properties in terms of the distance relations that obtain between the parts of the object **P**. However, a specification of such conditions would require a great deal of detail that would not contribute directly to our general goals here, and are not really necessary. For the purposes of this analysis I shall merely stipulate certain kinds of objects that our intuitions tell us would obviously serve as the kinds of objects needed. Although this aspect of the relation should be noted, I will not address it here.

Along the same lines, a necessary requirement seems to be that the conditions placed on the distance relations between **S** and **P** take into consideration all the various distance relations **S** has to all of the points that **P** consists of. The inner-outer relation is between **S** and **P** as a whole. This is shown by the following consideration. Suppose that for a given **S** and a given **P** only those relations between **S** and a portion of **P** were

specified, as in Figure 3 where the small segment would consist of no more than a line or curve segment. The inner-outer relation, however, does not apply between **S** and a line segment.

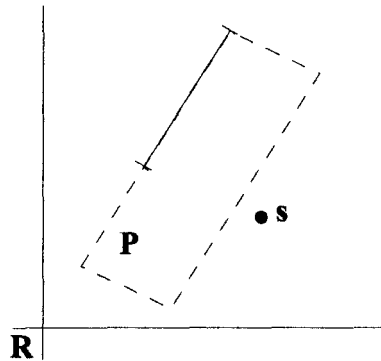


Figure 3

It appears then, that we need to establish the conditions that apply to the distance relations between **S** and all the points on **P** to determine that the relation between **S** and **P** is an inner-outer relation.

Generalizing the above observations, then, it appears that the criteria for determining that **S** is inside (or outside) **P** would seem to be divided into two parts:

- 1) conditions that specify the kinds of distance relations that must obtain between the constituent points of **P** (that is, conditions that define what kind of object **P** must be in order to be something that **S** could be inside) and, 2) conditions that specify the kinds of distance relations that must obtain between **S** and all of the points of **P** as a whole. In the following analysis, we shall be concerned primarily with the latter criteria.

I shall now turn to the analyses of several specific cases for which it is intuitively apparent that an object **S** is in(side) or out(side) of another object **P**. These analyses will result in formulations of the necessary and sufficient conditions (truth-conditions) that determine whether or not a given spatial relation is an inner or outer relation. These truth-conditions will then constitute at least one possible analysis of inner-outer expressions.

B. TRUTH-CONDITIONS FOR SPATIAL INNER-OUTER EXPRESSIONS

I shall begin by examining two particular cases in detail that are illustrated in Figure 4.

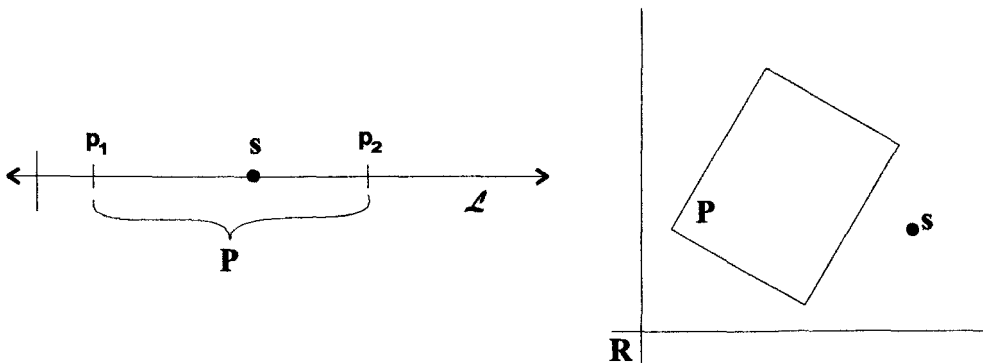


Figure 4

The first case is that of a one-dimensional spatial relational system \mathbf{R}_1 . This one-dimensional system will consist of a line \mathcal{L} . With respect to this relational system, I shall

consider the truth-conditions entailed in saying that a point **S** on the line is “inside” or “outside” an interval, **P** of the line \mathcal{L} , that extends between the points p_1 and p_2 . The second case will be that of a two-dimensional spatial relational system that consists of an Euclidean plane. For this spatial relational system, reference frame \mathbf{R}_2 will ground the spatial relations between its points. For this case I shall analyze the truth-conditions involved in saying that a point **S** of the plane is inside or outside of a two-dimensional region, **P** (a square), also on the plane. The second case is an extension of the first into two dimensions.

After analyzing these two cases, I shall then show that the results of these analyses can be recursively extended further to apply to geometrical objects of three- or more dimensions. Thus my strategy in analyzing inner-outer expressions ascribing these kinds of spatial relations will be inductive in nature, beginning with the analysis of conditions involved in the simplest, one-dimensional case and then extending these same conditions to the two-dimensional case and then ultimately to virtually all cases of the class of inner-outer expressions under present consideration. From the examination of each of these individual cases, I will then formulate the general components of a set of general truth-conditions that applies to all spatial cases. Later chapters further generalize the truth-conditions for the spatial case to cases that involve other kinds of spatial relational systems.

1. A Point Inside/Outside an Interval On a One-Dimensional Line

For this case, I shall stipulate a spatial relational system consisting of all of the interrelated points on a one-dimensional line, \mathcal{L} . To describe this system I shall employ an object language whose extensional range consists only of points on \mathcal{L} . The language, therefore, cannot refer to points that are not on \mathcal{L} . The fact that we as three-dimensional beings can talk about points that are not on \mathcal{L} shows that we utilize a spatial language whose extensional range includes points of a three-dimensional spatial relational system. The fact that we do, however, does not prohibit us from artificially constructing a language whose extensional range is restricted exclusively to the points on \mathcal{L} . Since the domain for which we understand the expression to be meaningful (i.e. the universe of discourse) is the line \mathcal{L} , both the point \mathbf{S} and the interval \mathbf{P} (i.e. $[\mathbf{p}_1, \mathbf{p}_2]$) must be parts of \mathcal{L} . Thus, for an inner-outer expression of the specified object language such as 'S is in/out of P,' \mathbf{S} refers to some point on \mathcal{L} and \mathbf{P} refers to an interval $[\mathbf{p}_1, \mathbf{p}_2]$ on \mathcal{L} . Figure 5 illustrates what expressions such as 'S is inside of P' and 'S is outside of P' might refer to for this context.

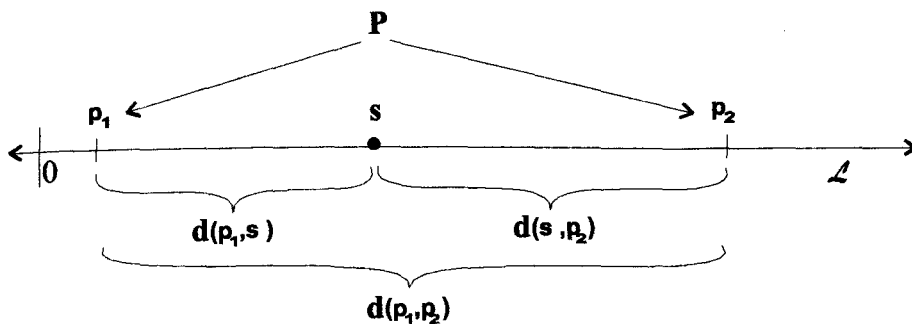


Figure 5

The endpoints of the interval, p_1 and p_2 , may be any two points on \mathcal{L} . As a limiting case we may also allow the possibility that $p_1 = p_2$.

Alternatively, it would be superfluous to talk about a simple \mathbf{P} identified by three or more points, since it would always do to say such \mathbf{P} is identified by the two points (out of the three or more points) that are furthest in distance from each other. A complex \mathbf{P} might consist of two or more disjointed intervals. However, presently, we may limit our considerations to the simple, two point, one interval case, and deal with the complex case as a construction (a disjunction) of the simple cases.

Now, on the basis of these foregoing considerations, we may state truth-conditions for the statements ' \mathbf{S} is in(side) \mathbf{P} ' and ' \mathbf{S} is out(side) \mathbf{P} ' as follows.

(A) ' \mathbf{S} is in(side) \mathbf{P} ' is true if and only if

$$d(p_1, s) + d(s, p_2) = d(p_1, p_2)$$

(B) ' \mathbf{S} is out(side) \mathbf{P} ' is true if and only if

$$d(p_1, S) + d(S, p_2) > d(p_1, p_2)$$

Where d is the distance function as defined earlier.

These conditions are clearly sufficient since it is intuitively obvious that for (A) all of the points for which the condition applies are just those points that we call the interior of P , while for (B) all the points for which the condition applies are just those that we intuitively call the exterior of P .

Likewise, these conditions are necessary. However, more needs to be said on this point. For, it is possible to provide truth-conditions formulated in some other way. For example we could use the directional component of spatial relations and say that a point S is inside an interval P with endpoints p_1 and p_2 if and only if S is to the right of p_1 and S is to the left of p_2 and a point S is outside of an interval P with endpoints p_1 and p_2 if and only if either S is to the right of both p_1 and p_2 or S is to the left of both p_1 and p_2 . However, these conditions are at least materially equivalent to the truth-conditions stated above. Thus, the original truth-conditions could be interchangeable for the latter for the present context. Moreover, the same would be true of any formulation of truth-conditions. So it is necessary that some truth-conditions can be formulated in some way (in order for the expression to have cognitive meaning). But any formulation of conditions would be materially equivalent to (A) and (B) above. It follows that (A) and (B) are in this sense necessary.

Now, we may observe that truth-condition (A) captures our intuitions about insidedness insofar as these intuitions are related to our intuitions about enclosure and surroundedness. The ideas of enclosure and surroundedness imply that so long as an object is enclosed it does not get increasingly further away from the enclosure; it does not “escape” the enclosure. Rather, as the enclosed subject moves away from one part of the enclosure, it approaches another part of it. Thus the distance relations between **S** and **P** as a whole remain constant—in balance. This seems to be an essential feature of our intuition of something being inside of something else. If this condition did not hold, if the subject could move increasingly further away from **P**, then it would not seem to be contained or enclosed by **P** and would then say that the object was external to **P**.

Condition (B) which says that the combined distance between **S** and **p₁** and **p₂** may increase without limit, however, does convey this sense of “external.” For a point **S** that satisfies (A), then, there is a constant relation of immediacy between **S** and **P**. If **S** does not satisfy (A), then it would satisfy (B) in which case the relation between **S** and **P** is not subject to a constant degree of immediacy.

We may observe further that for a one-dimensional spatial relational system such as the present example illustrates, it is clear that given a partition (the endpoints of an interval) on that system, each point of the system satisfies at least one of the alternative criteria, (A) or (B), formulated above. For, every point on \mathcal{L} would have some distance relation to both **p₁** and **p₂**, and these distance relations would satisfy one or the other of

the two criteria. Correspondingly we would intuitively say that every point on \mathcal{L} is either inside or outside of \mathbf{P} . But no point on \mathcal{L} can satisfy both criteria simultaneously, since a number cannot be both greater than and equal to another number. And this is again consistent with our intuition that something can never be both spatially inside and spatially outside of the same object at one time.

Thus, \mathbf{P} divides the line \mathcal{L} , the universe of discourse over which \mathbf{P} exists, into two mutually exclusive subsets that exhaust the universe: those points which satisfy the criterion (A) and those points that satisfy the criterion (B). It is this property of the object referred to by the partition term that motivates my use of the term ‘partition term.’ In general, the partition term refers to any values of the objects of a spatial relational system that divide or “partition” the objects of the system (in the present case the points of the line \mathcal{L}) into two (and only two) mutually exclusive regions or sets of objects: the region that satisfies the criterion for an object to be inside the partition, and the region that satisfies the criterion for an object to be outside of the partition. The object denoted by the partition term in the present case is the pair of endpoints that delimit the interval. In the case of a two-dimensional figure on a plane, a partition term will refer to the perimeter of the figure. It will refer to the surface of a three-dimensional region. In general, the partition will refer to any values of any object of a spatial relational system that delimit a “region” of the system. We shall see in subsequent analyses that in all inner-outer expressions (even in non-spatial cases) the partition term performs a function analogous to the function performed in the present example.

Another immediate observation we can make concerning the above truth-conditions is the following. Since the truth-conditions of the expressions predicating an inner-outer relation in question reduce the inner-outer predicate to simpler terms (i.e., the terms of distance and the ordering relation), the inner-outer predicate is, then, complex. I will, however, delay further discussion of the nature of the complex meaning of the inner-outer predicate until we have extended the present kind of analysis to other more involved cases of objects of more than one dimension. Doing this will then allow us to generalize upon the complex structure of all inner-outer expressions that express a spatial relationship. Let us continue now with further analyses of the more involved cases.

2. A Point Inside/Outside of a Geometric Figure in 2-Dimensions

The second case to be considered is the case of a point **S** being inside or outside of a partition **P**, where **P** is a simple two-dimensional figure, specifically a square on a plane, as Figure 6 illustrates.

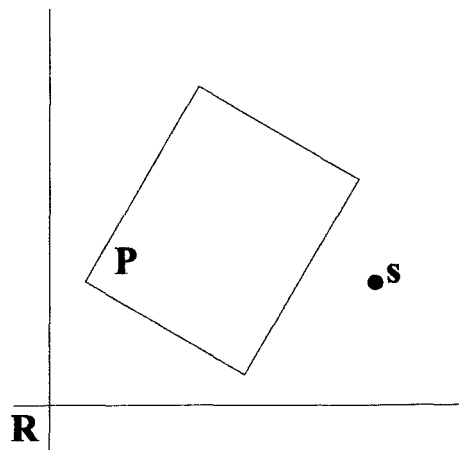


Figure 6

I shall not consider exhaustively the conditions that such a figure must satisfy in order to be the kind of object that something can be inside of for the two-dimensional case, since such considerations would detain us unnecessarily. I shall base the stipulation that **P** will refer to a square on the grounds that it is intuitively obvious that a square would be an appropriate object for the present case.

However, we may observe that a square does in general satisfy the following property. As Figure 7 illustrates, generally it is the case that for any other line \mathcal{L} that passes through a point **S** on a plane and that intersects **P** at at least one point, that same line intersects **P** at at most two points. As a point of further detail, we may also observe that, for some **S**s, there will be exactly two such lines that will intersect **P** at only one point, and all other lines will intersect **P** at exactly two points. (See Figure7.)

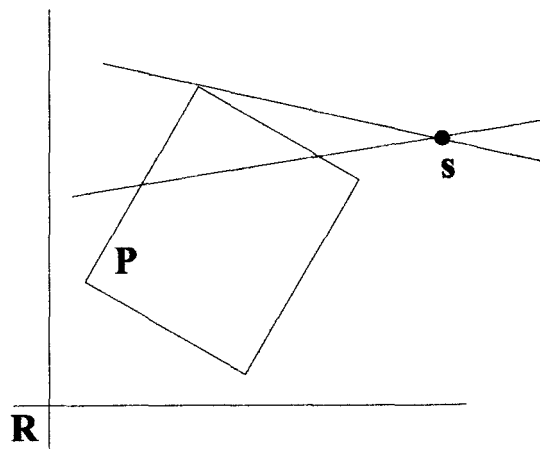


Figure 7

In general, then, we can say that for any line \mathcal{L} that passes through point \mathbf{S} and intersects partition \mathbf{P} , that line will intersect \mathbf{P} at two points, \mathbf{p}_1 and \mathbf{p}_2 . We can consider the case in which \mathcal{L} intersects \mathbf{P} at only one point a special case where $\mathbf{p}_1 = \mathbf{p}_2$.

Now, for a point \mathbf{S} on the plane, let us consider any line \mathcal{L} that passes through \mathbf{S} on the plane and intersects \mathbf{P} (generally at two points \mathbf{p}_1 and \mathbf{p}_2). We can say the following about the distance relations between \mathbf{S} , \mathbf{p}_1 and \mathbf{p}_2 . When we intuitively consider \mathbf{S} to be inside of \mathbf{P} , then the sum of the distance between \mathbf{S} and each of \mathbf{p}_1 and \mathbf{p}_2 is always equal to the distance between \mathbf{p}_1 and \mathbf{p}_2 . This is true regardless of the choice of \mathbf{S} or \mathcal{L} (as long as \mathbf{S} is inside of \mathbf{P}). On the other hand in the case that we would intuitively consider \mathbf{S} to be outside of \mathbf{P} , then the sum of the distances between \mathbf{S} and each of \mathbf{p}_1 and \mathbf{p}_2 is always greater than the distance between \mathbf{p}_1 and \mathbf{p}_2 , regardless of our choice of \mathbf{S} (as long as \mathbf{S} is outside of \mathbf{P}) or \mathcal{L} . Figure 8 illustrates these relations.

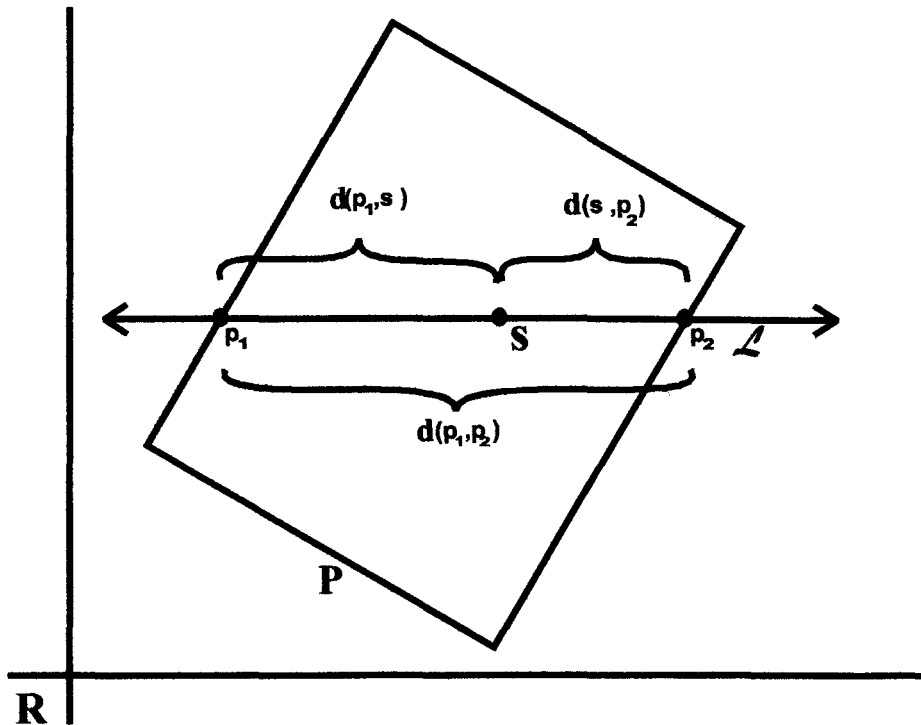


Figure 8

Thus, we may formulate the truth-conditions for a point **S** being inside/outside of **P** in the following way:

For a point **S** and a square **P** on a plane \mathcal{P} , where the spatial relations between **S** and **P** are defined with respect to a reference frame R_2

(A) '**S** is in(side) **P**' is true if and only if:

For any line \mathcal{L} on \mathcal{P} passing through **S** and intersecting **P** at p_1 and p_2

$$d(p_1, s) + d(s, p_2) = d(p_1, p_2).$$

(B) 'S is out(side) P' is true if and only if:

For any line \mathcal{L} on \mathcal{P} passing through S and intersecting P at p_1 and p_2

$$d(p_1, S) + d(S, p_2) > d(p_1, p_2).$$

These criteria are both necessary and sufficient for reasons similar to those for the one-dimensional case. Since they are defined for any line \mathcal{L} that passes through S and intersects P, they specify S's distance relations to the whole of P.

Again, these criteria reflect the same kinds of intuitions about the inner-outer relation that we observed in the first case. When something is inside of a partition P, as it moves away from one point on the partition, it simultaneously moves toward another point on P in the opposite direction of the point it is moving away from. Thus, there is always a balance between the two distances and the sum of the two distances remains constant. Otherwise, when something is outside of a partition P, then, as it moves away from a point on the partition, it simultaneously also moves away from the other point on the partition opposite of the first point with respect to the direction of movement from the partition. If the outside space is unbounded, S's distance from the points on the partition may increase indefinitely. But these distances can never be less than or equal to the distance from the first point on the partition to the second until S is at least a point on the partition (when it would be considered to be inside the partition) or is properly inside the partition.

3. Complex Cases of Two-Dimensional Partitions

So far, we have formulated truth-conditions for determining whether **S** is inside or outside **P** when **P** is a simple partition, a square. This stipulated partition has the property noted above, that any line that intersects it does so at no more than two points. Without this property, we could not formulate the truth-conditions that we did above. For if the line intersected the partition at more than two points there would be any number of additional distances between the point **S** and those points and this would result in failure of the criteria for some cases. Obviously there are many other kinds of two-dimensional figures that could serve as partitions but do not have this property of squares. There are many two-dimensional figures for which a line might intersect the figure at three, four, or any number of points. For example, a more complex partition might look like this (See Figure 9):

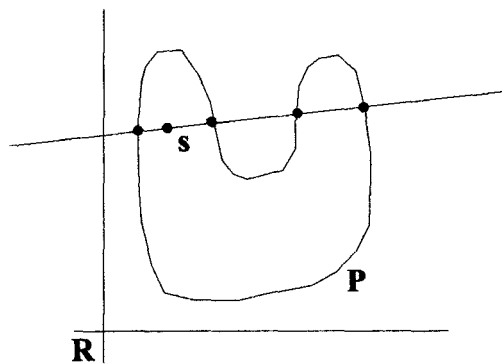


Figure 9

For this kind of case, then, it would be impossible to apply the criteria developed earlier. We need, then, to establish a method of applying the criteria developed thus far to other complex cases. The following construction will satisfy this need.

For cases involving more complex partitions (e.g. irregular areas and multi-dimensional spaces) we need only divide up the complex partition into a finite number of simple spaces (such as squares) as in Figure 10.

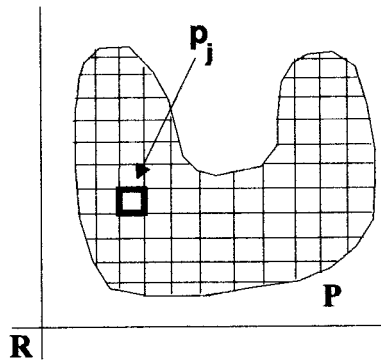


Figure 10

Call each of these simple constituent partitions P_j , where $1 \leq j \leq n$, n being the total number of simple partitions. We can then define the criteria for being inside or outside of P as follows:

A point S is inside of P iff for some P_j , S is inside of P_j (where the criterion for being inside of P_j is defined above).

A point S is outside of P iff for all P_j , S is outside of P_j (where the criterion for being outside of P_j is defined above)¹⁸.

¹⁸ Note that although these criteria for being inside or outside of P are defined in terms of being inside or outside of a P_j , this is not a circular definition, but rather a recursive definition where being inside or outside of P_j is already defined non-circularly.

Again, these criteria for being inside or outside a complex partition are ultimately based only on distance relations between the point \mathbf{S} and all of the points of \mathbf{P}_j .

Having established the criteria for a particular point being inside or outside a partition \mathbf{P} of any complexity, we can now define the space that is inside \mathbf{P} (the interior of \mathbf{P}) as the locus of all points “inside of” \mathbf{P} . We can further define the occupation of that space by an object as follows:

A spatial object \mathbf{S} occupies a space inside \mathbf{P} iff all the points in the space occupied by \mathbf{S} are coextensive with points that are part of the space inside \mathbf{P} .

We now have criteria for determining a space that is interior to any partition \mathbf{P} of any complexity in two-dimensions, and for occupation of that space by an object that is more complex than a single point.

Again we may observe that with respect to \mathbf{P} the established criteria divide the range of all points in \mathbf{R} into two subsets that are mutually exclusive and totally exhaustive of the universe of discourse. Again, we call \mathbf{P} the partition term since the object that it denotes ‘partitions’ the space of which it is a part into these two parts.

4. Irregular Cases: Unclosed Partitions

We should also observe briefly that while the above criteria are applicable to any closed, continuous two-dimensional figure, it commonly occurs that we use inner-outer

expressions to describe the relationship between a point (or a larger spatial object) and a portion of a closed figure. (Figure 11)

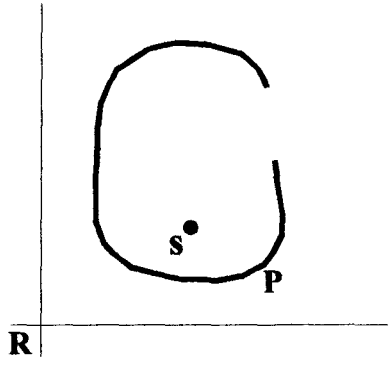


Figure 11

With regard to this kind of case we might suppose that the criteria established so far would apply if the discontinuities were completed by imagining a line constructed between points where discontinuity occurs, thus yielding a closed figure, as in Figure 12.

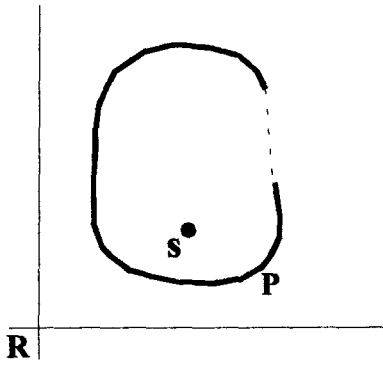


Figure 12

The formulations developed above would apply to such constructed closed figures and such a construction would seem to satisfy our intuitions about how to determine when a point **S** is inside or outside of such a figure. Further, it would seem very plausible to say that we do in fact make such constructions imaginatively for concrete situations analogous to these in order to evaluate the meaningfulness of inner-outer expressions applicable to them.

5. Extending the Analysis to 3-Dimensional Cases

Having looked at these one- and two-dimensional cases in some detail, we may consider only briefly the three-dimensional case. It is apparent that for the three-dimensional case we could establish recursive criteria based on the criteria for the one- and two-dimensional cases. We could do this by extending the simple case of a square to a cube. Given any point **S** in the same spatial relational system as the cube, we could then construct a number of planes that would intersect both **S** and the cube. The intersection of each plane with the cube would consist of a locus of points that form a rhomboid. The truth-conditions for a point being “inside” or “outside” a rhomboid could then be applied to the distance relations between **S** and the resulting rhomboid. If for any intersecting plane, the application of the truth-conditions under discussion show that **S** is inside the rhomboid, then **S** is inside the cube in question. Similar results apply to the case where **S** is “outside” the cube. These criteria could be extended to any more

complex three-dimensional solid by methods similar to those for dealing with complex two-dimensional figures.

Furthermore, although cases of figures of more than three-dimensions usually occur only in theoretical contexts, we could continue to recursively extend the analyses that have been developed so far to any number of dimensions. Such cases go beyond the present need for the spatial context of inner-outer expressions. However, we might note here that some non-spatial relational systems that are entailed by non-spatial inner-outer expressions will have a structure that is analogous (isomorphic to) spaces of any number of dimensions. More will be said of these relational systems later.

C. GENERAL OBSERVATIONS ON THE ANALYSIS OF SPATIAL INNER-OUTER EXPRESSIONS

In the foregoing discussion, we have analyzed a number of cases of inner-outer expressions that ascribe some kind of spatial relation between two spatial objects. We began by considering idealized simple geometric objects of one-, two- and three-dimensional spaces. We also considered geometric objects that were of greater complexity or irregularity. The truth-conditions for the most basic case—a point inside or outside an interval on a line—were framed in terms of distance relations between the point under consideration and the endpoints of the interval. Truth-conditions for a point being inside a square are then recursively framed in terms of the lines that pass through the point and the square. Truth-conditions for a point being inside or outside a cube were framed in terms of distances between the point and the rhomboids that result from the

intersection of the point and cube by a plane and so on. Truth-conditions for cases involving more complex figures were then framed as constructions built upon the more basic cases. Finally, for the case of concrete physical objects, truth-conditions would be framed in terms of principles based on the abstract geometric case. Since our analyses of all these various cases have this recursive nature, we can reasonably conclude that this class of expressions behave as a single system based on a unified set of principles. Let us summarize the principles involved in this system.

1) Inner-outer expressions of the category under consideration generally ascribe some spatial relation between two spatially describable objects.

2) The kinds of spatial descriptions involved in such ascriptions are analyzable into constructions upon the basic spatial relation of distance.

3) Descriptions in terms of distance relations between two spatial objects are only meaningful relative to a system of interrelated spatial objects of which the objects so described are parts. Such a spatial system is defined by a reference frame which grounds all spatial relations and in turn entails the system of spatial relations. It is because descriptions of distance are meaningful only relative to such a system that our intuitions tell us that an expression such as ‘That rock is twelve feet from a B♭ (a musical note)’ is senseless. It is senseless because while the rock is an object of a spatially ordered universe, the musical note B♭ is not. This being the case, it would then be impossible for the distance relation to exist between a rock and a B♭.

4) A system of distance relations is ordered. That is, between any two distance relations, there is an ordering relation. For example, the distance relation “twelve feet” is

“greater than” the distance relation “eight feet.” And likewise, a unique ordering would obtain for any series of distance relations. Thus the following distances are listed in ascending order correctly: “1ft.,” “1.5ft.,” “3ft.,” “6.2ft.,” “8.4ft.”..

5) Such ordering relations are second-order since they are relations that obtain between first-order relations.

6) For the spatial context, we can formulate truth-conditions for inner-outer expressions in terms of ordering relations that apply to various distance relations between the objects of the expression. For example, it applies in the one-dimensional case “s is ‘inside of’ an interval P” if and only if the sum of the distances between s and the two endpoints of the interval are equal to the distance between the endpoints.

What the foregoing analyses have shown, then, is that the two-place relational predicates ‘is in’ and ‘is out of’ are complex. According to our analyses, these predicates are constructions based on the more basic predication of a distance relation. From the simple predication of distance relation, the complex predications ‘is in’ or ‘is out of’ are compounded by adding to the distance predicates a further predication of a ‘>’ or ‘=’ relation. When analyzed in this way, the ‘is in’ and ‘is out’ predicates are second order relational predicates that describe first order predications of distance between various spatial objects. The inner-outer predicate may then range in complexity depending upon the complexity of the objects of the two terms that it relates.

The next chapter discusses how these principles are generalizable to other cases of inner-outer expressions that do not involve predication of spatial relations.

**- CHAPTER III -
ANALYSIS OF NON-SPATIAL
INNER-OUTER EXPRESSIONS**

In contrast to spatial inner-outer expressions examined in the last chapter, there is a wide variety of inner-outer expressions that do not express a spatial relation between two concrete, spatial objects. Nor do they seem to explicitly express any kind of relation between two concrete objects on first inspection. For example the subjects of the sentences 'That coat is in fashion' or 'Jones is in (political) office,' refer to concrete individuals. But the sentences do not appear to assert a relationship between the concrete individuals referred to and other concrete objects. Rather, they seem to predicate some apparently non-relational property of their subjects. This raises the question of how the two kinds of inner-outer expressions (spatial and non-spatial) might be related, if at all. In this chapter I shall argue that the principles involved in the analysis of spatial inner-outer expressions are generalizable to a higher level of abstraction, and further, that these more generalized principles apply to the non-spatial inner-outer expressions in a way that is analogous to their application in the spatial context.

According to the summary of principles with which the last chapter ended, the basis for analyzing the kind of relation predicated by a spatial inner-outer expression is a spatial relational system, defined by some reference frame, and of which the objects

referred to by the expression are parts. Such a system is the basis for description of distance relations. For such a system, the distance relations that obtain between its parts are all ordered. Consequently the system is also a basis for a second-order ordering relation that obtains between pairs of first-order distance relations. Given the spatial relational system, we can specify the truth-conditions for spatial inner-outer expressions in terms of the second-order ordering relation that obtains for the relations between the objects referred to by the expression. Thus, for the context of spatiality, we may understand inner-outer relations as a particular kind of second order ordering-relation.

But spatial relational systems are not the only kind of relational system. Rather, there are numerous other such systems based on other kinds of relations. Similarly, I shall argue, such alternate, non-spatial relational systems provide the bases for analysis of other kinds of non-spatial, inner-outer expressions. Thus, while non-spatial inner-outer expressions may sometimes appear to predicate a non-relational property of their subjects (e.g. 'Jones is in office'), in fact, they merely appear to do so. In the closer analysis that shall follow, I shall show that in actuality, what such expressions really predicate is indeed a relation that is similar in structure to the kind of relation predicated for the spatial context. Since I claim that non-spatial, inner-outer expressions are grounded in non-spatial relational systems, the natural starting point of the proposed analysis is to discuss the nature of such non-spatial systems.

A. NON-SPATIAL RELATIONAL SYSTEMS

Consider the example of a relational system whose objects consist of various acoustic pitch values and the pitch relations that obtain between these values. Such pitch relations obtain between any two sound tokens of a simple, identifiable pitch, just as various spatial relations obtain between any two spatial objects. A clear illustration of such pitch relations is the case of the pitch relations that obtain between the sound tokens produced by the various keys of a piano keyboard. Together, the various possible pitch relations between the sound tokens produced by the various keys of the piano constitute part of an ordered system of acoustic pitch relations. To better understand the nature of these pitch relations, let us consider the physical basis for the phenomenon of pitch.

Theoretically the phenomenon of pitch is caused by vibrations through a medium that impinge on the sense organ. These vibrations occur at various frequencies. The frequency of a sound is the number of vibrations that occur over a given unit of time. For example the standard basic frequency of the sound produced by the key of a piano known as 'A above middle C' is 440 cycles (vibrations) per second. The difference between two pitches is due to the fact that they are caused by vibrations at different frequencies. Sounds of lesser frequency sound different than sounds of greater frequency. Generally a sound of "base" pitch is one whose frequency is lower than the frequency of a middle C on a piano, and a sound of "treble" pitch is one whose frequency is higher than that of a middle C.

Thus, we can define each unique pitch value by reference to numerical values—the number of cycles over a unit of time that causes the particular pitch value.

Consequently, given a particular unit of time, each real number over a continuous range of real numbers (that will be delimited by various physical limitations) will define a unique pitch value and vice versa. This being the case, the various pitch values possible constitute an ordered continuum ranging between some upper and lower limits. The keys of a piano are arranged to reflect this ordering. A piano keyboard consists of a succession of keys, and correlatively, the pitches of the sound tokens produced by this sequence of keys likewise constitute an ordered sequence of successive values. One hears this ordered sequence when listening to a scale being played on the piano.

Now, insofar as all acoustic pitches are just that—pitches—they all share a common phenomenal character—the character of pitch—as opposed to the phenomenal character of say color or temperature. Given two sound tokens of different pitch value we can say that even though they differ in their pitch values, they do, nevertheless share in common the general character of pitch. How, they differ, as two tokens of pitch is due to the degree to which one deviates from the other with respect to the common phenomenal character of pitch. Correlatively, we can make an analogical claim about the physical vibrations that we understand are the underlying cause of the phenomenon of sound. Given two tokens of vibrations of different frequency, we can say that the two vibrations are identical insofar as they are both vibrations. How they differ as vibrations is due to the degree to which one deviates from the other with respect to frequency. If the two vibrations are different, then this difference can only be due to the difference in frequency between them. The frequency of one must be either greater or lesser than the frequency of the other.

The fact that two vibrations differ from each other only with respect to their differing frequencies provides a basis for defining a system of relations that obtain between vibrations of various frequencies. A particular relation between two vibrations would be defined in terms of the specific difference between their respective frequencies. Thus the relation between a vibration with a frequency of, say, 250 cycles per second and a vibration with a frequency of, say, 320 cycles per second would be defined in terms of the difference between 320 and 250. This difference would be distinguished from another difference, say the difference between a vibration of 250 cycles per second and 440 cycles per second. Correlatively the two differences here would each define a unique relation distinguishable from the other. In general, a vibrational relation obtains between the vibration of 250 cycles per second and each vibration of any other frequency. And what defines each relation is no more than the specific difference in frequency between the vibration of 250 cycles per second and the vibration it is related to.

Since the phenomenon of pitch is caused by vibrations in a medium, and since there is an isomorphic correspondence between each vibration of a particular frequency and some unique pitch caused by the vibration of that frequency, it follows that there will be an isomorphism between pitch relations and vibration (frequency) relations. That is, differences between pitches correspond to differences between vibrations (i.e. their frequencies). Since specific differences between frequencies define specific frequency relations, the corresponding differences between pitches define specific pitch relations.

There is, however, a great difference between talk of pitches and talk of vibrations. While we take the former to be mere phenomenal entities, we theoretically

take the latter to be physical events. The frequency of a vibration is a natural property that we can measure with respect to some system of measurement. We can measure the frequency of a vibration, and given this measure, we can define a specific frequency in terms of the numerical value of its measurement. We can define specific vibrations as, for example, a vibration of 220 cycles per second, 280 cycles per second, 440 cycles per second and so on. In contrast, we cannot measure the phenomenal characteristics of pitches (taken as phenomena versus vibrations) in this way. We can, of course, measure the vibrations that cause them.

Since we cannot attach measurements to pitch phenomena, in speaking of differences between pitches *per se* (which define pitch relations) we cannot directly express such differences in terms of differences between the numerical values naturally fixed by the frequencies of vibrations. Moreover, we cannot make the correlation between pitches and vibrations that would enable us to define pitch relations without some kind of scientific theory that explains the relation between pitches and vibrations and the means to make the required measurements. Commonly, one does not have such a theory and the means to make such measurements available to them. It is more likely that one's understanding of pitches is based solely on the appearances of pitch phenomena. Nevertheless, one does have some at least tacit understanding of pitch phenomena and the relations that hold between them. Thus children and adults who exercise their musical abilities can come to understand basic pitch relations in complete absence of any theoretical knowledge of how pitches correspond to vibrations. How is

this possible? A number of twentieth century philosophers¹⁹ have demonstrated how it is that we can construct systems of such phenomenal relations as pitch relations in a way that is independent of an understanding of the underlying physical states that we take to condition the phenomena. The discussion that follows is based upon the analyses that have been developed by these philosophers.

The fact that there is no naturally fixed numerical value that should be attached to each pitch does not prevent us from describing pitches numerically, and consequently describing differences between pitches (and thus pitch relations) in numerical terms. Although there is no numerical value that nature assigns to each pitch (as a phenomenon), we can assign such numerical values by means of a few principled conventions. There is, after all, some observable natural order to this array of phenomenal objects, and so they should be describable as ordered, and so describable as numbered, since number is, among other things, a way of symbolizing order. The following is a description of how we might do so, and by so doing construct a system for numerically defining pitches and pitch relations. The construction described is a system of description for phenomena that are naturally, sequentially ordered. The result then is not that we put the natural phenomena into order, but rather that we put into order our names for what is already naturally, sequentially ordered. Such systematic ordering of our names of such phenomena as pitches is what is lacking in our common, ordinary language about the phenomena. For example, when we refer to a certain pitch as being a G#, or a color as being red, there is nothing in these names that explicitly expresses that the G# is related

¹⁹cf. Rudolf Carnap, *The Logical Structure of the World*, Rolf A. George, trans. (Berkeley: University of California Press, 1967) and Bernard Harrison, *Form and Content* (Oxford: Basil Blackwell,

to other pitches, or that red is related to other colors, or how they are related.

Consequently, we commonly overlook these relations and when we do want to talk about them have difficulty, since we lack the language.

We can begin the construction of a system for describing pitches and pitch relations by selecting any two specific pitches that are distinctly different. That is, we can select any pitch and another pitch at random that we would perceive as being different (“higher” or “lower”). To make this method objective, let us say that the selected pitches could be reproduced by some mechanism. Let us also say that any other pitches we speak of in what follows would be reproducible by some mechanism. Having selected the two initial pitches, let us now assign some arbitrary numbers to each of the two randomly selected pitches, say 1 and 10. We can hereafter refer to these pitches by the names ‘1’ and ‘10.’ We would now begin to randomly sample other specific pitches, referring back to the pitches already produced whenever we needed to in order to compare the presently sampled pitch to the pitches we have already sampled.

Suppose now we sample a third pitch significantly different from 1 and 10. Since pitches are naturally, sequentially ordered, we are able to perceive that the third pitch falls somewhere in sequence with 1 and 10. Perhaps it would be sequentially before 1 (i.e. we would perceive it as being ‘lower’ than 1), perhaps sequentially after 1 and before 10 (i.e., we perceive it as being “higher” than 1 and “lower” than 10), or perhaps sequentially after both 1 and 10 (i.e. we perceive it as being “higher” than 10). Suppose the second alternative is the case. We would then assign the third pitch a number-name that is somewhere—it doesn’t matter where—between 1 and 10, say 4. We would then

continue to sample a fourth pitch, again assigning it a number-name between the number-names of whatever pitches we have already sampled that we perceive the fourth pitch to be between. We could continue in this manner indefinitely. If we use real numbers for our number-names we will never be at a loss for names, since there is always some uniquely different number between any two real numbers.

Since there is an infinite number of pitches, this process would continue indefinitely. However, at any point that we decide to pause from this process and reflect upon the results achieved, we observe that we have constructed an ordered sequence of number-names that identify the natural ordered sequence of specific pitches. These number-names would not only name each pitch, but also explicitly express its position in the natural ordering of pitches. Our sequence of number-names, though ordered, would, however, most likely be somewhat irregularly “spaced,” since there is an element of randomness in our method. But this could be “ironed out” by simply mapping our ordered sequence of number-names onto a more regular sequence of number-names. For that matter, if one should in the meantime acquire a scientific theory of acoustics, one could simply map the sequence constructed onto the sequence of numbers that represent the actual frequencies of the vibrations that cause each of the named pitches. But it doesn't matter that we do so.

Now that we have constructed an ordered system of number names for the various specific pitches, we can define the relations between pitches in terms of the differences between their number-names. Thus, we can call the relation between the pitch we call ‘2’ and the pitch we call ‘5’ a ‘3’ relation, and so on. This method will then give us a way of

explicitly referring to each specific pitch relation that may obtain for the system. For each number representing a difference between two number-names, that number will represent a specific pitch relation. Moreover, this system of referring to pitch relations makes explicit the ordered structure of the system of pitches. Thus it will allow us to make explicit the nature of certain general second-order properties of the system. Specifically, it allows us to describe the ordering relation as it obtains between pitches. Thus, for example, if we say that the numerical difference between pitch X and pitch Z is greater than the numerical difference between X and Y, then it follows that the ordered sequence for the three pitches is X, Y, Z.

Although this method of describing pitches and pitch relations may seem somewhat artificial at first glance, there are, at least two good reasons to suppose that it formally represents our common sense understanding of such phenomena. First, the method is a very abstract and rudimentary, but nevertheless plausible theory of empirical learning. Our understanding of the phenomena that represent for us the physical world takes shape through a process of individual encounters with these phenomena. The principle of the above method according to which we construct the system of pitch relations on the basis of individual samplings represents this general principle of learning. As we progress in our encounters with the individual experiences, we compare experiences with other like experiences, establishing the relations we perceive to obtain between them and thus synthesizing them. This synthesis consists of the understanding of the way that like phenomena are systematically related. The above method, then, abstractly describes how this synthesis might be achieved. This is not to say that we

represent this system to ourselves explicitly in the form of relations between Arabic numerals. It remains unclear what the actual mode of representation is. But this is inconsequential. However it is that we do represent such a system to ourselves seems to require two key elements that the above treatment provides. The mode of representation must first represent the identity of each individual phenomenon and secondly the mode of representation must represent how these entities are ordered with respect to the other identities. The foregoing method simply formalizes these two functions of representation. Numbers provide an infinite supply of unique names that can be appropriated to the entities in question. Moreover, since numbers make explicit their ordered relations, they make explicit the structured relations of the representations.

The second reason for saying that the above method makes good sense ties in with the nature of the numerical representations. When Descartes developed the method of Analytic Geometry, he devised a system that gave numerical names to the different points in space. This system describes the distance relations between those points in terms of the differences between their number names. This method has been very fruitful for describing spatial relations. For some reason it seems very natural to assign number names to points in space, whereas it may seem less natural to do so for such objects as pitches. Perhaps this is due to the fact that for a long time we have described distances in terms of units of some number. There is, however, no special, exclusive metaphysical link between spatial points and numbers, or distances and numbers. Numbers are ontologically syncategorical. We regularly apply them to a wide variety of categories of

objects, ranging from temporal moments to people. There is no reason why we shouldn't apply them to pitches in just the way I have described.

Moreover, the method described above, as applied to acoustic pitches, has been, in principle, already established in modern music theory for a special subset of the natural pitches called the chromatic scale. The only two differences between modern music theory and the system described above is that: a) music theory uses an ordered sequence of letters rather than numbers. (However, these could be easily mapped onto numbers); and b) music theory applies to a special subset of pitches, whereas the above method applies to the whole continuum of natural pitches. Significantly, however, modern music theory does use number names for the relations obtaining between pitches. Thus, a relation that obtains between any pitch on the chromatic scale and the pitch that occurs as the third pitch in the sequence beginning from the former pitch is called 'a 3rd,' between the former and the fifth, 'a 5th' and so on.

The ordered system of pitches, as described by the method outlined above, exhibits the same essential structure as the spatial systems examined in the last chapter. Both structures consist of: a) various objects—points for the spatial system and specific pitch values for the acoustic pitch system; and 2) various ordered relations that obtain between each object of the system and the other objects of the system. For both systems the relations between the objects consist of no more than the degree to which one object deviates from the other as an object of that system (i.e. the difference between the two objects). For the spatial system such differences are identified as the distance between the two points. For the system of pitches, such differences are the deviation of one pitch

from another. I shall use the technical term “relational difference” to refer to the difference that defines a relation. Restating the principles described above, what defines each relation is its relational difference. Since the relational difference is simply the difference that obtains between the two objects of the relation and since this difference can be referred to by a numerical value, we can represent a specific relational difference by some numerical value that would derive either from some natural grounds (e.g. the measurement of the natural frequency of a vibration) or from some principled convention (e.g. the method outlined earlier for constructing a system of pitch relations). Further, we may compare any two relations of a system in terms of their respective relational differences. If we say that the relational difference of the relation between X and Z is greater than that of the relation between X and Y, what we mean is simply that Y is more closely related to X than Z is. Consequently in the continuum of relations of the system of which the three objects are parts, the three objects occur in the sequence X,Y,Z.

Further, I have argued that the system of pitches has the same kind of structure as a spatial system. Because this is so, we can map the objects and relations of the system of pitches onto a spatial system—specifically, a one-dimensional line. Thus, if we draw a line, and give numerical values to its points, we can use this system of line and numerical values to represent the system of pitches, as Figure 13 illustrates.

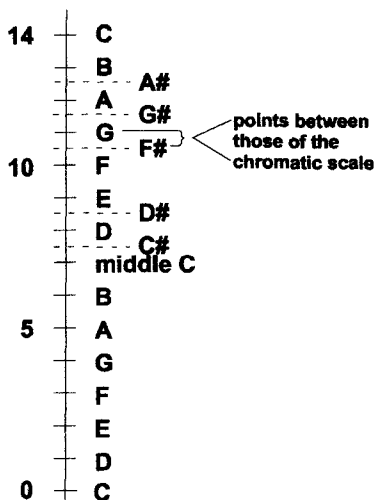


Figure 13

A variation of this linear representation of the system of pitches is the standard musical staff which represents the various possible pitch values of a chromatic system as a virtual vertical line (Figure 14). The major difference between a staff and the line continuum, however, is that the staff represents only a small finite series of discrete pitch values from among the infinite continuous series represented by the line continuum.

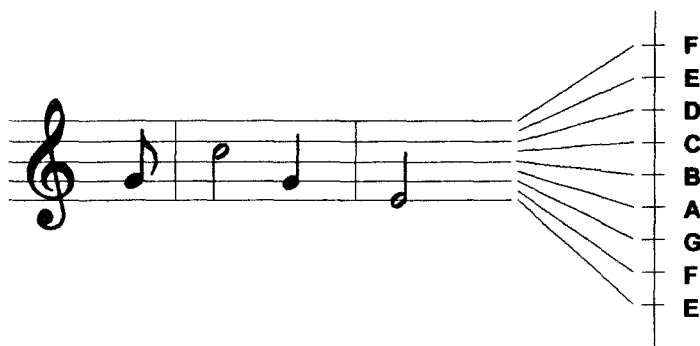


Figure 14

Now, in addition to the ordered relational systems of spatial points and pitches, there are numerous other kinds of ordered relational systems. A further example would be the ordered system of weights. This system has a structure that is similar to the system of acoustic pitches. For the same reasons that apply to the system of acoustic pitches, we can refer to each specific weight value with a system of number-names that reflects the ordering of the system. We can also refer to weight relations with a number that represents the numerical difference between the number-names of the weight objects. Likewise, we can map the system of weights onto a one-dimensional spatial system (i.e. a line). Points that are lower on the line would represent a “lower” weight. Points that are higher on the line would represent “higher” weights.

Other possible systems sharing a similar structure include those consisting of relations of: time, temperatures, money values, intensities (of light, sound, pressure), and so on. Each of these distinctly different kinds of systems involve phenomenally distinct kinds of objects and relations. Nevertheless each instantiates an ordering that can be made explicit by giving each of its objects a number name. Thus, each specific relation between the objects of the system can be represented as the numerical difference between the number names. For this reason we can represent each of these systems as a continuous series of points on a line. Because each of these systems has a structure that is isomorphic to that of a continuous spatial line, we can think of all of these systems as “linear” systems.

In addition to these continuous “linearly” ordered systems, there are a number of continuous but “non-linearly” ordered systems. Perhaps the most prominent example of

such a system would be the kinds of spatial systems of two or more dimensions discussed in Chapter II. Obviously it is not possible to represent a space of, say, three-dimensions by means of a one-dimensional line. Nevertheless, the three-dimensional space is subject to an ordering, although the ordering is more complex than the ordering of a one-dimensional system. Likewise the number-names for the objects of a three dimensional space are more complex, consisting of ordered tri-tuplets (e.g. $\langle a, b, c \rangle$).

Another non-linear and non-spatial relational system is the system of colors. Like acoustic tones, weights and moments of time, colors are systematically related. Unlike the former, however, colors are not linearly related. Rather the system of color relations has a structure that is analogous to a three-dimensional space. But, again the multi-dimensional system of color relations is an ordered space. What is sometimes referred to as 'the color solid' is a three-dimensional spatial model of the color values of this system.

We can illustrate the ordering of color relations by considering a small portion of this complex system—a "cross section" that does display a "linear" ordering. Consider the range of colors that are produced by combining the primary color red with the primary color yellow in all of the various ratios of the two that are possible. For example combining red and yellow in the ratio of 1/1 (i.e. one unit part red and one unit part yellow) will produce the color orange; combining red and yellow in the ratio of 3/1 will produce the color red-orange; combining them in the ratio 1/3 will produce the color yellow-orange; and so on for all possible ratios. Since the numerical values of the ratio of the combination may be taken from a continuum of real numbers there will be a corresponding continuum of distinct colors produced. We can represent this continuum

of ratio values as a continuous line segment. Since each ratio will define a unique color, we can represent all the various colors that would be so produce with the same continuous line segment. Some point over the continuum would, then represent the color orange (specifically, that point that would represent the color produced by combining red and yellow in the ratio of 1/1); another point would represent red-orange; another yellow-orange and so on. The following diagram (Figure 15) illustrates this continuum.

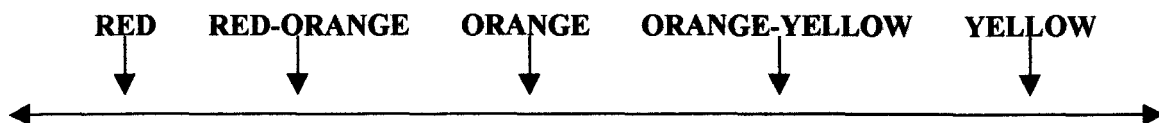


Figure 15

As this representation illustrates, this continuum of colors is ordered. And according to this ordering the difference between, say red and orange (i.e. the relational difference of the red to orange relation) is greater than the difference between, say red and red-orange (i.e. the relational difference of the red to red-orange relation). Likewise, between any two pairs of colors of this range, a similar ordering obtains. Thus the colors we have produced constitute an ordered system of color relations.

As in the case of acoustic pitches, the colors considered so far constitute a relational system that has the same ordered structure as a line segment. But if we were to extend the color system to include other colors, a line segment would not be adequate to represent the extended system. We could, however, adequately represent the system with

a spatial system of greater dimensionality, and complexity, than a line segment. We could, for example, represent the proportions of the primary colors of red and blue with another spatial dimension, and the combinations of red and blue with shades of gray with yet another dimension and so on. In general, however, it is sufficient to say that the resulting representation would be a complex, three-dimensional space. The spatial representation of the ordered system of colors is often referred to in the philosophical and psychological literature as the “color solid.”²⁰

So far, the systems considered have extended to no more than three dimensions in complexity. In the last chapter, which dealt with spatial systems, we began with the simplest spatial system, a one-dimensional line. This case involves principles that are relatively uncomplicated and intuitively clear. We then extended these principles to the two-dimensional case and then finally to the three-dimensional case. We stopped at three dimensions because the human visual perception of space is limited to three dimensions. But our theoretical understanding extends well beyond our visual intuitions. Standard analytic geometry offers theoretical tools for constructing spaces of any number of dimensions. We can apply these tools to the analysis of spatial inner-outer relations, allowing us to formulate criteria for a point being inside or outside of a partition of any number of dimensions. Such criteria would, of course, be purely theoretical. We would not be able to intuitively envision such a partition or what it would be like for a point to be inside or outside of such a partition.

²⁰ For further discussion of this topic, cf. Harrison, Bernard, ‘A Model of Color Naming’ in Bernard Harrison, *Form and Content* (Oxford, 1973), 53. Here Harrison develops a theory of color naming that is analogous to the method for mapping acoustic pitches onto a range of real numbers that I presented earlier in this chapter (p.). Also, cf. Rudolf Carnap, ‘The Ordering of Colors,’ in Rudolf Carnap, *The*

Analogously, we began the present chapter with an examination of a simple non-spatial relational system, the system of acoustic pitches. This system, we saw, has a structure that is identical in certain essential respects to the structure of the spatial system of a one-dimensional line. Because the two systems are identical in structure (in the noted essential respects), we can map the objects and relations of one onto the objects and relations of the other. We can represent one by means of another. Since, the structure of pitch relations is isomorphic to that of a one-dimensional line, the whole of the former relational system is intuitively apparent. There are other non-spatial systems, on the other hand, that are not isomorphic to a linear spatial system. Nor are they isomorphic to two- or three-dimensional spatial systems. Rather their structures are much more complex.²¹ Because of the complexity of their structures, it is difficult, if not impossible, to intuitively envision the structure of the whole of the relational system, just as it is difficult, if not impossible, to intuitively envision a spatial object of say four or five or six dimensions. But just as we can describe four- or five- or n-dimensional space abstractly, likewise we can describe these more complex non-spatial systems using abstract mathematical tools such as those of the fields of Topology or Abstract Algebra. What we can intuitively envision in the case of multi-dimensional systems is a “cross section” of the complex space that would represent the color system. This cross section is, by itself, a “piece” of the complex system that does have a “linear” structure. These “cross sections” allow us to get an intuitive glimpse of the whole, just as the two-dimensional

Logical Structure of the World, trans. Rolf A George (University of California Press, 1969), 144.

²¹The theoretical structure of the color solid takes the form of a spherical coordinate system. The structure of the system of figure relations, on the other hand would be immensely complex, having the form of a manifold of infinite dimension.

shadow of a three-dimensional solid object gives us a glimpse of the structure of the three-dimensional object.

In general it is plausible to suppose it possible to construct multi-dimensional representations of such complex relational systems as the system of color relations, and numerous other complex systems as well, using the techniques of Abstract Algebra or Topology. Having done so, the constructed systems would provide the language tools that would be necessary to describe the relations obtaining between each of the objects of a particular system. Just as the systems constructed for the spatial case, utilizing principles of standard Analytic Geometry, provide the symbolic tools that enable us to describe the various spatial relations that obtain for a spatial system. Moreover, such non-spatial systems would also provide tools for representing comparisons, with respect to the ordering relation between the relational differences between two relations that obtain for a particular system. These ordering relations, as expressed by the notation of the system, would provide the basis for formulating truth-conditions for the respective inner-outer relations.

Before examining the nature of such truth-conditions, however, I shall digress into a topic that emerges from the discussion so far. In looking at several non-spatial relational systems we have seen that among them certain general principles found applicable to spatial systems in Chapter II apply equally to these non-spatial systems. Because certain non-spatial relational systems have structures analogous to some spatial systems at this level of generality, we can represent non-spatial relational systems by means of spatial systems. For example the relational system of temporal moments is

often represented by means of a line. The fact that non-spatial systems can be represented (or mapped onto) spatial systems has an important bearing on the fact that when spatial terms are used in the context of other relational systems, such usage is taken to be metaphorical.

B. RELATIONAL SYSTEMS AND METAPHOR

English users commonly describe non-spatial subjects with words that appear to be spatial in their root meaning. For example, in discourse on acoustic phenomena we often use spatial talk to describe pitch qualities and relations. Thus a “bass” pitch is often described as a “lower” note, and a treble pitch as a “higher” note. These terms, “higher” and “lower,” seem to have root meanings that make implicit reference to positions on a vertical line—a spatial system. Similarly, the technical term for the difference between two pitches of a musical scale (which constitutes a pitch relation) is called an “interval,” which term again seems to draw its meaning from the spatial context, an interval being the space that lies between two limits of the interval. In general, it is often convenient or useful to represent not only pitch relations but relations and properties from many other contexts as well via spatial representations.

Because we can understand the meaning of the terms ‘high’ and ‘low’ to originate from the context of spatial talk, and since the term ‘pitch’ is not intrinsically spatial (although sound tokens do have spatial properties), one might be inclined to take the expressions ‘high pitch’ and ‘low pitch’ to be metaphorical in nature. For, one may argue, we may interpret them as saying literally something like ‘the pitch is in a high or

low position in space,’ and that is not what they are intended to mean. What they are intended to convey is that the pitch is of one extreme or another of a certain kind of empirically observable continuum, the continuum of pitches, which is not a spatial continuum.

But it is just as plausible to say that for the contemporary English user, the word ‘low’ as used in the expression ‘low (acoustic) pitch’ does have a very specific, concrete sense that is different from the sense that it has in an expression such as ‘low ledge.’ Specifically, in the first context, the word ‘low’ simply has the sense that refers to a particular extreme on an ordered continuum of pitches. In the second context it has a sense that refers to a particular extreme on an ordered continuum of spatial positions.

Clearly these two senses are analogous. The analogy is apparently due to the fact that the relational systems entailed by each of the two expressions are isomorphically structured. In general, an analogy consists of two sets of terms that each instantiate the same generalization. For example, the analogy “Dogs are to barking as birds are to chirping” entails the following generalization-instance structure (Figure 16):

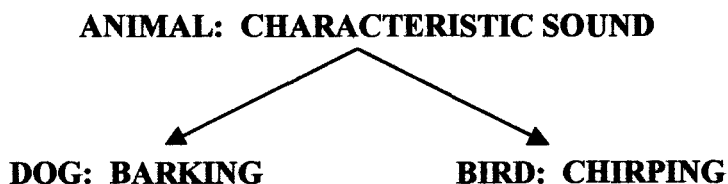


Figure 16

We note here that since analogies consist of specific instances of a generalization, we can compound the analogy by simply adding other instances of the same generalization.

Thus we may say that dogs are to barking as birds are to chirping as frogs are to croaking as horses are to whinnying and so on.

On this model the following analogical structure (Figure 17) obtains between the expressions 'low ledge' and 'low pitch':

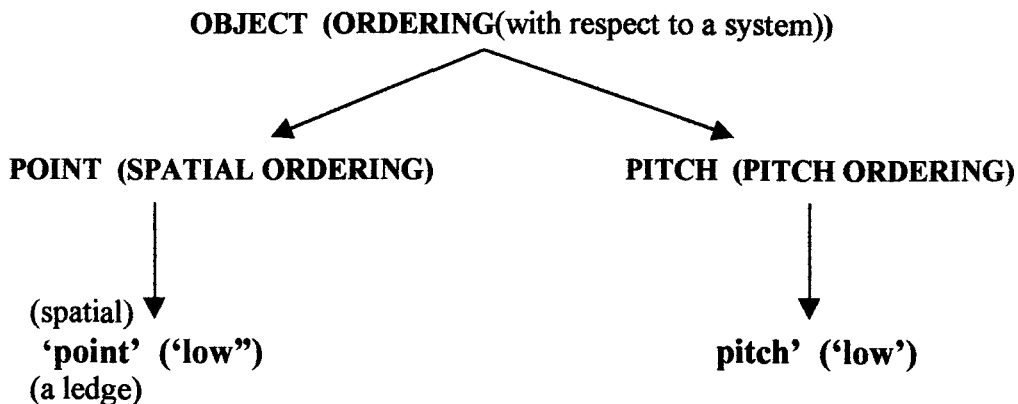


Figure 17

For this analogy there is no element of reference that is in principle inaccessible to empirical examination. The fact that we use language that we otherwise recognize as spatial talk to represent certain non-spatial (acoustic) properties does not mean that our understanding of pitch relations is limited to or dependent on or conditioned by our understanding of spatial relations, that we project our understanding of spatial relations onto pitch relations. Rather, pitch qualities and relations are every bit as empirically accessible as spatial qualities and relations. We perceive pitch qualities and relations in a manner quite distinct from and (in essential respects) independent from our perception of spatial qualities and relations. Likewise, we have an understanding of pitch qualities and relations, based on these perceptions, that is quite independent of our understanding of

spatial qualities and relations, our understanding of each being based on their unique and equally distinct apparent phenomenological characteristics.

Although it is useful to represent pitch relations spatially (with lines, for example), it is not at all unnecessary to do so. In the absence of recourse to spatial representation, it is possible to represent pitch relations in a purely acoustic representational medium. We could represent a certain pitch relation by simply producing two pitches for which the desired pitch relation obtains, just as we would produce two points in space that are related in a certain way to represent a certain distance relation. Presumably, blind musicians or composers, who have no access to spatial representations of sound, represent pitch relations with actual or imagined sounds rather than with spatial representations.

Nevertheless, our distinctly different and independent understandings of the two kinds of phenomena share a common basic structure. Both phenomena entail systems of objects—points in the spatial case, pitches in the case of sound and each of these distinctly different kinds of objects are systematically related. The relations between them are ordered, the ordering providing structure to the system. Because the two distinct and independent kinds of phenomena share a common structure we can represent one by means of the other. We can represent pitch relations by means of spatial representation and likewise, though it is not as intuitively obvious, we can represent spatial relations by acoustic representations. In general, we can say that pitch relations and spatial relations are analogically related.

Now it might be that, in the context of pitch description, the original usage of the adjective 'low' (or its equivalent in an earlier form of the language from which it originated) was metaphorical. If so, on the analysis advanced, the reason that it would have been metaphorical might be that the nature of pitch relations is not as intuitively obvious as the nature of spatial relations. One discerns spatial relations spontaneously; the recognition of pitch relations, on the other hand, perhaps may require a bit more "study." Perhaps this is due to the fact that our species' reliance on its ability to discern spatial relations is so much more essential to survival than our reliance on the ability to discern pitch relations. Thus, if the use of the word 'low' for a context entailing pitch relations (or temperature relations, or whatever) was originally metaphorical, that is because those who would have originally used it so may have been less than clear on the nature of what they were describing, and so one component (pitch relations) of the comparison would have been less than fully clear in meaning. But over time, and usage, it is possible to discern quite clearly what the adjective 'low' was being used to describe in this usage, specifically a certain pitch relation. And correspondingly the incompleteness or vagueness of the analogy would be filled or clarified. At this point the word 'low' would cease to function metaphorically. Rather it would take on a new, quite distinct sense. It would become polysemic, having one sense that would apply to spatial ordering and another sense that applies to the ordering of pitches. If it did originate as a metaphor, it is now certainly a dead metaphor.

On the other hand, it is also possible that the original users of the word 'low' for the context of pitch description were tacitly aware of the analogy between the structures

of spatial locations and pitches. Perhaps it was convenient to appropriate the word 'low' to descriptions of pitch ordering as well as spatial ordering, rather than inventing a new word. Thus, the usage 'low pitch' might have been born of the principle of economy rather than any obscurities about its meaning.

In any event, it is not the case today that the expression 'low pitch' is a metaphorical expression, at least for those who understand what it means. Rather, this expression conveys a clear and definite cognitive meaning of its own.

In general there are certain English words that we use to express the ordering relation as it applies to specific relational systems: for example words such as 'further' or 'closer,' 'higher' or 'lower' (from the context of distance relations), 'before' or 'after' (from the context of temporal relations), 'colder' or warmer (from the context of temperatures), 'heavier' or 'lighter' (from the context of weights). But in addition, we often use the words that are germane to one system to express the ordering relation of another analogical system. But though such words express the ordering relation with special respect to some system(s), what they express is a general relation that applies to all such systems. Each of the systems involves the ordering relation, but the ordering relation itself is not defined with respect to any one particular system. What is defined with respect to a specific system is the kind of relations that are so ordered. Spatial systems consist of distance relations, the temporal system consists of temporal relations and so on. The notion of "ordering," on the other hand, does not entail any one particular system, but rather applies generally to any kind of relation that is orderable. This being the case, it seems that there should be some terminology that expresses this general

relation that would be applicable to all such systems. The terms 'greater than,' 'less than' and 'equal to' are just such terms. If we look at each of the terms used to express ordering for specific systems, we see that they each entail either the notion of 'greater than,' 'equal to' or 'less than.' For example the expression 'Point C is further from point A than is point B' basically means that the distance between A and C is greater than the distance from A to B, and so on for the other terms. The following schema (Figure 18) illustrates how the terminology from several relational systems follows the generalization-instance structure, where the generalization is the general ordering relation.

<p>GENERAL RELATION</p> <p>GENERAL TERMS</p>	<p><u>ORDERING</u></p> <p>'greater than'</p> <p>'less than'</p> <p>'equal to'</p>			
<p><u>SPECIFIC RELATIONS</u></p> <p>SPECIFIC TERMS</p>	<p><u>SPATIAL</u></p> <p>'further'</p> <p>'closer'</p> <p>'same'</p>	<p><u>PITCH</u></p> <p>'higher'</p> <p>'lower'</p> <p>'same'</p>	<p><u>TEMPORAL</u></p> <p>'before'</p> <p>'after'</p> <p>'earlier'</p> <p>'later'</p> <p>'same time'</p>	<p><u>WEIGHT</u></p> <p>'heavier than'</p> <p>'lighter than'</p> <p>'weighs same'</p>

Figure 18

The difference between the general and the specific terms for ordering is that while the special term entails the general notion of ordering, they are each differentiated by a further component of meaning concerning the specific kind of relation that the ordering principle is being applied to. For example, the term 'later' entails the general

ordering relation ‘greater than,’ but it also connotes that this ordering relation is being applied to temporal relations. In general, since ‘greater than,’ ‘equal to’ etc. express the general ordering relation, it should be the case that we would be able to translate all expressions that use a special term to express the ordering relation—a term that is germane to some one (or more) special system(s)—into sentences that replace the special term with the general term. We may further note that for some systems, there is no special word that is used to express the ordering relation. In such cases, the general terms can always be used. For example, there is no special (or analogical) word that expresses the ordering relation of colors. However, we can always make such statements as “The difference between (relational difference of the relation between) red and yellow is greater than the difference between red and orange.”

Having clarified the terminology of ordering of relational systems, we may now proceed to develop a general formulation of truth-conditions for non-spatial inner-outer expressions based on non-spatial relational systems.

C. TRUTH-CONDITIONS FOR NON-SPATIAL INNER-OUTER EXPRESSIONS

Recall that the truth-conditions for inner-outer expressions entailing spatial relations developed in the last chapter are based on the ordering relation as it applies to spatial relations. At this point we have generalized both the notions of relational system—of which a spatial relational system is just one instance—and the ordering relation, a general second-order relation that applies not only to spatial systems, but to

any such relational system. We are now prepared to develop truth-conditions for a variety of non-spatial inner-outer expressions. Because these truth-conditions are based on principles analogically reflecting the principles that ground truth-conditions for the spatial case, the truth-conditions that I shall develop will demonstrate that spatial and non-spatial inner-outer expressions are analogical in meaning. But because the terms involved in the latter expressions can be understood to have a clear sense that is independent of spatial reference, such non-spatial expressions are not intrinsically metaphorical, nor dependent in meaning on the spatial context.

Let us begin by returning to the simple case with which this chapter began, of sentences that express something relative to acoustic pitch. The sentence 'That piano is in tune' expresses something about the acoustic state of the piano with regard to pitch. But a piano's being in tune is a rather complex matter. For a piano to be in tune, each of its eighty-eight keys must be in tune with each other. Let us begin by looking at the much simpler case of the sentence 'The middle C (key) of that piano is in (or out of) tune.' Let us consider what such a sentence might mean.

The grammatical subject of the sentence in question is the middle C key of a particular piano. But the keys of a piano are physical objects constructed of wood and ivory (or plastic). Taken at face value, such a statement would have a rather odd meaning, since, generally speaking, such objects are not the kinds of objects to which pitch properties obtain. We may understand the designator 'the middle C of that piano' to implicitly refer to some aspect of the whole mechanism that the key operates. This mechanism involves various levers that the key activates when it is struck. These levers

in turn activate a “hammer” that then strikes a wire that is stretched under a certain amount of tension over the length of a sound board. Because the wire is of a certain gauge and is stretched under a certain amount of tension, when it is hit by the hammer mechanism it vibrates, producing a sound of a certain pitch. The pitch it produces is a product of the gauge of the wire and the tension it happens to be under. In saying that the key is in (or out of) tune, what we mean is that the sound tokens produced by the wire activated by the key are of a pitch that is in (or out of) tune. Given that the foregoing is what the meaning of the expression in question is about, let us consider what it means for the pitch of a sound token to be “in tune.”

In assessing that a certain pitch is in or out of tune, we do so by comparing the pitch of the tone actually produced by the wire (and, by virtue of a causal chain, the key) to some standard or pre-established pitch of some particular frequency. In saying this we need to realize that although we speak theoretically as if the standard pitch spoken of here is like a unique point on a continuum that we can precisely locate, in practice we could never do more than approximate this ideal standard. To the human ear there is always a small range of pitches that deviate from the standard pitch that would not be distinguishable from the ideal standard. The same is also true of instruments that measure pitches, the only difference being that such instruments would be capable of greater accuracy. But in general, all measurement is, in principle, subject to some degree of error, however small. Thus, in practice the pitch relation that is the basis for an assessment of whether or not the wire is in tune is not really between two unique pitches, but rather between the actual pitch of the wire and some small range of pitches that would

converge around the ideal standard pitch. How extensive the range would be would depend on the extent to which we want to be accurate. This point is especially borne out in cases where the standards for being ‘in tune’ are more relaxed. For example a novice at music may consider an instrument to be “in tune” when in fact to a trained ear or measuring instrument the pitch of the instrument deviates noticeably from the “standard.”

Thus, saying that the piano wire is in tune is, after all, based on a compound relationship between the actual pitch of the wire and some range of pitches over the ordered system of pitches. Let us say that this small interval is delimited by upper and a lower threshold points, a and b respectively. Truth-conditions for such an expression would need to be expressed in a way that reflects this compound relation of the actual pitch to the upper and lower threshold points. Such truth-conditions would be completely analogous to the truth-conditions for a point being inside or outside of an interval on a one-dimensional line.

In general, the basis of this assessment is the pitch relation that obtains between the pitch the wire produces and the standard pitch. This pitch relation is defined by the relational difference between the “standard” and the pitch actually produced, the smaller the difference, the closer the pitch is to being “in tune.”

Now, as the first section of this chapter establishes, defining such pitch relations entails reference to a system of pitch relations. The system of pitch relations is analogous to a linear spatial system of distances. We can represent the system of pitches by a vertical line, as we did in the first section.²² Doing so, we can then represent the standard

²²This move is merely heuristic. Representing the system of acoustic pitches by a linear spatial system merely allows us to ‘see’ more intuitively that we can formulate truth-conditions for the expression

pitch as a certain small interval on this line. Likewise, we can represent the pitch that the piano wire actually produces as a point on this line as well. If the wire is in tune, the point will have a certain kind of relation to the threshold points of the small interval that represents the standard. If not, another kind of relation will obtain. The following diagram (Figure 19) illustrates the case in which the wire is out of tune.

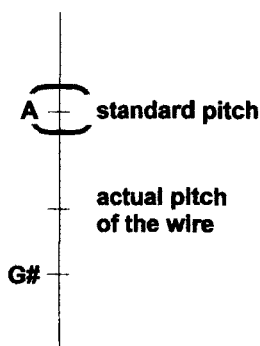


Figure 19

The interval of the standard pitch values would be fixed on the line representing the system of pitches. The point representing the actual pitch of the wire would move up and down the line as adjustments are made to the tension of the wire, causing variations in the pitch the wire produces. As the point representing the actual pitch moves over the line, the relation that the actual pitch has to the fixed range would vary.

The pitch relations that obtain between the actual pitch of the wire and the standard pitch would be registered in the degree to which the former pitch would differ

in question on the basis of a system of acoustic pitches. But, as I have been arguing, our understanding of the meanings of the pitch relations that are involved in these truth-conditions does not depend on our understanding of spatial relations. It would also be possible to refer directly to the pitch relations themselves, but this couldn't be done on paper.

from the latter (i.e. by the relational difference between the two pitches). The standard pitch to which the wire's pitch is being compared is a constant—a fixed point on the line representing the system of pitches. The actual pitch of the wire is variable. As the amount of tension applied to or released from the wire varies, there is a corresponding variance of the pitch produced by the wire. Thus as the tension of the wire varies, so too will the relational difference (the relation) between the pitch of the wire and the standard pitch to which the wire's pitch is compared. The nature of these pitch relations provides a basis for formulating truth-conditions for a sentence such as 'That key (pitch token produced by striking the key) is in (or out of) tune.'

The basis for the truth-conditions for this kind of statement is the fact that when and only when the wire is in tune, will the pitch of the wire be indistinguishable from (be virtually the same as) the standard range of pitches. Conversely, when and only when the wire is out of tune will there be some difference between the two—and this difference may vary to any degree. We can express these conditions formally in terms of the ordering relation as follows.

The expression 'That key is in tune' is true if and only if:

For the pitch s of the sound token produced by the wire, the sum of the relational differences between s and the threshold points a and b of the standard range P is equal to the relational difference between the two threshold points a and b . (Where this relational difference would be taken to be 0).

The expression 'That key is out of tune' is true if and only if:

For the pitch s of the sound token produced by the wire, the sum of the relational differences between s and the threshold points a and b of the standard range P is greater than the relational difference between the two threshold points a and b .

The truth-conditions we have established here are very similar to those established in the second chapter for a point being inside or outside of an interval on a line. There is but a single difference. Whereas for the spatial case the truth-conditions for determining whether a point s is inside or outside of a region P involve identifying s 's spatial relations to a range of points delimited by the range's endpoints, in the present cases the relation identified is between a single pitch s and some other small range of pitches P . But the model for the present truth-conditions is based on the idealization that we can know when two such pitches are truly identical, and so, that the relational difference between them is 0. In principle, this constitutes no real difference between the spatial case and the acoustic pitch case. For both a point in space and a unique pitch of a system of pitches are really limiting cases of an interval on a line or an interval of pitches respectively.

In this latter kind of case the interval is a structure that would fulfill the sense of "containment" that the terms 'inside' and 'outside' seem to connote. A point "inside" such an interval may move or range over the interval, but cannot surpass the endpoints without becoming "outside" the interval, in which case the endpoints function as "barriers." They act as "partitions" in a fuller sense of the word.

D. A GENERAL TREATMENT OF TRUTH-CONDITIONS FOR INNER-OUTER EXPRESSIONS ENTAILING OTHER SIMPLE RELATIONAL SYSTEMS

Earlier in this chapter we saw that all of the relational systems considered are ordered systems, and so entail an ordering relation. We can always express the ordering

relation by the terms 'greater than,' 'less than' or 'equal to.' For many systems, however, there are special terms that can also be used to express the ordering relation for relations of a specific kind. Because of this principle of ordered systems, it will always be possible to formulate truth-conditions for inner-outer expressions entailing these systems that are analogous to those that we have already developed for the system of spatial relations and the system of acoustic pitches. To illustrate this claim, consider another such expression based on the ordered system of weights.

All physical objects on Earth exhibit the property of weight. Each object has some weight whose measurement is based upon a system of weights. This system is ordered. We can always say that the weight of one object is greater than or less than or equal to the weight of another object. The system of weights is, like the system of acoustic pitches, analogous to a linear spatial system. Thus we could map the various weight values onto a horizontal one-dimensional line, just as we did with the system of pitches.

There are a variety of inner-outer expressions that entail this system of weights. One such case arises within the context of the transportation of goods over interstate freeways by means of trucks. The trucks that carry these goods are subject to certain weight regulations. Specifically, they are prohibited from weighing more than certain established limits. In order to enforce these regulations, trucks are weighed at regular intervals. In such a process, expressions such as the following might be produced: 'The weight of this truck is within the limits' or 'The weight of this truck is outside the limits.'

For such expressions the limits prescribe a particular interval over the system of weights that would extend from the nominal lower bound of zero pounds to an upper bound of some number of pounds. This interval is prescribed by some convention, rather than by some natural force. (Actually this is not entirely accurate since such limits are determined in part by the effect that the weight of the truck has on the material from which the road is constructed, the weight of trucks having a deteriorating effect on this material over time.) Nonetheless, it is an interval over the system of weights. The endpoints of this interval would then constitute a partition of the system of weights. We could therefore formulate truth-conditions in the same manner we did for acoustic pitches and spatial objects. We would again base such truth-conditions on the weight relations between the weight of the truck and the extreme points of the range of allowable weights. To these relations, we would apply the ordering relation in a manner analogous to the examples already considered.

For inner-outer expressions that entail other kinds of systems, we follow the same kind of pattern to formulate truth-conditions. Since this pattern is now familiar, I shall not belabor the point with further examples. What does merit comment, however, is how we would formulate truth-conditions for expressions that are based on more complex, non-linear systems. But since these more complex systems differ from linear systems only in degree of complexity, and not in any essential respects, I shall limit my comments to how these complexities would be handled.

I have already discussed the fact that 'linear' relational systems have a structure and an ordering that is analogous to the structure and ordering of a system of points on a

line. This analogical relation is due to the fact that the ordering relation is a general relation that applies to many relational systems. The system of points on a line is just one instance of many such systems that share the same ordering structure. Thus it is possible to map the objects and relations of one system onto the objects and relations of another. It so happens that lines in space are very accessible to human intuition, and so it is often useful to represent other relational systems by means of a linear system.

But, just as there are numerous simple relational systems whose structures are analogous to that of a system of linearly related points, there are also other systems whose structures are analogous to spatial systems of dimension greater than one. In Chapter II we saw that truth-conditions for the one-dimensional spatial case could be extended to apply to spatial systems of two and three and virtually any number of dimensions. For these multi-dimensional systems, we can define partitions of the system to which a spatial object, say a point, has various spatial relations. To the relations that obtain between the object and the partition, we can then apply the second-order, ordering relation to establish truth-conditions that determine when the object is inside or outside the partition.

For other complex systems the objects and relations that they consist of are not spatial. The system of colors, for example, does not consist of spatial objects. But between each color of the system, color relations obtain. For this system we could identify certain objects (certain colors) as constituting a partition. Any other color of the system will then have various color relations to the colors that constitute the partition. Again, since these relations are ordered we could compare the various relations that

obtain between a particular color and the colors of the partition with respect to the ordering relations. On the basis of these ordering comparisons we could then establish truth-conditions that determine whether or not a particular color is “inside” or “outside” the range delimited by the partitioning colors. A similar analysis would apply to any other complex system.

E. THE IMPLICIT FORM OF NON-SPATIAL RELATIONAL SYSTEMS

As observed at the beginning of this chapter, sentences like ‘The pen is in the drawer’ make explicit reference to two spatial objects, in this case the pen and the drawer. This kind of sentence asserts some kind of spatial relation between the two spatial objects. Since the relation asserted is a spatial relation, we can abstract the spatial properties of the pen and drawer from the many other properties and relations that these objects possess, for example their color properties, weight, texture, material composition and so on. What the statement asserts is not really about the whole of these physical objects, but rather some aspect of them (i.e. their spatial locations). We consider this aspect to be an object relative to some relational system. For this case, the aspects of the pen and the drawer that we are interested in are their spatial locations, which are points of a spatial system. Such points of a spatial system are subject to the spatial relations that constitute the structure of this system. It is on the basis of these structured spatial relations that we can formulate truth-conditions for the system. The statement ‘The pen

is in the drawer' asserts something about the nature of the spatial relations that obtain for these two objects. The truth-conditions specify what the nature of that relation is.

We have seen that other inner-outer expressions also assert something about non-spatial relations that obtain between non-spatial objects. But in contrast to spatial inner-outer expressions, non-spatial expressions do not always explicitly refer to the objects involved in the relation asserted. Let us consider, for example, the expression 'The middle C (key) of the piano is in tune.' Here the subject of the expression is 'the middle C (key) of the piano.' Again, like the spatial example, this subject refers to a spatial object. But, as we have already observed, what the sentence asserts is not about the middle C key itself, but rather the sound tokens produced by the wire that the key causes to vibrate by means of a mediating mechanism. Moreover, what the sentence asserts is not about the sound tokens themselves, but rather the pitch of the tone phenomena that the vibrations produce. It is this pitch that the sentence is implicitly concerned with. The sentence, however, refers to this pitch only implicitly.

Similarly, the prepositional object of the word 'in' (i.e. 'tune') does not explicitly refer to any object at all. For that matter, the meaning of this word as it occurs in this sentence is rather puzzling at first glance. Nevertheless, on the analysis advanced here, we can take this word to implicitly function as a referring word. What it implicitly refers to is some small range of pitches of the relational system of pitches that is delimited by two extreme pitches of the range. This function is essential for the sentence to be able to make the kind of assertion it does. For it is only by referring to this range of pitches that a pitch relation can be established. If no reference is made to some other pitches, there

would be nothing to which the pitch of the wire could be related. Moreover, such reference is all that is needed to establish the kind of relation the sentence asserts. It is both necessary and sufficient for the object of the preposition to refer (either implicitly or explicitly) to some object (i.e. a partition) of the same relational system the object referred to by the subject is a part of, and that object referred to by the subject can be either inside or outside of.

In general we may take inner-outer expressions (whether spatial or non-spatial) to entail implicit reference to three essential elements: 1) a relational system, which is determinable by the nature of the objects referred to (either explicitly or implicitly) by the subject term and the prepositional object term; 2) one or more objects that function to partition the relational system into two mutually exclusive ranges (this partition being implicitly identified by the prepositional object of the sentence) and 3) an object of the system subject to relations with the partitioning object(s) (this latter object being referred to—implicitly or explicitly—by the subject term of the sentence). The relations that so obtain between the subject object and the partition object will always satisfy exactly one of two sets of criteria that determine whether the relations that obtain between the two objects are inner or outer relations. Again, though a sentence asserting an inner-outer relation needs to refer to these elements, it is usually the case that such reference is made implicitly, rather than explicitly.

F. EXPRESSIONS ENTAILING MULTIPLE RELATIONAL SYSTEMS

So far we have been dealing with expressions that entail individual relational systems. Sentences such as ‘The middle C is in (or out of) tune,’ ‘The truck is within (or outside of) regulation weight,’ ‘We are in (or out of) time’ and so on, make implicit reference to only one relational system. There is, however, a variety of inner-outer expressions that entail reference to multiple systems. In this section, I shall briefly discuss how such expressions may be analyzed.

Let us consider the sentence ‘That coat is in fashion.’ While the subject of the sentence refers to a concrete physical object—some coat—the prepositional object refers neither explicitly nor implicitly to any simple object of some relational system. Nor does the sentence entail any clear reference to a particular relational system. How can we analyze sentences like these along the lines that we have so far maintained?

We can answer this question by looking at what it would mean for this sentence to be true. Generally, we judge an item of clothing to be “in fashion” on the basis of its color, figure, pattern, texture and so on. For it to be true that a given coat is in fashion, the coat must be of a certain color, figure and so on. Of course the colors, figures, etc. that are considered to be fashionable at any given moment are subject to continual change. Likewise, such colors are not always quite definite. In real contexts it is apparent that fashions are continually changing and the factors that influence such dynamics are enormously complex. But these are matters of how it is that particular standards of fashion are actually arrived at, and these matters are irrelevant to the fact that for any particular case, certain standards of fashion will apply, whatever they might be,

however clearly they are defined and however they came about. On this analysis the word 'fashion' serves to implicitly identify a number of simple qualities, which, compounded, provide the means for judging that a particular concrete object, such as a coat, is in fashion.

But, now, each of these simple qualities entail a single relational system. The property of color entails a relational system of color. Likewise, the property of figure entails a relational system of figure relations. The properties of texture and pattern, similarly entail relational systems. That these properties entail a relational system is shown by the fact that for any given texture or pattern, it is possible to imagine an ordered series of small variations on that texture or pattern with respect to some particular parameter. For example the texture of sandpaper varies with the coarseness of the grains of sand that are used to make it. Since the size of the sand grains is ordered, so too will be the various textures produced by the sand grains of various size. We can make other ordered variations with respect to other parameters. For example we can substitute various other kinds of particles for sand, for example chips of plastic, wood and so on. These other particles are orderable with respect to several parameters: hardness, weight, density and so on.

In general, given any two textures (or patterns) it is always possible to imagine an ordered series of intermediate textures (or patterns) between the two given textures (or patterns). Of course imagined intermediate textures may not occur in nature, and so, intuitively, it may seem to be that many of the textures found in nature are discrete cases unrelated to others. But this is merely a limitation of nature and/or human experience.

The fact that there may be factual or experiential 'gaps' in the actualization of a system does not diminish the meaningfulness of talking about this kind of ordered system.

Systems are defined by general principles. It is unnecessary to encounter every possible instance of the general principle to make it valid. What is necessary is merely that each possible instance encountered behave according to the general principle. Thus, for example, the principles of number theory postulate an ordered infinite continuum of numbers between every two whole numbers. It is an impossibility that each of the real numbers between say 1 and 2 have been explicitly thought of or spoken of or written down. But this does not mean that there are gaps in the system. Nor does it mean that the numbers close to 1 are unrelated to the numbers close to 2. Similarly it is not necessary that all of the infinite variety of textures entailed by the system of textures actually exist or have been actually experienced in order to make it valid to say that there is an ordered system of textures. It is enough to say that the principles of the system are applicable to the cases we do know of.

Of course, the ordered system of textures would be enormously large and of some large dimensionality. Nevertheless the system would be, in principle, ordered, and, like any other ordered system. Thus it is possible to identify ranges over this system, defined by a series of partitioning values. Given any particular partition of the system, then, we could formulate truth-conditions for whether or not some particular texture is "inside" or "outside" the range. Because the system of textures is so large, we might intuit only small fragments of this system. But such small fragments of ordered textures would be sufficient to determine, for a particular range of textures that occurs within the fragment

whether or not some particular pattern falls “inside” or “outside” the partition. If the given texture is not a part of the fragment, it is clearly outside of the partition. If it is a part of the fragment, then it could be evaluated according to the truth-conditions. Similar remarks apply to patterns.

Returning to the example in question, in general each of the kinds of properties whereby we judge the coat to be “in” or “out of” fashion entail relational systems. As a consequence, we could formulate truth-conditions for the expression in terms of a conjunction of truth-conditions that apply for each of the specific simple relational systems entailed by each of the properties that come into play in assessing whether or not the coat is in style.

This conjunction of truth-conditions is complicated by the fact that at any given time, for any particular culture or sub-culture there may be several sets of standards for fashion. For example, with respect to color several distinct ranges of color may be considered to be fashionable. This diversity in fashionableness would then be handled by establishing a separate set of truth-conditions for each discrete range and then formulating general truth-conditions for fashionableness in terms of a disjunction of the several sets of truth-conditions for each of the various cases.

G. CONCLUSIONS

In summary, inner-outer expressions entailing non-spatial properties and relations are analogous in meaning to the spatial cases examined in Chapter II. The basis of the argument has been that, like spatial properties, non-spatial properties entail relational

systems structurally analogous to the relational system of distance relations. In particular, the relations of such systems are definable in terms of the relational difference that obtains with respect to each relation, and for each of the relations of the system there is a second-order, ordering relation that obtains between that relation and each of the other relations of the system. The second-order, ordering relation is simply the ordering that applies to the various relational differences that define the relations of the system. The meaning of the general ordering relation is identical for each system. It simply means that for a given system, there is a unique order of the objects (and relations between objects) of that system, whether those objects are spatial points, colors, acoustic pitches, etc. The only factor that differentiates the general meaning of the ordering relation with respect to a particular system is the nature of the kinds of objects that are ordered. For example, what differentiates the ordering of spatial points and the ordering of temporal moments is just the fact that what is ordered—the objects—are different in each case—spatial in one case, temporal in another. Other than differences in objects ordered, what it means to be ordered, in general, is the same in each case. But though essentially the same in each case, ordering is also subject to various degrees of complexity. Thus the ordering structure of a three-dimensional solid space is more complex than the ordering of a one-dimensional line.

Given the entailment of a relational system by each of the different kinds of inner-outer expressions in question, truth-conditions for each of the expressions are based on the ordering relation that each of the systems is subject to. Indeed, such a basis is necessary, since it is the only way that some kind of relation can be established. Because

the truth-conditions for each kind of inner-outer expression under consideration are based on a common principle, and because we have empirical access to the objects to which the principle applies, the meanings of each of the various kinds of expressions are not metaphorical, though they are analogical. Although they may have originated as metaphors, they later acquired a concrete meaning based on the empirical observability of the objects of the complete analogy that they expressed.

- CHAPTER IV -
INNER-OUTER EXPRESSIONS ENTAILING
REFERENCE TO DISCRETE SYSTEMS

The last two chapters treated a number of relational systems that provide bases for literal interpretations of a wide range of inner-outer expressions. For each system, the kind of relation the system consists of is uniquely different than, and logically independent of the relations that constitute other systems. Nevertheless all such systems share the common feature of being subject to a general ordering relation. The ordering relation is a second order relation that applies to a variety of relational systems.

There is one further feature all of the relational systems considered so far share. For each of the relational systems examined, the objects of the systems form a continuous whole. For example all of the points of a one-dimensional spatial system form a continuum that extends over a one-dimensional line. Similar comments apply to two-, three-, and more-dimensional systems. Likewise, for the system of acoustic pitches, between any two pitches there is a continuum of pitches. Again, for the system of colors, between any two colors there is a continuous gradation of colors. In general, for each of these systems, if we take any two of its objects there will be a continuum of objects between the two objects in question. Thus, for these systems the differences between its objects are never discrete differences; rather, for each difference there are always intermediate differences.

In contrast to these “continuous systems” there are a number of “discrete” relational systems. The structures of discrete systems take a form that can be represented by a “network.” Each object of such networks may be represented by a discrete “node” interconnected by lines that represent relations that obtain between that object of the system and others. The nodes that networks consist of are each discretely differentiated from the other objects of the system. Thus, between two adjacent nodes of a network, there are no intermediate nodes (and so no intermediate objects). Similarly, the relations that obtain between the nodes (objects) are discrete relations for which there are no intermediate cases. The structure of such systems, then, is not that of a continuum. But though the structures of discrete systems differ from the structures of continuous systems, the former like the latter are equally subject to the ordering relation. Thus, for example, in one of the simplest cases of four nodes, a, b, c and d being serially related, d is related to a by means of b and c. Thus, b and c mediate a and d. What makes this system discrete is the fact that there are no intermediate objects between each of a and b, b and c, and c and d.²³

This chapter examines a number of inner-outer expressions that entail reference to discrete—as opposed to continuous—relational systems. I shall argue that we can formulate truth-conditions for these expressions in much the same manner that we formulated truth-conditions for expressions entailing continuous systems. The basic reason for this is that these truth-conditions are essentially based on the ordering relation,

²³ For a formal treatment of discrete systems cf. F.S. Roberts, *Discrete Mathematical Models* (Englewood Cliffs, N.J.: Prentice-Hall, 1976) or Gary Chartt, *Introductory Graph Theory*, (New York : Dover Publications, 1977).

and though the structure of discrete systems differs from the structure of continuous systems, nevertheless both kinds of system are equally subject to the ordering relation.

A. INNER-OUTER EXPRESSIONS ENTAILING REFERENCE TO SYSTEMS

The variety of inner-outer expression considered in this section consists of those expressions that make explicit or implicit reference to systems, generally asserting that something is inside or outside of a system. Examples of such cases may include the following.

The child is in the local school system.

The child is out of the local school system.

The data is in the computer (where the computer is understood to be a kind of system).

Systems are generally describable in functional terms. What makes a collection of objects a system is fundamentally that the objects maintain various functional relations with each other. What makes an object a part of a system, then, is that it performs some functional role for the system. In order to understand the fundamental principles involved in the expressions in question, then, we need to examine the notion of “function.”

1. The Notion Of "Function"

The word 'function,' occurs in a diverse range of contexts, as the following series of examples offered by Larry Wright²⁴ illustrates:

The Apollonaut's banquet was a major function.

I simply can't function when I've got a cold.

The function of the heart is pumping blood.

However, the class of expressions of primary interest to philosophers consists of expressions of the general form:

The function of X is to Y.

This form is the form of the last example given above. Other cases may be either derivative in meaning from sentences of this form or have a different meaning that is not as philosophically relevant. Clearly the truth-conditions for the kinds of expressions of interest to us at present—those involving an inner-outer relation entailing functional ascription—entail function statements of this primary form. Saying that the machine is out of order, for example, presupposes knowing what its function is and a proposition of this form stating such functional ascription expresses such knowledge. This analysis, therefore, will focus on the notion of function involved in sentences of the form in question.

The question of the meaning of functional ascriptions of the form in question remains a controversial issue in the recent literature on the subject. There is, however,

²⁴Larry Wright, "Functions," *Philosophical Review*, 1973, 82: 141.

some agreement as to the nature of the problem. Hempel²⁵ formulates the problem as being that of determining the criteria by which we distinguish, from among the various effects or capacities that an object X exhibits, those effects or capacities which are to be called functions of the object and those that are not to be so considered. Larry Wright similarly articulates the problem in terms of the function/accident distinction.²⁶

The often cited paradigm of this problem involves the human heart as an object of functional ascription. The heart exhibits various capacities among which are both the circulation of blood and the production of a pulsing sound. Yet while the former is generally taken to be a function of the heart, the latter is not. The problem for an account of functions, then, is to specify the nature of the criteria by which we make such distinctions.

The terms 'effect,' 'property' and 'capacity' which are often used in describing functions—a function of an object being identified in terms of the 'effects,' 'properties' or 'capacities' of the object—deserve some attention. In some cases a function may be ascribed to an object, yet that function is never actualized. For example the function of a spare tire of an automobile is potentially the same as that of the other tires, yet, in the best of worlds the spare tire would never be used. In this case the function of the spare tire is not identified with any of its actual effects, but rather a possible effect. In order to allow for such possibilities, then, it is perhaps better to formulate the problem in terms of all potential effects rather than just actual effects. To this end, the word 'capacity' is

²⁵C.G. Hempel, "The Logic of Functional Analysis," in *Aspects of Scientific Explanation* (New York: The Free Press, 1965), 297-330.

²⁶Larry Wright, "Functions," *Philosophical Review*, 1973, 82: 141.

perhaps the more appropriate term. Moreover, the notion of function under consideration here may extend to contexts that do not pertain to physical processes. For example, one may say that the function of the word 'tree' in the sentence 'That tree is an oak' is to symbolize reference to a particular object. This function, however, is not a physical effect of the word. Again, it would perhaps be more appropriate to say that functions are capacities. Accordingly, the word 'tree' has the capacity to refer to a particular kind of object. The point however is a small one. Generally, these words may be used interchangeably and frequently the choice of words is a matter of context or style. I will use the word 'capacity' for the most part.

Given these terminological considerations, we may ascribe to an object X any number of capacities. For that matter, since it is always possible to discover new capacities of an object that may have previously been either unrecognized or unactualized, it is plausibly the case that the number of capacities that an object has is unbounded. According to the present formulation of the functional theorist's problem we divide the possibly unbounded set of capacities of an object into two mutually exclusive groups; one group of capacities we call functions of the object, the other group we call mere or accidental capacities. What an account of the notion of function needs to explain is the nature of the criteria by which we separate the two groups.

Accounts of the nature of functions presently take a number of approaches. Of the available options, however, Robert Cummins' analytic approach seems to offer the most promise for an analysis of inner-outer expressions that entail functional ascription along the lines developed so far. In order to illuminate and motivate the adoption of this

account, however, I shall briefly review the leading alternative views before discussing the principles of Cummins' account. Peter Achinstein²⁷ categorizes the leading alternatives to Cummins' approach into three basic views. He calls these three basic views: 1) "The Good-Consequence Doctrine," which is maintained by Hempel, Canfield, Hull, Lehman, Ruse, Sorabji, Woodfield, Beckner, *et al.*; 2) 'The Goal Doctrine,' held by Nagel, Boorse *et al.* and 3) "The Explanation Doctrine," represented by Wright, Ayala, Bennett, Levin *et al.* I shall consider the general principles of each of these views and the problems that they incur in turn.

a) The Good Consequence Doctrine:

For the "Good Consequence Doctrine," generally, a capacity C of an object X of a system S is a function of X relative to S if and only if X's doing C confers some good on the system S.²⁸ Criticisms to this proposal—and the other two as well—generally take the form of showing that the criteria offered provide neither sufficient nor necessary conditions for distinguishing between those capacities that, in practice, we call functions from those that we do not. The literature offers numerous counterexamples to this effect.

Achinstein offers a typical counterexample that illustrates the problem with respect to the necessity of the criterion in question. He asks us to consider the case of a sewing machine which contains a special button that activates a mechanism which will blow up the machine. He points out that activating the button would presumably never have any good consequences for the machine, its user or its designer. Nevertheless, the

²⁷Peter Achinstein, "Function Statements," *Philosophy of Science*, 44 (1977) 341-67.

²⁸*Ibid.*, 342.

function of the button is to activate the explosive mechanism.²⁹ The problem this example shows is that it may be difficult to identify any good consequence of the exercise of certain capacities of some objects, even though in practice we would call those capacities functions of the object.

One may forestall the objection posed by this example by replying that the designer at least believed it would have had a good effect. But this would not sufficiently address the objection, since one could simply consider a case for which the designer did not have any good in mind when he included the explosion mechanism in the design of the machine. In general, such *ad hoc* amendments to the original proposal do not save it from being problematic, however, since other kinds of counterexamples are readily available. Thus, the criterion is not necessary.

Counterexamples that show that the criterion in question is not sufficient are also not difficult to find. For example, suppose that for the above sewing machine, a wire loosens within the machine, thereby breaking the electrical circuit that powers its motor. The machine would then be unable to operate. But now suppose a bolt above the loose wire accidentally loosens, falling down on the wire causing it to make the contact necessary to complete the circuit and thus restoring power and functionality to the machine. In this case the loosened bolt contributes some good to the machine (or at least its user). We would not however say that its causing the contact of the wire is a function of the bolt. Thus to say that an action of some part of a system contributes some good to the system is not sufficient reason to consider that action a function of the part.

²⁹Ibid., 344.

b) The Goal Doctrine:

The “Goal Doctrine” generally distinguishes functional capacities from non-function capacities on the basis of the following criterion: A capacity C of an object X in a system S is a function of X, relative to the system, if and only if X’s doing C contributes to some goal which S (or X) has or which the user, owner, or designer of S (or X) has.³⁰ This proposal is open to the same lines of objection as the Good-Consequence Doctrine. Achinstein thus points to the possibility “that neither the designer nor user of the sewing machine with the self-destruct button has as a goal the activation of the exploding mechanism, and that doing this contributes to no goal of the designer or user.”³¹ Again there are many ready counterexamples showing this criterion to be unnecessary.

c) The Explanation Doctrine:

For the “Explanation Doctrine,” a capacity C of an object X in a system S is a function of X if and only if X is there in S because it does C and C is a consequence of X’s being in S³². That is, C is a function of X if and only if taking C to be a function would explain why or how X came to be a part of S. An objection to the necessity of this proposal may point to the fact that an object’s having a particular function does not imply anything about how or why the object came to exist. Achinstein points to the case of the heart. He asks, rhetorically, “Does the fact that my heart pumps blood causally explain how my heart came to exist, or why it continues to exist, or why it is present on the left

³⁰Ibid., 342.

³¹Ibid., 346

side of my body? How will natural selection plus heredity lead causally from the fact that my heart does pump blood to the fact that it exists or even to the fact that it continues to exist?"³³

d) Achinstein's View:

Since it is never too difficult to produce counterexamples for any of the above kinds of criteria it is problematic to say that any of them adequately define the meaning of "function." Achinstein attempts to avoid the kind of difficulties that these foregoing approaches encounter by suggesting that the word 'function' is used in several senses, varying from context to context. Thus he offers three different kinds of criteria for use of 'function' in varying contexts, with the understanding that the sum of these three different criteria provides necessary and sufficient conditions for using the word in any context of its use. He motivates this proposal with the following illustration.

Suppose that a magnificent chair was designed as a throne for the king, i.e., it was designed to seat the king. However, it is actually used by the king's guards to block a doorway in the palace. Finally, suppose that although the guards attempt to block the doorway by means of that chair they are unsuccessful. The chair is so beautiful that it draws crowds to the palace to view it, and people walk through the doorway all around the chair to gaze at it. But its drawing such crowds does have the beneficial effect of inducing more financial contributions for the upkeep of the palace, although this was not something intended. What is the function of this chair?³⁴

Achinstein suggests that each of the above effects of the chair may be called functions. "It would be appropriate to say what the chair was designed to do, what it is

³²Ibid., 344.

³³Ibid., 348.

³⁴Ibid., 349.

used to do and what it actually does, which serves to benefit something.”³⁵

Accordingly, Achinstein recognizes three types of function: the design function (purpose); use function (explanation) and service function (good) and specifies the criteria used in calling a property of an object a function in terms of the notions of design, use and service.

This account, however, suffers a problem of circularity. For, as we have seen in the opening of this section, words such as ‘serve to’ and ‘use for’ entail the meaning of the word ‘function.’ Thus although Achinstein does articulate the problem for an account of functions more fully, his account does not seem to provide an adequate answer to that problem.

e) Cummins’ Account:

The criticisms of the first three proposals presented above generally take the form of pointing to counterexamples for which the given proposals fail. In “Functional Analysis,” an article that takes a rather different approach to the problem of defining the notion of function, Cummins argues that accounts such as the above are problematic in principle. He bases this assessment on an analysis showing that there is a fundamental conflict in two basic presuppositions that theories such as the above all make.

Cummins observes that the leading accounts commonly make the following two basic assumptions.

(A) The point of functional characterization in science is to explain the presence of the item (organ, mechanism, process or whatever) that is functionally characterized.

³⁵Ibid., 349.

(B) For something to perform its function is for it to have certain effects on a containing system, which effects contribute to the performance of some activity of, or the maintenance of some condition in that containing system.³⁶

The line of his argument consist in showing that (A) and (B) are logically incompatible and that due to this incompatibility any account of functions that assumes both (A) and (B), as the aforementioned accounts do, is fundamentally wrong. The incompatibility between (A) and (B) lies in the fact that accepting both (A) and (B) leads to an infinite regress.

According to (B), one condition placed on a capacity of an object X, for the capacity to be considered a function, is that the capacity have an effect on a system in which the object occurs as a part. This in itself is no problem. Talk about the function of an object is basically talk about what the object does with respect to a larger context—a system.

The infinite regress results when (A) is added to (B). To say that the item in question not only has an effect on the system, but, in addition, is present because it has that effect, is to say that the object is there for a reason. Presumably the immediate reason would be just to produce the effect that it does on the system. This reason, however, is insufficient. There also needs to be some reason why the system should exhibit the effect produced by its part. For if there is no reason that the system should do so, then there is no ultimate reason why the system should have the object as one of its parts to produce the effect. But what would constitute a reason for the system to exhibit the effect caused by the part? Presumably, this reason would be spelled out in terms of

³⁶ Robert Cummins, "Functional Analysis," *Journal of Philosophy* 72(1975),741.

the effects produced by the system for a larger context, that is, a larger system. The effect on the larger system, however, would then also need a reason and the chain of reasons would regress indefinitely.

Cummins illustrates this general problem with a biological case.³⁷ Presumably, one of the functions of the contractile vacuole in protozoans is elimination of excess water from the organism. Now according to the kind of account that Cummins wants to refute, we would say that what makes this a function of the vacuole is that the effect of eliminating excess water contributes to the performance of some function F of a protozoan. But in order to know this, we would have to know what makes F a function of a protozoan. But this leaves us with another unanalyzed functional ascription. This will either lead to a regress or the analysis will break down at some level if no further functions or containing systems can be appealed to. Cummins concludes, then, that “it must be possible to analyze at least some functional ascriptions without appealing to functions of containing systems.”³⁸

To avoid this problem an account of functions must eliminate either assumption (A) or (B) or both. A closer consideration of (A) and (B), however, shows that we do, in fact, have good reason to accept (B), whereas this is not the case for (A). Our reason for accepting (B) is that functional ascriptions do generally make at least implicit reference to systems. Thus, each of the above accounts recognizes the role of the containing system. In the paradigmatic example of the heart, we say that the function of the heart is to pump blood. Here we implicitly make reference to the circulatory system of an animal

³⁷Ibid., 752.

³⁸Ibid.

body. On the other hand, with regard to assumption (A), it is not at all apparent that in making functional ascriptions we are explaining the existence of the object to which the function is ascribed. This rather seems to be a conjecture imposed on the ascription. Thus while (B) is an observation, (A) is purely a conjecture. Thus while it seems that any account of functions must account for (B), (A) is at least optional.

It is not surprising that Cummins proceeds to develop an alternative account of functions that maintains (B) but replaces (A) with a different understanding of the purpose of functional ascription. The point of functional analysis, for Cummins, is not to explain why or how the object is present in the system. Rather, what the function of the item explains is merely how the object contributes to some capacity of a containing system. As Cummins writes, “to ascribe a function to something is to ascribe a capacity to it which is singled out by its role in an analysis of some capacity of a containing system.”³⁹ Generally, on Cummins’ view, a capacity C_X of an object X in a system S is a function (i.e. a functional capacity) of X if and only if an account of how S has some other capacity C_S appeals to X ’s capacity C_X .

Cummins offers the example of an assembly line to illustrate his analytic account of functions. The purpose and general effect of an assembly line is to produce some manufactured item. An assembly line accomplishes this by assigning to each part of the assembly line a specific task involved in the ultimate construction of the product. The assembly line as a whole has the ability to produce the finished item by virtue of the parts that perform their various tasks. Correlatively, the task that each part performs contributes to this general capacity of the assembly line. The fact that each part performs

the task that it does partly explains how it is that the line has the capacity that it does. For this reason, on Cummins' account, the performance of that task is (at least one of) that parts "functions" relative to the assembly line.⁴⁰

By analyzing functional capacities in terms of how they contribute to capacities of the containing system rather than analyzing them as explanations for the presence of certain objects in the system, Cummins avoids the regress problem. For though the notion of function entails the notion of capacity (since a function of something must also be a capacity of the thing), not all capacities need be functions. Thus we can appeal to capacities without appealing to functions. We can identify some capacity of some system S—a system such as an organism, a machine, a facility, a social group, etc.— without taking that capacity to be a function. Then, the capacities of parts of that system that are considered to be functions of those parts are merely those capacities that contribute to and make possible the capacity of the system as a whole. No further explanation is necessary since the original capacity of the system explained (i.e. analyzed) in terms of the functional capacities of the parts of the system is merely an observed fact. For example, it need not be more than an observed fact that the circulatory system has the capacity to circulate blood to other organs of the body. Saying that the heart functions to pump the blood that is circulated merely explains how the circulatory system has this capacity. There is no regress of explanation.

With these considerations, I shall adopt Cummins' account of functions for an analysis of inner-outer expressions involving functional ascriptions. But, as they stand,

³⁹Ibid., 765.

Cummins' principles are too limited to provide a sufficient basis for formulating truth-conditions for the expressions in question. Before dealing with the analysis of inner-outer expressions it will be necessary to expand upon the principles established by Cummins. In the following pages, I shall present my own analysis of some principles of functions and functional relations that follow from the basic principles of Cummins' account.

2. The Structure of Functional Relations:

In general, Cummins' account of functions is concerned with the description of objects on two levels. On one level objects are describable with respect to their capacities. Such description concerns merely what an object is capable of doing. Since all objects are capable of doing something, all objects are describable in terms of capacities. On a higher level his account is concerned with describing objects with respect to functions. As we have seen, describing an object as having a certain function entails describing that object as having a certain capacity. But functional description also entails more than description in terms of mere capacity. It entails how it is that the capacity of an object relates to a system. These two levels of description are thus closely related. But they are also quite distinguishable. All functions are capacities, and, moreover, capacities of a certain kind. They are capacities that relate to a system in a certain way. Functions are capacities and more. On the other hand, mere capacities are not intrinsically functional capacities. Not all capacities may be considered as functions. I will proceed, then, by examining separately, each of these two levels of description. I

⁴⁰Ibid., 760.

shall first develop some of the implications that Cummins' account has for the notion of "function," then examine some of its implications for the notion of mere capacities, and then, I shall draw out some conclusions about the relationship between the two.

a) The nature of functional analysis:

On Cummins' view functions are defined relative to some capacity of a containing system. We define the function of an object X , where X is a part of system S , on the basis of how the capacities of X contribute to the capacity of the S in question. Now this principle allows us to define or identify functions in two ways. One way is by interpolative analysis. The other is by extrapolative synthesis. I will discuss each of these approaches separately.

i) Interpolative Analysis:

On Cummins' view, a capacity of an object is a function if it contributes to some capacity of the system of which it is a part. This way of identifying functions is interpolative in nature. The identification begins with the identification of a capacity of the system as a whole. Identifying this capacity of the system then leads to the identification of functional capacities of the parts of the system—that is, capacities of the parts of the system that account for how it is that the system has the capacity it has. Proceeding in this manner, both functional ascription and functional analysis are based on the recognition of some original capacity of the system in question. Functions are defined on the basis of this original capacity. The coherence of this view rests on the fact that the original capacity C_S of the system is not itself defined with reference to other

capacities or functions. C_S is accepted as a given. It is merely an observed fact that the system has the capacity that it does. Thus, the original capacity is an unexplained starting point of interpolative functional analysis.

ii) Extrapolative Synthesis:

Cummins' account also allows us to distinguish functional capacities from other capacities that are not functional in another way as well. Given an object X, X will have, in principle, innumerable capacities. Of these capacities one or more may be singled out as a function on the basis of the fact that it explains some other capacity of a containing system S. But X may be involved in more than one system. Relative to another system, say S', the capacity of X singled out as a function relative to the original system S may not be a functional capacity. Another capacity not functionally relative to S may be functional relative to S'. Thus, a capacity of an object X that is not taken to be a function relative to one system, may be understood as a function by changing the system that X is taken to be a part of or changing the capacity of the system to be explained by X's capacity.

This method is an alternative to the method of interpolative analysis discussed above. In contrast to interpolative analysis, which starts by identifying a capacity of a system and results in identifying the functional capacities of the parts of the system relative to the capacity of the system, extrapolative analysis begins by considering any capacity of an object to be a functional capacity and proceeds then to identify a system relative to which it is then a function. Note that this is not a regressive analysis, since

once such a system has been identified, its capacity needs no further explanation. It is simply an observed fact.

Cummins' discussion of the throbbing sound of the heart illustrates the possibility of such extrapolative analysis.⁴¹ Generally, this capacity of the heart is not taken to be one of the heart's functions. But, on Cummins' account, relative to the capacity of the circulatory system to produce noise, we can consider it to be a function. One of the capacities of the circulatory system is the capacity to produce "circulatory noise." This "noise" is the result of the distinct sound made by each part of the circulatory system. The heart is one part of the circulatory system, and its producing a distinctive sound makes possible the "circulatory noise." The production of this unique sound would be a function of the heart relative to the circulatory systems capacity to make "circulatory noise."

This example illustrates that the production of a sound can be a function of the heart if we so consider it by an appeal to the capacity of the circulatory system to make noise. We could also provide an alternate analysis that would make the production of "noise" a function of the heart by appealing to a system other than the circulatory system. This other system includes each of the components involved in medical diagnosis: a physician, the physician's cognitive abilities, instruments (e.g. stethoscope) the diagnosed organism etc. Taken together we may understand these components as constituting a system—a "diagnostic system" if you will—the capacity of which is to produce diagnostic pronouncements. (e.g. "The patient is healthy.") The role that the heart plays

⁴¹Ibid., 763.

in this system is that it produces pulsing sounds that make it possible for the physician, using some procedure, to arrive at the diagnosis.

In general we may consider any capacity of an object to be a function of that object provided we can identify an appropriate system and a capacity of the system relative to which the capacity of the object is a functional part. There seems to be no reason to suppose that given any capacity of an object, we could not always, with enough scrutiny, find such a system. For any capacity of any object we may simply suppose that that capacity might be a function and then look for some system relative to which it is a function. Doing so, the original capacity (presumed to be a function) would point to a system containing the object and a capacity of that system relative to which the capacity of the original object would be defined as a function. The original capacity directs us to some other capacity of a larger system containing that object.

To illustrate this point further, observe the capacity of circular objects to rotate. “The inventor” of the wheel might have begun with this kind of observation. The inventor’s insight might then have been the realization that the rotational capacity of circular object would allow such objects to function as a part of a larger system that would have the capacity to continuously convey larger physical objects over surfaces by means of the continuous circular motion of the circular object, as for example a cart would do. For a system such as a cart, the capacity of the circular object to rotate uniformly explains the capacity of the cart to move as it does. In this example, the inventor presumably did not begin with the capacity of the system and from it analyze the function of the wheel. The starting point is rather a capacity that an object is observed to

have, and that suggests (or points to) the larger system for which that capacity could be a functional capacity. The inventor extrapolates from the capacity, arriving at a larger system and a capacity of the system. The original capacity from which the larger system is extrapolated becomes a functional capacity relative to that system.

b) The Relativity of Functional Ascription

Functional analysis can work in two directions. On the one hand, we may interpolate from a capacity of a system to functional capacities of parts of the system. On the other hand, we may extrapolate from the capacity of an object to capacities of larger systems of which the original object is a part contributing to the capacity of the system. Moreover, given any capacity of any object or system, we may proceed in both directions. Objects and systems always consist of parts that may be functionally analyzed. Objects and systems are found to be parts of larger systems. In principle there is no reason to believe that this will not always be the case. On the contrary, intuitively, it would be just those capacities of a system that are discernable as functions for larger systems that would be the prime candidates for the starting points of interpolative functional analysis. To use Cummins' example, we identify the functions of the parts of an automobile factory with reference to the factory's capacity to produce automobiles. But this capacity is itself a function for one or more larger systems, such as a system of transportation or an economic system. It's just the fact that this capacity is a function in a larger system that makes it of interest to interpolative functional analysis. In practice the capacities of containing systems, with reference to which functions are determined, are likewise understandable as functions themselves in larger systems. This is no regress

since the larger system is not appealed to in order to justify the capacity's being a function. The capacity merely suggests that there is a larger system relative to which the capacity is a function. But nothing depends on whether or not there is such a larger system.

In addition to the observation that there are two possible directions of functional analysis we may observe that both of these directions begin with the recognition of an original capacity of some object (i.e. system). Moreover, the coherence of this account rests on the principle that functional analysis begins with some original capacity to be analyzed in either or both of these two directions and that this original capacity grounds all functional ascription that is made relative to it. The ascription of "function" to capacities of parts of the original object are made with reference to the original capacity of the object. The functionally ascribed capacities explain the original capacity. Likewise, in extrapolating from the original capacity, larger systems, for which the original capacity "functions," and the capacities of these larger systems, are designated as such by reference to the original capacity presumed to be a functional capacity for some larger system. Since it is this original capacity that leads to the larger system, these larger systems are, in turn, defined as such by the fact that they are systems for which the original capacity plays a functional role.

Unlike the other capacities that are defined as functions on the basis of their relationship to the original capacity, the original capacity does not appeal to some further capacity as its basis. Nor could we expect that it should without engendering the regress problem that Cummins observes to be present in accounts that do attempt to base

functional analysis on some further principle. The regress problem poses no difficulty for this account which holds that the functional understanding of the world simply terminates in the identification of certain key capacities of key systems.

Functional description is analogous to description in terms of distance relations. As we saw in chapter II, description of distance relations requires a reference frame consisting of original points, units of measure and directional orientation. While these components of the spatial reference frame are related with respect to distance to the other points of the system (i.e. the original point is a point with respect to the system), they are not described by any further reference to another point. One difference between functional and distance description may be that in the latter case only one point is needed to establish a frame of reference, whereas in the former more complex case, it may be that numerous and various original capacities cohesively ground the functional description. But this is a difference of complexity rather than of kind.

c) Functional Relations:

A further point regarding this relativistic account of functions concerns the relationship between a functional description and the system relative to which a functional description is made. On the present view, we describe a capacity as being a functional capacity if it contributes to a capacity of the system. To describe a capacity as being a function thus entails implicit reference to another capacity of the system. There is necessarily a relationship between the functional capacity and some capacity of the system. Whether or not a particular capacity is a functional capacity may be a contingent matter. But if it is a functional capacity, it is necessary that there is some relation between

it and some capacity of the system. This is so because functions just are capacities of a part of a system that contribute to some other capacity of the system. By definition, the functional capacity of the part is necessarily related to the capacity of the system insofar as the former makes possible the latter. Let us call this kind of relation a “functional relation.” Because functional relations are necessary, functional descriptions are logically related to descriptions of some capacity of a system. Thus, for any capacity C_f , of object X, there is some capacity C_s of a system S of which an object that has C_f is a part such that ‘ C_f is a function’ implies that S has C_s . Likewise, other parts of the system are functionally related to the system. Furthermore, by virtue of these common functional relations the parts are systematically, “functionally interrelated” to each other.

Extending this point, we observe that each of the functions of the parts of the system are also capacities of that part. Furthermore, each part is a whole consisting of subordinate parts. The heart, for example, is a complex organ consisting of many parts. We may consider the part in question to be a system itself. The capacity of this sub-system—which is a function of the sub-system relative to the larger system—is to be explained by the capacities of its sub-parts which would then be functions of these sub-parts. Such analyses could proceed indefinitely.

Now, since each of these capacities of the sub-parts of the part in question are functionally related to the capacity of the part, they are all functionally interrelated to each other. And since the capacity of the part is a function which is functionally interrelated to the functions of the other parts of the system as a whole, the sub-functions of the part are functionally interrelated to the functions of the other parts as a whole.

Thus, by interpolation, a functional ascription will entail a complex network of functional interrelations between the various functions ascribed to the parts, sub-parts etc. Similar principles hold in the direction of extrapolation. Figure 20 illustrates the structure of such a network of functional relations.

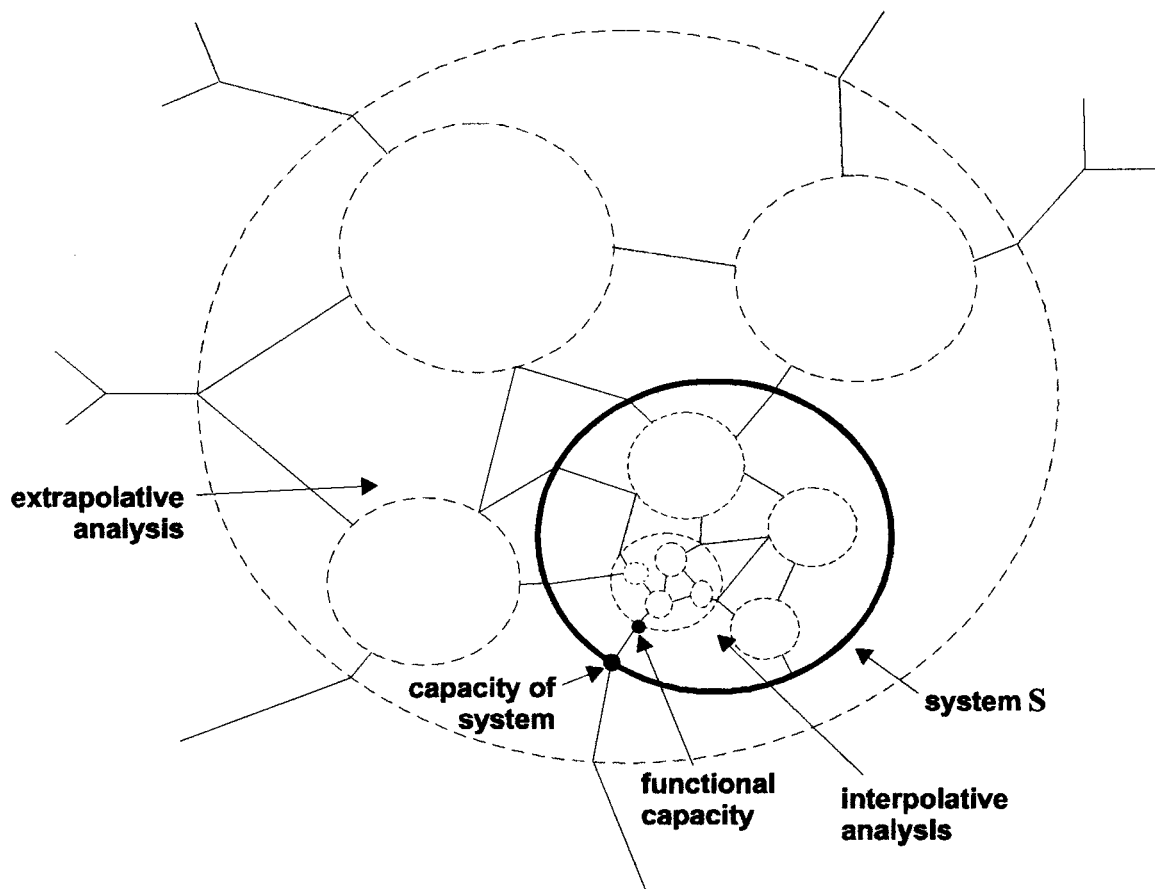


Figure 20

Clearly, systems of functional relations may involve structures whose level of complexity extends well beyond what can be comprehend in one intuition. Nevertheless, we can

suppose that such systems of higher complexity would be constructed upon the fundamental principles of functional relations illustrated here.

From an originally selected capacity, we may derive by interpolative and extrapolative analysis an extended network of functional relations. I shall call such a network, consisting of all such relations possible, a “functional scheme” (symbolized as Σ). Functional analysis of some identified capacity of an object consists in discerning such a functional scheme. For the functional scheme, the original capacity itself also plays the role of a function, to which the various other functions, derived by interpolation and extrapolation, are functionally related, just as the original reference point in a spatial system of distance relations is itself a point.

This account of functional description ties in well with the principles of relational systems developed in the previous chapter. Functional descriptions entail systems of functional relations, just as spatial descriptions, temporal descriptions, descriptions of acoustic pitch and so on entail relational systems. We may further observe that the functional relations that obtain for a functional scheme are ordered relations, just as the relations involved in the other kinds of systems examined are ordered. I shall discuss this point in more detail after considering the notion of capacity and the relationship between capacities and functions.

d) The Notion of Capacity:

To describe an object as having a capacity is to describe it as having a potential to causally affect other objects. Thus, describing the capacity of any object entails implicit reference to other objects. For the object to have an effect it must affect something other

than itself. For even if we say that the object affects only itself, it would affect either the whole of itself or only a part of itself. But if it affects itself as a whole, it would change as a whole and then become a different object. So it would again affect a different object. It would cause a different object to come into being. This may appear to be an impossibility—perhaps an ideal limiting case that can never actually occur. If it is, then that leaves us with only the remaining possibility. But if the object affects only a part of itself, this part would have a different identity than the object as a whole. It would have the identity of a part of the whole. It too would then be, in principle, a different object. For example, the heart is a different object than the whole body.

So, in general, under any circumstances, for an object to have an effect, it must affect another object. Moreover, when one object X , by virtue of some capacity C_X affects another object Y , its effect on Y is itself a capacity of Y . That is, when Y is affected by X by virtue of C_X , Y then exhibits some specific change. This change is a reaction of Y to X 's effect. But for Y to react in the way it does it must have the capacity to do so. The action (reaction) is, then, an actualization of Y 's capacity to act (react) in the way it does. Let us call this capacity C_Y . From these considerations it follows that to say that an object X has a capacity C_X entails a relation between C_X and some other capacity C_Y of some other object Y . For example, to say that the heart has the capacity to pump blood implies that blood has the capacity to be pumped. Let us call this a "capacital relation."

But saying that an object X has a certain capacity entails more than just that X produces certain effects on one or more objects. For, capacities are potentials that are

actualized under particular circumstances. The circumstances in question are those in which other objects have particular effects on the object with the capacity in question, thus causing that object to exercise its capacity. Thus, for example, the heart has the capacity to pump blood, but only when it itself is stimulated, nourished, etc. by other parts of the body. To say that an object X has capacity C_X implies that there is at least one other object Z with capacity C_Z to cause X to exercise its capacity C_X . To say that X has capacity C_X entails a capacital relation between C_X and at least one other capacity C_Z of some other object Z .

In general, ascription of any particular capacity entails at least two and possibly many capacital relations between the capacity in question, ascribed to some object, and other capacities of other objects. Moreover, the other capacities entailed by the original capacity themselves entail several other capacities and so on. Just as in the case of functions, ascription of any one capacity entails a whole network or system of capacital relations obtaining between the object to which the capacity in question is ascribed and other objects of the ascribed object's environment. Let us call such a system a "capacital system."

Similar to the other kinds of relations that we have examined, a capacital relation between two capacities provides the basis for a logical relation between the descriptions of the capacities involved in the relation. For example, suppose C_X is a capacity of X because it is a potential of X to produce effect E_Y in Y whenever conditions are present that cause X to produce E_Y . Suppose also that Y exhibits E_Y only when X 's capacity C_X causes it to do so. Further, when Y exhibits E_Y , this effect causes some other object to be

affected. Then E_Y is a capacity of Y that we can also call C_Y . Then in this case, C_X and C_Y are capacitally related. On the basis of this relationship, we can say that “ Y has C_Y ” implies “ X has C_X .” For example, we presume that food has the capacity to nourish animals because of certain effects it produces in animals. Because of these effects animals have the capacity to be active. There is then a capacital relation between the capacity of food to nourish and the animal’s capacity to be active. Similarly, for some animal A and some food F that A has been eating, “ A has the capacity to be active” implies that “ F has the capacity to nourish.” In general, then, the descriptions of a capacital system entail certain logical relations. Again, as in the case of functional systems, various capacities that constitute a capacital system are ordered, a point I shall further develop.

e) Capacital Systems and Functional Schemes:

According to the account advanced here, a capacital system serves as the backdrop on which a functional scheme is painted. All functions are capacities, though not all capacities are functions, relative to a particular functional scheme. For a given capacital system (e.g. the system of capacital relations ascribed to the universe of physical objects) we define a particular functional scheme (system) by first selecting one (or, perhaps usually, several) capacity (ies) of a certain object (or several objects) relative to which other capacities of other objects (all part of the capacital system) would count as functions. What capacities would count as functions would be those that in some way make the originally selected capacity possible (interpolative analysis) or those that would

be involved in making the originally selected capacity a function for a larger system (extrapolative synthesis).

Given that the capacital system is a network of interrelated capacities, a functional scheme is just a portion of the larger capacital network. A functional scheme (system), then would consist of all of the capacities of the capacital system that would count as functions relative to the originally selected capacities. Figure 21, below, provides a simple illustration of this relation between a capacital system and a functional scheme.

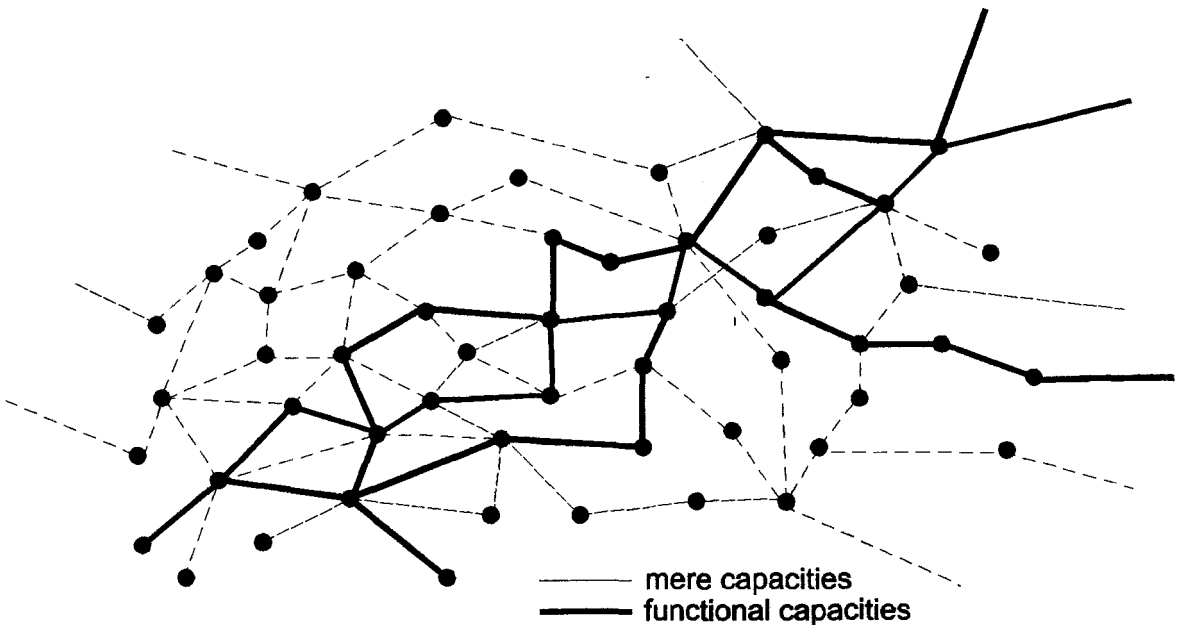


Figure 21

For this illustration, each node of the network represents a capacity of an object and the lines (both dotted and solid) between the nodes represent the capacital relations that obtain between the capacities. Since functions are certain kinds of capacities they

too are represented as lines of the network. To distinguish functional capacities from non-functional capacities, the functional capacities are represented as solid lines.

Now, insofar as a capacital system is a system of relations between various capacities, we may look upon capacital systems as being similar to the other kinds of systems discussed in the last chapter. These earlier systems were systems of interrelated objects⁴² and that is what a capacital system is. We may say the same of a functional scheme which is a specific range or portion of a capacital system on the present account.

Beyond this similarity, there is a significant difference between the kinds of systems discussed in the last chapter and capacital (and functional) systems. Specifically, the systems of the last chapter were continuous. That is, between any two objects of these kinds of systems there is a continuous range of intermediate objects. For example between any two points in space there is a continuous series of intermediate points. Similarly, between any two colors there is a continuous range of intermediate colors. In contrast, for capacital and functional systems there are not always intermediate capacities or functions between any two capacities or functions. For example, for organisms that have circulatory systems, there is a capacital and functional relation between the heart's capacity to pump blood and the blood's capacity to be pumped. But between these two capacities, there are no intermediary capacities. While the structure of the systems of the last chapter had the property of being continuous, the structure of capacital and functional systems is rather that of a network of discretely related capacities and systems.

⁴²I use the word 'object' here in the sense of 'object of discourse' which does not imply 'material object' or 'substance.' Thus, for example, the color red is not a material object or substance but is an 'object' of vision or discourse about vision.

This difference between the earlier systems and the present capacital and functional systems makes a difference in the way in which the two kinds of systems can be partitioned. For a continuous system such as a system of spatial points, we can define a specific range over this system by identifying the limiting points of the range. Since the system is continuous, identifying the limiting points of a range will implicitly identify all of the intermediate values between the limiting points. For example, we can identify a range of points on a line by identifying the two endpoints of the range and then understand the range to consist of all of the points intermediate between these two points. Or for a two-dimensional plane, a figure, such as a circle, may serve to define the continuous range of points that lie between the points on the circle. Thus, a partition of a spatial system may consist of a boundary with respect to which the continuum of objects on one side of the boundary are “within” the boundary and the continuum of objects on the other side are “outside” the boundary, and one continuum is isolated from the other. In contrast, functional and non-functional capacities are not continuously related. Likewise they are not isolated from each other by a continuous boundary. Rather, as the diagram suggests, the two are intertwined.

I have used the term ‘partition’ to refer to, not a whole range of objects, such as a range of points on a line, but rather the limiting points that implicitly identify the range. To partition is to divide and it is the limiting points on a line that divide the line into those objects that are a part of a particular range and those that are not. Since the limiting points of a range implicitly identify all of the objects of the range, we can formulate truth-conditions for expressions that assert that an object is within or outside of a

particular range in terms of the object's relation to the limiting (or partitioning) points. For, by knowing how the object in question is related to these limiting (partitioning) points we implicitly know how the object is related to the entire range.

But for capacital and functional systems, it is not the case that there are certain limiting capacities/functions that define a network of capacities or functions. Rather, what defines the network is each and every part (i.e. object—represented by a node) of the network. With a network, any one of its components may be “rerouted” thus changing the identity of the network. Expressing this in another way, if we envision a network as a series of interrelated ‘nodes,’ then to define a particular network, each of the nodes of the network must be identified individually. For any node can be changed independently of the others, thus changing the identity of the network. For a network it is not the case that certain “end” nodes implicitly identify others as is the case for the objects of a continuous system. Thus, for a discrete system, the term ‘partition’ must mean the entire collection of objects that constitute the network.

But this difference between the two kinds of systems will have an effect only on how we define a partition of the system. Otherwise, the truth-conditions for inner-outer expressions entailing reference to discrete systems will be analogous to those of continuous systems. The truth-conditions for both kinds of expression are not based on how a partition is defined, but on how objects are related to the partition. Defining such relations is based on the second-order, ordering relation, which applies similarly to both continuous and discrete systems.

f) The Ordering of Capacital and Functional Systems

In order to characterize the nature of the ordering of functional relations it is helpful to borrow a few of the concepts and terms of contemporary Graph Theory or, alternately, Discrete Algebra, general theories of the nature of discrete systems such as a functional scheme or capacital system. Graph Theory concerns the fundamental relational properties of any structure that can be represented as a network. Functional schemes are such structures and so the principles of Graph Theory will apply to them. According to the principles of Graph Theory, a graph is a representation of a series of discrete relations such as are involved in a functional scheme. The branching diagrams that have been used to represent functional schemes are, graphs of functional schemes. A particular graph may be denoted by a single capital letter, for example 'G.' A graph consists of a number of nodes called "vertices" which, for present purposes, represent the capacities of the system. These vertices are joined by lines called "edges" which represent the capacital relations between the capacities represented by the vertices. We may represent the set of all vertices of G by the notation V_G and the set of all sides of G with the notation E_G . The number of vertices of G is called the "order of G," and is symbolized by the notation " $|V_G|$." Likewise the number of sides of G is called the "size of G," and is symbolized by the notation $|E_G|$. Thus for example, the order of the graph illustrated in Figure 22 below is 11 and its size is 11. For the present analysis, I shall only have need to consider the order of a graph, say G, of a functional scheme Σ . For the sake of simplicity, then, I shall use the notation $|G|$ to represent the order of the graph G.

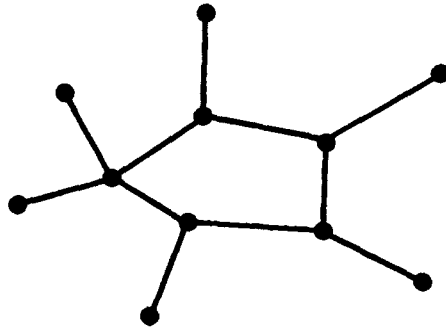


Figure 22

Expanding on these notions of the order and size of a graph (in this case representing a functional scheme) for the case of functional analysis, we may observe that, for each functional system S consisting of parts, each of the parts of the system is also a system itself—a sub-system of the system. These sub-systems could also be functionally analyzed as consisting of parts that could again be functionally analyzed and so on. Likewise S itself may be viewed as a sub-system for some larger system. This larger system may be viewed as a function for yet a larger system and so on. Thus a system S is embedded within a hierarchy of larger systems and is embedded with a hierarchy of sub-systems. A graph of such embedded systems, then, might look like this (Figure 23).

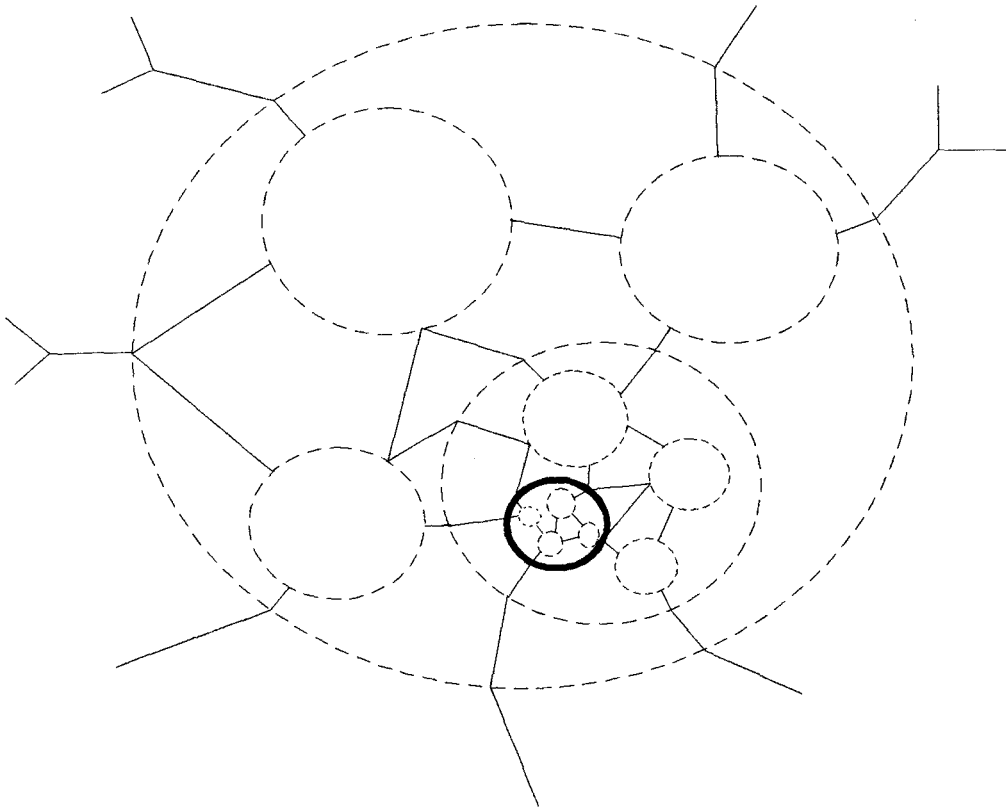


Figure 23

We may observe that a particular function of a functional scheme may be considered a function relative to any number of larger systems in which it is embedded.

Applying the notion of the order of a graph (or alternately, the order of a functional scheme) to the embedded structure of a functional scheme we observe that the order of a system that some sub-system is embedded in will always be greater than the order of the sub-system itself. And the order of the system that the sub-system is embedded in will always be less than the order of a larger system that that system is embedded in. Thus, in general, to the hierarchy of a series of embedded systems there will correspond a hierarchy of orders of the embedded systems.

Given this property of functional relations, I shall use the term “minimal functional system for a capacity C ” to mean the smallest system S (i.e. the system with the smallest order) such that, relative to S , C is a function. I shall denote the minimal functional system for a capacity C by the notation “ $M(C)$.” The order of $M(C)$ will then be denoted by $|M(C)|$. For example, consider a photocopy machine used in a department of a larger institution. We say the copy machine has certain functions relative to the department, and again, say the copy machine functions relative to the larger institution as well. Relative to this example, the minimal functional system for the capacity of the copy machine is the system instantiated by the department, rather than the functional system instantiated by the larger institution, since the order of the functional scheme of the latter would be much greater than the former. Of course we could analyze the department into a number of smaller sub-systems, relative to which analysis the minimal functional system for the capacity of the copy machine might be some smaller system.

We may expand upon the notion of a minimal functional system by applying the notion to a set of more than one capacity. Thus, the minimal functional system for two capacities C_1 and C_2 (i.e. $M(C_1, C_2)$) would be the smallest system for which both capacities function. For example, relative to the above case, the minimal functional system for the set of capacities consisting of, say, the capacity of the photocopy machine of a department of a larger institution and some other capacity of some other object, say, a vending machine in a lounge area of the same larger institution, would now be the larger institution rather than either the department or the lounge facility. For, neither the department nor the lounge facility are systems relative to which both the capacity of the

copy machine and the capacity of the vending machine are functions, but the larger institution is such a system relative to which both capacities are functions.

The notion of the minimal functional system for a set of capacities provides a formal means of talking about the ordering of the functional system. Although the ordering of a functional scheme differs substantially in some respects from the ordering of continuous system, as orderings they do share the following common feature. Let us recall that one of the fundamental notions involved in the ordering of the objects of a continuous system is the relational difference that obtains between any two objects of the continuous relational system. For objects X , Y , and Z of a continuous system, the ordering of those objects is X, Y, Z only if the relational differential between object X and object Z is greater than the relational differential between objects X and Y . Now, for the case of a discrete system such as a functional scheme, we can explain the relational difference between any two capacities in terms of the notion of a minimal functional system for the two capacities.

To illustrate, let us reconsider the copy machine. Let us also consider, in relation to the copy machine, a certain paper cutter. Now, we might consider as a minimal functional system for the two capacities of these objects the department within which these two objects have a functional role. We could, of course, analyze the department further and identify some smaller sub-system of the department that would be a more precise minimal functional system for the two objects. The notion of minimal functional system is subject to degrees of precision. But for the present example, to say that the department is the minimal functional system of the two capacities will suffice.

The order of the functional scheme of the department would be some number, say m . Consider now the minimal functional system for the copy machine and a vending machine in a lounge facility of the institution. The minimal functional system for the capacities of the copy machine and the vending machine would now be the larger institution for which both function. (Again, we could be more precise, but the above will be sufficient for this illustration.) The order of the functional scheme of the larger institution, however, will be some number n that is necessarily greater than m , the order of the functional scheme of the department. Thus $n > m$. This reflects the fact that the relational difference between the function of the copy machine and the vending machine is greater than the relational differential between the function of the copy machine and the function of the paper cutter. The latter pair are more closely related than the former, although all are ultimately related since they all play a functional role for the larger institution.

In general, the notion of the minimal functional system provides a means of identifying the relational difference between any function X and another function Y and also of comparing the relational difference between function X and Y to the relational difference of function X and another function Z .

3. Truth-Conditions For Inner-Outer Expressions Asserting that Something Is Inside Or Outside A Given System

We generally understand the systems explicitly or implicitly referred to by such expressions as 'The child is in (or out of) the school system' 'The data is in the computer' and so on to be complex objects whose parts are functionally related. The functional

relationships are defined by reference to a capacity of the system which, together, the functionally related parts produce. Since the functions of each of the parts of the system are all interrelated, they constitute a part of the functional scheme.

However, the functional scheme extends beyond the system as well. Finite systems such as school systems, electrical systems and computers operate as parts of larger environments. A school system is not a wholly autonomous object but an object that relates functionally to the larger community. The functional scheme that describes the system extends beyond the system and describes the larger system of which the given system is a part. We can illustrate this point by examining the case of the school system in more detail.

On the social level, a functional scheme that describes a school system includes descriptions of the functional relations of the various individuals concerned with the formal education of other individual members of a social group. These relations occur between teachers, administrative personnel and students. What makes the collection of these individuals a system is the network of functional relations through which they interrelate. On the physical level, other physical objects such as school buildings, desks, blackboards, books etc. are also a part of the school system, again by virtue of the functional relations these objects have to the educational process. We can also identify as parts within the school system various sub-systems such as academic departments, administrative offices, physical operations, libraries etc.. Likewise, we can analyze such sub-systems into smaller sub-systems, and those sub-systems into sub-sub systems and so on.

The functional relations of the school system extend beyond the system as well. The school system as a whole performs a function with respect to a larger system, namely the larger community of which the school system is a part. Each functional aspect of the school system is either directly or indirectly functionally related to the community as a whole. For example the money that operates the school system, and is therefore a functional part of the system, is also functionally related to the economy of the community at large. Likewise, the artifacts that physically implement the school system are all products of the larger community and indirectly serve the larger community by serving as instruments for the education of its population. Similarly, the teachers, administrative personnel and students are each functionally related to the larger community in various ways. In general, the functional scheme that describes the school system is but a portion of a much larger functional scheme that functionally describes a much larger socio-economic system.

For inner-outer expressions involving descriptions of systems such as the school system, there is an implicit assumption that the subject of the expression is describable as being functionally related to the larger functional scheme that describes not only the system but the environment relative to which the system functions as a part. For example, the subject of the expression 'The child is in the school system' is presumably a functional member of the community as well. Likewise, for the expression 'The child is out of the school system,' even though the child is no longer a functional member of the school system, he/she does remain a functional member of the larger community in some way. Similarly, for the expression 'A portion of the states money is in the school system'

or ‘..has been taken out of the school system’ the money referred to performs a functional role for the economies of both the school system and the larger economic environment whether or not it is used to operate the school system. Again for the expression ‘These books are in the school system’ or ‘..out of the school system’ the books referred to perform an educational or intellectual function for both the school system and the larger community outside.

Such inner-outer expressions as those of the present case seem to involve only such subjects as those describable with respect to the larger functional scheme that functionally describes the larger community and of which the functional scheme that describes the school system is but a part. To illustrate this point, suppose that a large rock located on the property of a member of the community is moved to the schoolyard. It would be peculiar, if not meaningless, to say ‘There is a large rock in the school system.’ Likewise, if it were removed from the schoolyard, it would be unusual if not meaningless to say ‘The rock is out of the school system.’ One reason for the peculiarity of these sentences is that the rock referred to simply has no apparent functional relation to the larger socio-economic functional scheme in terms of which the school system and the larger social environment are described. The rock does not perform a function within the school system. Nor did it perform a function that was part of the larger socio-economic functional scheme ‘outside’ of the system that was somehow functionally related to the school system. On the other hand it is meaningful to say ‘A large rock is in (or out of) the school grounds.’ For, in this case the rock—a spatial object—has some spatial relation with the school grounds which also have spatial boundaries. What this

example illustrates is that being both “within” or “outside of” a system entails having some functional relation to the larger system of which the system in question is a part. In contrast to the preceding example, it may be meaningful to say that the child of the same community member was put into (or moved out of) the school system, because the child does play a functional role for the larger socio-economic system.

The case involving a computer, considered as a “system” shares similar presuppositions. It is meaningful to say “The data was put into the computer” (where ‘computer’ means data processing system vs. physical object). The meaningfulness of this expression is due to the fact that data has a functional role for the functional scheme describing both the computer and the larger technological environment of which both the computer (as a sub-system of the technological environment) and the data are parts. On the other hand it would be absurd to say “A peanut butter sandwich was put into the computer” (where again ‘computer’ means data processing *system vis-à-vis* physical object). The absurdity of this expression is due to the fact that the peanut butter sandwich simply has no functional role for the computer or the technological environment of which the computer is a part.

Let us presume the subjects of inner-outer expressions of the present kind are describable with respect to the larger functional scheme that describes the larger functional environment of a system. Now, this functional scheme of the larger functional environment constitutes an ordered system as described in the preceding discussion of functional relations and functional systems. Furthermore, what terms such as ‘school system’ or ‘computer (i.e. data processing system)’ refer to with respect to the larger

functional scheme is a sub-system of the larger functional system. This portion constitutes a partition of the larger functional scheme into two parts: those functional capacities that play a functional role for the system and those that do not play a role for the system, but yet are in some way still functionally related by virtue of their functional roles for the larger system. What inner-outer expressions involving these kinds of descriptions convey is something about the functional relationship between the functionally described subject of the expression and the portion of the larger functional scheme that constitutes the system—a partition of the functional scheme.

We can express the kind of functional relations that statements of the form “X is in (outside) of some system S” refer to in terms of the notion of minimal functional system. Thus relative to some larger functional scheme Σ of which system S is a partition and some functionally described object X:

‘X is (functionally) inside system S’ is true if and only if:

$$|M(X,S)| = |S|$$

and

‘X is (functionally) outside system S’ if and only if

$$|M(X,S)| > |S|$$

For the above truth-conditions, $M(X,S)$ is the minimal functional system for the functional capacities of X and the set of functional capacities that constitute the system S. Now if and only if X is (functionally) outside of S, the order of $M(X,S)$ (i.e. $|M(X,S)|$) will necessarily be greater than the order of S (i.e. $|S|$). The reason for this is that if X is functionally outside of S, then any minimal functional system relative to which both X

and S function would necessarily be some larger system that (functionally) contains both S and X. For example, if a child is outside a school system, but still a functional member of the community, then the minimal functional system relative to which both the child and the school system function would be the functional system of the larger community. The order of this system will necessarily be greater than that of the school system since the school system is a sub-system of the larger socio-economic system of the community.

On the other hand when and only when X is a functional part of a particular system, and thus functionally “within” the system S, the order of the minimal functional system for both X and the other functions of the system will necessarily be equal to the order of the system, since the minimal functional system for both will simply be the system S.

B. INNER-OUTER EXPRESSIONS DESCRIBING FUNCTIONAL STATES

Sentences such as ‘The soda machine is in/out of service,’ ‘The facility is in/out of order’ and ‘The machine is in/out of operational mode A’ exemplify yet another subclass of inner-outer expressions involving functional descriptions of objects. To say, for example, that a particular machine is ‘in service’ implies knowledge of its function and *vice versa*. Thus Fodor claims that

Prima facie, there is a relation between the question ‘What is the function of a mousetrap?’ and the question ‘What is it to repair a mousetrap?’..Talk about the function of Xs is, in short, related in a variety of ways to talk

about artificial Xs, substitute Xs, [and more to the present point] impaired activity of Xs, pathological Xs, normal Xs and so on and on."⁴³

We may express the general form for the class of inner-outer expressions in question as follows:

X (a machine, etc.) is in/out of some functionally defined state
(e.g. order, service, operational mode X).

Let us presume that expressions such as 'S is in service' or 'S is out of service' are roughly semantically equivalent to 'S functions' or 'S is dysfunctional' with respect to a particular functional scheme. According to the foregoing analysis a capacity C of a capacital system S, is a function only insofar as it is functionally related to some functional scheme Σ defined relative to the capacital system S of which C is a part. To know that some behavior of an object is functional behavior would entail knowing how that behavior relates to a presupposed functional scheme. Such descriptions may indeed be very complex since a particular machine may have any number of functions with respect to a given functional scheme. In order to simplify the present analysis, I will limit discussion to the simple case in which an artifact has only one function relative to a given functional scheme and later discuss how the case of multiple functions might be handled.

To illustrate knowing that something either functions or dysfunctions presupposes knowledge of something like a functional scheme, consider the following simple, hypothetical scenario. The case involves a small company that is in the business of selling Product A and Product B. The company operates from a building that has two rooms: a small front sales room that is used for conducting business with outside customers and a larger back room that is used to stock the two products the company

sells. The front room is relatively empty, its most prominent furniture consisting of a counter which customers approach to place orders and behind which stands a clerk, Ms Smith, who takes orders.

Located on the counter are two buttons, buttons A and B. Both of these buttons are connected via electrical wires to a small box that contains an electronic signaling device. The device is connected via electrical wires to a loudspeaker located in the back stock room. The device is designed to produce exactly two different kinds of signals that are transmitted to the speaker in the back room. Each signal produces one or the other of two kinds of sounds through the loudspeaker, a medium pitched buzzing sound or a high pitched ringing sound. The signals producing these sounds are transmitted only when the device is activated by pressing one of the buttons. Button A activates the signal that produces the medium buzzing sound, and button B activates the signal that produces the high pitched ringing sound. All of this is used as a means by which the order clerk is able to communicate with the stock people. When a customer places an order for Product A, Smith presses button A, which then activates the speaker producing a medium buzzing sound. The stock person then knows to get one of Product A and bring it into the front room for the customer. If the customer places an order for Product B, an analogous sequence of events occurs involving button B and the high pitched ringing sound.

This system has been used by the company for a number of years and has always worked well. Over this period of time the employees have become accustomed to the system. On one particular day, however, two unique events occur relevant to the moral of this story. The first event is the hiring of a new stock person, Tom, who now must be

⁴³Jerry Fodor, *Psychological Explanation* (Random House, 1965)

trained for the job. Tom is taken to the stock room and put under the charge of the stockroom manager, Mr. Jones. During the course of training, Jones explains to Tom that when a sound comes over the speaker, that means that Tom is to get one of the products from the shelf and take it to the sales room for the customer. Not wanting to inundate the trainee with new information, the manager decides not to explain what the different signals are. He simply tells Tom that, for the time being, when the speaker sounds he shall tell him which product to get.

Shortly thereafter, a medium pitched buzzing sound emits from the speaker. The manager tells the stock person to get one Product A and take it to the sales room. The trainee does so, is congratulated on his fine work and all is well. A short while later, a high pitched ringing sound is heard from the speaker. The manager tells Tom to get one product B and take it to the sales room. Tom does so and returns quickly. Shortly thereafter, however, the second significant event of the day occurs when, for the first time, the speaker produces a low pitched foghorn kind of sound. Tom eagerly jumps up and asks "Which product should I get Mr. Jones?" Mr. Jones replies pensively, "Tom, I will need to handle this one." A moment later Mr. Jones appears in the sales room whereupon he sees Smith talking to a customer in apparent anticipation of a product. When Smith sees Jones appear without a product, she responds with some puzzlement. "What seems to be the problem, Jones?," she queries. Jones replies, "I believe that the signal device is out of order. Which product did you want?"

When the confusion is settled and the customer happily on her way, Jones and Smith set about examining the signal device. Upon lifting its cover, they discover one of

the wires of the device had somehow worked its way loose, barely making contact.

This accounted for the distorted sound that came through the speaker. They fastened the loose wire and proceeded to test the device. When their test proved that their efforts had been successful, Jones comments to Smith, "I'm glad we've got that thing back in order." They all went back to business as usual.

Besides having a happy ending, this story presents a case in which describing an object as being either functional or dysfunctional presupposes knowledge of a functional scheme relative to which the capacity of the object has some capacital relation. Of the four characters portrayed, Tom, Jones, Smith and the customer, neither Smith, nor the customer would have had any grounds for saying that the signal device was out of order. The customer had no grounds to do so since she had no clue as to what was going on with respect to this situation. While Smith, on the other hand, knew what was supposed to have happened, since she knew about the system and apparently activated one of the buttons. However, since she did not hear the unusual sound of the speaker, she had no evidence there was any problem. Both Tom and Jones, had enough perceptual evidence to know that something about the system was out of order. However, Tom had no background knowledge of the system. He knew the speaker should produce sounds and that the sounds meant that he was to get one of the products, but, except for those he had heard, he didn't know how many different kinds of sounds it was supposed to produce, or what those different kinds of sound were supposed to be, qualitatively, or what they meant specifically. When the speaker produced the low foghorn like sound, Tom interpreted this as just another signal and expected to act accordingly.

Only Jones could know the signal device was out of order, because only Jones had the relevant information. He had evidence of the deviant behavior of the speaker, as did Tom. But he also knew that the behavior was in fact deviant behavior because he knew what the sounds were supposed to be and what response they were supposed to effect. On these grounds alone, he could know at least that the larger communications system, which consisted of the buttons, the box the speakers, as well as the input of the sales clerk and the output sounds of the loudspeaker, was “out of order..”

But Jones also knew the function of each component of the system. He also knew it was not the speaker that was out of order, since the loudspeaker did make a sound, so, as a loudspeaker, it did function properly. When he went to the sales room, he could also surmise from Smith’s reaction that the buttons had not been tampered with and were otherwise secure. He could surmise that one of them had been activated. Thus, by process of elimination, he could confidently say it was the signal device that was out of order. In general, this case illustrates the fact that the use of inner-outer expressions entailing functional ascription, or, for that matter, explicit functional ascription, presupposes a background of knowledge of a functional scheme (or at least a part of a functional scheme) relative to which the object in question has some functional relation.

But now, while this conclusion does apply to this one carefully constructed case, can we say this thesis is true generally? I would argue that it is. In general, I think it most plausible to say we necessarily bring to our judgments about such matters a great deal of information over and above what we directly perceive, and among this information, how it is we understand the artifacts to relate to something like a larger functional scheme.

This tacit information provides the basis for the judgments that we make, though it usually does so without our noticing it. The main difference between the above illustration and everyday cases is that the above case shows explicitly the role of such tacit information and the fact that when it is lacking the judgments in question cannot be reliably made.

Certainly, we often do make correct judgments about artifacts, even those with which we have no previous familiarity, to the effect that they are in or out of order. We make these judgments on the basis of immediate appearances. However, such cases are possible only because we have general knowledge about how such things work that we apply ready made to situations such as these. This principle is brought out in cases in which judgments go awry. The reason they do is usually not for lack of perceptual evidence, but because some crucial piece of background information is missing as the case above serves to illustrate.

In general, judgments concerning whether or not an artifact functions presuppose knowledge of a functional scheme relative to which we can assess the artifact's present capacities. Our judgments as to whether an artifact is 'in (or out of) order' depend on our knowing how that artifact's capacities relate to a given functional scheme. Generally, to describe an object, relative to a given functional scheme, as dysfunctional entails that it normally does or should have some particular capacity that is functionally related to a functional scheme but that at the present, none of its capacities can be described as being that functional capacity. Describing something as dysfunctional is, then, derivative of functional description.

On the account of functions given, the only objects that should or normally do have a particular function are those that may be described with respect to the capacital network that is the basis for a functional scheme that the normal function is a part of. For it to be possible for a particular object to function in a certain way requires at least that the object can be described with respect to the capacital universe to which the functional scheme applies. Accordingly, when a physical object (e.g. a machine) is dysfunctional, it does not “drop out” of the capacital universe of physical objects. It still has physical capacities. (It still takes up space and has the capacity to physically resist other physical objects and so on.)

Though a background understanding of how an artifact works relative to some functional scheme is a necessary condition for judging the artifact to be “in” or “out of” order, such understanding is not sufficient. In addition to knowing how the artifact would or should work relative to a particular functional scheme, in order to say the artifact is “in” or “out of order” also requires a comparison between what the artifact would or should do relative to the functional scheme and what it actually does. Knowledge of a functional scheme is prerequisite to knowing what an artifact should do. In addition to this background knowledge, perceptual evidence is required to know what the artifact in fact does. An artifact’s being in or out of order is a matter of the relation between what it does do and what it should do relative to some functional scheme. Truth-conditions for each of the two cases consist in specifying the difference between how the actual behavior compares to the supposed functional behavior when the artifact is functional as opposed to when it is dysfunctional.

Such an assessment involves a comparison between qualitative features of the actual behavior of the artifact and qualitative features of the behavior that the artifact should display relative to the functional scheme. However, an object's being out of order is not merely a matter of qualitative difference. There is also an intrinsic quantitative aspect to the difference involved. This quantifiable difference is a matter of: 1) how much difference there is between the two behaviors and 2) how much of a difference this makes for the overall behavior of the larger system the artifact is a functional part of. Let us consider each of these differences separately.

1. For any two distinguishable properties of the same kind (e.g. two color properties), we may say they are qualitatively different. We can also say how much different. For example, we say that the color red is different than the color blue. Likewise, we can ask how much different is red from blue? This cannot be answered in absolute terms. We have to say something to the effect that there is a greater difference between red and blue than there is between red and purple. We could continue with comparisons until satisfied that we understand how different red is from blue. The question, "How much...?" is, of course, a question about quantity.

Consider this quantitative aspect of comparison with respect to the signal device of the short story above. In that episode, Jones judged that the signal device was out of order on the basis of his perception of the sounds produced over the loudspeaker. His judgment that the communications system was out of order was based on the fact that he discerned a qualitative difference between the third sound produced and the kind of sounds it would make if it were in order. There is also, however, a quantitative aspect of

the distinction he made. To illustrate this, suppose that the third sound was not a low pitched foghorn sound as was described earlier, but rather a buzzing sound, much like the first sound, though at a slightly lower pitch. In this case the two sounds would have been qualitatively different. But in this case the sound would have been close enough to the first sound that Jones could have taken it to be a token of the first kind of sound and thus confidently interpret it as meaning “get product A.” He might not have judged anything out of order, merely in need of adjustment.

We can vary this example to any extent. We can consider a whole range of alternative sounds produced by the loudspeaker that vary from sounds similar to the medium pitched buzzing, to the extreme case of the low pitched foghorn sound. When the sound is similar enough to the medium pitched buzzing sound, Jones can confidently interpret the sound to be a token of that kind of sound. However, as the sound produced deviates more and more from the standard sound, at some point Jones will begin to question whether or not the sound should be taken as a token of the standard sound. At the point at which he cannot decide whether the sound is a token of the standard sound, the sound produced will have become ambiguous, and Jones will not know what to do with respect to getting product A or B. Beyond this point the sound would not have the effect it should have relative to the functional scheme. At this point something is “out of order.”

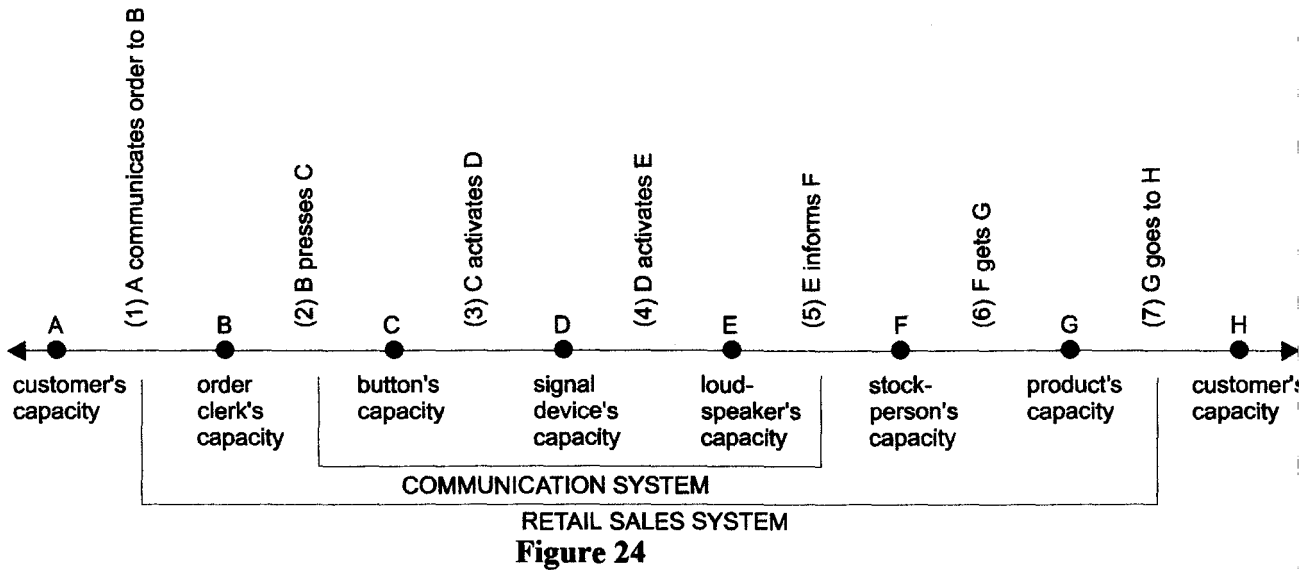
This example illustrates that it is not simply that the behavior of the object is qualitatively different from some standard that indicates something out of order. Rather, judging that something is out of order is also intrinsically a matter of judging how much

different the behavior is from the standard. Is the behavior different enough that it makes a corresponding difference in the behaviors of other objects of the system? If so, it is out of order. If not, it is not out of order.

2. Consider also the quantitative difference the behavior of an artifact can make with respect to the behavior of the other parts of a functional system to which it is related. Consider, for example the effect the deviant behavior of the loudspeaker has on the behavior of the other parts of the system of retail. Observe the sequence of events that normally occur when the communication system is functional. This sequence consists of the following:

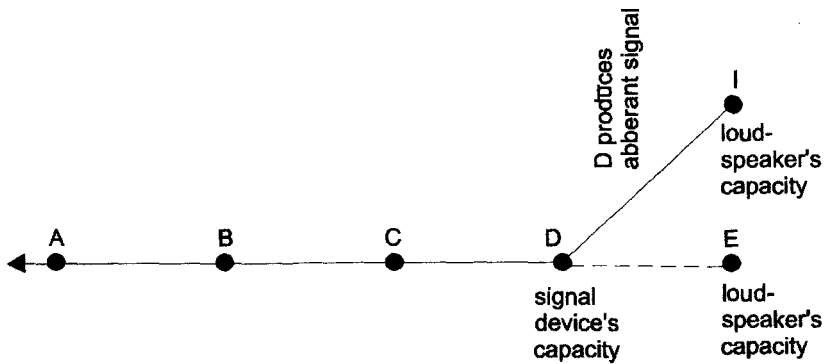
1. A customer communicates a purchase order for Product A or B to the order clerk.
2. The order clerk presses button A or B.
3. Button A or B activates the electronic signal device.
4. The electronic device sends signal A or B to the loudspeaker.
5. The loudspeaker produces sound A (medium buzzing sound) or B (high pitched ringing sound).
6. Sound A or B informs the stock person whether to get product A or B.
7. Stock person gets product A or B and takes it to the customer in the front room.

There are seven basic steps between the input of the customer's placing an order and the output consisting of the stock person's bringing the product to the customer. This sequence could be analyzed in more detail but that would not affect the conclusion drawn from this analysis. Figure 24 illustrates the sequence.



Call this sequence of causal interactions the “normal functional scheme” of the system or simply N.

When the communication system dysfunctions, the above normal sequence is broken. When the sequence reaches step (4), although button A is pressed, the signal device does not send signal A, as it should. Rather it sends an aberrant signal. Thus, the sequence of actual behaviors to this point looks like this (Figure 25):



(This could also be augmented by the repair system.)

Figure 25

As Figure 25 illustrates, when the signal produces the aberrant effect (i.e. the deviant sound over the loudspeaker) although the normal causal chain is broken, activity does not come to a halt. Rather, a new sequence of behaviors is triggered. This new sequence is as follows.

3. Button A or B activates the signal device (same as (3) above).
- 4a. Upon being activated by button A, the signal device sends a deviant signal to the loudspeaker (rather than signal A).
- 5a. The loudspeaker produces a sound significantly (quantifiably) different than sounds A (medium buzzing sound) or B (high pitched ringing sound).
- 5b. The different sound causes the stockperson to question what is being ordered.
- 5c. This question motivates the stockperson to walk out to the sales room to discover what to do.
- 5d. Asking the order clerk what to do causes the order clerk to respond by telling the stockperson which product to get.

- 6a. The order clerk informs the stockperson whether to get product A or B.
(Thus the order clerk's saying which product to get in effect replaces the functional role of the loudspeaker.)
- 7. Stockperson gets product A or B and takes it to the customer in the front room. (same as (7) above)

In addition to these modifications, the dysfunctioning of the communications system also causes the order clerk and stock person to execute several other procedures involved in repairing the system. Figure 26 illustrates this new modified sequence.

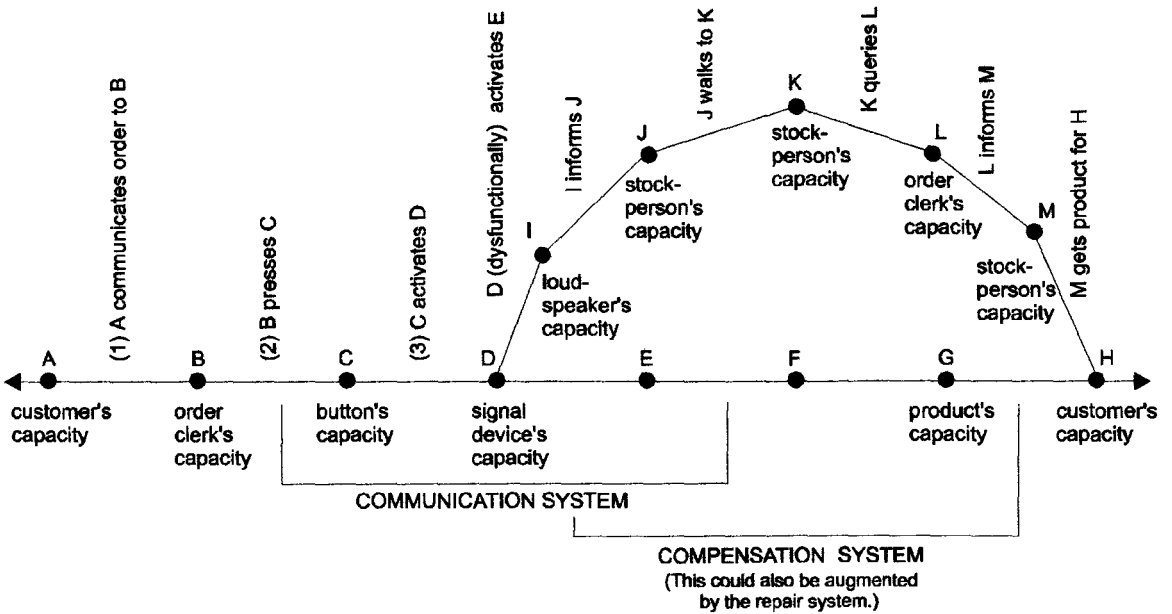


Figure 26

When the signal device dysfunctions, the normal chain of events is modified by the appearance of an extended sequence of behaviors. Since these new behaviors also contribute to the output capacity of the larger retail sales system, we may consider these

new behaviors as functional behaviors as well. In effect, when the signal device dysfunctions the usual functional scheme is modified by new additions that extend the original functional scheme. As the diagram shows, the steps that are added to the original network have the effect of producing a bridge from the dysfunctional capacity to an effect that is part of the original functional scheme (i.e. effect (7)) that would have occurred if the behavior of the part of the system had been functional. Let us call this alternate functional scheme—which describes what actually happened—the “actual functional scheme” of the system.

“The original normal functional scheme N is describable in quantitative terms. Specifically, the causal sequence of the original functional scheme involves seven causal interactions between eight capacital states.⁴⁴ These seven interactions between eight capacities are representable by a graph such as Figure 26 above. The order of N is eight (i.e. $|N|=8$). Similarly, we can describe the actual functional scheme triggered when the signal device dysfunctions in the same kind of quantitative terms. Let us call the actual functional scheme ‘A.’ The order of A is ten (i.e. $|A|=10$). Furthermore, although Smith and Jones repaired the signal device after the customer had been taken care of, the same results could have been achieved had they repaired the device first. Thus the repair of the device would be describable by a separate causal (and functional) network that would be independent of the compensating network that we have just called A. Let us call this network A_1 . Thus, the order of A_1 would be 9 (i.e. $|A_1|=9$).

⁴⁴The reason that there are 8 capacities is that, recalling from previous discussion, a capacity entails a two way relation. Being a capacity C entails having a certain effect E when acted upon by some anterior cause A. Thus, the capacity C entails a capacital relation between A and C and also between C and E. If A and E are also capacities, then A, C and E will entail 2 relations between 3 capacities. In general, for

Both the order and the size of either A or A_1 are necessarily quantitatively greater than the order and size of N . This is not merely coincidental, but rather a logical consequence of the natures of N , A and A_1 . For N describes a particular sequence as it normally occurs, whereas both A and A_1 would need to account for all of the events described by N and also other events that must supplement one of those of N . That is, for the case of, say, graph A (a graph of the interactions that would occur when one of the relations of N is broken), one of the capacities of N is replaced by a new “dysfunctional” capacity that is now part of A . That dysfunctional capacity must be compensated for by adding new additional capacities to network A . These new capacities eventually reestablish the original connection the dysfunctional capacity should have had with the network, so these new supplementary capacities will add to the order of A over and above the capacities that are in N . Thus no matter how the dysfunctional capacity is compensated for, such compensation will result in a network that involves more events than would occur otherwise.

A system's being out of order involves additional efforts to compensate for its disfunction. That is why a system's being out of order is undesirable. If, however, the actual performance of the system did not involve the disfunctioning of one of its parts, then the scheme A that would describe such a non-dysfunctional performance would be the same as N . That is, all of the actual capacities of the system would be the same as those described by N . Consequently the order of A would be equal to the order of N .

These observations lead to a way of formulating the truth-conditions for the signal device's being in or out of order for this context. The signal device is in order if and only

if the order of A (where A is the functional scheme that describes the actual behaviors constituting the larger retail sales system) is equal to the order of N (the functional scheme that describes the “normal” functional scheme of the sales system). That is, if all goes as planned, then $|A|=|N|$. Conversely, the device is out of order if and only if its behavior is qualitatively different than its behavior under N and the order of A is larger than the order of N. These truth-conditions capture the intuitions that not only does the behavior of the device differ from its usual behavior but the difference in its behavior results in a quantitative increase in the order of the sequence of causal events (i.e. number of events of the sequence) needed to compensate for this difference.

Truth-conditions for this particular case are generalizable to cover all cases of describing an artifact to be in or out of order only if any artifact’s being out of order implies a repair or compensating system be operable, in principle, when the artifact dysfunctions. The number of events that take place whenever a repair system is required to compensate for some dysfunctional component of a system are always greater than the number of events that normally take place.

I argue that, in principle, whenever something is judged to be out of order it is always possible to point to something like a repair system, even if only in the barest of terms. For certainly, any artifact considered out of order could also be repaired with some undetermined amount of effort. It may be that in some cases, for practical reasons, we may choose not to make the needed repairs. In other cases, the means of repair are not actually or practically available. But this does not imply such repairs could not be made in principle. This conclusion is evidenced by a commonly used aphorism to the

effect that anything can be fixed, it's just a question of how much it will cost.

Moreover, for any case for which, in principle, it is not possible to repair the artifact in question, it would seem inappropriate to say it is out of order. It would rather be appropriate to say it is destroyed, ruined, demolished, annihilated, etc., whereupon we understand it to have lost any capacity whatsoever to be related to a normal functional scheme. It seems appropriate to say that anything out of order can be put back in order. This conveys the implicit symmetrical nature of the inner-outer relation. What is "in" can be "out" and *vice versa*. But to be able to put something back into order entails the possibility of a means to do so. Such a process would constitute an extension to the normal functional scheme relative to which the artifact is out of order.

Given that the expression 'out of order' implies 'reparable,' and that a repair system would be an extension of the normal functional scheme, which necessarily increases the order of the normal functional scheme, we may generalize the truth-conditions for the particular case of the signal device described above as follows. For some object X that is normally functionally describable with respect to some normal functional scheme N, and whose function with respect to some actual functional scheme A can also be described.

'X is in order' is true if and only if:

$$|A| = |N|$$

'X is out of order' is true if and only if:

$$|A| > |N|$$

These truth-conditions can be alternately stated in terms of the notion of a minimal functional system. Thus:

'X is in order' is true if and only if:

$$|M(X,N)| = |N|$$

'X is out of order' is true if and only if:

$$|M(X,N)| > |N|$$

When and only when X is out of order, the order of the minimal functional system for both X and N is necessarily greater than the order of N. The reason for this is since X is out of order, it does not have a present capacity that is a part of N. Thus any system with respect to which both X and the other capacities of N are functional is necessarily one that contains both N and X, and whose order must be greater than that of N. Specifically, the system in question relative to which both X and N would function is the system comprised of both N and a repair system that functionally relates X to N by compensating for its dysfunctional behavior. If X is in order though, the minimal functional system relative to which X and the other capacities of N functions is N itself. Thus the order of the minimal functional system in question is equal to the order of the system N.

This discussion has considered only single-function subjects. What about machines and other artifacts that have more than one function? We may describe an artifact's having several functions in terms of a (logical) conjunction of those functions. For example, a soda machine may have the functions of: dispensing soda, AND keeping the soda cold, AND making change and so on. On the present account, truth-conditions for each of these functions, individually, would involve the kind of analysis developed for single-function artifacts. Since we can describe multi-function artifacts in terms of a conjunction of functions, truth-conditions for describing such a multi-function artifact as being "in" or "out of" order consist of a conjunction and/or disjunction of truth-

conditions for each of the individual functions of the multi-function artifact. The exact arrangement of these truth-conditions for individual functions (i.e. whether they should be disjunctively or conjunctively related) vary from case to case, since for a given artifact, the loss of one function makes it “out of order,” while for others it may be that the loss of several or all of its functions would be required to make it “out of order.”

Because of the complexity of this last topic, I shall not pursue it here. Moreover, what has been presented so far concerning both the nature of functional description and truth-conditions for inner-outer expressions entailing functional description does not tell the whole story of the subject of this discussion. The subject of functional analysis is an enormously complex topic. What I have attempted is to provide a general treatment of the principles that seem to be involved in the analysis of the expressions in question. While these analyses are neither complete nor unproblematic, they present a plausible and potentially fruitful approach to the present issue.

If what has been presented is plausible, then the upshot of the foregoing analysis is that the truth-conditions for such complex cases involve an extension of the same kinds of principles involved in the analyses of inner-outer expressions entailing reference to continuous systems discussed in chapters II and III. Specifically, the truth-conditions for both an object’s being functionally in or outside of a system or functionally described as being in or out of order presuppose a larger functional system relative to which X is functionally related to some portion of the larger functional system. How it is related to that portion, whether it is internally related or externally related can be evaluated in terms of the ordering relations that apply to X and the system as a whole.

C. INNER-OUTER EXPRESSIONS FOR THE CONTEXT OF GAMES

In the context of discourse about games we encounter such expressions as ‘The ball is in/out (of) bounds’; (In chess) ‘The king is in/out of check’ and so on. Let us consider the principles that would be involved in truth-conditions for such cases.

Consider some of the components entailed by the concept of a game—more concretely, as they obtain for a particular game of basketball, for example. A general description of the event of a particular college basketball game may include the following: The event takes place at the school gymnasium of one of the teams. Spectators arrive and move about to get to their seats. The auditorium fills. A pre-game show is offered by the team’s cheerleaders. The pre-game show ends and the contending teams enter the court. In a short ceremony the players and coaches are introduced. As the crowd enthusiastically watches, the players assume their starting positions. A buzzer sounds. The clock starts. The game begins. For several hours, the players run up and down the court, dribble the ball, pass the ball, shoot the ball, block each other, elude each other and in general do all the things players do when playing basketball. Occasionally there is a time out. Regularly, a score is made. The ball goes out of bounds and is put back into bounds. What in all of this do we call the basketball game? And what do we mean when we say “The ball is in (or out of) bounds”?

With regard to the first question, certainly the term ‘basketball game,’ taken in a narrow technical sense, does not refer to all that has been described. The fans, the cheerleaders, the building, even the actions of the players before and after the game and

during time out are incidental to what we would refer to as the game *per se*. These are not essential to the game. Had the competition occurred in an empty gym or on an outdoor court, it would still be called a basketball game. By what criteria should we distinguish from all that has been described that to which the term 'basketball game,' refers? We can answer this question straightforwardly by appealing to the defining rules of the game of basketball. The rules of the game prescribe which objects and which actions are to count as being part of the game and which are not. Although they take natural human and physical limitations into account, we formulate these rules primarily on the basis of convention.

A simple inventory of the objects to be counted as a part of the game of basketball includes: a certain kind of ball, a court with specific boundaries, hoops located in specific places, a number of players etc. Those actions to be counted as parts of the game include those that satisfy the rules of the game. The rules of the game establish certain restrictions on how the ball is handled, how a score is made, when the game begins and ends and so on. Actions which are not in some way prescribed by these rules are not, strictly speaking, to be counted as part of the game.

While the above description includes a number of details that might occur as part of the events surrounding the game in question, what is to count as the basketball game according to the rules of the game consists of only a portion of these details. Much of the above description refers to objects and events that are not technically a part of the game as defined by the rules. Thus a spectators enthusiastic cheering would not count as part of the game *per se*. No human voices other than perhaps the pronouncements of the

officials would count as a part of the game as defined by the rules. Nor would the actions of spectators, cheerleaders, nor those of the players that are not prescribed by the rules (e.g a players' tying his/her shoe) count as part of the game.

In general, a game is defined by the rules of the game. Moreover, the concrete objects that constitute the concrete instantiation of a game constitute a functional system. The various relations that are involved in this system are defined by the rules of the game. For example, the rules of the game of basketball define how each of the players relate to each other, how they relate to the ball and the court and the baskets and so on.

With respect to the question of inner-outer ascriptions in this context, we observe that the court counts as part of the game. It is also the case that the floorspace extending beyond the boundaries of the court counts as a part of the game. The rules of the game take into account that the court is part of the physical world. As a matter of practicality any court is contiguous with the physical surface around it. Specifically, the rules explicitly state that the physical surface extending immediately beyond the boundaries of the court will count as "out-of-bounds."

When in the course of the game, the movement of the ball (the ball also being counted as a part of the game) crosses from the physical surface counted as the court over to the physical surface that extends beyond the boundaries of the court, we say, in accordance with the rules, "The ball is out-of-bounds." Similarly we say of a player (the player also counting as a part of the game) "He or she is out-of-bounds" whenever the player crosses over the boundaries onto the physical surface beyond the court.

Such utterances are prescribed by the rules of the game and are applicable only to objects that are counted as part of the game. In contrast to the above cases, suppose a spectator, in a moment of blind enthusiasm, walks onto the court. It is not appropriate in this case to say of the spectator “He/she is in-bounds.” Likewise, it is not appropriate to say of the spectators seated in the bleachers beyond the boundaries of the court “They are out-of-bounds.” Although it is appropriate to say that the spectators are seated outside the court. This latter description, however, is a description of position in physical space totally irrelevant to a description of the game.

The above considerations suggest something about how it is that we make inner-outer ascriptions relative to the context of the game of basketball and to games in general. The rules of the game abstract from the physical world a set of objects and functional relations between these objects that are to count as parts of the game. With respect to the game, objects that do not count as parts of the game are irrelevant. The rules of the game define a relational system, a system consisting of only those objects that count as parts of the game and of only those relationships between those objects that count as parts of the game.

Furthermore, the rules may divide the “universe” a game constitutes in various ways, to which divisions the inner-outer relation may apply. Thus, in the above example, the rules of basketball divide the immediate physical floor space that is a part of the game into that which is to count as the court, or proper playing area, and that which is not part of the court. According to this division ascriptions of the inner/outer relation are made to other objects that are parts of the game-system: e.g. “The ball is in/out (of) bounds”; “The

player is in/out (of) bounds” etc. Such ascriptions are not applicable, however, to objects not counted as parts of the game, such as spectators, vendors, etc.

The expression ‘The ball is in/out-of-play’ amplifies this point. For the division implicitly made by this expression is not a spatial division. It is rather a complex division made with respect to several relational systems entailed by the rules of basketball. Specifically, the ball is “in-play” only during certain portions of a real-time continuum. It is “out-of-play” during the moments of its existence “outside” of these portions of “playing time.” Simultaneously, the ball is “in-play” only when it is being handled in certain prescribed ways and “out-of-play” otherwise. So the rules of the game make a division in certain kinds of interrelated actions of the players as well.⁴⁵

The kind of division made by the rules of basketball relative to the expression ‘in/out of bounds’ is a spatial division defined by the boundaries of the court. Consequently, part of the criteria that provide truth-conditions for such expressions consist of just the same criteria used to make a purely spatial statement about some physical object’s relation to the area designated as the court. However, in addition to these criteria, additional criteria must be added that tell what particular kinds of objects count as part of the game and which do not. Such criteria are provided by the rules of the game, which describe the system that constitutes the game. So, for example, relative to a basketball game, the expressions ‘X is out-of-bounds’ is true if: 1) it satisfies the usual spatial criteria for any object to be outside the spatial partition that constitutes the basketball court; and 2) the rules specify that X is a part of the game and the kind of part that could be out of bounds. The latter are functional criteria. Thus we say “The ball is

out-of-bounds” because it may satisfy both (1) and (2). But it would be meaningless to say “The spectators are out-of-bounds,” since they would not satisfy (2), though they might satisfy (1). Yet it would be meaningful to say “The spectators are outside the court” since this is a purely spatial description that is not bound to the rules of the game.

There are numerous games that make the kind of spatial division the game of basketball does, for example, baseball, soccer, football, tennis, etc. However, there are various other kinds of divisions made in other kinds of games as well. For example, in the context of chess, utterances like “Your king is in check” or “My king is out of check” are common. These ascriptions of the inner-outer relation do not entail spatial divisions since the situation to which these utterances apply could occur anywhere on the board. It is even possible to conduct a game of chess using only symbols, in which case there is no spatial aspect involved at all.

The kind of division involved here is a division of the more abstract set of possible relations that the pieces have to each other. At each point in a game of chess each of the pieces is related in some way to each of the other pieces on the board. These relations consist in the kinds of moves that the pieces can potentially make and their abilities to capture the other pieces.

Let us consider a very large set consisting of all possible combinations of relations between active chess pieces. Another way of describing this set would be the set of all possible permutations of the pieces on a chessboard. Among these various combinations, there is a subset for which the relations among the pieces constitute “check.” For all other combinations not of this set the relations between pieces do not

⁴⁵Thanks to Sue Cunningham for pointing out this case.

constitute check. Furthermore, the rules of the game specify the necessary and sufficient conditions that define this subset. These consist of conditions upon how each of the pieces relate to the other pieces for a given arrangement of the board. Specifically, if it is possible for one of A's pieces to take B's king in the next move, then B's king is in check. The partition entailed by the expression 'in check' is the set of all permutations of arrangements of pieces on the board for which the above condition holds.

This subset is a structured subset. The rules of chess partition the set of all possible combinations of relations between pieces into two sets: the set of combinations that constitute check and those that do not. When the combination is a member of the set that constitutes check, it is appropriate to say of one of the pieces that "It is in check." When the combination changes from one that is part of the set to one that is not it is appropriate to use the expression 'It is out of check.' Since the subset is a structured subset defined by the rules of chess, the necessary and sufficient conditions for being a member of this subset will be defined by the rules of the game. What it means to say that a king is 'in' or 'out of' check is that its current relation to the various other pieces is related in one way or another to the structured subset of such relations that constitutes "check." That is, that it satisfies certain criteria.⁴⁶

Chess begins with a standard arrangement of the pieces on the board. The play begins when one of the players moves a piece. Since chess involves a finite number of pieces that can only move to a finite number of spaces on the board, there is only a finite

⁴⁶To clarify this point, I am not saying that being in check is simply a matter of being a member of a certain sub-set of the various possible permutations of arrangements of the board. What I really want to say is that being in check is a matter of satisfying certain criteria set out by the rules of the game of chess. I am using set language here only to convey the idea that these rules prescribe a certain partition of a larger

number of first moves that a player can make. Specifically, on a first turn, the first player can make twenty different moves. She can move any of the eight pawns either one or two spaces (sixteen possible moves) or she can move either of the two knights to either of two spaces (four possible moves). When she makes her move, the arrangement of pieces on the board changes from the standard opening configuration to any of the twenty possible permutations of arrangements of the pieces. Let us represent this with the following tree diagram (Figure 27).

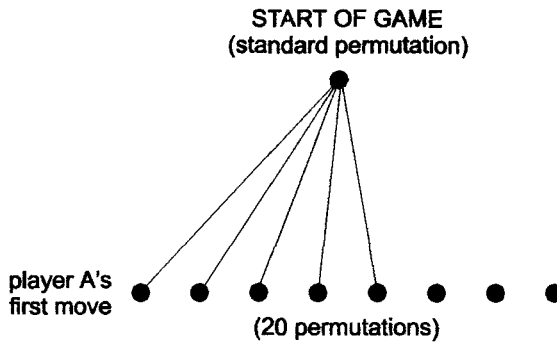


Figure 27

After the first move is made, the second player makes his move. Again, the second player on his first move will have twenty options. When he makes the move he will change the arrangement of pieces from one of the twenty permutations possible from the first move to one of twenty other permutations. Thus, the possible number of permutations of the board resulting from the first two moves of the game will be $20 \times 20 = 400$. The following diagram (Figure 28) illustrates the sequence of possible permutations of the board resulting from the second move of the game.

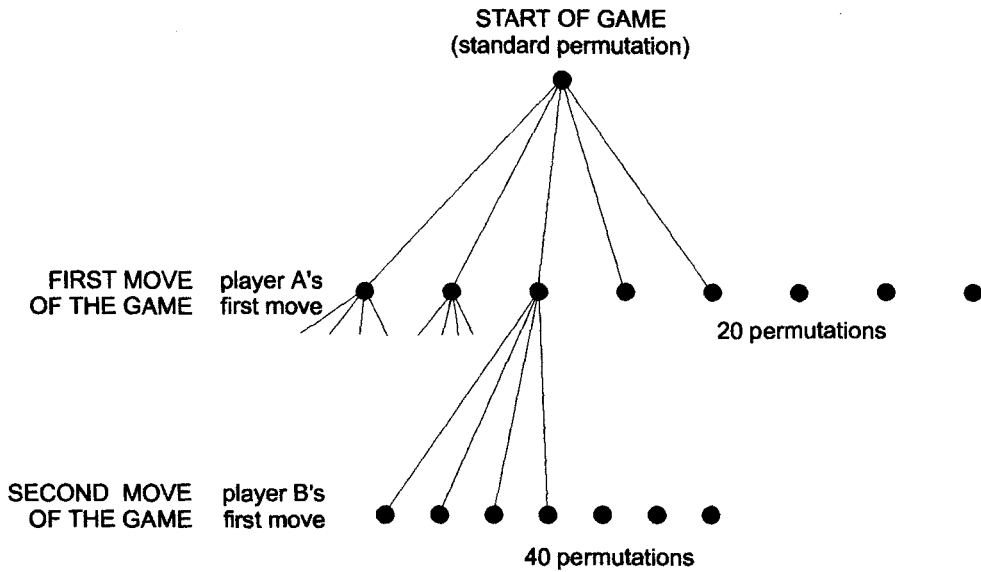


Figure 28

When player A makes her second move (the third move of the game) she will again have a determinably finite number of options. Thus, the third move of the game will change the arrangement of the board from any of 200 possible permutations to one of the determinable number of possibilities for the next move. To illustrate the possible permutations of the board for the third move, we extend each of the 400 nodes representing the permutations resulting from the second move by a number of branches that each represent one of the possible permutations of the several permutations resulting from the second move.

By reiterating this process we can represent all of the possible sequences of moves of any game. Of course, as is clearly indicated by a brief consideration of the first two moves, such a tree diagram would be enormous. However, it would be finite, since all chess games end in a finite number of moves (if we add the twenty move rule to prevent the pieces from moving around indefinitely non-aggressively). The rules of

chess define a fixed and ordered network of possible sequences of permutations of the arrangement of chess pieces on the board. We may describe a particular game of chess in terms of a particular branching path that begins with the initial standard arrangement of pieces and ends at one of the terminal nodes of the branching network.

The terminal nodes of the branching network represent one of three possible kinds of permutation of the board. One kind of permutation is called check-mate. For this permutation, the relations among pieces are such that a) one of the kings may be captured on the opponent's next turn and b) there is no permutation available for the player whose king may be taken on the next move such that the player's king cannot be taken. Another set of terminal permutations consists of those for which there is no permutation of the existing board available to a player such that his king will not be in check. This is called stalemate. The last kind of permutation would be one in which the only pieces on the board are the two kings, a tie.

Distributed throughout the network of permutations that describe chess are a number of identifiable permutations called check. The set of all such permutations constitutes a partition of the nodes of the branching network. For these permutations the relations among the pieces are such that the king of one player may be taken by the opponent in exactly one move (i.e. one permutation of the board). Thus a player's king is "in check" (i.e. the permutation of the board is one "in" the discrete partition of the network that constitutes check for that king) if and only if among the permutations possible in the next move there is at least one such that, for that permutation, the king is taken. This, however, does not imply that that permutation will be the one that the

opponent takes, since it is possible to be in check without the opponent realizing it. If the opponent does not realize it he may move to some other permutation that does not constitute check.

Suppose the permutation of the board is such that player A's king is in check.

Suppose player A has a number of optional moves for getting out of check. Suppose that she makes one of the optional moves. If her king is truly out of check, then for her opponent to capture her king would involve more than one permutation of the board. (Otherwise she would still be in check. But that would be illegal, unless she were in checkmate, ending the game) This means that on the branching network, from the existing permutation (for which player A's king is out of check), any possible permutation that constitutes her king being taken is more than one permutation away. Thus, we may say that (after having been in check) a king is "out of check" if and only if the existing permutation of the board occurs on the branching network at a place such that all possible permutations subsequent to the existing permutation that constitute the king's being taken are more than one move away.

Saying that all permutations that constitute the king's being taken are more than one move away leaves open how many moves away the next such permutation might be. It could be that the earliest possible permutation such that the king would be taken is three moves away. However, it could also be nine moves away. Thus, while being in check is an absolute matter, (the king can be taken in exactly one move), there are degrees of being "out of" check. Thus the king may be "narrowly out of check" or "well out of check," etc.

As with the basketball case considered earlier, it is appropriate to use expressions such as ‘Your king is in check’ only with respect to objects that are considered a part of the game and are thus systematically related to the other parts of the game, these systematic relations being described by the rules. Thus, for example, if during the course of a game, a nearby saltshaker is jokingly placed on a square of the board that one of the active pieces could capture, it would be absurd to say that the salt shaker was “in check.” This ascription legitimately applies only to the two pieces of the game designated as kings. Yet should the players agree to allow the salt shaker to count as a king, the ascription then legitimately applies because now the saltshaker is a functional part of the game.

In the context of discourse on games, ascriptions of inner-outer relations are based on the rules of the particular game in question. These rules define a system. Relative to the system there is some portion of the system described by the rules that constitutes a partition. To say that some object X is “in” or “out” of that partition means it is somehow related to that portion of the system. But the nature of the object and the nature of its relation to that portion of the system are necessarily defined by the rules of the game which define the relational system.

D. INNER-OUTER LANGUAGE FOR THE CONTEXT OF SET-THEORETIC DISCOURSE

A last case to be examined concerns the use of inner-outer language for the context of set theory. One of the fundamental notions of set theory is the notion of set

membership. For any object s and any set S , either s is a member of S or s is not a member of S . Whenever s is a member of S we may say that “ s is in S ” and whenever s is not a member of S we may say that “ s is outside of S .” The expressions ‘ s is a member of S ’ and ‘ s is in S ’ are interchangeable, as are the expressions ‘ s is not a member of S ’ and ‘ s is outside of S .’ The interchangeability between the correlates of these pairs of expressions suggests that they are synonymous.

The possibility that the correlates of these pairs of expressions are synonymous raises an important question. The question is motivated by the fact that any partition term from any inner-outer expression identifies a set of objects. For example the term ‘that box’ which may occur in the expression ‘The pen is in that box’ refers to some specific box. By so referring, the term ‘that box’ identifies the set of all points that lie between the sides of the box. It also identifies the complement of this set, the set of all points that do not lie between the sides of the box. It is also the case that the set of points of space the object in the box (the pen) occupies are points of space that are members of the set of points that are identified by the term ‘that box’ (the set of points that lie between the sides of the box). Similar remarks apply to any other context for inner-outer expressions as well. The question that arises from these considerations, then, is this: Is it the case that for an object s to be inside some other object P just means that s is a member of a certain set S of objects identified by P ? Is inner-outer language just another way of talking about set membership.⁴⁷

This is a question of the meaning of inner-outer language. However, there are several aspects of word meaning that bear relevance to this question. Among these

aspects are what are traditionally called the “extension” and “intension” of an expression. Let us consider the present issue with respect to these two aspects.

The expressions ‘s is a member/non-member of S’ and ‘s is in/out of S’ are interchangeable because the predicates ‘is a member of S’ and ‘is in S’ are co-extensive, as are the predicates ‘is a non-member of S’ and ‘is outside of S.’ That is, for each pair, both predicates of the pair apply to the same individuals. For any s, s is a member of S if and only if s is in S. And if s is a non-member of S, then s is outside of S. Thus, ‘is a member of S’ and ‘is in S’ are extensionally equivalent. But the fact that they are extensionally equivalent does not imply that they are intensionally equivalent. Although ‘is a member of S’ and ‘is in S’ will apply to the same individuals, this does not imply that both expressions convey the same sense. Is there any reason to suppose that they might convey a different sense?

To answer this question, we must compare how it is that we might identify something to be a member (or non-member) of a set, on the one hand, and, on the other hand, how it is we generally identify something as being in (or out of) something. With respect to the first part of this comparison, we can identify an object as being a member (or non-member) of a set in one of two ways.⁴⁸

The first way is simply to stipulate the members of a set, that is, to define the set’s extension (extensional definition). For example, we may define a set whose members are: the Sears Tower, the event of the signing of the “Declaration of Independence,” and my copy of Kant’s Critique of Pure Reason. Accordingly, the objects that are “in” this set

⁴⁷I extend my appreciation to Arnie vanderNat for calling my attention to this important issue.

⁴⁸I extend my appreciation to Paul Moser for the suggestion to approach the analyses that will

are: The Sears Tower, the event of the signing of the “Declaration of Independence,” and my copy of Kant’s Critique of Pure Reason. We identify the members of this set only by direct reference to them. We may observe here that there are no apparent relations between the objects of this set other than the fact that they have been designated as members of this set. So the only relation that obtains between them is the relation of being co-members of the same set. We could, however, extensionally define a set whose members happen to be related in some other ways.

A second way of identifying the members of a set is to identify some simple or complex property and to say that any object that has this property will be a member of the set (intensional definition). Thus we may define a set S as consisting of all the points of space that lie between the side panels of some particular box. The members of this set will share a common property and relation to the other members of the set over and above the simple property of being members of the set. In defining the set in this way we do not refer directly to each of the members of the set. It would not even be possible to do so. We identify an object as being a member or non-member of the set by testing to see the object possesses or does not possess the defining property.

Given these two ways of identifying the members of a set, consider how it is that these two ways relate to how it is that we identify something as being “in” or “outside of” something else. I shall first consider the question of this relationship with respect to identifying the members of the set intensionally and then with respect to identifying the members of the set extensionally.

Let us begin by considering the context of spatial inner-outer expressions.

Consider the expression 'The pen is in that box.' As observed, the term 'that box' identifies a particular set *S* of spatial points. This set of points consists of all the points that occur between the sides of the box. We may also observe, however, that although the term 'that box' can be used to identify this unique set *S*, it does not seem to be the case that 'that box' directly refers to *S*. Rather, what the term 'that box' refers to is a material object whose parts consist of the material sides of the box. The points in space that lie between the sides of the box are not a part of the box *qua* material object, although they are related to the box in a unique way. They are the points inside the box or the points the box contains. For the case of an object of reference such as a box it is easy to conflate the box with its interior points. Since a box completely encloses its interior points with a solid surface, a box is phenomenally indistinguishable from a solid block, whose interior points are part of the block. However, further considerations illustrate the distinction between the box *qua* material object and its interior.

First, let us vary the object under discussion—the box. Let us consider a different object, a bowl. Like a box, a bowl has an interior. And so expressions such as 'The fruit is in the bowl' are meaningful. However, it is apparent that the interior of the bowl is not a part of the bowl *qua* physical object. The bowl consists of its material parts, which happen to partially enclose an interior. The points of the interior space of the bowl are again related to the material parts of the bowl in a special way.

There are many other physical/spatial objects that are like bowls in that, although they have an interior, and although we can describe other objects as being inside or

outside of them, we do not consider either the objects so described or the space that such objects occupy as being a part of the containing object. There seems to be no reason why we should consider the interior of an empty box or any objects that the box might contain to be a part of the box.

A second consideration is of the nature of the relationship between the box and its contents. Consider first the nature of the interior space of an empty box. The box itself consists of matter. But of what does the interior of the box consist? Disregard the fact that the box might contain air, for it is apparently not air that constitutes the interior of the box, although the air might be interior to the box. Suppose that the box is in a vacuum. The interior of the box in a vacuum consists of no more than the space that occupies it. But what happens to this space when the box moves? Does the space move along with the box, as if it is part of the box? Presumably not. If at one moment the box is at one position A and then later at a different position B the space that the box occupies will have changed from the space located at A to the space located at B. Presumably the interior space of the box will have undergone the same change, assuming that the box's interior space is a part of the one larger space that locations A and B are a part of. (See Figure 29)

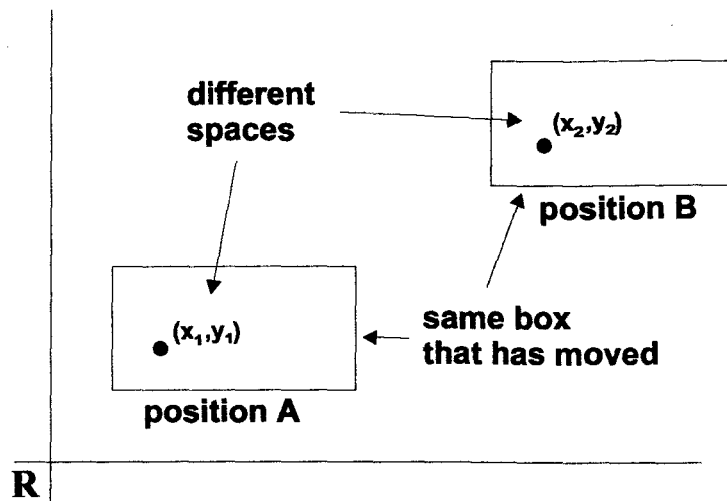


Figure 29

Observe that when the box moves from location A to location B, two items remain relatively the same. First there is the material composition of the box, consisting of the side panels. Although the interior space of the box has changed (from the space of location A to that of location B), what has not changed is the nature of the relationship between whatever space the box occupies and the spatial properties of the material box itself. The interior space of the box at location A will have the same spatial relationship to the spatial properties of the material box as the interior space of the box when located at B. Thus the box will have the same kind of spatial relations to whatever portion of space that it occupies. But this is a relational property of the material box (consisting of its side panels) and not of the space it occupies.

An analogy clarifies this point. Any physical object on the earth has another object to the left of it (even if that object is a volume of air). If there is a physical object s , then it is an essential property of s that there is another object l that is to the left of it.

However, this does not mean that the object to its left, *l*, becomes a part of *s*. What is a part of *s* is its relatedness to *l*, not *l* itself. Likewise, it is an essential property of the box that it will have certain kinds of relations to whatever space it occupies, specifically, the relation of internality of the space with respect to the box. And the space it occupies enters into these relations with the box. It is inessential to the occupied space that it enter into such relations. Nor does the occupied space become an essential part of the box just because it has entered into a relation with the box.

Similar comments apply to any physical objects that may occupy the interior space of the box. Any physical objects a box might contain have an accidental relationship to the box. Their being in the box is a contingent, usually temporary fact. For this reason, it is not the case that when we refer to “that box” we are also referring to its material contents. If we did refer to the contents of the box when referring to the box, then the expression ‘The pen is in that box’ would be a superfluous (perhaps tautological) reply to a question such as ‘Where is the pen?’ A more direct response would seem to be something like ‘There (pointing to the box).’ The expression ‘The pen is in that box’ identifies the location of the pen indirectly. It identifies the location of the pen by first identifying the box and then adding to that reference the fact that the location of the pen is related to the box in a special way. It adds that the pen is “in” the box to which reference is made.

These considerations show that the referring expression ‘that box’ identifies two distinct sets. Let us call these sets *P* and *S*. *P* is a set whose members include all parts of the box. These members include all of the physical structure of the box—the material

side panels of the box. S consists of all of the objects that have interior relations to the box (or, alternately, to P). These objects include the spatial objects that have interior relations to P. Together these spatial objects constitute the interior space of P.

These considerations also show that S is not a part of P. The interior objects of P are neither essential nor permanent parts of P. Nor does the expression 'that box' refer directly to the objects of S. 'That box' allows us to identify the objects of S only because it is essential to the structure of the box that at any given moment it will have internal objects, objects related to the box in a special way. The objects of S consist of those objects that are related internally to P at that time. Over time, however, the parts of S are subject to change whereas the objects of P are relatively permanent.

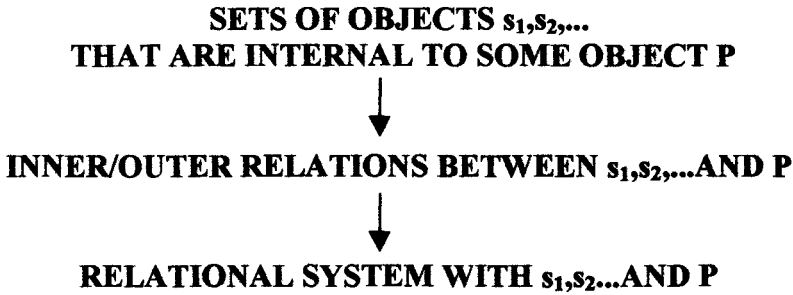
A further, significant observation concerns the way in which the set S is defined. We define P by direct reference to the box in question. P consists of all of the physical parts of the box to which direct reference can be made. We do not define S, however, by direct reference to any object. For example, we do not say, on the basis of direct reference to the pen in question and without further reference to the box in question that the pen is a member of S. For it is not an essential property of the pen that it is "in that box." It is only by virtue of its relation to "that box" that the pen has the property that it is "in that box." This is the case for all the members of the set S. For S is defined as the set of all objects that hold a certain relation to P. We can call this relation "internality" and may describe it in a manner similar to that developed in Chapter II. S is the set of objects that are internal to P. That is, S is defined as the set of objects that have the property of being internal to P. S is derived from P and the relation of internality to P.

It is only after we assert some object s is inside of (or outside of) some other object P that we can say s belongs to the set of objects internal (or external) to P . From this we may discern the following series of grounding relations:

Defining a set S of objects s_1, s_2, \dots internal or external to some object P is grounded by discerning that objects s_1, s_2, \dots enter into inner/outer relations with P .

These inner/outer relations are grounded by a relational system consisting of various objects including s_1, s_2, \dots and P and the relations between these objects.

Schematically, this series of grounding relations consists of:



With these observations, we return to the question of the meaning of the expression 'The pen is in that box.' The foregoing considerations indicate it is not the case that what the sentence 'The pen is in that box' conveys (at least directly) is that the pen is a member of a certain set of objects internal to the box. For as we have seen, to be able to say that the pen is a member of the set of objects internal to the box presupposes, over and above what it states, that we can discern that the objects of the set enter into a relation of internality with the box. However, the statement 'The pen is in the box' does not require any presupposition over and above what it states. Rather it is this very presupposition in question that the sentence is about. We have observed that the expression 'that box' refers to the essential or relatively permanent parts of the box, and

does not refer directly to the set of objects that maintain interior relations to the box.

Also the expression 'the pen' refers to a certain pen, also a material object, that is not a part of the box. What the statement 'The pen is in the box' asserts is that the pen has a relation of internality to the box. What the statement is about is the nature of the spatial relations that exist between the pen in question and the box in question—two spatially describable material objects. Thus, the sense that an expression such as 'The pen is in that box' conveys is the sense that the two objects are spatially related in a certain way.

But if the statement 'The pen is in that box' asserts that the pen has a relation of internality to the box, then it would follow that the pen is a member of the set of objects that have the relation of internality to the box. Thus, the statement 'The pen is in that box' implies the statement 'The pen is a member of the set of objects that are internal to the box.' And in general, the statements

(1a) 's is in that box' and

(2a) 's is a member of the set of objects that have the relation of internality to the box'

have co-extensive truth-yielding substitution values for s. However, the foregoing analyses show these two sentences have different senses. The differences between them are shown by the fact that (1a) does not directly refer to the set of objects that have the relation of internality to the box whereas (2a) does. And secondly, that (2a) presupposes (1a), but (1a) does not presuppose (2a). Although, both mutually imply each other, this is due to the fact that (2a) is defined in terms of (1a).

Thus, for the spatial context, it is not the case that what the sentence 'The pen is in that box' conveys (at least directly) is that the pen is a member of a certain set of

objects internal to the box. Rather, what this statement conveys is that the pen is spatially related to the box in a certain way. The nature of this specific kind of relation pen and box maintain could be described in terms of the model for inner-outer relations developed for other contexts in this essay. In particular, these relations could be described in the manner developed in Chapter II. Once such relations are discerned as obtaining between two spatial objects, it follows that one object is a member of the set of objects internal to the other object.

We can generalize these results to apply to other non-spatial contexts. For, in general, for any object P, we can only determine the set of objects that have relations of internality to P by first determining the relations objects might have to P. If an object s has a certain kind of relation to P, a relation of internality, then s will be a member of the set of objects that are internal to P. Likewise for external relations. The relations of internality and externality are describable in terms of the model for inner-outer relations that has been developed in this essay.

For example, consider the statement 'The child is in the school system.' For a given community and a given school system, this statement is true of a number of children. The collection of all the children that this statement is true of constitutes the set of all children that have internal relations to the school system. However, we can only discern which children would be members of this set by first discerning the nature of each child's relation to the school system. If the child's relation to the school system is of a certain kind (as described earlier in this chapter) then the child has a relation of internality to the school system and is a member of the set of children who have this

relation. The statement 'The child is in the school system' asserts that the relation of internality obtains between the child and the school system.

To summarize, for a given object P , we can identify intensionally the set $S = \{s_1, s_2, \dots\}$ of objects that have a relation of internality to P . For this case, however, it appears that statements like ' s_n is in P ' and ' s_n is a member of S ,' although co-extensive, nevertheless convey a different sense, for the reasons discussed above.

The case of a set S that we identify extensionally, however, behaves somewhat differently. Suppose we define a set S to consist of objects a, b, c, d and e . For this set, we may say

(1b) 'c is in S .'

or, equivalently, we may say

(2b) 'c is a member of S .'

In this case, however, both statements make direct reference to S . Moreover, since S has already been defined as having c as a member, statement (2b) does not presuppose statement (1b) and statements (1b) and (2b) imply each other. Thus the differences that arise between the two kinds of statements when S is intensionally defined do not arise when S is extensionally defined. Thus, while for the case where S is intensionally defined, we have reasons to differentiate the senses of expressions like the earlier expressions (1a) and (2a), we have no such reasons to differentiate the senses of the latter expressions (1b) and (2b). This suggests the senses of (1b) and (2b) are the same for this case.

Suppose the senses of the two expressions are the same for this second case.

Does the assertion that the senses of these two expressions are the same in any way

conflict with what has already been said for the other case? Further analyses will show that the assertion in question does not involve any such conflict. Moreover, there are reasons that explain why it is that the senses of the two expressions seem to converge for this case.

Let us begin by considering what it is that makes the present case unique. Recall that for the case when a set S is intensionally defined as the set of objects that maintain a relation of internality to another object P , there is a hierarchy of grounding relation. The scheme for this hierarchy of grounding relations is:

- (a) Defining a set S of objects s_1, s_2, \dots internal or external to some object P is grounded by...
- (b) Discerning that objects s_1, s_2, \dots enter into inner/outer relations with P . These inner/outer relations are grounded by...
- (c) A relational system consisting of various objects and the relations of the kind that defines the relational system that obtains between these objects. s_1, s_2, \dots and P can be described as being among the objects of that system.

Schematically, this series of grounding relations is

- (a') The set s of objects s_1, s_2, \dots internal to some object P
- (b') Inner/outer relations between s_1, s_2, \dots and P .
- (c') Relational system with objects s_1, s_2, \dots and P

According to this scheme, the set S , consisting of objects s_1, s_2, \dots (i.e., a'), is ultimately grounded by some relational system (i.e. spatial relations, color relations, functional relations, etc.). The relational system grounds internal and external relations, and, in turn, the internal and external relations identify sets of objects that have the property of being internal or external to some object. This series of grounding relations applies to the

case where a set *S* is intensionally defined. However, as it turns out, we can also understand this same series of grounding relations to apply to the case of sets that are extensionally defined. What is unique about this case is that the grounding relational system (*c'* is the relational system consisting of relations of set membership). Let us further examine the nature of this relational system.

Let us begin by considering a few principles regarding the extensional definition of a set. In general a set is just a collection of objects. For any given universe of discourse (the limiting case for a universe of discourse being the universe consisting of all conceivable objects) there is nothing prohibiting us from selecting any number of objects of the universe of discourse and stipulating that these objects are the members of a certain set. For example, for the universe of discourse of all conceivable objects, we might define a set *S* as consisting of the objects: The Sears Tower, the event of the signing of the “Declaration of Independence,” and my copy of Kant’s Critique of Pure Reason. According to the notion of a set, this collection of objects counts as a *bona fida* set. This is just one of an infinitely large number of sets that could be defined relative to the universe of discourse in question. We also observe here that the set *S* is a subset of the infinitely large set of all conceivable objects. Further, any possible set defined in the manner described is also a subset of the universal set consisting of all of the objects of the universe of discourse. Thus, tautologically, the set of all subsets of the universal set—formally known as the power set—would consist of all the possible sets that could be formed from the objects of the universe of discourse.

The sets that are subsets of the power set of a universe of discourse constitute an ordered relational system. The objects of the system are the sets that are members of the power set (including the universal set). The relations between these objects are subset relations. Thus two sets S_1 and S_2 of the power set are related if and only if one is a subset of the other. Since each set of the power set is either a subset of another set of the power set, or has a subset, all of the sets of the power set are interrelated by the subset relation.

To illustrate this ordered relational system, consider a very simple universe of discourse consisting of five simple objects a, b, c, d and e. The power set then consists of (See Figure 30):

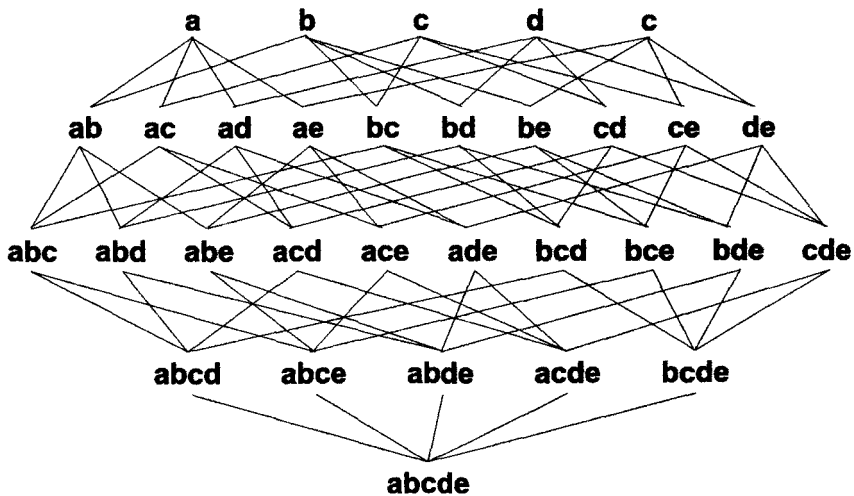


Figure 30

This system consists of all thirty-one of the sets that can be formed from the five simple objects a,b,c,d and e. Alternately, we may say that this system consists of all of the subsets of the set $\{a,b,c,d,e\}$. Each of the sets of this system is related to a number of

other sets by virtue of the subset relation. Thus $\{a\}$ is related to $\{a,b\}$, $\{a,c\}$, $\{a,d\}$, $\{a,e\}$, $\{a,b,c\}$, $\{a,b,d\}$, $\{a,b,e\}$, $\{a,c,d\}$, $\{a,c,e\}$, $\{a,d,e\}$, $\{a,b,c,d\}$, $\{a,b,c,e\}$, $\{a,b,d,e\}$, $\{a,c,d,e\}$ and $\{a,b,c,d,e\}$ since $\{a\}$ is a subset of each of these other sets. In all, $\{a\}$ is related to fifteen other sets. The set $\{b,d,e\}$ on the other hand is related as a subset to only three sets: $\{a,b,d,e\}$, $\{b,c,d,e\}$ and $\{a,b,c,d,e\}$.

Let us define an operation on a single set S called the “relational order” of a set S , symbolized as $R(S)$. The relational order of a set S is the number of other sets of the system that S is related to by virtue of being a subset of those sets. Thus, for the examples of the preceding paragraph, $R(\{a\}) = 15$, while $R(\{b,d,e\}) = 3$.

We now observe the ordered system of sets just described provides a basis for defining inner-outer relations between objects of the system. Given this system, we can express the criteria for one object being inside or outside of another object in terms of the operation of the relational order of a set. We can express these criteria as follows:

Given that sets S and P are objects of a relational system such as the one described above,

‘ S is in P ’ is true if and only if

$$R(S \cup P) = R(P)$$

‘ S is outside of P ’ is true if and only if

$$R(S \cup P) < R(P)$$

For example $R(\{a\} \cup \{a,c,d\}) = 3 = R(\{a,c,d\})$ and we would also say “ a is in $\{a,c,d\}$.”

On the other hand $R(\{e\} \cup \{a,c,d\}) = 1 < R(\{a,c,d\}) = 3$ and we would say that “ e is outside of $\{a,c,d\}$.” The reason that these conditions hold is that whenever some object S

is in a set P , then the union of S and P will always be P . The relational order of the union of S and P will always be equal to the relational order of P . On the other hand, whenever S is outside of P , then the union of S and P will always result in a set that is larger than P and which will subsequently have a smaller relational order.

Observe that this way of defining inner-outer relations for the present context is analogous to the way of defining inner-outer relations for other contexts. It is grounded by a relational system which is described above. Given the relational system, we can define inner-outer relations in terms of certain special conditions that obtain whenever one object is either inside or outside of another object. Consequently the above analyses of the nature of inner-outer relations for the context of set-theoretic discourse are consistent with earlier analyses of inner-outer relations for other contexts. However, for most contexts the set S of objects internally related to another object P is defined intensionally. And for this case, the sense of inner-outer talk differs from the sense of set membership talk, as observed above. Thus, in general, it is not the case that inner-outer talk is reducible to set membership talk. This reduction is genuinely possible only for the special case where a set is extensionally defined. But the reason we can make the reduction in this case appears to be that the relational system that grounds the inner-outer talk is the set membership relation.

- CHAPTER V -
GENERAL RESULTS OF THE ANALYSES OF
INNER-OUTER LANGUAGE AND
APPLICATIONS TO THE PHILOSOPHY OF MIND

A. GENERAL RESULTS OF THE ANALYSES OF
INNER-OUTER LANGUAGE

1. Formulation Of A General Model For Inner-Outer Expressions

This essay has provided careful analyses of inner-outer language for a variety of both spatial and non-spatial contexts. These analyses began with a universally accepted proposition: that inner-outer language for the spatial context does have a clear literal sense. The second chapter detailed what the sense of spatial inner-outer expressions involves. Spatial inner-outer statements purport to refer to some kind of spatial relation. I proposed a formal way of expressing the kind of spatial relation such expressions refer to. Regardless of the exact nature of the kind of spatial relation that spatial inner-outer statements refer to, any description of such relations can only be meaningful relative to an ordered system of spatial relations, such as the kind of system of spatial relations described by classical analytic geometry. Relative to the system, we may describe inner-outer relations in terms of general conditions that apply to the relations of that system obtaining between the objects of the ascription of the inner-outer relation. The analysis,

then, takes the form of a transcendental argument that establishes the necessary grounds for the possibility of spatial inner-outer statements having a sense.

Further results, arrived at through similar transcendental argument, show that a non-spatial inner-outer expressions can have a literal sense, provided we discern, relative to the context of its use, some reference to a relational system grounding its literal sense. Formally stated, the foregoing analyses show truth-conditions for inner-outer expressions of the general form 's is in/out of P' presuppose that:

- 1) There is an ordered relational system (e.g. a system of spatial relations, color relations, pitch relations, temporal relations, functional relations etc.) consisting of:
 - a) objects that are denotable in terms of some kind of common property value (e.g., a location value, a color value, a pitch value, a functional value etc.) and
 - b) the ordered relations that obtain between the objects denoted by common property values. (e.g., spatial relations between location values, color relations between color values, pitch relations between pitch values, functional relations between functional values etc.)
- 2) Both s and P refer, either explicitly or implicitly, to objects of the relational system. (I.e., s and P denote common property values).

Generally P will refer to a set of objects of the system that partitions the system into two parts. Thus the set of objects P refers to delimits the system into the range of objects within the partition and the range of objects outside the partition, while s refers to some particular object or complex of objects related to the set of objects of P. By virtue of the kind of relation s has to P, we may understand s to be either inside or outside P.

Given these prerequisites:

- 3) We can formulate truth-conditions for expressions of the form 's is in (out of) P' in terms of the kinds of relations that obtain between s and P whenever it would be appropriate to say that "s is in (out of) P."

Together, these general principles constitute a model for the truth-conditions for the inner-outer expressions examined so far. I shall refer to this model as "the model for inner-outer expressions" or, briefly, as "the model."

One of the central notions of the model is the notion of "partition." And it is important at this point to make a few clarifying comments about this notion as it is employed by the model. The term 'partition' is polysemantic and its usage incurs some ambiguity. On the one hand, for a given relational system, we understand the term 'partition' to mean a certain portion of the system. For example, for a spatial system, we may understand a partition of that system to be a certain portion of the system, such as the area of a rectangle. (See Figure 31.)

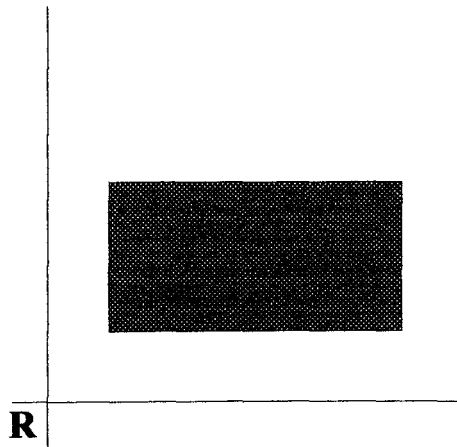


Figure 31

In this sense the partition consists of all of the points of the area of the rectangle.

On the other hand, however, we also understand the term ‘partition’ to mean “that which divides.” Thus, for the present spatial example, the partition in this latter sense is not the entire area of the rectangle, but rather the perimeter of the rectangle. (see Figure 32)

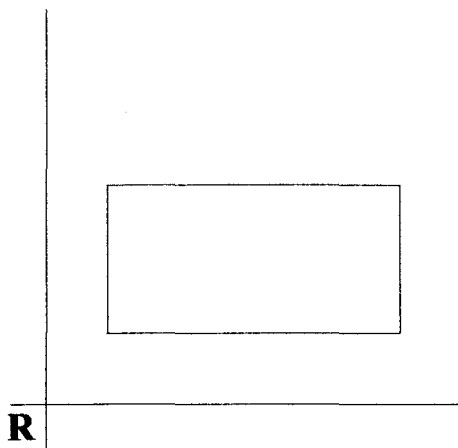


Figure 32

The perimeter delimits the area of the rectangle and sets it apart from the remainder of the spatial region, thus dividing the region into parts.

The second sense is more fundamental since we can only determine that an object belongs to (is a part of) the partition in the first sense by virtue of its relation to the objects of the partition in the second sense. To illustrate this point using the spatial example, we can only determine that a set of points of space belongs to the area of a rectangle (partition in the first sense) by virtue of the relations these points have to the points of the perimeter of the rectangle. Suppose, for example, that we have a rectangular partition (in the first sense) R of the region of space S . So long as we have access to the

perimeter of R , we can determine that any contiguous set of points is either a part of R or not a part of R . In Figure 33 below we see that the set a is a part of R , but the set b is not a part of R .

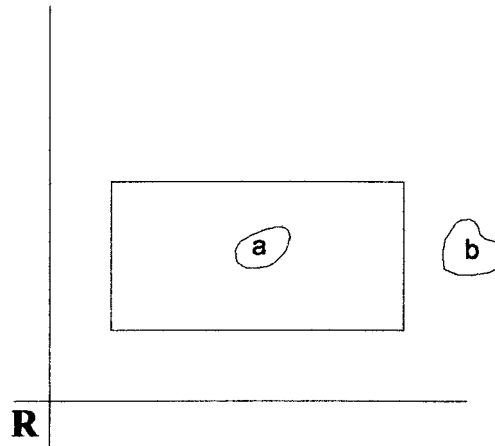


Figure 33

But now suppose that our field of access is restricted to the area in close proximity of a set of points c and that the perimeter of the rectangle P lies somewhere beyond this restricted field of access. For example, suppose we are looking at c through a microscope and the perimeter of P is entirely outside of the field of view as Figure 34 illustrates.

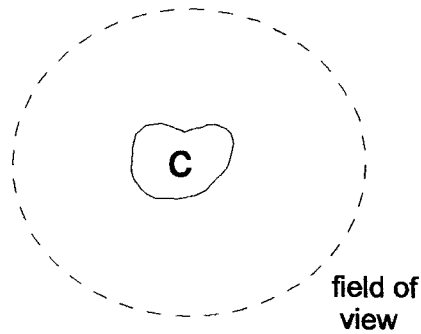


Figure 34

In this case we are not able to determine whether the set of points c is either a part of P or not a part of P . This shows there is no property intrinsic to the set of points a , b or c themselves according to which we can say that they either are or are not parts of P . It is only by virtue of the relations of a , b and c to the points of the perimeter that we are able to make this determination. This illustrates that the latter sense of 'partition' is the more fundamental, and it is in this sense that I shall use the term.

A second important point to make about the notion of the partition is the following: The range of values of the objects prescribed by the partition term is subject to varying degrees of determinacy. (I.e. the partition term may vary in its precision.) Thus, for example, for the spatial context, the expression 'The ball is in the court,' used in the context of a game of tennis, involves a partition term—'the court'—that is fairly precise, since the boundaries of the court are, in principle, accurately marked. However, the expression 'The boat is in the middle of the lake' is much less precise, because what constitutes "the middle of the lake" is to a greater degree indeterminate. Similarly, for a non-spatial context, the expression 'The piano key is in (out of) tune' involves a partition

term—‘tune’—that can be fairly precise. The degree of precision depends on the discriminatory abilities of the listener or the instrument that might measure the pitch of the instrument. The expression ‘That coat is in fashion’ is vague, because what constitutes the complex range of values of color, texture, design and so on, fashionable at a given time is to a greater extent indeterminate. Again, for the case of a discrete system, the precise structure of the system may not always be determinable at each and every point. For example, the structure of a certain functional system may not be fully determinable. In such cases it may be indeterminate to what extent an object functions within the system or is outside the system. Thus inner-outer expressions are subject to varying degrees of determinacy. However, it is important to realize they incur their varying degrees of vagueness and precision from the degree of precision of the partition term, not because of the basic meaning of the inner-outer term or the basic nature of inner-outer relations. But though analyzing these more difficult cases along the lines of the model requires greater effort, it is more in the interest of genuine understanding to pursue this line of analysis, rather than to relegate these more complex expressions to the realm of inherent obscurity called metaphor.

2. Assessing The Adequacy Of The Model

Having formulated the basic principles of the model outlined above, we now reflect upon whether it is plausible to suppose that these principles adequately capture the sense of inner-outer expressions in general. There are three separate lines of consideration that support an affirmative answer to this question.

First, to answer this question conclusively involves an evaluation of the applicability of the model to all possible inner-outer expressions. Of course, the fact that there is an endless number of such expressions prohibits our doing this. Nevertheless, we have seen that the model does apply to a very wide and representative range of cases. Indeed it is from the various cases that we have examined that we have abstracted the model. These results provide inductive support to the idea that the model does provide an adequate analysis of the kinds of expressions in question.

Secondly, we may consider to what extent the model formally captures our general intuitions about the meaning of inner-outer expressions. Accordingly, we consider what accepted inner-outer expressions seem to be about and whether the general model advanced here captures this general sense. In general, inner-outer statements seem to predicate some kind of relation. This is clearly the case for the spatial context, where inner-outer expressions predicate a kind of spatial relation between two spatially describable objects. But what about cases of inner-outer statements that apparently do not predicate a spatial relation?

In general, the kind of relation these other kinds of inner-outer statements predicate obtains between some actual state of the object referred to by the subject term of the statement and some prescribed range of states described either implicitly or explicitly by the partition term of the statement. For example, we may understand the statement 'The piano is in tune' to describe a relation between the actual pitch state of the piano and a prescribed range of pitch states. There is no reason to believe such states and relations between states should be spatial states and relations between spatial states. On

the contrary, they can be states of any kind. As the earlier analyses have shown, we can clearly understand inner-outer statements to predicate relations between acoustic states, color states, functional states and so on.

We also observe a certain dynamic aspect of the kind of relation that inner-outer expressions describe. For example when we say "The child is in the yard," the child may occupy any of a range of changing spatial locations, and yet the expression retains the same truth-value. This dynamic aspect of inner-outer relations is expressed more explicitly by expressions such as 'The child is running around in the yard' or 'The child ran out of the yard.' For these expressions, the yard refers to a certain constant range of spatial locations, but the locational property of the child varies in time over a continuum of possible spatial locations.

Similar observations apply to non-spatial contexts. When we say "The piano key is in/out of tune" then although the actual pitch property of the key at any given moment is a single value, this value may vary in time over a continuum of possible values. Again, this dynamic aspect of inner-outer relations is brought out by expressions such as 'The key is going out of tune' or 'The piano tuner put the key back into tune.'

It is also possible for the range of values prescribed by the partition term to vary over time. When we say "That coat is coming back into fashion," presumably the color, texture and design properties of the coat have not changed. Rather the ranges of color, texture and design values that constitute what is fashionable have shifted from one range of the continua of such values to another.

In general when we say that “s is in/out of P,” the properties of either s or P (but usually s) with respect to which they are related, may be any of a range of possible values. Moreover, the values that s (or P) may actualize may change over time, and yet the inner-outer expression referring to them retains its sense.

Looking at these points from another perspective, if inner-outer statements predicate a relation between an object and some prescribed range of states, then that object must have the potential to actualize the kind of state prescribed by the partition term of the expression. If we say that an object is “in” the range of prescribed states, then that object must have a potential to actualize a state (or property) of the same kind as the prescribed range of states. It must be possible that the actual state of the object in question could in fact be one of the states that are among the states of the prescribed range of states. Likewise, when we describe an object as being “out” of some range of states, this presupposes it would have been at least possible that it could have been among the prescribed range of states. It would, for example, be meaningful to say something is “out of tune” or “out of order” only when it is possible the object could have been “in tune” or “in order.” Accordingly, the object that is “outside” of a prescribed range of states must also actualize a state (or property) that is of the same kind as the states (or properties) of the range of states prescribed by the partition term.

These observations imply that the actual properties referred to by the subject and partition terms of an inner-outer expression are properties from a range of possible values of the same kind. This range of possible values constitutes the values of a relational

system, which, according to the model for inner-outer expressions, is presupposed by inner-outer statements.

The foregoing reflections suggest the general sense of saying something is in or outside of something else is grounded in a reference to some kind of relational system. It is only against a background of such relations that the kind of dynamic aspect that is attributable to inner-outer expressions is intelligible. It is this fundamental sense that the proposed model for inner-outer expressions captures. Given some relational system against which we understand the relation ascribed by an inner-outer expression, we understand the nature of the ascription to consist in the particular conditions that apply to the relations of the relational system that obtain between the objects referred to by the expression.

A final consideration that supports the plausibility of the model concerns its ability to distinguish between meaningful and meaningless statements of the grammatical form in question. The analyses of the foregoing chapters provide ample evidence that statements that do satisfy the principles of the model count as meaningful. Correlatively, it would also confirm the plausibility of the model if whenever an expression (of the form in question) violates one or more of the principles of the model, we would ordinarily regard it as meaningless.

According to the model, if P identifies (implicitly or explicitly) some range of values (objects) of a relational system relative to which the subject of the sentence cannot be described, then the expression should be meaningless. For in this case, there would be no means of relating the subject of the expression to the objects referred to by the

partition term. There would then be no way of understanding the sense according to which the subject is “inside” or “outside of” the range. Thus, if we construct sentences that violate the principles of the model in this way, the result should be a statement we would ordinarily count as meaningless.

Accordingly, it is meaningful to say “That piano key is in (or out of) tune” since the piano has properties that may be described with respect to a system of acoustic pitches. And what it means to be “in (or out of) tune,” according to the model, is that the relations between the pitch of the piano key and the range of pitches prescribed by the partition term ‘tune’ satisfy certain second-order, ordering relations. However, it is clearly meaningless to say “That coat is in (or out of) tune.” On the present account, the meaninglessness of this expression is due to the fact that articles of clothing such as coats do not have properties that are describable with respect to the system of acoustic pitches. Thus it is impossible for there to be any relation between a pitch property of the coat and a range of pitches that count as “tuning.” On the other hand, it is meaningful to say “That coat is in the closet.” This is so because the term ‘closet’ refers to a bounded range of spatial locations. Likewise the coat has spatial properties describable with respect to the same spatial relational system that describes the closet, and so the needed truth-conditions are formulable.

The reason for the meaninglessness of expressions for which the subject and prepositional object terms do not identify some common relational system has to do with the ordering of the values that occur as parts of the same system. While the various values of a given relational system (such as the systems of color, spatial location, figure,

weight, pitch, texture, function etc.) entail certain ordering and logical relations, properties from two different relational systems are logically independent and no ordering relation obtains between them. Thus, there is no ordering between, say, the property RED and the location X. While we say ORANGE is more immediate to RED than is YELLOW, and we say location X is more immediate to location Y than location Z, we never say RED is more immediate to location X than YELLOW.

Nor, if P is some spatial partition, do we say that RED is “in (or outside of)” P. We do, however, say that certain spatial objects are inside of P, and it could be these objects are colored red. We may also identify that object by virtue of its color (i.e. we may refer to “that red object”) But this would not mean that the color RED is inside of P. The color RED can only be inside or outside of some range of colors. For example, we can say the color RED is “within” the range of earth colors. The object referred to has several kinds of properties. One of these properties is the color property of being red. It has other properties as well, including spatial properties. Although it has color properties that may be used to identify it, it is with respect to its spatial properties that it is inside or outside of the spatial partition P, its color properties being logically independent of its spatial properties.

As the present example suggests, a given subject may be describable with respect to a number of relational systems. A physical object may be describable with respect to its spatial properties, color properties, weight, function etc. As a consequence of the fact that different relational systems are logically independent, a given object describable in terms of several relational systems may enter into several logically independent inner-

outer relations. For example, a certain piano might be “in a room,” “in tune,” “in (mechanical) order” and “in fashion” (in the way that furniture is in fashion). Because these separate relations are logically independent, a change of the truth value of any of them will have no effect on the truth value of the others. Alternatively, it is logically coherent to say that the piano is “out of the room,” “in tune,” “out of (mechanical) order” and “in fashion.” It would be logically incoherent, however, to say the piano is both “in the room” and “out of the room,” “in tune” and “out of tune,” etc. (assuming that these are discrete cases). This is due to the fact that for each of these pairs, both the “in” and “out” cases entail reference to the same relational system and with respect to that system the two cases are logically, mutually exclusive.

The foregoing two lines of consideration demonstrate that the proposed model provides an adequate general representation of a basic core of the sense of inner-outer expressions of the form in question. One of the immediate implications of the analyses is that we may understand inner-outer expressions to have literal meanings in both spatial and non-spatial contexts. In addition to spatial relations, there are numerous other kinds of non-spatial, empirically ordered relational systems to which the ordering relation applies that provide a basis for understanding non-spatial inner-outer expressions to have a literal sense.

As a result of this last implication we may tentatively suppose the general model for inner-outer expressions applies equally to discourse on mind. For if the use of inner-outer language for the context of discourse on mind stems from our ordinary understanding of the meaning of such expressions, as the figures quoted in the Chapter I

suggest, and if this ordinary understanding is captured by the proposed general model, then this model should accordingly extend to discourse on mind. The next section of this chapter examines the case of inner-outer language for the context of discourse on mind in order to assess the applicability of the model to that context and to consider the implications this application has.

B. APPLICATION OF THE ANALYSIS OF INNER-OUTER EXPRESSIONS TO THE CONTEXT OF DISCOURSE ON MIND

The first chapter of this essay identified two problems concerning the use of inner-outer language for philosophical discourse on mind. These problems are, first, that inner-outer language is intrinsically obscure metaphorical language that is largely meaningless for discourse on mind, and, second, to the extent that inner-outer language is meaningful, it entails subscription to a dualist ontology. This section applies the principles of the model that resulted from the foregoing analyses of general usage of inner-outer language to these problems. The foregoing analyses have shown that, in general, inner-outer expressions for non-spatial contexts can have a clear non-metaphorical sense. Extending this result to the context of philosophical discourse on mind, I argue that: 1) inner-outer language can have a clear non-metaphorical sense for discourse on mind, and 2) use of inner-outer language for the context of discourse on mind does not intrinsically entail subscription to a dualist ontology. Rather, the sense of inner-outer expressions represented by the model render inner-outer expressions meaningful for various dualistic and monistic theories of the mind-world relation. Both

of the aforementioned problems were raised and articulated by Gilbert Ryle in a way that is fairly representative of general criticism concerning inner-outer language. For this reason, I shall address these issues with specific reference to Ryle.

1. That Inner-Outer Language For The Context Of Discourse On Mind Can Have A Literal Sense

a) Ryle's Claim That Inner-Outer Expressions Are Spatial Metaphors And Consequently Meaningless For Discourse On Mind

As discussed in the first chapter, Ryle holds that, in general, inner-outer language is founded on spatial metaphor. It follows, since mind is not conceived of as having any spatial properties, for the context of theoretical discourse on the mind-world relation, inner-outer language is not only intrinsically vague and obscure, but, more significantly, misleading. Let us examine more closely, how and why Ryle understands this to be the case.

He succinctly states that the use of inner-outer language for the context of discourse on mind is metaphorical in the first chapter of The Concept of Mind, entitled "Descartes' Myth"

This antithesis of outer and inner is of course meant to be construed as a metaphor, since minds, not being in space, could not be described as being spatially inside anything else, or as having things going on spatially inside themselves.⁴⁹

Ryle assumes that inner-outer language has literal meaning only for the spatial context and that for any other context inner-outer language is spatial metaphor. Since mind is not

⁴⁹Gilbert Ryle, *The Concept of Mind* (Barnes and Noble, 1949), 12.

describable in spatial terms, it follows that use of inner-outer language for the context of discourse on mind is spatial metaphor.

In Section five of the second chapter, entitled “In my head,” Ryle provides a speculative explanation of how it is that the purported inner-outer metaphor “is felt to be an appropriate and expressive metaphor.”⁵⁰ He begins with an account of how it is that we come to use the phrase ‘in the head.’ He supposes our general understanding of mental phenomena as being “in the head” arises from how it is that we experience “imagined noises.” Such “imagined noises” would include such items as the “words which I fancy myself saying to myself and the tunes which I fancy myself humming or whistling to myself.”⁵¹ Ryle then proposes an explanation of why it is that we describe such imagined noises as being “in the head.” In general, his explanation rests on the supposition that we closely associate such imagined sounds with actual physical sounds that originate within the head—such sounds as coughing, sneezing, the sound we hear of our own overt speech and so on.

The reason we associate imagined sounds with actual physical sounds that originate from within the head, Ryle suggests, is that both of these kinds of sounds share several common properties—properties that distinguish them in similar ways from physical sounds that originate from physical objects spatially external to the head. He observes that sounds that originate from external physical objects have several properties: 1) they appear to originate from physical sources that can be identified in terms of their direction to and their distance from the hearer; 2) the hearer can manipulate the intensity

⁵⁰Ibid., 35.

⁵¹Ibid., 36.

of these sounds, or eliminate them completely, by obstructing the portals of the sensory organs of hearing in various ways (e.g. covering them or placing obstructions between them and the sources). In contrast, these properties apply neither to the sounds that originate from within the human body nor to imagined sounds. Neither of the latter sounds have the qualities of seeming to occur at any distance from the hearer or in some direction from the hearer; nor can the intensity of the latter kinds of sounds be varied or eliminated by means of the kinds of manipulations employed to vary the intensity of physical sounds that originate from objects that are spatially external to the body. Moreover, according to Ryle, we often experience imagined sounds with such vividness that they may seem to us to be just like actual physical sounds that originate within the head.

According to Ryle it is for such reasons that it is natural to describe imagined sounds in the same way we describe actual physical sounds that originate from inside the head. But since imaginings are not spatially located, imagined sounds cannot be understood to be literally “in the head.” Describing imagined sounds as being in the head is merely metaphorical. According to Ryle, when one imaginatively hums a tune or recites to oneself in thought the steps of a mathematical proof, for example, then one says these sounds are in one’s head as “a lively way of expressing the fact that the imagination of the production-*cum*-audition is a vivid one.”⁵² Ryle would liken such expressions as ‘The tune (or proof) is in my head’ to such *bona fide* metaphorical expressions as ‘I see’ as it might occur in the statement ‘I “see” the incident now, though it took place forty

⁵²Ibid., 37.

years ago.’⁵³ But this usage of ‘I see’ is clearly metaphorical. Likewise, Ryle argues, the expression ‘in the head’ is metaphorical as well.

Ryle also extends this explanation of how and why it is we speak of imaginative sounds as being “in the head” to account for the fact that other imaginative experiences such as visualizing are also spoken of as being “in the head.” Thus, Ryle takes his account to be a general explanation of why it is we find it natural to describe any of the various mental phenomena—imaginative hearing, seeing, dreams, etc.—as being “in the head.”

Finally, Ryle further supposes that the explanation that he has advanced for why it is that we find it natural to describe mental phenomena as being “in the head” also explains why it is that we find it natural to describe these phenomena as being “in the mind.” The sense conveyed by ‘in the mind’ is generally the same as the sense conveyed by the expression ‘in the head.’

When people employ the idiom ‘in the mind,’ they are usually expressing over-sophisticatedly what we ordinarily express by the less misleading metaphorical use of ‘in the head.’⁵⁴

However, he offers no further argument for this questionable assertion.

The moral that Ryle draws from the characterization of inner-outer language as spatial metaphor is that though there may be good reasons why we have a tendency to talk about mental entities in terms of the inner versus the outer, to do so makes no literal sense. Consequently, for Ryle, inner-outer language has no use for theoretical discourse. He emphasizes this consequence, for example, in the forth chapter, “Sensation and

⁵³Ibid., 37.

⁵⁴Ibid., 40.

Observation.” He argues there that, since mental entities cannot be described in terms of spatial properties, it is meaningless in any literal sense to use inner-outer talk to describe them. For the case of sensations, for example, he argues:

...while one common object, like a needle, can be inside or outside another, like a haystack, there is no corresponding antithesis of ‘inside’ to ‘outside’ applying to sensations. My tweak is not hidden from the cobbler because it is inside me, either as being literally inside my skin, or as being, metaphorically, in a place to which he has no access. On the contrary, it cannot be described, as a needle can be, as being either internal or external to a common object like myself, nor as being either hidden or unhidden.⁵⁵

This treatment of sensations serves to exemplify his more general position. Since we do not understand any mental entities to have spatial properties, there is no literal sense in describing any mental entities as being internal to the mind. This is mere metaphorical talk, and, as such, it obscures the true nature of the mental at best, and at worst perpetrates a false picture of the nature of mental entities.

b) A Critical Assessment Of Ryle’s Account

Ryle’s The Concept of Mind is undoubtedly one of the significant achievements in philosophy of mind of this century. His work has had major impact on how it is we think of mind and the various mental concepts included in our theoretical repertoire. Ryle gives significant attention to the role of inner-outer language for philosophy of mind. However, unlike the many admirably cogent arguments that Ryle develops for his various theses, he fails to provide any well founded support for his views on inner-outer language. Despite the *prima facie* persuasive force of his arguments concerning inner-outer language, a critical assessment of his account will show it is fundamentally question

begging, and does little more than expound upon the unfounded presupposition that inner-outer language has literal meaning only for the spatial context, and so, for the context of mind such language is metaphorical.

Consider the first quotation. This passage is representative of a typical argument used to support the view that inner-outer language for the context of discourse on mind is spatial metaphor. In this argumentative passage, Ryle first states his conclusion that

(C) For discourse on mind, inner-outer language is metaphorical (and, so, consequentially meaningless for theoretical discourse on mind).

He then goes on to provide a brief argument for this conclusion consisting of the single premise that

(P) Minds, not being in space, can not be described as being spatially inside anything else, or as having things going on spatially inside themselves.

As stated, this argument is not valid. To be a complete, valid argument, this argument would require the additional implicit premise that

(P') inner-outer language has literal sense only for the spatial context and, correlatively, for all other contexts it is metaphorical.

With this added premise, Ryle's argument can be parsed out as a valid *modus tollens* syllogism.

Ryle's argument for the claim that inner-outer language for the context of discourse on mind is metaphorical, then, is founded upon the implicit presupposition that inner-outer language has literal sense only for the spatial context and for all other contexts it is metaphorical. Because his argument makes this implicit assumption, it is

⁵⁵Ibid., 208.

question begging. For the question of whether inner-outer language can or cannot be taken to have literal meaning for the context of discourse on mind is just a species of the larger question of whether (and if so how is it that) inner-outer language can or cannot be taken to have literal meaning for non-spatial contexts. The conclusion he draws is, therefore, just another way of stating the premise he uses to come to this conclusion. The real issue is whether inner-outer language can have a literal sense for non-spatial contexts, and correlatively, if it can, what is the nature of this sense. Once an account answering these questions is provided the question concerning the sense of inner-outer expressions for the context of discourse on mind follows.

A further flaw of Ryle's account concerns this explanation of how it is that we have come to use inner-outer language to describe mental phenomena. If it is not possible to explain how or why we use the expression 'in the mind' metaphorically, then the absence of such an explanation casts doubt about the truth of the claim. By providing a seemingly plausible, if speculative, explanation of why it is that we come to find it natural to use inner-outer language metaphorically, Ryle eliminates one motive for doubting his claim. But the fact that he does provide such an explanation, by no means eliminates all motivation for doubting the claim, and is far from a conclusive demonstration of the truth of the claim. It does not follow from the fact one can construct an explanation E for how or why X might be the case that X is in fact the case. Nor, for that matter, can we say that even though E would explain how or why X might be the case, and even though X is the case, that E is the real reason how or why X is the case.⁵⁶

⁵⁶ For example, one might say the fact that Jones needed money could contribute to evidence that he committed the robbery and could explain why he committed the robbery. But even if it is true that Jones

That Ryle can construct an explanation of how or why we have come to use the expression 'in the mind' metaphorically does not demonstrate that we do in fact do so for the reasons he supposes.

But above the fact that the explanation he gives does not by itself validly demonstrate the conclusion he makes, the explanation itself involves a further logical gap. What Ryle needs to establish is that expressions such as 'in the mind' are metaphorical, since theoretical discourse on mind is about "the mind." His account for how it might be that we use expressions like 'in the mind' metaphorically, however, involves a slight of hand. He shows how we might use expressions like 'in the head' metaphorically, and then simply asserts, without argument, that the expression 'in the mind' conveys the same sense as the expression 'in the head.' This assumption makes it appear as though his account of our using the "metaphorical" expression 'in the head' extends to the expression 'in the mind.'

His account of the purported metaphorical expression 'in the head' is plausible. But this is likely due to the fact that, for the context of discourse on mental phenomena, the expression 'in the head' is *a bona fide* metaphor. The head is a material object, whereas an imagined sound we might describe as being in the head is not spatially describable. There is, then, no way the imagined sound could be spatially related to the head, and so no way it could be described literally as being spatially 'in the head.' If anything, such description would be metaphorical

did need money, this alone does not establish Jones in fact did commit the robbery. Nor, is it necessarily the case that if Jones did commit the robbery, he did it because he needed the money, even though he may have needed the money and his needing money would explain why he committed the robbery. It may have happened that Jones saw the security door wide open and unattended and so proceeded to commit the

But Ryle's assertion that 'in the mind' is just another way of saying 'in the head' is doubtful. First, to suggest the expression 'in the mind' conveys the same sense as the expression 'in the head' is tantamount to saying that the term 'the mind' has the same sense as the term 'the head.' But clearly there is a distinction between what it is that the terms 'the mind' and 'the head' refer to. Many philosophers take it that mind-body dualism is a natural standpoint the ordinary person naively accepts. But a dualist, naive or otherwise, does not identify mind with head. There is little that can be gleaned from the common viewpoint concerning the mind-world relation that supports the supposition that talk of "in the mind" stems from talk of "in the head."

Second, while Ryle supposes the expression 'in the mind' is an "overly sophisticated" way of expressing what we say when we use the expression 'in the head,' there is more reason to believe that the case is just the opposite, that "in the head" is just a metaphorical, stylistic, way of expressing what we mean when we say "in the mind." The fact that in philosophical literature, talk of "in the mind" has been around for centuries, whereas "in the head" appears as part of the contemporary jargon, lends support to the latter view.

Finally, , while it is clear that the expression 'the (imagined) sound is in my head' is metaphorical, since the head is a spatial object, it is not immediately obvious that the expression 'the (imagined) sound is in my mind' is metaphorical. Since the mind is not spatial, and something like an imagined sound is not spatial the latter expression does not require us to think of the imagined sound as being spatially inside of some other spatial object. However, the expression 'the (imagined) sound is in my head' does require us to

think of the imagined sound as being something that is spatially inside a spatial object, the head.

We may observe at this point however that Ryle, himself, makes no pretense about what we can actually conclude about the meanings or reasons for our use of expressions like 'in the head' or 'in the mind' from the general explanation he offers. He comments:

It does not matter for my general argument whether this excursus into philology is correct or not. It will serve to draw attention to the sorts of things which we say are 'in our heads,' namely, such things as imagined words, tunes, and perhaps, vistas.⁵⁷

In saying this Ryle expresses an awareness of the highly speculative nature of the account he presents.

In the end, Ryle's claim that expressions such as 'in the mind' are spatial metaphors is no more than a theoretical conviction he maintains without substantive argument. What he does have to say about such expressions serves to do no more than expound upon his conviction.

c) On The Possibility Of A Literal Sense For Inner-Outer Expressions For The Context Of Theoretical Discourse On Mind.

When talking about the mind, inner outer expressions, if taken literally can be problematic. For this reason we find it easier to describe such expressions as metaphorical rather than to discern what literal sense they have. This is not due to the fact that the notion of inner-outer relations is so complex. It is due to the complexity and abstruseness of the notion of mind, and of the accompanying notions of the kinds of

relations occurring between various mental entities and between mental entities and the physical world. These subjects have evaded the understanding of philosophers, scientists and lay persons for centuries, and are likely to continue to do so.

The present model for inner-outer relations captures the sense of what it means for something to be in or out of something else, regardless of subject matter. Nevertheless, to the extent that we do not fully understand the nature of “mind” and related notions we should not expect to be able to understand fully what it means for something like a “thought” to be “in the mind.” This, however, does not render such inner-outer expressions mere metaphor. It rather renders them complex expressions, whose degree of complexity is proportional to the degree to which the notion of “mind” is complex.

Although we do not fully understand “mind” at present, philosophers and scientists have long theorized upon its nature and have articulated a variety of theoretical pictures portending to represent its fundamental principles. While we may not be able to say conclusively what the general meaning of an expression like ‘thoughts are in the mind’ is, we can ask specifically what such an expression would mean when “mind” and other related notions are understood in terms of some particular theory. Taking this approach, I shall proceed to examine two distinct theories of mind: the interactive dualism of Descartes, which is the subject of Ryle’s critique, and a generic form of contemporary functionalism. Each of these theoretical contexts make use of inner-outer expressions to describe the mind-world relation. For each of these theoretical contexts I shall show that each of these theories of mind conforms to the principles of the model for

⁵⁷Gilbert Ryle, *The Concept of Mind* (Barnes and Noble, 1949), 208.

inner-outer expressions. This result, then, will establish my first main thesis, that, *contra* Ryle, for the context of discourse on mind, inner-outer expressions can have a clear literal sense.

**d) The Sense Of Inner-Outer Language For
The Context Of Cartesian Dualism.**

The core of Descartes' interactive substance dualism consists of two main theses.

Broadly stated, these theses are:

(1) There are two kinds of beings or substances that exist, each with fundamentally distinct kinds of properties. These two kinds of substances are: minds and physical bodies (whose essential properties will be defined).

(2) These two distinct kinds of beings causally interact.

As a means of organizing my application of the model to Cartesian interactive dualism I shall discuss each of the two theses in turn.

**i) Inner-Outer Language And The Thesis That
Minds And Physical Bodies Are Distinct
Kinds Of Beings.**

Descartes' primary treatment of the thesis that there are two distinct kinds of substances occurs in the Sixth Meditation, entitled "The Existence of Material Things and the Real Distinction Between Mind and Body."⁵⁸ He also advances this thesis in his later work, *The Principles of Philosophy*⁵⁹ This thesis and his arguments to support it have been the subject of critical scrutiny over the several centuries since their first publication.

⁵⁸Rene Descartes, *Meditations*, in Cottingham John, ed., *The Philosophical Writings of Descartes*, Vol.II (Cambridge,1985), 115-116.

⁵⁹Rene Descartes, *The Principles of Philosophy*, in Cottingham John, ed. *The Philosophical*

However, since it is not my purpose to defend or refute Descartes' position, there is no purpose in digressing into matters concerning the critique of his arguments. What is important is how he characterizes mind and the physical world. These characterizations provide the theoretical framework to which I shall apply my analysis of inner-outer language. I shall proceed by examining each of Descartes' two ontological categories: extended being and thinking being.

(a) Extended Being:

Descartes' theory of material being pivots on his thesis that the essence of corporeal body, or material being is extension. He states this thesis in several places in the Meditations, Principles of Philosophy and in other works as well. In postulating this thesis, Descartes goes so far as to literally identify corporeal body, or matter, with extension. Materially, a body is its extension and no more, and conversely that which is extended is matter.

This claim has far reaching consequences. If it is true, and if the universe is spatially describable, then it follows that the universe is full of matter. Wherever there is space, there is matter. No space is void of matter. Space is matter. The notion of a vacuum, understood as a space with no matter occupying it, is incoherent. Descartes' general picture of the material universe is this: The material universe extends indefinitely, and is filled with matter, since extended space simply is matter. However, space may be divided into innumerable infinitesimal parts, and correspondingly, matter is divided into innumerable, infinitesimal particles.

To this picture of extended being Descartes adds the claim that all of the particles of matter are in motion. (He understands rest to be a mode of motion.) Motion is the change of the positions of the particles with respect to each other. Thus motion is a function of extension. It is the change of the ordering of that which is extended. When motion occurs what previously occupied this position of extended being now occupies that position. The patterns of motion vary with each particle. Some particles move turbulently by themselves. Other groups of particles move together, thus creating the effect of larger bodies.

Since all particles of matter are contiguous with other particles, the movement of any one particle will set up a chain or a "circle of motion." Descartes uses the expression "circle of motion" figuratively. He does not mean that chains of motion follow patterns that are geometrically circular. What he means is that chains of motion follow patterns that take the form of closed systems of various degrees of complexity, whose parts interact dynamically and in accordance to some order, but which maintain an overall homeostasis. In nature we observe such systems of movement as weather patterns, ecological systems, etc., which seem to exhibit a kind of "cyclical" pattern. Indeed, he compares the motion of the whole universe to the circular motion of a whirlpool created by the action of water in a stream. Among such systems, it is fair to place the human body along with its physical environment, which is also a part of the system. The input and behavioral output of such an organic system can be described in terms of such circles of motion.

Descartes devotes a great deal of his work to the explanation of how it is that the basic principles of matter and motion can be used to explain the operations of the human body. He views the body as a kind of mechanical system whose operations can be explained in terms of his basic principles of matter (i.e. extension and motion). He maintains that all animal behavior (and likewise the animal behavior of human beings—that is, certain mechanistic aspects of human behavior) is the result of (and can be completely explained in terms of) complex physical processes based on the fundamental mechanical principles of his account of material being.

Among the many features of the mechanism of the human body that Descartes discusses, most central to the present discussion is the nervous system. He conceives of the neural system as a complex network of tubular fibers which all ultimately lead to a central location in the brain which he seems to identify with what we now call the pineal gland. Through these fibers flow a very “rarified” matter which he calls “animal spirits.” The system of neural fibers and the animal spirits which flow through them act as a kind of hydraulic system. When the animal spirits are caused to move in any one part of the system, this motion sets up a chain (or circle) of motion that is conducted along the passages of the neural fibers, resulting in motions of the animal spirits in other parts of the system.

With this model of the nervous system in mind, Descartes explains human behavior in terms of a kind of stimulus-response mechanism. A stimulus is introduced to the nervous system by the action of a material object on the outreaches of the neural network, the sensory organs located throughout the body. This action of the material

object causes a motion to be introduced in the animal spirits contained by the neural fibers. Each of the various physical objects will affect the motion of the animal spirits in some distinct way. The particular specification of the pattern of movement of the animal spirits depends upon the specific features of the physical object (i.e. the particular object's specific shape, size, the velocity of its motion, etc., all of which can be described in terms of extension and motion) with the result that the motions of the animal spirits caused by the action of the particular object will have a pattern that corresponds in some way to the specific features of the object. In this way the animal spirits embody what I shall call a "material image"—a material "imprint"—of the object that introduced the pattern of movement in the animal spirits. Since "material images" are physical patterns of motion of animal spirits they are clearly distinct from "mental images," although there is some ultimate relation between the material image and the mental image.

Once the impact of the external object establishes the pattern of motion of the animal spirits—the material image—this pattern of motion is then transmitted by a chain of motions of the animal spirits through the neural fibers, ultimately making its way to the pineal gland. The pineal gland is capable of a latitude of motions in any of a range of directions. The animal spirits then impact on the pineal gland causing it to move in one way or another as specified by the pattern of motions transmitted by the animal spirits. The image that was originally "imprinted" on the animal spirits located at the extremities of the nervous system is transmitted to and subsequently "imprinted" on the pineal gland.

For the case of purely reactionary behavior such as a mere reflex reaction or even the more elaborate conditioned behavior of animals, when the material image is

imprinted on the pineal gland, the pineal gland responds mechanically in one way or another to the motion that the material image causes, thereby setting up a pattern of motion in the animal spirits in other neural fibers. The patterns of response motions of the pineal gland, however, do not necessarily replicate the original image it is responding to in the sense that it codifies the same information. Rather, the response motions establish other kinds of patterns that are directed through other neural fibers to the muscular system and other organs of the body, such as the heart. These “response” patterns then direct the muscles to move in various ways that correspond to the response images. The response images are images of behavior. The pineal gland performs the complex function of translating the patterns of motion specified by the sensory stimulus images that are transmitted to it *via* the sensory nervous fibers into appropriate response images which it transmits to the muscles, thereby informing the muscles of what actions they should take. These actions constitute the overt response behavior of the organism. In terms of the “circle of movement” model, the stimulus-response mechanisms of the animal organism serve to channel a portion of a complex circle of movement that begins with the sensory stimulation and ends with the overt behavior of the organism.

If we limit our considerations to fixed reactionary behavior, such as reflex behavior or conditioned animal behavior, the pineal gland’s function is theoretically explainable wholly in physical terms. So long as the range of possible input patterns is fixed, and corresponds in a rule-governed way to a set of output patterns, no more is required than the right kinds of physical mechanisms capable of carrying out such physical transformations. This is no more physically unexplainable than the complex, but

nonetheless explainable, translations that computers perform. So far as the possibility of mechanistic animal behavior is concerned Descartes' account is not, in principle, problematic. What is a problem is when, given certain input patterns, the output patterns exhibit creativity or freedom.

To explain human creativity and freedom, Descartes appeals to the interaction of the mechanisms of the body with a separate entity, the mind, and its faculties of reason and free will. Descartes maintains that these interactions between mind and body occur through the pineal gland. But to appreciate the nature of his account, we need to examine his account of the nature of mind in more detail. I wish to postpone that discussion for the moment, however, and turn to a consideration of how and the extent to which the model of inner-outer relations might be applicable to Descartes' theory of material being and his account of the purely mechanistic behavior of living organisms.

b) Inner-Outer Language and Descartes' Account of Material Being

The model proposed for the kinds of inner-outer expressions that are the subject of this essay involves the following key elements: 1) there is a relational system R relative to which both s and P can be described, and relative to R we can determine s's relation to P with respect to the relational system R; 2) s's relation to P satisfies one or the other of two sets of criteria that can be formulated in terms of the relations of the system R. Satisfaction of one or the other of these two sets of criteria determines whether s is inside or outside of P. Given the principles of this model, we may inquire whether

Descartes' account of material being provides grounds for some kind of literal meaning for inner-outer expressions.

The review of Descartes' account of material being shows he reduces all descriptions of the material world to extension and, derivatively, motion. Moreover, the principles of extension and motion are subject to description in terms of the principles of mathematics, in particular geometry and mechanics. Presumably, the kind of geometry and mechanics he has in mind are described by the system of classical analytic geometry, since it is Descartes himself who originally devised this system.

It immediately follows that, according to the principles of the model, Descartes' account of the material world provides sufficient grounds for a literal sense for any ascription of spatial inner-outer relations within this context. Any expression that purports to say that *s* is spatially inside or outside of *P* would clearly adhere to the principles of the model in the manner described in Chapter II. There is no difficulty in discerning the sense of saying something to the effect that an organ of the body, say the pineal gland, is spatially within the body.

Similarly, the foregoing discussion of the physical aspect of material sensory stimulus images shows that Descartes takes such images to consist of material patterns encoded in the movements of animal spirits, and, by virtue of a material causal chain, patterns materially encoded by the movements of the pineal gland. Insofar as these coded patterns are embodied by the animal spirits or the pineal gland, and insofar as we may identify them as material objects (i.e. patterned arrays of animal spirits) we may also apply the model of inner-outer language to discern the sense of saying something to the

effect that “the (material) sensory image *s* (taken as a material object) is spatially (materially) within the body or within the nervous system or within the pineal gland.”⁶⁰

In addition to providing grounds for inner-outer expressions that assert a spatial relation, Descartes’ account of material being also provides a basis for understanding inner-outer expressions entailing functional ascriptions to have literal meaning.

According to the earlier discussion of functional relations, a function of some object *x* is a capacity *c* of *x* that contributes to the capacity *C* of a system *S*, of which *x* is a part.

Descartes’ account of material being provides a basis for describing the physical—that is, mechanical—functions of material objects. Relative to his account, the capacities of systems are describable in terms of the various kinds of spatial movements the material system is capable of. Such description is ultimately reducible to description in terms of extension, since motions are describable in terms of spatial locations of extended objects. Movement is a function of spatial description, and so the descriptions of the capacities of systems are reducible to description in spatial terms. Such description is simply mechanical description. Likewise, the capacities of a part *x* of a system *S* is limited to those movements that *x* is capable of, and the function of *x* relative to *S* consists of those capacities of *x* to move in ways that contribute to or explain *S*’s capacities to move.

For Descartes’ account of the stimulus-response mechanism of the animal organism, we say that one of the functions of the animal spirits is to impact upon the

⁶⁰In saying this, however, we should recognize an important distinction. We can speak of patterns in two different respects. In the foregoing paragraph, what I meant by the pattern encoded by the animal spirits for example, was a particular instantiation of a pattern by a physical object—a token. However, in addition to talking about this or that instance of a pattern, we may also talk about patterns in the abstract or patterns qua pattern. It is only the former usage for which Descartes’ account would provide grounds for a literal sense.

pineal gland in certain ways that cause the pineal gland to move in certain ways. This function occurs as a part of an extended functional scheme that describes the workings of the stimulus-response mechanism. A system of description in terms of spatial relations provides a basis for a system of description in terms of mechanical motion, which in turn provides a system of description in terms of functional relations. On the basis of the spatial relations and relations of mechanical motions we superimpose a system of capacital relations, and in turn, schemes of functional relations.

This being the case, Descartes' account of material being provides a basis for discerning the sense of inner-outer expressions entailing mechanical functional ascriptions in a manner described in Chapter IV. So, it makes sense to say the pineal gland functions "within" the stimulus-response system of the animal. In terms of the model, the sense of such statements is based on a system of capacital relations described in terms of mechanical motions, and a functional scheme which identifies all the motions of the material objects involved in the organism's abilities to respond to stimuli. Such a functional scheme describes all the functional parts of the stimulus-response mechanism, but also extends to describe the non-bodily physical objects that act as stimuli to the body's stimulus-response mechanism. Relative to this functional scheme, certain pineal capacities make possible the organism's stimulus-response capacities, and so satisfy the criteria formulated in Chapter IV that determine that the pineal gland functions "within" the system. Relative to this scheme, physical objects independent of the body that act upon the stimulus-response count as external to that system.

In making the claim that Descartes' account of material being supports an analysis of inner-outer expressions entailing functional ascription it is important to note that this claim is limited to purely mechanical functions. For not all functions need be mechanical. We may intelligibly talk about functions of the faculties of the mind, for example, which are not mechanical. However, until having examined the nature of mind and its relation to the body, we cannot say anything about the intelligibility of inner-outer expressions involving functional ascription that is not mechanical.

c) Descartes' Account of Mental Being

The pivotal thesis of Descartes' philosophy of mind is his claim that the essence of mind is thought. One of the primary texts in which he expresses this thesis occurs in the "Second Meditation." Having concluded that he exists, he proceeds to observe:

At last I have discovered it—thought; this alone is inseparable from me. I am, I exist—that is certain. But for how long? For as long as I am thinking...I am, then, in the strict sense only a thing that thinks; that is, I am a mind, or intelligence, or intellect, or reason—words whose meaning I have been ignorant of until now.⁶¹

In asserting that his essence is that of a thinking thing, Descartes goes so far as to identify the substance mind (or, alternately intellect or reason) with thought itself just as he identifies the material substance with extension. However, this conclusion leads to a further question: What is thinking or thought? Thus, in the next paragraph of the text he asks

⁶¹Rene Descartes, *Meditations*, in John Cottingham, ed., *The Philosophical Writings of Descartes*, Vol. II (Cambridge, 1985), 82.

But what then am I? A thing that thinks. What is that? A thing that doubts, understands, affirms, denies, is willing, is unwilling, and also imagines and has sensory perceptions.⁶²

This answer to the question, however, does not define thought analytically (or intensionally). Rather, the explanation of what thought is takes the form of pointing to examples.

Descartes has more to say on the nature of thought in the sixth Meditation. In addressing the issue of the existence of the body he provides a brief analysis of the distinction between “pure thought” such as acts of understanding, and species of thought, such as imagination and perception, which are conditioned by the mind’s relation to the body. He observes that an act of “pure understanding” consists solely in the comprehension of the properties essential to the object of understanding. “Pure understanding” consists solely in the comprehension of an “idea” or “concept.”⁶³ For example, in an act of understanding what a triangle is, one comprehends the idea of a figure bound by three sides. But, in comparing an act of understanding what a triangle is to an act of imagining a triangle, Descartes observes that when he “imagines” an object such as a triangle he not only comprehends the idea of an object, but also clearly sees, with the mind’s “eye,” the image of a three sided figure.

He further observes that, though he may clearly understand the idea of a chiliagon—that is, the essential properties of such an object—it is impossible to vividly imagine such a figure. Though he can intellectually discern the properties of a chiliagon

⁶²Ibid., 82.

⁶³To anticipate the discussion that will presently follow, we may generally interpret Descartes use of the term ‘idea’ here to convey the sense of “concept.”

with the understanding, the obscure image that he experiences in imagining such a figure does not allow him to discern these properties of the figure.

This leads him to conclude that modes of thinking such as understanding and judging are intrinsically different than and independent of the modes of imagining and sensory perception. In contrast to understanding and judging, imagination and sensory perception involve something over and above what is involved in the former. In imagining or sensorily perceiving a geometric figure, for example, not only does he understand the nature of the figure, but in addition, he experiences an image of the figure. He takes this additional element involved in the latter modes to be due to the mind's interaction with the body. Because the body is subject to certain physical limitations, likewise, there are limitations involved in his capacity to imagine and to perceive not involved in the use of understanding alone. He states this observation in the following way:

[The difference] between this mode of thinking [i.e. imagination] and pure understanding may simply be this: when the mind understands, it in some way turns towards itself and inspects one of the ideas which are within it; but when it imagines, it turns towards the body and looks at something in the body which conforms to an idea understood by the mind or perceived by the senses [this something being a mental image].⁶⁴

This observation he takes as at least an inconclusive indication that the body really does exist.

In general then, Descartes' analysis characterizes the content of thought in terms of two main components: ideas and mental images. On the one hand there are thoughts whose objects are simply concepts. Such thoughts he calls "pure" thoughts. On the other

⁶⁴Ibid., 111.

hand there are those thoughts whose objects are ideas somehow related to mental images, which, in turn, are somehow further related to some physical brain embodied by the pineal gland.

d) Inner-Outer Language and Descartes' Account of Mental Being.

The foregoing examination of Descartes' account of mind provides ample grounds for application of the proposed model of inner-outer language, particularly with respect to his account of mental images. Each of the various categories of qualities Descartes attributes to the mental images we experience (i.e. spatial figure, color, texture, smell etc.) involves a range of values systematically related to each other. The quality of spatiality, for example, that one experiences through mental images involves all of the familiar elements of an ordered spatial system discussed in Chapter II. Similar remarks apply to color, texture, smell and so on. The model applies to each of these systems in just the manner described in earlier chapters.

When we experience the imaginary or perceptual image of a pen within an open drawer, we experience that image as having a spatial quality. We describe the spatial quality of the image experienced in terms of all the elements of the spatial system laid out in Chapter II. Relative to that system, the criteria developed in that chapter are applicable to the pen and the drawer. This analysis articulates the sense of saying something like "I am imagining the pen as being in the drawer" (i.e. I am experiencing a mental image of which one experienced part is within another). Analyses similar to those presented in later chapters would articulate the sense of saying something such as "I am imagining the color red to be within the range of earth colors" or "I am imagining the pitch of the piano

key to be in tune.” Each of the various categories of qualities attributable to mental images provide relational systems that ground criteria for defining inner-outer relations relative to them.

Application of the model of inner-outer language to the context of mental images imposes prohibitions on the meaningfulness of inner-outer expressions similar to those discussed earlier in this chapter. For example, suppose one imagines a red ball to be inside an open box. On the principles of the model, it is senseless to say something like “I imagine the color red (qua color) to be (spatially) in a box.” For, as pointed out earlier, colors as colors are not spatially describable, and so the color red cannot be spatially related to the box. As a consequence, what is claimed in the above sentence is impossible to imagine. However it does make sense to say things like “I imagine the color red to be within the range of earth colors” or “I imagine a red ball (a solid object that is colored red) as being (spatially) inside of a box.” Here the first statement ascribes a relation that would obtain between one color and other colors. The second sentence ascribes an inner-outer relation, not between the color red and the box, but between an object that is experienced as having spatial dimension and that is experienced as red and as in the box. Those inner-outer expressions that would count as meaningful on the model, are those that ascribe a relationship between objects that are each describable with respect to the same relational system.

The above considerations illustrate how Descartes’ account of mental being provide grounds according to the principles of the model for a number of inner-outer expressions occurring in the context of discourse on mental being. However, more

central to the thesis of this essay are expressions that concern not just the realm of mental being by itself or material being by itself, but rather expressions that say something about the relation between mind and body.

*e) Inner-Outer Expressions That Ascribe Inner-Outer Relations
Between Objects of the Mind and Material Objects*

Each of the categories of description that Descartes countenances—the categories of extension (spatial description), ideas, and the various categories that describe the contents of mental images—makes implicit reference to a relational system, relative to which the items of that category describe objects. For example we can make sense of expressions such as ‘An imagined (or perceived) color is within (or outside of) a certain range of imagined colors,’ or ‘A tree (as material object) is outside the body,’ and so on. These expressions make sense on the model because for each of them we discern a single relational system relative to which we describe both terms of the inner-outer ascription. Such relational systems ground the sense of such inner-outer expressions.

However, for statements such as ‘Ideas are in the mind’ or ‘material objects are external to the mind’—the kinds of expressions that Ryle questions—the case is different. The sense a statement like ‘Ideas are in the mind’ conveys is that ideas are in the mind as opposed to outside the mind. Similar remarks apply to expressions like ‘Material objects are external to the mind.’ What is needed to ground expressions such as these is a single relational system capable of describing both the objects that are considered to be within the mind and those that are external to the mind.

But Descartes' first principle posits an ontological division between mental and physical objects. According to this principle, there are no properties that are common to both categories. Thus, on this first principle alone there is no single relational system, relative to which the term 'the mind' denotes some region of that system and 'physical object' denotes other portions of that system not bounded by the region regarded as mind—a system that would ground inner-outer statements.

Thus, on Descartes first principle, it is impossible to discern a literal sense for the kinds of expressions Ryle questions in terms of the model for inner-outer expressions. If we take expressions like "Ideas are in the mind" or "Physical objects are external to the mind" to be grounded on a system of physical spatial relations, as Ryle and others do, then according to the model this expression would have no literal sense. Although physical objects could be described with respect to such a system, neither the mind nor its ideas could be so described.

This consequence explains the source from which the position represented by Ryle draws its support. Ryle and others suppose that a spatial relational system is the only kind of relational system grounding the sense of inner-outer expressions. They suppose that the only kind of literal sense that an inner-outer expression can have is about spatial relations. Against this position, I have argued that various sorts of relational systems can ground the sense of an inner-outer relational system. However, even with this broader interpretation of inner-outer expressions, the first principal thesis of Cartesian dualism still does not provide us with a single relational system grounding the kinds of inner-outer statements in question.

However, we have yet to consider the second of Descartes' tenets, the thesis that mind and body interact. In the next section, I argue that this second thesis of Cartesian dualism offers a basis for discerning a relational system grounding the kinds of inner-outer expressions in question. I argue that on the basis of this second thesis, we can discern a literal sense for such expressions according to which we may understand such mental objects as "ideas" as being causally or functionally within the mind and physical objects to be causally or functionally external to the mind.

ii). Inner-Outer Language And The Thesis That Mind And Body Interact

The second of Descartes' dualistic theses is that mind interacts with the body. Descartes generally maintains that the events in which the body causally acts on the mind occur primarily between the pineal gland and the sensory faculty of the mind. As a result of these events, the encoded activities of the pineal gland cause the mind to have a mental image that correlates with the coded activity of the pineal gland. Events in which the mind causally acts on the body occur between the mind's faculty of will and the pineal gland. This second kind of interaction involves the mind's causing encoded activity of the pineal gland which corresponds to an image of the mind that is willed. The coded activity the mind causes to come about in the pineal gland is then communicated to the body *via* the animal spirits in the neural fibers, thus causing the body to act correspondingly.

Descartes' doctrine of mind-body interaction is one of the main difficulties of his dualism. From the time of its first publication to the present it has been criticized.

Commentators generally acknowledge that he himself was greatly concerned to address the problems this doctrine posed, but that he was never able to satisfactorily solve them. However, although neither Descartes nor any later defenders have been able to successfully dismiss the problems posed by this doctrine, neither can it be said that any argument disfavoring this doctrine yet raised has conclusively disproved it. It would be a significant digression from the goals of this chapter to examine in any detail the extensive literature on this topic. Suffice it to say there is, at present, no conclusive reason to prohibit the Cartesian dualist from maintaining this thesis. The Cartesian dualist, therefore, can, within the scope of his own theory, legitimately, though tenuously, maintain that mind and body interact, that causal events between the mind and body do occur.

For the Cartesian, mind and the physical world are interrelated by virtue of a continuous, complex causal nexus. This causal nexus consists of the causal relations between physical objects, which are then continuously joined to the various causal relations between mental entities by means of mental-physical causal relations. We may describe this causal nexus using the terms of description of causal relations treated in Chapter IV. Accordingly, this causal nexus is describable in terms of a complex network of causal relations. Such causal relations extend continuously over both the realm of physical being (the causal relations that occur between physical bodies) and the realm of mental being (causal relations that occur between the dualist's mental entities such as thoughts, desires, imaginings, sensations and so on), where continuity of causal relations between the two realms obtains by means of mental-physical causal relations.

Relative to this continuous network of causal relations, that portion of the network that consists of the causal relations between mental entities together with the mental-physical causal relations constitutes a single system whose inputs and outputs consist of mental-physical causal events. Relative to the vast, continuous causal nexus that extends over both the realms of physical and mental being, mind is describable as a partition that can be defined in terms of the input/output relations, which the dualist identifies as mind-body interaction. The network of mental, physical and mind-body causal relations that the dualist is committed to provides the kind of relational system that the model for inner-outer expressions requires.

What dualism lacks, however, is a complete account of the exact details of the causal network it hypothesizes. For that matter, no theory at present provides any such account. For this reason it is impossible to determine how dualism fulfills the remaining criteria for something being within or outside the mind. This is due to the complexity and abstruseness of the subject of such causal relations. However, the dualist is committed to the existence of such causal relations, whether or not a complete account of the details of these interactions can be provided. Given an account of the details of these interactions, in principle it would then be possible to formulate the truth-conditions in question.

In conclusion, the model for inner-outer relations provides a way of understanding a literal sense for expressions like 'thoughts are in the mind' or 'physical objects are external to the mind' for the theoretical context of Cartesian interactive dualism. According to the foregoing analysis, this sense is grounded in a network of causal

relations. Thus, according to the theory of dualism, thoughts are 'in the mind' in a non-metaphorical, causal sense.

This concludes my case for the claim that inner-outer expressions for the context of Cartesian dualism can be understood to have a clear non-metaphorical sense. At this point I will extend this specific claim applying to the context of Cartesian dualism by claiming that we can understand inner-outer expressions to have a clear non-metaphorical sense for the general context of theoretical discourse on mind.

My argument for this claim is that any theory of mind that implicitly or explicitly posits the existence of a relational system relative to which the terms of an inner-outer expression can be described thereby provides a basis for a non-metaphorical sense for the inner-outer expression. Generally speaking, it is plausible to suppose that any theory of mind makes such provisions, since any theory of mind needs to describe in some way the relationship between mind and world. To illustrate this, I shall now examine how the model for inner-outer relations applies to the contemporary theory of mind known as wide functionalism. Since my detailed analysis of dualism has already illustrated the lines that such analyses take, I shall provide only a sketch of how the model for inner-outer language applies to functionalism.

e) Wide Functionalism And Inner-Outer Relations

The functionalist's counterpart to the dualist's mind substance is a psychological system. The functionalist describes this system in terms of functions and functional relations. We may view functionalism in terms of the principles presented in the analysis of the notion of function developed in Chapter IV. This analysis defined functions in

terms of the notions of systems, parts of systems, capacital systems and functional schemes.

For humans, such a psychological system is embodied by the physical body, or perhaps, more narrowly, the nervous system, but the physical structure of the system is not essential to the theory. What is essential is the functional structure of the system, which consists of the various functional relations (versus other physical relations) between the physical parts of the system. How it is that the physical parts perform the functions of the system, however, is an issue that I will not be concerned with here. I will focus rather on some of the general features of the functional relations of the system.

As a physical object, the embodied psychological system has certain general capacities. The general capacities of the system as a whole may be identified with the overt physical behavior of the body. Further, we understand the body and the system to consist of parts, each of which has capacities of its own. In accordance with the defining criteria of a function, developed in Chapter IV, when the capacities of these parts contribute to the general capacities of the system as a whole, then such capacities constitute functions with respect to the system. As the analysis of Chapter IV further discerned, the functional capacities of the parts are interrelated, forming a structured network of functional capacities all ultimately related to the general capacities of the system as a whole, that is, its behavior.

Since overt physical behavior is a capacity of the system, this behavior grounds the relations of the functional network which constitutes the structure of the system. But the overt behavior of the body is at the same time capacitally related to the objects of its

physical environment, the physical world. Moreover, what counts as intelligent behavior is generally determined with reference to larger systems consisting of the other objects of the environment as well as the individual mind. For example, social behavior, including linguistic behavior, is defined with reference to the larger social system and its physical environment. Although an individual may have the capacity to produce arbitrary sounds, this does not count as intelligent behavior, since such behavior does not relate to the socio-linguistic system. What count as intelligent behaviors are only such sounds that relate to the socio-linguistic system in some purposeful way—a way that contributes to some capacity of the larger social system by way of communication.

In general, the intelligent behavioral capacities of an individual which define its own internal functional network are, at the same time, functional capacities involved in a larger functional network defined by some system of the larger environment. We similarly extrapolate from this larger system of functional capacities to a yet larger system, and so on, perhaps indefinitely. In Chapter IV we called the complete network of all possible functional relations between the functional capacities so derived a functional scheme. On the basis of this interpretation of functionalism we may say further that what functionalism identifies (in terms of functional relations) as mind (a psychological system) is but a portion of a larger functional scheme that describes the larger world as well as the individual mind. The larger functional scheme constitutes a relational system that provides a basis for inner-outer relations in the manner discussed in the last chapter.

With respect to the larger functional scheme, the functional behavior of the body defines a partitioning of the larger functional scheme into two parts: those functional

capacities that occur as parts of the individual psychological system (i.e. parts that contribute to the ability of the individual to have capacities for intelligent behavior) and those capacities of the functional scheme that do not occur as functional parts of the individual mind (i.e. the functional capacities of other objects of the environment). The former would constitute internal functions, the latter external functions.

The larger functional scheme relative to which we identify a psychological system and, again, relative to which we identify those functions that are internal and those that are external supervenes on physical objects, the body and the other physical objects of the world. To say the larger functional scheme supervenes upon the physical world means we can describe the physical world, including the bodies of organisms, in terms of the larger functional scheme. The actualization of the larger functional scheme is the embodiment of the functional scheme by the physical world. We may also describe the physical world in other terms. For example, we can describe the world in terms of spatiality rather than functionality. If we do so, then, we can talk about what is spatially internal to the body and what is spatially external to the body. Specifically, the brain and its parts are inside the head and objects such as rocks and trees are spatially external to the body.

There is a parallel between functional inner-outer relations and spatial inner-outer relations. What defines the functional system we call a psychological system is the overt behavior of the body. Such overt behavioral acts are considered capacities of the body that the functional capacities of the psychological system make possible. Relative to such behavioral capacities, the functional capacities of the psychological system are internal to

the system. Likewise, the functional capacities of objects that are not parts of the body do not contribute to the behavioral capacities of the body in the same way that the functional capacities of the psychological system do. They are external to the psychological system.

With respect to spatial inner-outer relations, it is the same physical body, whose behavior partitions the functional space into the inner psychological system and the external functional world, that spatially partitions the spatial world into that which is inside the body and that which is external to the body. It is the physical parts of the body, which are internal to the body, that actually perform the functions that are internal to the functional system. Thus, in general, there is a parallel between, on the one hand, what is functionally internal to the psychological system and what is spatially internal to the body, and on the other, what is functionally external to the body and what is spatially external to the body.

This analysis shows that, on the present account of inner-outer language, for the theoretical context of wide functionalism it is possible to meaningfully speak of inner-outer relations with respect to mind considered as a functional system without making implicit reference to spatiality. For the present case, the basis of what it means to be inside or outside of the psychological system is the larger system of functional relations of which the individual psychological system is a portion. Since expressions that ascribe such relations do not make implicit reference to spatial relations, such expressions are neither literally nor metaphorically spatial.

f) Conclusion Of Arguments For The Thesis That Inner-Outer Language Can Have Literal Meaning For The Context Of Discourse On Mind

My analyses of the case of Cartesian dualism and the case of wide functionalism have shown that for both of these theoretical contexts we can discern a basis for a literal sense for inner-outer expressions. These results justify my thesis that, *contra* Ryle describing the mind-world relation in terms of the inner-outer dichotomy can have a literal meaning that does not entail the notion of spatiality. Such description, then, need not be metaphorically spatial.

However, what it means to be “within” or “outside” the “mind” will vary from one theory of mind to another. For, what inner-outer expressions mean in any particular instance depends on what relational system is taken to ground the expression, and that will vary from one theory of mind to another. A functionalist theory implicitly defines both the internal (mind) and external (extra-mental) in terms of the category of function. Although objects considered to be external to the mind may be taken to be material objects, it is only with respect to the functional relations of these objects, defined with respect to some functional scheme, that the object is considered external to the mind. In any other respect, the object is irrelevant to what is taken to be mind, for the object is a part of some other category of description. Other theories of mind, however, might define mind in terms of some other category of description. If so, whether inner-outer expressions occurring in the context of such theories would be meaningful or meaningless, literal or metaphorical, depends on whether or not the appropriate relational

system can be identified, and, given the appropriate relational system, whether or not what is understood as “mind” identifies an appropriate partitioned portion of that system.

2. That Describing The Mind-World Relation In Terms Of The Inner-Outer Dichotomy Does Not Involve An Implicit Commitment To A Dualist Theory Of Mind

It follows directly from the results of the preceding section that inner-outer expressions can be meaningful for any theoretical context provided that that context establishes a relational system that grounds inner-outer expressions. Use of inner-outer language does not intrinsically involve a commitment to any one particular theory of mind as Ryle maintains.

Ryle’s treatment of inner-outer language for the context of discourse on mind provides some indication of his motivation for believing that describing the mind-world relation in terms of the inner-outer dichotomy involves implicit subscription to dualism. Ryle maintains that Cartesian dualism itself derives from a kind of metaphorical or analogical way of thinking. As discussed earlier, Ryle maintains that Descartes’ dualism is the result of understanding the mind on the model of physical substance. Thus the dualist understands mind to be another kind of substance, subject to various attributes and modifications just as material substances are. Accordingly, whenever material substances are analyzed in some manner, the mind substance is open to analysis in a similar manner. For example, there is an essential property of material objects, which is extension. Likewise there is an essential property of mind, which is thought. Extension is subject to various modes or forms Likewise thought is subject to various modes or forms. Thus, according to Ryle and other commentators, Cartesian dualism is intrinsically wedded to a

presumed analogy between mind and material body. Ryle implicitly holds that if one subscribes to Cartesian dualism then one subscribes to the analogy between mind and material body, and conversely if one subscribes to an analogy between mind and material body, then one implicitly subscribes to dualism.

According to Ryle's view, inner-outer language does have literal meaning for the spatial context. It is from the spatial context that non-spatial inner-outer expressions derive their metaphorical sense. Since material substances are spatially describable, we can apply inner-outer language to material substances with literal sense. It follows that if we also apply inner-outer language to mind-world relations we do so with the implicit understanding that there is some kind of analogy between mind and material substances. According to this analogy, just as it is meaningful to talk about one material substance being spatially within or outside of another material substance it is in some sense meaningful to talk about objects that are in some sense internal or external to the mind substance. Such extended application of inner-outer language to the mind-world relation is intrinsically wedded to the analogy between mind and material substance and, by extension, a dualistic standpoint on the nature of mind.

We can formally express the intrinsic bond between inner-outer language and dualism that Ryle maintains exists in terms of a bi-conditional:

(A) We can in meaningfully describe the mind-world relation in terms of the inner-outer dichotomy if and only if (B) dualism is true

This bi-conditional is equivalent to a conjunction of two conditionals.

(I) If (B) dualism is true, then (A) we can meaningfully describe the mind-world relation in terms of the inner-outer dichotomy.

(II) If (A) we can meaningfully describe the mind-world relation in terms of the inner-outer dichotomy, then (B) dualism is true.

Let us look at each of these conditionals separately.

The first conditional (I) provides, for the anti-dualist, a basis for an argument against dualism. Specifically, if the anti-dualist shows that (A) is false—that we cannot meaningfully describe the mind-world relation in terms of the inner-outer dichotomy—then it follows that (B) is false as well—that dualism is false. The argument takes the form of a deductive *modus tollens* argument as follows:

P1: If (B) then (A)
 P2: (A) is false
 C: Therefore, (B) is false

This is the kind of argument that Ryle advances. By purporting to show that inner-outer language for the context of discourse on mind is essentially meaningless, Ryle attacks dualism. This explains why it is that Ryle is so concerned with the theme of inner-outer language.

The above argument is a valid *modus tollens* argument. However, an application of the consequences of the proposed model for inner-outer relations shows that this argument is clearly unsound. According to the proposed model for inner-outer expressions, the first premise (P1) of the argument would indeed be true. If dualism is true, then the principles of dualism provide a means for understanding inner-outer language to have a literal sense. And so it follows that it would be true that describing the mind-world relation in terms of the inner-outer dichotomy is meaningful.

However, according to the proposed model, the second premise of the above argument is not true. According to the model, we cannot independently (i.e. without the

grounds of a theory) maintain that it is false that inner-outer language used to describe the mind-world relation is literally meaningful. According to the above model, inner-outer language can have a literal sense for non-spatial contexts, and, in particular, inner-outer language can have literal meaning for the context for discourse on mind. We can describe the mind-world relation in terms of the inner-outer language. However, the model shows that we can only understand such inner-outer language to have a literal sense on the basis of some relational system that grounds this sense. This relational system is provided by some theory of mind. In order to say such inner-outer language does or does not have some literal sense, it is necessary to presuppose some theory of mind against which the sense of inner-outer language can be assessed. Thus, according to the model, we cannot make a general statement to the effect that for the context of discourse on mind, inner-outer language is or is not meaningful. We can only make statements to the effect that for theory X, inner-outer language is or is not meaningful.

Applying this principle to the argument in question, the second premise needs to be restated as “For the context of dualism, inner-outer language has no literal sense.” This kind of statement paraphrases as “If dualism is true, then it is false that we can meaningfully describe the mind-world relation in terms of inner-outer language.” Using the propositional symbols above, we analyze the premise ‘(A) is false’ to have the implicit form ‘If (B) (dualism is true), then (A) is false.’

Substituting the implicit form of the second premise (P2) for the original statement of that premise still yields a valid argument. For a conditional can be true whenever the antecedent of the conditional is false. Thus both of the conditionals ‘If (B),

then (A) is true' and 'If (B), then (A) is false' can both be true. But they can both be true only when (B) is false. Thus if both conditionals are taken to be true, then it necessarily follows that (B) is false. However, application of the proposed model for inner-outer language shows that the second premise 'If (B) (dualism is true), then (A) is false' is false. The earlier analysis of inner-outer language for the context of Cartesian dualism shows that, according to the proposed model, dualism does provide the kind of relational system required to ground the meaningfulness of inner-outer statements. If dualism is true it follows that inner-outer language for that context is meaningful. Thus, while the argument in question is valid in form, on the proposed model it is clearly unsound.

The foregoing analysis disarms the anti-dualist of his argument against dualism. It does not, however, deny the truth of the first conditional (I) above. On the contrary, the first conditional above expresses the results of the earlier analyses of **inner-outer** language for the context of dualism. These analyses showed that when we presuppose the truth of dualism, then inner-outer language is meaningful. Thus conditional (I) above is consistent with the analyses of inner-outer language developed in this essay.

It is the second conditional (II) that According to these analyses, conditional (II) is false, however. Conditional (II), says that if inner-outer language for discourse on mind is meaningful, then dualism is true. This says, in effect, that understanding inner-outer language for the context of discourse on mind entails a standpoint of dualism. On the proposed model for inner-outer expressions, however, this assertion is not true. What the proposed model shows is that statements of the form 's is in (outside) the mind' can

have a literal sense provided that the word 'mind' is defined in a way that provides a relational system grounding the meaning of inner-outer language. I have shown that dualism does make this provision. But similarly, functionalism does so as well. It is plausible that many other kinds of theories of mind also do so. Consequently, on this analysis of inner-outer language, the conditional 'If dualism is true then inner-outer language for this context is meaningful' (i.e.(I)) counts as being true. But so does the conditional 'If functionalism is true, then inner-outer language for this context is meaningful.' In general the conditional 'If theory X is true, then inner-outer language is meaningful' counts as true, so long as theory X provides a basis for the meaning of an inner-outer statement. But none of these conditionals involve commitment to the truth of the theories in question. (Again, a conditional can be true even when the antithesis is false). Nor would a commitment to the premise that, inner-outer language **can have** a literal meaning for the context of discourse on mind allow us to validly infer from any of the above conditionals the truth of the theory referred to by that conditional. Thus, on the analyses advanced here, conditional (II) is false.

I conclude that use of inner-outer language to describe the mind-world relation does not involve an implicit commitment to dualism as Ryle suggests it does. Nor does use of inner-outer language for the context of discourse on mind involve commitment to any particular theory of mind. To say what sense inner-outer language for the context of discourse on mind has does, however, require a definition of mind that may be provided by some theory. And since the sense that inner-outer language has depends on this

definition, the sense that it would have may vary, depending on the theory of mind according to which mind is understood.

C. GENERAL CONCLUSIONS

I have argued in this essay against two interrelated claims concerning the nature of inner-outer language. These claims, which are explicitly expressed and argued for by Gilbert Ryle in The Concept of Mind, represent a core of sentiments concerning inner-outer language for discourse on mind shared by a number of philosophers.

First, Ryle and others maintain that for the context of discourse on mind inner-outer language is spatial metaphor and for this reason intrinsically obscure. Against this claim, I have argued that inner-outer language is not intrinsically spatial talk; that it can have a literal non-spatial sense for a wide range of contexts. The general model for the inner-outer language, derived from consideration of the necessary elements involved in our use of inner-outer language shows that the sense of inner-outer statements is grounded by a relational system relative to which inner-outer relations are second-order relations definable in terms of the first-order relations of the relational system.

Secondly, Ryle has suggested that using inner-outer language to describe the mind-world relation involves an implicit commitment to dualism. Against this claim I have argued for the thesis that we can understand inner-outer language to have a literal sense for any theoretical context so long as the theory in question provides a for a relational system that grounds the sense of the inner-outer expression.

As a direct consequence of this result, use of inner-outer language does not involve commitment to any particular theory of mind. It is the case however, that meaningful use of inner-outer language does presuppose some theory of mind. For it is only when we can make sense of the notion of mind and mind-world relations that we can make sense of inner-outer expressions that describe these relations. However, dualism is often considered to be the standpoint of naive common sense. And if this is true, then, while inner-outer talk does not necessarily presuppose a commitment to dualism, it may be the case that when we use inner-outer language in everyday contexts, we do have a tendency to ground the sense of such language in a dualist standpoint. This tendency, however, should not pose a problem for understanding inner-outer language in non-dualist theoretical contexts.

These conclusions, then provide a means of resolving the dilemma identified in the first chapter. But beyond the particular issues that have been the focus of this essay, the analyses presented here have broader implications. If it is true that understanding of the sense of inner-outer language is grounded by a broader understanding of the mind-world relation then in using inner-outer language to describe the mind-world relation we need to bear in mind that such language only describes that which we already understand or implicitly assume about that relation on the basis of this broader understanding. We do not need to avoid inner-outer language altogether, as some suggest, but inner-outer language does carry with it a complex of meaning. It is my hope that this essay helps to clarify the meaning such language conveys.

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