

THE COMPARATIVE PHILOLOGY OF FUNCTIONAL INTELLIGENCE

A Study of Semantic Systems in the Thought Processes
of Bilingual Children

by

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"I often feel that Anthropologists by making a careful comparison between the languages of Dover and Calais could long ago have discovered what they only brought to light recently by going all the way to the South Sea Islands.

J.G.Weightman: "Translation as Linguistic Exercise",
English Language Teaching, V.3 (1950): 69-76.

"The credit for being the first to recognize that Egyptian writing consisted mainly of phonetic signs belongs to Thomas Young, the author of "The Undulatory Theory of Light" who obtained a copy of the Rosetta Stone in 1814; he also demonstrated a fact which had been previously suspected by Zoega, de Guignes and others, that the ovals or cartouches, in the hieroglyphic version contained Royal names. Thomas Young's discoveries were not, however, limited to the Rosetta Stone, but included among many other achievements the decipherment of the names of Berenice and Cleopatra, the latter on a granite obelisk with a bilingual text in Greek and hieroglyphics which had been excavated at Philae in 1815 by W.J.Bankes of Kingston Lacy. It is difficult to estimate the extent to which Young's discoveries assisted the French scholar Jean Francois Champollion (1790-1832), but it is likely that in many cases both these pioneers reached similar conclusions independently. In 1822 the list of alphabetic Egyptian characters that had been drawn up by Young was corrected and greatly enlarged by Champollion, who, between that date and the year of his death, correctly deciphered the hieroglyphic forms of the names of most of the Roman Emperors, and drew up a classified list of Egyptian hieroglyphs, and formulated a system of grammar and general decipherment which is the foundation whereon all later Egyptologists have worked".

"The Rosetta Stone" (p.3) published by the Trustees of the
British Museum, London, 1957.

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CHAPTER I

NEURO-PSYCHOLOGICAL ASPECTS OF FUNCTIONAL INTELLIGENCE

- (a) Applied Psychology in the field of Bilingualism.
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Bilingualism in terms of Comparative Philology

The use of language, above all else, seems to distinguish human thinking from that of the animal and human intelligence is almost always assessed by means of words and other symbols. An operational definition of intelligence in a context of comparative linguistics would thus appear desirable, since not all have access to the same language structure and the structure may in part determine performance.

Some evidence on the relationship between language structures and intellectual performance is provided by subjects who use two or more languages, particularly when these have been learned early. The situation is, however, quite complex since most multi-lingual subjects have learned their languages at different ages, by different means and use them in different contexts. It is the aim of the present research to clarify some of the issues involved by examining a number of hypotheses relating to the intellectual performance in English and Welsh of children who use both these languages.

The psychological study of the development of an individual in time has often proved to be rewarding but the study of individual and group differences has also thrown great light on the problems of personality structure. Likewise it is suggested that although the study of a monoglot may provide us with a valuable end-product such as a simple word count the comparative study of bilinguals may throw more light both on man's mode of thought and upon its relationship with the underlying neural structure.

The concrete object of our linguistic study is the social product deposited in the brain of each individual, namely, language. But the product differs with linguistic groups: we have in practice to work with languages. Thus our problem is of daily import whether it concerns the learning of English, Welsh or French in parts of the United Kingdom or whether it is the need to assimilate Ibo, Hausa and English in certain regions of Africa or French, German, Italian and Romansh in some parts of Europe.

The study of individual differences in a setting of comparative linguistics may thus lead us to speculate further on the neural mechanisms which themselves produce such diverse auditory and visual expressions of communication. Our study will, therefore, be concerned with

the logical and psychological relations that form a system, or systems, in the minds of the speakers moving in the same or possibly different social milieux; in order to bridge what has been termed by Miller as the gap between "image" and "behaviour".

Whatmough has stated that "language notwithstanding all the refinements of analysis, remains a continuum. Phoneme merges into morpheme and morpheme into construct, construct into discourse. The continuum extends from speaker to hearer and thence to the entire speech community. But the community has its historical descent linguistically and is itself normally a linguistic ancestor. It is not to be assumed that the language makes the culture. An entire speech-community working for generations is needed to make the language as a self-perpetuating system, capable of a status between complete rigidity and complete fluidity, that dynamic equilibrium on which human development depends".

But it is well to remember, as the present writer has indicated in his monograph on "Bilingualism in Wales, an Aspect on Semantic Organisation", that language serves but as a vehicle to convey the cognitive, conative and affective expressions of the individual, that the individual himself may in turn, be subject to a variety of influences which promote or inhibit the development of his personality and that the degree with which he will cope successfully with his environment will depend on his emotional development and the functional level of his intellectual capacity to overcome any socio-economic or other difficulties which he may have to face - within the framework of his own neuro-psychological structure.

Let us for a moment consider the structure:

The brain consists of two "hemispheres", on the right and the left, each made up of a number of lobes. The thin outer rim of grey matter called the cerebral cortex is composed of six layers of nerve cells freely interconnected in the cortex and more remotely in the sub-cortical white matter. The nerve cells and their interconnections thus form complex neural nets. Into the neural network of the occipital, temporal and parietal lobes are led successions of visual, sound and body sensory stimuli carried to them by long tract systems from the ears, eyes and other specialised

JOSHUA WHATMOUGH; "Language a Modern Synthesis" (p 125).
pub. The New American Library of World
Literature, U.S.A., 1957.

CYRIL JAMES: "Bilingualism in Wales: An Aspect of
Semantic Organisation", Educational
Research. Vol. II, Feb. 1960: pub. for
the National Foundation of Educational
Research by Newnes Educational Publishing
Co., London

end organs. The human cortex contains many millions of ganglion cells whose insulated axones and dendrites are capable of conducting electric currents. They are joined together by synaptic junctions and each area has its links with ganglionic connections in the centrally placed brain stem.

In these networks electro-chemical changes become perceptions, memories and in man language. The nature of this transition is not, as yet, known.

It is now a century since the French Surgeon Broca showed in 1861, that speech had some degree of neuronal localisation in the brain. He demonstrated that what he called "aphemia" and what we now call "aphasia" was produced by a relatively small destruction of a certain area of the cortex in the dominant hemisphere of a man. This meant, of course, not that speech was located there but that the area in question was used as an essential part of a mechanism while the individual spoke, wrote or listened to others who spoke. It showed further that a man could still carry out other forms of voluntary activity while the speech mechanism was paralysed.

In the awareness of each individual says Penfield there is a succession of perceptions of the present in terms of listening, speaking, reading and writing. The perceptions are made possible by the ever changing integrative activity of the brain. Perceptions are in one sense separable units since they are held in place for due consideration. But they are not disjointed. They are joined together by the continuous stream of time - the waking time of a man's life span. They are recorded in the brain in continuity and yet, separable related experiences are somehow classified and made available for later selective reconsideration.

Man, as distinct from the animal, possesses the strange ability to listen to and speak, to read and write a language of words: the organisation of his brain and related body structure endows him with the capacity to learn a language or languages. Wherever men have flourished - in India or in Europe, or the islands of the Pacific or in the cities of the Americas - they have learned to listen and talk to each other using a language of visual and auditory symbols of their own making.

Russell Brain has summed up a discussion of the origin and nature of languages as follows, "Speech is a mode of communication in which symbols are used to convey ideas to arouse feelings or to excite actions. In spoken speech these symbols are sounds, in written speech they are visual patterns. Tactile impressions play the part of visual symbols in the blind, and gestures replace spoken language in the deaf and dumb". Thus man has devised various means of communication, conveying ideas by means of symbols. Words are symbols of ideas whether they are spoken or written or used in unwritten formulations in the mind in terms of hypothetical constructs. Associated with the use of words as symbols says Penfield " a remarkable lateralisation and localisation of function has appeared in the human brain. From the point of view of comparative physiology this is a startling event but no more so than the appearance of language". Likewise from the point of view of comparative linguistics as reflected in the study of the functional level of man's intelligence the findings may prove to be rewarding.

The emergence of writing is a more recent event in the history of man. A study of the Rosetta, Stone, e.g. throws light not only on the translation of meaning but especially on the fecundity of man's varying symbols. It should be noted as Saussure has pointed out that "Language and writing are two distinct systems of signs; the second exists for the sole purpose of representing the first. The linguistic object is not both the written and spoken forms of words: the spoken forms alone constitute the object. But the spoken word is so intimately bound to its written image that the latter manages to usurp the main role". As we shall see during the course of

RUSSELL BRAIN: Aphasia, Apraxia and Agnosia: Wilson K.
"Neurology" London, Butterworth Vol. III
pp 1413 - 1483.

our experiment it is necessary to differentiate between the skills of speaking and writing - that is, there is much to be gained in terms of learning theory by studying the comparative linguistic results occasioned by auditory and visual stimuli.

At this point one should bear in mind Saussure's statement that there are only two systems of writing.

1. In an ideographic system each word is represented by a single sign that is unrelated to the sounds of the word itself. Each written sign stands for a whole word, and consequently, for the idea expressed by the word. The classic example of an ideographic system of writing is Chinese.

2. The system commonly known as "phonetic" tries to reproduce the succession of the sounds that make up a word. Phonetic systems are sometimes syllabic, sometimes alphabetic, that is, based on the irreducible element used in speaking.

Moreover ideographic systems frequently become mixtures when certain ideograms lose their original value and become symbols of isolated sounds. In our case the comparative study of English and Welsh makes use of the phonetic reproduction.

It is also important to note that not only are there two different systems of writing, that is, not only are there two different systems of presenting a language or languages visually - but there are differences in the forms of linguistic perception from language to language. In brief the perception of reality in one language may not necessarily coincide with the perception of reality in another language, for example, what is readily perceived and described as a colour in one language may not convey the same chromatic idea in another. As we shall see at a later point in our discussion a study of the functional level of intelligence in terms of comparative linguistics can supply useful information with reference to learning theory.

Let us consider for a moment the perception of light in the spectrum of colour. Indians for example do not distinguish linguistically between red and brown, or between red-brown-black or between white-grey-pale blue, etc. But for us it is relevant to cite a more striking example, which is closer to hand. When we describe perception of certain colours in terms of the English and Welsh language, for the Welshman the sea (môr) is "glas" and the grass (gwair) is "glas" and the sky (awyr) is "glas," thus:

Ferdinand De Saussure: Course in General Linguistics pp 23 et seq. published Peter Owen Ltd., London, 1960.

English	Welsh
blue	glas
green	
grey	llwyd
brown	

When comparing French and English one can also cite examples where the perception of reality is described differently: in other words the same basic stimulus may produce a different response within the same person according to language spoken. This can have interesting repercussions in the study of functional intelligence.

It, therefore, becomes necessary to distinguish between the language itself and what the individual speaks or writes for it becomes evident that the same individual may perceive the same object only to record it differently in two languages such as English or Welsh: in other words the functional level of a person's intelligence may be directly geared to his vehicle of expression.

"Language ('langue') says Saussure is not to be confused with human speech ("langage") of which it is only a definite part, though certainly an essential one. It is both a social product of the faculty of speech and a collection of necessary conventions that have been adopted by a social body to permit individuals to exercise that faculty. Taken as a whole, speech is many-sided and heterogeneous; straddling several areas simultaneously - physical, physiological, psychological - it belongs both to the individual and to society; we cannot put it into any category of human facts because we cannot discover its unity. Language on the contrary, is a self contained whole and a principle of classification. As soon as we give language first place among the facts of speech we introduce a natural order into a mass that lends itself to no other classification".

"In separating language from speaking we are at the same time separating:

- (1) What is social from what is individual.
- (2) What is essential from what is accessory and more or less accidental.

Language itself is not a function of the speaker; it is a product that is passively assimilated by the individual. It never requires premeditation and reflection enters in only for the purpose of classification. Speaking on the contrary, is an individual act, and we should distinguish between (1) the combinations by which the speaker uses the language code for expressing his own thought; and (2) the psycho-physical mechanism that allows him to exteriorize these combinations.

Another fundamental principle inherent in the actual structure of the recorded language as opposed to the spoken may influence the results of our research is that the style and therefore the content of that language will vary in accordance with the level of use. This will profoundly affect the way a speaker will handle a language and when two languages are used the resulting degree of fluency will depend on how far the speaker will have experienced and hence assimilated the different levels of language. It is in this context that a comparative study of the differences, if any, in the early and late learning of a language may be useful.

The following chart drawn up by Vinay and Darbelnet in their work, "Stylistique Comparée du Français et de l'Anglais" is of great help in clarifying their thoughts in this matter of levels of language:

Bon Usage	Langue Commune	Tonalité esthétique	Specialisations fonctionnelles
		Langue poétique	Administrative juridique, Scientifique, etc.
		langue littéraire	
langue écrite			
Langue Vulgaire		langue familière	les jargons
		langue populaire	
	argot		

It will be seen from the above that a person may be fluent on one level, for example, in the legal terms of one language whereas in another his mode of learning the language may make him more familiar with poetic and literary expressions. This fact will also have a direct bearing on the study of the results of early and late learning.

J.P.VINAY & DARBELNET: Stylistique Comparée du Français et de l'Anglais. pub. Didier, Paris, 1958.

As a preliminary to our discussion, therefore, we can summarize by our submission from a consideration of the foregoing that we have to consider the following:-

- (i) the actual neural mechanism concerned with producing language.
- (ii) that the language itself (langue) must not be confused with human speech ("langage").
- (iii) that the language itself flourishes at various levels.
- (iv) that the use of the spoken/written recorded language will itself be a function of the organisation of the neural structure of the individual brain - that is, it will represent the functional level of intelligence of an individual. *complicated.*
- (v) that instead of saying perceptual phenomena are strictly "perceptual" or that they are fundamentally the operations of "learning" we can postulate that perceptual theory and learning theory are two different ways of looking at the same facts. *?*
- (vi) we may, therefore, for the purpose of our present research hypothesise like Hebb that all psychological theories concern one unified aggregate, the behaviour of the organism. *therefore ?*
- (vii) that a study of the functional level of intelligence in terms of comparative linguistics calls for a synchronic description of individual bilingualism.
- (viii) that a series of hypotheses based for example on Hebb's neuro-psychological theory may help us to throw light on the relationship between early and late learning.

Applied Psychology in the Field of Bilingualism

"It always seemed to me" says Hebb, "that learning is the crucial question in psychological theory. Even in talking about the innate or the instinctive one is concerned in a sense with delimiting the role of learning. But as has been said, all lines of thought about learning and memory seemed nullified by the facts of perception". It is in the field of language acquisition that we are, par excellence, confronted with the whole range of problems concerned with the theory of learning and perception. These problems have for long exercised the minds of teachers and administrators, psychologists, and neurologists but it is only in recent years that it has been realised that certain advantages may accrue to the researcher who delves into thought processes of the bilingual child as opposed to the monoglot.

A study of the monoglot child may present one set of facts, the study of the bilingual child another set which on the surface appear to call for a different psychological interpretation in terms of learning theory. A closer consideration of the seemingly irreconcilable data, however, may lead to discussions and possible discoveries which were not possible in the single medium. That a consideration, for example, of the neuro-physiological mechanisms of speech should have some educational consequences, has stimulated the minds of the neurologists Penfield and Roberts to postulate the need to reconsider the policy adopted towards language teaching in general and to point out that for bilingual countries like Canada and Belgium and multi-lingual countries like the U.S.S.R., the learning of secondary languages is of prime importance.

In Europe with the coming of the "Common Market" and the closer political alliances the question of language policy becomes of paramount importance.

D.O.HEBB; " A Neuro-psychological Theory": Psychology. A Study of Science. Edited S.Koch, p.632, pub.Macgraw Hill Book Coy., London, 1959.

Let us first define our terms. For research purposes the complexity of the problem must be recognised in any definition. The Central Advisory Council for Education (Wales) states, "Bilingualism implies the simultaneous learning of, though not necessarily an equally proficient control over, two languages by an individual child, sometimes from an early age, on account of compulsions within his social environment."

This technique, however, needs amplification. Bloomfield defines education as a "native-like control over two languages;" and Leopold extends this definition further and states that bilingualism is the ability to speak two languages which are spoken equally well for all purposes of life. In practice only approximations to this ideal can be expected. Bilingualism is a fact even when one language is spoken better and more extensively than another, as long as both are regularly employed as media of intercourse.

Broad grades of bilingualism are readily distinguished. Saer, at an International Conference on Bilingualism in Luxemburg, divided them into three bilingual types and monoglot. The monoglot are children who have no effective comprehension of a second language. Except among very young children it would be difficult to find such children in Wales. The lowest degree of bilingualism is shown by those who comprehend simple questions in the second language but fail to make use of it in their answers.

D.O. HEBB: "A Neuropsychological Theory". Psychology: A Study of Science. Edited S. Koch pp 632. pub. Macgraw Hill Book Co. London, 1959.

HMSO: "The place of Welsh and English in the Schools of Wales". Report of the Central Advisory Council for Education (Wales) 1953.

BLOOMFIELD L

"Language", New York 1933.

LEOPOLD W.F.

"Speech Development of a Bilingual Child: a linguistic record", Chicago 1939.

SAER D.J.:

"Psychological Problems of Bilingualism. An address written for the International Conference on Bilingualism at Luxemburg, organised by the Bureau International d' Education and published in the "Welsh Outlook". Vol.XV, Nos.5 and 6, 1928.

Next come the average bilingualists who possess a good comprehension of the mother tongue and a good degree of facility in using it, together with a lower ability in using and understanding the second language. Finally, there are the bilingualists who speak their mother tongue regularly and take enough interest in it to read it, but who also have arrived at a good degree of facility in speaking the second language and make good progress in reading and writing it.

However, even within such gradations, there are a number of diverse elements to be differentiated. In thinking of any particular child or group of children in a bilingual situation, we must take account of such things as the effect of intelligence, age and method of acquiring the languages, the type of linguistic background of the home, the school and particularly the playground, the attitude of the child on those with whom he is in close contact towards the second language, his socio-economic level, as well as the educational, religious, administrative and political influences which affect him both directly and through the effects of broader issues of local policy.

Clearly, too bilingualism is an additional hazard of which account must be taken when attempting to assess the personality and the potentialities of a child. It is at this point that some research workers have confused the issue by attempting to apply purely statistical techniques (rather than experimental) in order to partial out the effects of certain variables under discussion. Not the least among the difficulties which the research worker has to face is, the effect of varying degrees of bilingualism within the environment and in the child himself, on the semantic organisation of different children. These differences, which are reflected in mental functioning and structure can hardly be dealt with by mainly statistical means. We are faced with the same order of problem as makes cross cultural research difficult.

The members of the International Seminar on Bilingualism in Education organised by U.N.E.S.C.O. at Aberystwyth agreed that a satisfactory definition of bilingualism was of utmost importance and took as its basic assumption and as a broad working hypothesis that bilingualism could be defined as the co-existence and the use of two languages in an individual and within a community. However, it was felt that rather than attempt a further refinement of this definition it would be more appropriate to make an analysis of the various

kinds of bilingual situations by means of a functional description of the prevailing patterns of bilingualism.

It was suggested that bilingualism should be considered within the terms of the actual bilingual situation but that comparison would be facilitated through the following two classifications or two sets of types of bilingualism.

- (a) The first classificatory system provided for several contrasting forms of the bilingual pattern.
 - (i) Organised or unorganised bilingualism. This referred to the learning situation of the bilingual child.
 - (ii) Balanced or receding bilingualism. This referred to the relative strengths of the two languages within the community.
 - (iii) Maintained or created bilingualism. This referred to whether a particular form of bilingualism had historical antecedents, or was being created either by the employment of a lingua franca or an imported language
 - (iv) Mixed or pure bilingualism. This referred to the relation of the two languages within the individual and the mode in which the alternative of usage occurred.
 - (v) Involuntary or voluntary bilingualism. This referred to the existence or non-existence of social pressures upon the child to learn the second language.
 - (vi) Complete or special group bilingualism. This referred to the proportion of bilinguals within a community.
- (b) The second system of classification was based upon the relationship of the two languages within a community and refined the concept of relationship. In making this breakdown or refinement one had to consider the weakest or the most unoriginal form of bilingualism possible. Thus, certain dialects of a language may be so extreme as to constitute for the learner of the standard language and the dialect much of the same kind of difficulty and often of the same dimensions, as occurred when two different languages were learned. Consequently such a relationship between a language and a dialect might in some instances be regarded as a type of bilingualism, but of marginal significance.

The following, therefore, are the forms of bilingualism within the second classificatory system:-

- (i) The home language of a relatively isolated group in relation to the language of the nation.
- (ii) A vernacular with a hitherto unrecorded literature in relation to a foreign language.

U.N.E.S.C.O.: United Kingdom National Commission for U.N.E.S.C.O.,
International Seminar on Bilingualism in Education,
Aberystwyth, Aug./Sept. 1960.

- (iii) A vernacular with a recorded literature in relation to a foreign language.
- (iv) A non-official and an official language, both with recorded literatures.
- (v) Two official languages.
- (vi) A federal system of languages, one of which tends to function as a common language.

The linguistic consequences of bilingualism are many. Of the two languages involved in a bilingual situation "it is the language of the learner that is influenced". If we regard two languages as social institutions - as "langage" rather than "langue" or "parole" - this is generally true. English, for example, is not affected by the mistakes a Welsh, or an Irish or a Ghanaian child makes. But as factors in the lives of a boy or a girl both languages are to some extent affected. There are some instances where no apparent interference occurs, for example, in Bolzano as between Italian ~~or~~ German. In Switzerland High German is affected by a German dialect. The English spoken by natives of the U.S.A. and of British Commonwealth countries has markedly divergent features. The same is true in the U.S.S.R. of Russian spoken by Georgian Tartars. and.

The linguistic consequences vary according to the age of the learner. The faculty of perceiving and forming the relevant sounds, particularly the prosodic features, deteriorates fast after the early years.

The consequences vary according ~~as~~ to whether the language is acquired largely by unsupervised imitation or at school. In this respect, too, it is possible to make a distinction between "co-ordinate" or "compound" bilingualism, according ~~as~~ to whether or not the two languages are entirely separate languages. The differences are produced largely by the two factors already mentioned, namely, age and the manner of learning the language.

Linguistic consequences will also vary according to the differences in the structure of the language involved as well as according to the levels at which the languages are employed.

One of the possible consequences of bilingualism is the creation of a new dialect of either language or a mixed language. In this process the quantity of language learned - principally as it affects vocabulary and the quality - principally as it affects idiomatic usage are affected adversely. Conversely the bilingual learner may over-compensate for his possible disadvantage by being over-correct in his second language so that he speaks it pedantically and over carefully. This is less likely to occur in what we term "balanced bilingualism" and may occur most frequently where the tradition of English teaching is formal and academic. "Hyper-correctness" is not a feature of "mixed bilingualism".

As previously indicated the features of either language that may be affected depend upon the comparative structural relationship of the two languages.

Difficulties arise where the scripts of the two languages are very different. Not only are the problems of reading more difficult, but considerable difficulties with spelling and even pronunciation may arise. Instances have been quoted from Yugoslavia, Armanian, Kurdish and Malaya. The T(h) ai group of languages also provide an excellent example. Likewise many examples in English and in Welsh can be quoted from the present research findings.

Phonic difficulties are frequent. It has been pointed out by many that the bilingual speaker substitutes the most nearly related sounds of his native tongue for those of the other language. It can be easily demonstrated that each apperceives the unknown sounds by means of the sound of his own language. This will be shown clearly in the present James Associative Word List Experiment. For practical and teaching purposes it is important to know which sounds are phonemic and which are not. These phonic features are sometimes lumped together as problems of accent but they need to be distinguished, for example, not the least important of them are "prosodic" features.

Apart from the difficulties which may face a child in learning a new language, there are problems that arise from the transfer of features, without much change from one language to another. Among the features thus affected are vocabulary, phonic items, syntax and morphology. In some cases too "models" which are appropriate to one language are introduced into the other and the vocabulary of the latter language is arranged according to the new or borrowed model. Idioms too are transferred. This has occurred between English and Welsh very frequently and many are often conscious of the literal translation of idioms as we shall see in the J.A.W.L. Experiment.

It may be that a further linguistic consequence of unorganised bilingualism is the loss of certain items in one or other language he has learnt. This is most true of vocabulary.

The ultimate result of all these factors may be a switch from one language to the other, generally speaking from the receding to the dominant language e.g. from Welsh to English. On the other hand, as has been stated, instead of switching there may be created a new language in this situation where switching might be expected, for example Dolgan speakers move towards Yakut but only to an intermediate or "mixed language" position. Furthermore, administrative and educational factors may be employed to reverse

the tendency to switch from the receding to the dominant language: such is the case in Eire. This is extremely important educationally since upon a close observation of this tendency will depend among other things a right decision on the question of medium of instruction.

This change of language and the way in which it occurs depend largely on a person's relative proficiency in the language, the mode of use for example in reading or comprehension, the age at which the second language was learned, the practical utility of the languages and their prestige and the general attitude to languages.

During the course of our study of the semantic systems in the thought processes of bilingual English and Welsh children we will see how many of these influences operate on the personality development of individual children with particular reference to the relative place of early and late learning in the linguistic pattern of the maturing child who is all the while learning through experience.

From the point of view of the research worker in Wales or elsewhere, the factor of bilingualism, complicated by the varying degrees of linguistic facility achieved by various children ranging from high to low intelligence and affected by different socio-economic influences makes it extremely difficult to design an experiment to ascertain the most effective method and curriculum for teaching any particular bilingual child.

It is, however, evident that research into the problem of bilingualism is important for the teacher and the medical officer, for the psychologist and the administrator, if indeed education and guidance are to be employed to the best advantage of Welsh children in particular and European children in general.

Reference to earlier work on the psychological aspects of bilingualism will help to serve as an introduction to the variables which enter into our research. Most of the research work by Welsh scholars into the psychological aspects of bilingualism had early on been concerned with testing the mental development of bilingual children, especially with the significance of the verbal factor and the attempt to determine whether bilingualism adversely affects intellectual growth. Early investigations in this field were conducted by Saer, Smith, Barke and Parry Williams. Their methods and results, which suggested some inferiority on the part of bilingual children, were generally accepted in the past but recent investigators have criticised them for various reasons. It has been maintained that some of the results were inappropriate and that the results were not always interpreted accurately.

Moreover, no assessment of the bilingual background of the subjects was made to ensure reasonably uniform groups, and the statistical treatment of the data was by contemporary standards inadequate. Later investigations in the same field by Jones working alone, and in collaboration with Stewart, and also by James, have attempted to avoid these errors. "But the paucity of the results from Wales and the lack of consistency among them obliges one to agree that there are few firm conclusions and fewer conclusive arguments so far to be drawn from Welsh evidence". Although this statement of the Report of the Central Advisory Council for Education (Wales) was largely true at the time (1953) more recent researches have at least come to grips with the acknowledgement that the problem is a highly complicated one since it involves as we shall see basic theorizing in the related fields of perception and learning.

Evidence from investigators in other bilingual countries needs cautious interpretation in the light of Welsh conditions. It is dangerous to generalise in terms of educational policy that what may be true in one country may apply equally well in another for example that the U.S.S.R. and the U.S.A. are multilingual countries but their approach to language learning differs radically on account of the differences in their historical development. However, after a study of the work of men like Gali, Hoffman, Pintner, Prescott, Malherbe and others, the writers of the Report of the Place of English and Welsh in the Schools of Wales finally agree with Arseniah, who remarked, "Bilingualism, that is the simultaneous learning of two languages from infancy, has no detrimental effect on the child's mental development provided;

- (a) that at the earliest stages of the child's language development a consistent method of source and presentation of the two languages is observed, that is, "une langue, une personne".
- (b) that psychological barriers or negative conditions such as inferiority or superiority of the language involved, or national and religious animosities are absent, and
- (c) that the languages are learnt by spontaneous informal or play methods, and not by formal or "task methods".

The reader who wishes to pursue his interest further should refer to the detailed statement in the Report of the Central Advisory Council for Education (Wales) including the discussion of research work on some of the psychological considerations in relation to bilingualism. Likewise a complementary discussion of the American point of view can be obtained by reading Darcy's article on "A Review of the Literature"

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on the Effects of Bilingualism upon the Measurement of Intelligence.

Let us consider briefly current researches involving bilingualism in Wales which are relevant to our present discussion. Within a limited compass it is not possible to give an exhaustive account of current researches and we will, therefore, confine ourselves to four main, but interdependent trains of investigation, namely -

- (a) the study of Welsh semantics.
- (b) test construction.
- (c) the application of psychological techniques to secondary allocation.
- (d) the effect of bilingualism on educational attainment.

The study of semantic organisation forms one of the main research interests of the Faculty of Education at the University College of Wales, Aberystwyth, under the leadership of Professor Jac Williams in applying the technique of linguistics to a study of the Welsh language. It is hoped that this study will facilitate the work of teachers of Welsh in English-speaking areas of Wales. A more or less complete classification of commonly used words, according to their morphological pattern is aimed at and syntactical forms are being studied with the intention of proceeding with the grading of sentence patterns. This basic and essential analysis and classification of word-forms and sentence structure should put the teaching of Welsh as a second language on a sound foundation and enable teachers to practice approved modern methods of presentation in a classroom.

In the field of test construction, progress has been made in several directions. In Pamphlet No. 3 of the University College of Aberystwyth, Department of Education, Pinsent describes "The Construction and Use of Standardised tests of Intelligence and Attainment," with special reference to problems of a mixed language area. In this department, several group tests of intelligence and Welsh attainment have been, or are, in course of being standardised:

Natalie T. Darcy: "A Review of the Literature and the Effects of Bilingualism upon the Measurement of Intelligence": the Journal of Genetic Psychology, 1953 82 p.p. 21 - 57.

Jac Williams: Bibliography: "Bilingualism Llyfryddiaeth Dwyieithog" with Special Reference to Wales. Pamphlet No.7(1960), Faculty of Education, University College of Wales, Aberystwyth.

- (i) A Welsh Word Recognition Test by J.L.Brace
(Pamphlet No.5).
- (ii) A Welsh Intelligence Test (Prawf Deallusrwydd).
- (iii) A Welsh Attainment Test (Prawf Iaith Gymraeg).
- (iv) A Welsh Linguistic Background Scale by Gwenda Rees.

Work of this nature at Bangor University College also aims at assessing various aspects of Welsh as a school subject where related work is being carried out in the Departments of Education and Applied Linguistics. Mention should also be made of useful work by W.R.Jones who has made use of tests of attainment and non-verbal reasoning for his research in this field. Recently, too, preliminary measures have been taken by Professor Charles Gittins, of the Department of Education at Swansea University College, to establish a Research Group with the aim of studying problems relating to the Principality.

The Carmarthenshire Local Education Authority, in conjunction with the National Foundation for Educational Research has produced a Bilingual (English/Welsh) Version of a N.F.E.R. Non-Verbal Reasoning Test administered and standardised by James and Pidgeon over the complete eleven-plus group of the county. A further discussion of the relevant details of this survey will be given later.

More recently the present writer has co-operated with W.G.Emmett (formerly of Room 70 Moray House, Edinburgh) and with Jac Williams of Aberystwyth in constructing the Deeside Non-Verbal Tests Nos.1 and 2 for use in bilingual countries.

Under the aegis of the North Wales Child Guidance Clinics, Morgan, Williams and Simmons, in consultation with Peaker, are proceeding with the development of standardised tests suitable for grading and assessing children in the classroom. Of particular interest is the work on the adaptation of the W.I.S.C. for use with Welsh-speaking children. The first full but still provisional version of the complete scale (verbal and non-verbal sections) was to be used with a random sample of approximately a thousand children for final standardisation in 1960. In addition an "oral language Questionnaire" was constructed for individual use in order to determine whether a testee should be tested in Welsh or not. This is necessary as no other satisfactory method for selecting the most suitable language was available.

Not the least among practical problems of a L.E.A. when it seeks to implement a bilingual policy is the question of the allocation of pupils to secondary schools. If indeed, in the words of the Carmarthenshire L.E.A., we hope to establish a system of educational guidance merging gradually into a form of vocational guidance which will enable pupils at any stage in their school career to make the most of opportunities afforded them, then the differential results and effects of each child's background must be taken objectively into account.

Thus, as well as the usual practice of allowing for age and possibly sex differences one had to partial out the effect of various influences in linguistically mixed areas.

In Carmarthenshire in 1958 a Pilot Scheme was tried out and proved satisfactory. The headteacher's assessments (order of merit lists) scaled by means of a Bilingual Version of a Non-Verbal Reasoning Test in accordance with a technique proposed by Yates and Pidgeon, taken together with external tests in Welsh, English and Arithmetic proved to be an excellent criterion for the allocation of pupils to secondary schools. Order of merit lists from seventeen schools were taken at random, from various areas throughout the county, ranging from complete first language English, through linguistically mixed schools, to first language Welsh schools, and the results were independently analysed by the N.F.E.R. The correlations between the order of merit lists and the total external examination scores proved to be highly significant in their degree of agreement in rating the abilities of children. It is important to note that the specially adapted Non-Verbal Reasoning Test, with bilingual constructions in English and Welsh, proved to be a useful scaling instrument because it had a reasonable positive correlation with attainment and teacher's judgments, particularly in view of its consistency within each school, where the scores were distributed over the same age range as the examination marks; A detailed discussion of these findings, which are highly relevant to our present research, will take place at a later point in our argument.

Earlier research workers concerned with the influence of bilingualism on the intellectual and educational development of children tended to confine this work to a more or less descriptive and literary approach to the problem. Some, however, studying attainment by more or less objective means, came to the conclusion that bilingual children tended to have a somewhat lower level of attainment, especially in reading.

Yates A. and Pidgeon D.A: "Admission to Grammar Schools,"
Third Interim Report on the
Allocation of Primary School
Leavers to Courses of
Secondary Education.

Published for the National Foundation of Educational
Research by Newnes Ed. Pub. 1958.

The present writer made a "Comparative Study of General Performance between Bilingual and Monoglot Children in South Wales (1947) and it was he who first used the statistical technique of Analysis of Variance in an attempt to partial out various influences which might affect test results and to isolate the effect of the "bilingual factor". His basic aim was to try out a careful experimental design which might be adapted for use on a wider scale by others in due course. This technique allowed him to study the differences, if any, between the performances of graded groups of bilingual and monoglot children.

His tentative conclusions were, that pupils of high intelligence profited from a bilingual educational policy, children of average mental capacity did not appear to be adversely affected by it but that slower learning children and particularly those who were mentally handicapped experienced augmented linguistic difficulties when attempting two languages. If these conclusions are true, it would seem that there is need for a "modified language of the hearth" policy for such pupils. Further, on the assumption that bilingual and monoglot groups are equally intelligent initially, we must emphasise the need to assess the relevant socio-economic influences before weighing the effect of bilingualism in the balance of educational attainment.

A similar experimental technique was subsequently employed by Jones (but without taking account of the basic assumption as to initial intelligence levels) in his work "Language Handicap of Welsh-Speaking Children (1952)". Subsequently the same technique was used by Jones, Morrison, Rogers, and Saer in their research on "The Educational Attainment of Bilingual Children in Relation to their Intelligence and Linguistic Background" (1957). Their main findings were:

- (i) That variations of language conditions, as a result of introducing a second language, do not (as one might expect) have an adverse effect on Mechanical Arithmetic and only a moderate one on Problem Arithmetic administered in English.
- (ii) that the performance of predominantly Welsh-speaking children in English reading and usage is not equal to that of the predominantly English and Mixed-English groups between ten and eleven years of age, but that the Mixed-Welsh groups did not compare unfavourably with the English groups in this respect; and
- (iii) that the level attained by the Mixed-Welsh group in Welsh reading and usage was significantly lower than that of the predominantly Welsh-speaking group at this stage.

These conclusions are described by the authors as tentative. It must also be stated that there were certain weaknesses in the design of the experiment. Jones in a more recent work "Bilingualism and Intelligence" (1959) tends to accept the original assumption of the present writer that "various groups of monoglot and bilingual children do not differ significantly in intelligence, provided that they are also of similar socio-economic status as indicated by parental occupations" and he concludes that bilingualism, as such, need not have an adverse effect on performance in a non verbal test of reasoning. Furthermore, the findings on this third occasion also suggest that the significant differences in non-verbal test scores observed between four linguistic groups on the other two occasions arise from occupational rather than linguistic variations between the groups, since variations of the latter kind were equally present on each three occasions.

Apart from indicating that bilingualism is not necessarily a source of intellectual disadvantage, the study of Jones and his collaborators has drawn attention to the influence of socio-economic factors in comparison between groups of monoglot and bilingual children and has emphasised the importance of such factors in the correct interpretation of the test results. Hence, many of the comparisons made in Wales and elsewhere between monoglot and bilingual groups, if they have omitted to allow for this important influence must be regarded with great caution. It must, however, be stated in Jones' own words concerning "A Critical Study of Bilingualism and Non-Verbal Intelligence" that the work of "James (1947) and Jones and Stewart (1951) show considerable advances, not only in the application of statistical techniques to the bilingual problem, but also in the adoption of various methods for quantitatively assessing the linguistic background of the children tested.

Jones W.R., Morrison J.R.

Rogers J & Saer H

"The Educational Attainment of Bilingual Children in Relation to their Intelligence and Linguistic Background". pub.University of Wales Press, Cardiff 1957.

W.R.Jones:

"Bilingualism and Intelligence", University of Wales Press, Cardiff, 1959.

W.R.Jones:

"A Critical Study of Bilingualism and Non-Verbal Intelligence" B. J. Ed. psych. Vol. XXX. Part 1. pp.71-77. Feb. 1960.

A quantitative assessment of the child's personality can be enhanced by a complementary qualitative appraisal. An attempt at producing a Synchronic Description of Individual Bilingualism was made by Mackey, Kehrli, James Smith and Nesheim in a working party at the U.N.E.S.C.O. Conference at Aberystwyth (1960). The schedule was devised primarily to provide a framework for the description of bilingualism in an individual at a single point of time.

It was based on a relativist and dynamic concept of bilingualism. The completion of the schedule (see appendix) should give a profile of bilingualism in the individual in respect of each language used by him. The separate tables in the schedule could be used to provide a factorial analysis of the bilingualism in an individual. By correlating elements in one table with elements in the other tables it should be possible to obtain highly significant information about his bilingualism. The schedule could also be used for the synchronic study of group bilingualism by applying it individually to a group of individuals and making a synthesis of the result. The diachronic study of bilingualism in individuals or groups was also possible through the application of this schedule. Various aspects of bilingualism could be studied by comparing the separate results obtained on a number of occasions when this schedule is applied to the individuals or groups over a period of time. The tables in the schedule were meant to be regarded as patterns of description. The tables themselves require to be expanded in detail by the specialists of the various disciplines concerned and it was to be hoped that programmes of research would be initiated for the creation of suitable measuring devices on the lines indicated.

The main divisions of description in the schedule were as follows - In the first place that of "Number" comprising the number of languages used by the individual. The next involved "Type" that is the linguistic relationship between the languages. This implied a differential description of the dialect of each language (idiolect) used by the individual. This part demanded very detailed technical knowledge and would require the services of linguists specially trained in the technique of linguistic description who would determine the phonological, lexical, semantic, structural, stylistic and graphological relationship of the languages concerned. Thirdly came the matter of "Degree" of proficiency in each language which called for an assessment of the listening, reading, speaking and writing skills in terms of the second division. The fourth division concerned the process of "Alternation" or switching from one language to another: the table set out to measure the individual's facility and practice (rate with

frequency of oral and written presentation) in switching from one language to another in different contexts of place, person, topic etc. Fifthly the schedule is concerned with "Interaction" or the way in which languages affect each other linguistically through various types of importation and substitution in bilingual situations.

The sixth division of "Function" is that which is of the greatest interest to this piece of research, namely, the conditions of learning and the use of the two languages. These conditions of learning may be described as (i) Intrinsic in terms of age, intelligence, emotional associations and orrectic factors (ii) Extrinsic conditions broadly defined as informal learning and formal learning. Informal learning would involve the languages learned in the home or within the community (neighbourhood, ethnic, church, occupational groups). Each context of use would itself be subject to group pressures (historical, political, economic, cultural, military, religious, administrative, demographic). Formal learning on the other hand included single-medium or dual-medium classroom techniques or else the methodology of other "agencies" such as private tuition, group learning, self learning or radio and television instruction.

In both cases extrinsic conditions of learning depended on:

- (i) Number of persons involved (relative population).
- (ii) Frequency of contact
- (iii) Language used
- (iv) Language skills used
- (v) Status
- (vi) Linguistic aptitude
- (vii) Linguistic aptitude
- (viii) Amount of each language used
- (ix) Relative standards
- (x) Duration
- (xi) Subjects taught in each language
- (xii) Teaching methods and techniques
- (xiii) Age of introduction.

It is clear from the foregoing that there are many independent variables which could be qualitatively delimited and quantitatively assessed. Each one of these variables would reward us well in terms of study. Our concern in this thesis however will be to examine one of those variables and to look a little more closely at the latter point, namely the effect of the age of introduction of the language or languages: our concern will be an examination of the comparative philology of functional intelligence in terms of the complementary or opposing effects of early and late learning on the mental process. In brief there are two opposing views: Epstein (1915) sees the problem of thinking as the association between ideas and words. He finds it possible to have a direct association between an idea and a foreign word, but the

U.N.E.S.C.O. "Synchronic Description of Individual Bilingualism"
1960.

knowledge of one language intervenes in the learning of subsequent ones: for according to earlier studies on memory, when an association 'ab' has been established, the formation of a second association, 'ac' is inhibited and once 'ac' is also formed, the reproduction of either 'b' or 'c' in association with 'a' is inhibited. For each idea therefore the bilingual's multiple concurrent word associations interfere with each other especially in the "expressive" usage of language (i.e. speaking and writing): in other words bilingualism is an obstacle to ideation.

The opposing point of view has been well expressed by W. Stern (1919) who as a student of language development in the child has stated that Epstein's findings apply only to adults and that his type of associational psychology has been superseded by a more advanced psychology of the thought processes. Thus as Stern sees it "the differences in languages...not only leads to the associative phenomenon of interference, but is also a powerful stimulus to individual acts of thought, to comparisons and differentiations, to the realization of the scopes and limitations of concepts, to the understanding of nice shadings of meaning".

In the 'juxta-position' of these two points of view we find the statement of our problem but the aspect of the problem with which we will concern ourselves will involve us in an attempt to assess the relative consequences of early versus late learning of the languages in contact. Let us first, however, consider some of the general effects of early learning and the related problem of perception.

EPSTEIN IZHAC: "La Pensée et la Polyglossie", Paris, 1915.

STERN WILLIAM: "Die Erlernung und Beherrschung Fremder Sprachen", Zeitschrift für Pädagogische Psychologie, 20 104-8 (1919).

Weinreich (1953) has posed the basic difficulty as follows:

"The problem of co-existence versus merging also affects the nature of the sign which in Saussurian terms, combines a unit of expression with one of content. Once an interlingual identification has occurred between semantemes of two languages in contact, it becomes possible for the bilingual to interpret two signs whose semantemes, or signifieds, he has identified as a compound sign with a single signified and two signifiers, one in each language. Instead of treating the English "book" and Russian "kniga" as two separate signs (A) he could regard them as a compound sign (B)." We can compare this for example with the use of the English and Welsh "cot (coat)" but there are further implications with which we will deal in due course.

The effect of early learning can be seen e.g. where "phonic" interference concerns the manner in which a speaker perceives and reproduces the sounds of one language which might be designated secondary, in terms of another called primary. Interference arises when a bilingual identifies a phoneme of the secondary system with one in the primary system and in reproducing it subjects it to the phonetic rules of the primary language. This can be shown to be true in case of the effect of Welsh imitations which can only be reproduced with difficulty by a first language English child.

Weinreich's comparison of the primary system (Romansh) with a secondary system (Schwyzertütsch) has shown that under - or over- differentiation of phonemes occurs when two sounds of the secondary system whose counterparts are not distinguished in the primary system are confused; also reinterpretation of distinctions occurs as well as phone substitutions: in short, unlike the layman, the linguist can be a victim of his primary sound system; his native phonemics can be an important source of error, particularly if his description is of the sub-phonemic, impressionistic type still practised by dialectologists." Clearly we are on the track which leads us slowly towards Hebb's theorizing, for again it is true when a lay uni-lingual hears his language spoken with a foreign "accent", his perception and interpretation of the accent is itself subject to the interference of his native phonic system and serves as evidence of the lasting effect of early learning. As Weinreich has pointed out "it requires a relatively high degree of cultural sophistication in both languages for a speaker to afford the structural luxury of maintaining separate sub-phonemic habits in each". Indeed according to Bazell "there is no limit in principle

URIEL WEINREICH: "Languages in contact" : Findings and Problems
Publications of the Linguistic Circle of New
York No. 1. (1953).

to the influence which one morphological system may have upon another", for example the outright transfer of morphemes from one language into speech in another is often done as a means of correcting inadequacies of a lexicon: this is particularly true where English influences colloquial Welsh where although the basic grammatical structure of the speech may be Welsh the morphological content may be anglicised as a result of lexical interference or borrowing: a particularly well known example in Wales is to take an English verb and add 'O' to transform it into a Welsh structure. But it is equally of interest to note that a considerable body of common culture in Europe is reflected in the large amount of common vocabulary in all European languages. For the reader who wishes to follow more clearly the effect of linguistic interference reference can be made to Weinreich's table summarizing the form and structure resulting from the counterbalancing of two opposing forms namely 'stimuli' of interference and 'resistance' to interference. Dauzat sums up the situation by asserting that vocabulary is most exposed to influence: then come the sounds, then syntax while "morphology the fortress of language surrenders last".

A study of the comparative philology of a bilingual individual or group will help to throw light on a problem of central importance in the theories of learning and perception. From the point of view of the individual the two languages are two types of activity in which the same organs are employed. A comprehensive psychological theory ought, therefore, to account for both the effectively separated use of the two languages for the interference of the languages with one another in such a way as to throw light on the psychological mechanisms of switching code.

It has been pointed out by Weinreich that "there are at least two characteristics of a bilingual person which predispose him to specific modes of behaviour as an agent of language contact even before the actual speech situation arises. The first is the individual's aptitude for learning a second language is by definition a factor in his performance in the second language. Comments in this field have been made by Tireman, Spoerland, Toussaint. The second characteristic is that the ideal bilingual is able to switch from one language to another according to appropriate changes in the speech situation (interlocutors, topics, etc.) but not in an unchanged speech situation and certainly not within a single sentence. In this respect we can visualize "two types of deviation from the norm.

ALBERT DAUZAT: "Les Patois", Paris, 1927

one in the direction of excessively rigid adherence to a language, the other in the direction of insufficient adherence to one language in a constant speech situation". We will have more to say about this when we discuss tentative explanations of our own findings in the light of Hebb's neuro-psychological theorizing.

During the foregoing discussion we have attempted to analyse the variables involved in this problem. We have seen the complexity of this problem: there is a need to differentiate between the various influences and at the same time a need to assess the relative strengths of these influences.

The problem in hand, therefore, resolves itself into the relation of qualitative to quantitative analysis. As Hebb has pointed out in his neuro-psychological theory " We cannot profitably refine our quantitative values to a much greater degree than the refinement of our qualitative conceptions - the two must work hand in hand. Before we can measure profitably we must know what one is measuring or find the right things to measure. In this sense qualitative analysis must precede quantitative." In our discussion of the synchronic description of Individual Bilingualism we have sought to make this qualitative analysis first. We will follow it up by cross-fertilizing the two procedures, for Hebb sees quantitative and qualitative thinking as going hand in hand, not as opposed to one another and he feels in psychology we must always be as much concerned with the question of what to quantify as with quantification of presently known variables.

(iii) A PRELIMINARY CONSIDERATION OF HEBB'S NEURO-PSYCHOLOGICAL THEORY

The use of language, we have seen, seems to distinguish human thinking from that of the animal. In the past Hebb's neuro-psychological theorizing has because of the difficulties of designing an experiment, been largely related to sensori-motor experience of perception and learning. In our discussion we shall try to translate some aspects of Hebb's theory into a higher level of human experience and examine them in relation to the specific human problem of language development particularly the crucial question of the effect of early versus late learning.

It is not possible for us within the scope of this work to discuss critically the various controversies among learning theorists. This can best be done by reference to works such as Hilgard (1956) and Estes et al (1954). It suffices for our purpose, rather than formulate a definition of learning, to quote Hilgard (1951), "that the inference to learning is made from changes in performance that are the result of training or experience, as distinguished from changes such as growth or fatigue and from changes attributable to the temporary state of the learner." Our concern, therefore, will be for Hebb's preoccupation with conceptual development as the basis of

learning when he says, "Before turning to the question of neural mechanism I want to bring together some of the behavioural evidence that throws light on how the learning capacity changes with growth. In general it is a conceptual development rather than the elaboration of a number of motor responses. Perceptual organisation is also involved, but percept and concept are intimately related and the term "conceptual development" will do to cover both". We will, therefore, accept for the moment this basic assumption of Hebb's as well as his nomenclature but we will have more to say at a later point when we discuss semantic differences between the perceptual and conceptual levels of functional intelligence. In the meantime we must bear in mind throughout our introductory discussion of the theories of perception that Hebb has stated "It always seemed to me that learning is the crucial question in psychological theory. Even in talking about the innate or the instinctive one is concerned in a sense with delimiting the rate of learning". He has, however, been careful to point out that "we must deal with set and attentions and perceptual generalisation and learning in one theoretical framework, not have one approach for thinking, another for learning and a third for perception". It is true to say that Hebb's theory is the one which attempts this, indeed it is the only attempt to deal with the thought process and perception in the framework of a theory of learning. It will be our endeavour to design an experiment with bilingual children to study the thought process, including the relationship of perception, learning and set, by studying the comparative philology of their functional intelligence - for example Hebb maintains that perception in some of its most essential features is not an innate process but has to be learned.

It has also been suggested by Wallon (1956) that perception is largely dependent upon early learning through the principles of classical conditioning. Thus the infant would gradually come to discriminate between those patterns of stimulation which preceded the presence of disturbed states or those which accompanied satisfying ones. Perception of the mother, in this manner, would be favoured and she could be expected to acquire the properties of a conditional stimulus for many different unconditioned reflexes, involving the satisfaction of bodily needs.

WALLON H. (1956): "Les etapes de la personnalité chez L'enfant". In symposium: "Le probleme des stades en psychologie de l'enfant". Paris, Presses Universitaires de France.

Let us turn to a preliminary consideration of Hebb's neuro-psychological theory by stating "theory it seemed must begin with (1) perception and take in (2) learning in such a way as to encompass (3) ideation and attention or set" Hebb indicated that he could find no mechanism for learning that was consistent with his own ideas about perception. He felt, however, that using the crude mode analogy of attention, it was like a process in the brain that opened one afferent pathway leaving others blocked. Thus though attention or set depended on a kind of connection which he was convinced was untenable, he was interested enough to go back and look at the whole question of connections in the light of recent physiological ideas.

Here we cannot but admit that Hebb is on good grounds. By conceiving the physiological basis of perception to be the organisation of neural elements and their impulses rather than fields he surmounts many theoretical difficulties although he is left without the means of explaining equipotentiality.

Allport has best summarized Hebb's contribution as follows:

"What Hebb has done is to reject the picture of behaviour and of its cortical segment as a process having a "determinative" whole character. He has substituted for this the idea of an "aggregate of elements" joining together and operating together under definite physiological laws. Such a model has certain advantages. The joining of elements may take time; and repeated excitations of the elements may be needed throughout the early years or even later. If the aggregating occurs at a later period and takes an appreciable time and many trials, we recognise it as "learning". If it has occurred extremely early, or if it now occurs very quickly, that is, under conditions in which it is repetitive or trial and error aspect cannot be observed, we call it perception".

"By this conception Hebb has not only been able to make a place for the learning process that is lacking in Gestalt-theory and to incorporate perceptual data from clinical physiological, comparative and developmental psychology, but he has also provided a generalisation that may increase the parsimony of psychological systems. It is true that the model proposed is not sufficiently flexible; equipotentiality is not fully accommodated; some essentials of explanation are missing; and, as some critics have pointed out it is too much controlled by cognitive aspects at the expense of

D.O.HEBB; "A Neuropsychological Theory (p.625) Psychological: A Study of Science Study 1. Conceptual and Systematic Vo.1. Sensory, Perceptual and Physiological Formulations. pub. Mac Graw Hill. 1959.

motivation. Nevertheless the germ of a useful idea is there. The model comports well with trial and error manifestations in learning and thinking; and it provided for the energising or disruptive effects upon the phase-sequences exerted by metabolic changes and processes involved in drives, pain and emotional states. Though the model has many shortcomings in the field of perception and certainly cannot be called a satisfactory general theory, it probably goes further in suggesting the way toward such a theory than do other conceptions that lack its denotational clarity and boldness of design."

As we have seen above Hebb has drawn attention to two lines of evidence regarding the role of learning in visual perception, which strongly challenge the gestalt nativistic theory at any rate in higher primates.

Drever has indicated in his monograph on "Early Learning and the Perception of Space" that in stating his case Hebb says that the work of Senden and Riesen is fundamental to his argument. Hebb also makes some use of his own work on rats, though this suggests that it is with the higher animals, presumably because of their greater proportion of unspecialised cortex, that the distinction between early and late learning is important.

One line of Hebb's evidence comes from Senden's review of the progress of vision in adult patients who have congenital cataracts removed. Although they were able vaguely to distinguish masses or wholes - in conformity with the well-known figure-ground principle - to learn to distinguish one object from another, or one face from another, required prolonged learning and many of the patients never attained anything like normal visual perception. To distinguish for example, a triangle from a circle the most intelligent and best motivated patient had to seek corners painstakingly. Similarly for weeks there was a practically zero capacity to learn names for such figures even when tactual recognition was prompt and complete.

The second line of evidence comes from Riesen's experiments with chimpanzees. Animals reared in the dark from birth to two years showed similar impairment to Senden's patients. Even on such a primary reflex as blinking on the rapid approach of an object, only appeared consistently after forty eight days of life under normal illumination. Furthermore,

FLOYD ALLPORT: "Theories of Perception and the Concept of Structures. p.181.
A Review and Critical Analysis with an introduction to a Dynamic Structural Theory of Behaviour". pub.Wiley, New York, 1958.

a chimpanzee which had already acquired a good deal of visual facility by spending its first eight months under normal conditions lost it completely after spending the next sixteen months in the dark. Lack of social contact as a motivating factor was ruled out, as there had been a good deal of play with the animal during its life in darkness. Again lack of motivation could hardly account for the animals' difficulty, in learning to avoid electric shocks which were heralded by visual signals. Senden's experiments showed that similar results with man are not due to some inadequacy of the clinical tests, nor peculiarly human. The course of perceptual learning in man was gradual proceeding from a dominance of colour, through a period of separate attention to each part of a figure, to a gradually arrived at identification of the whole as a whole: an apparently simultaneous instead of a serial apprehension. It is possible that the normal human infant goes through the same process and that we are all able to see a square or such in a single glance only as a result of complex learning.

In brief, therefore, the available evidence suggests that the development of visual perception to instance but one modality takes a long period of learning, involving discrimination and association: that there may be critical periods during which such learning can most readily and appropriately take place; and that the function can be lost - at any rate in early life - in the absence of prolonged visual stimulation.

Hebb's neuro-psychological hypotheses seek to account for such phenomena and at the same time to overcome the difficulties which any stimulus-response learning theory faces in dealing with concepts, expectancies or constancy in perception. Hebb has described his theory of psychological constructs as follows: I started with the **perception** that ideation existed; the difficulty was to see what brain process could have the properties that ideation implies in relation to behaviour. The assembly did not follow logically from the neurological evidence; on the contrary, its specifications put a heavy strain on the evidence and only the known existence of delayed response, expectancies, imagery and so forth made the argument remotely possible. What I mean by psychological as

JAMES DREVER: "Early Learning and the Preception of Space"
American Journal of Psychology. Dec.1955.
Vol.68.No.4, pp 605-614.

D.O.HEBB: "Organisation of Behaviour".p.29 & p.32.
pub.Wiley,New York 1949/55.

opposed to physiological construct, therefore, is that its referents are primarily in the behaviour of the intact animal. He may name it, and hypothetically describe it, in physiological terms; but this is in the effort to maintain communication between different levels or universes of discourse. My theory is not an attempt to substitute physiology for psychology. No theory of the behaviour of the whole animal could be, because in such a theory one is trying the functioning of the whole brain and nervous system, as influenced moment by moment by the whole internal environment, and the kind of construct one must work with ("learning", "capacity", "anxiety", "intelligence") takes one at times completely out of the universe of physiological method and its concentration on the functioning of part systems rather than the whole body over extended periods of time".

Hebb's theory takes account of the following facts concerning the brain: first the numerous interconnections between cortical cells, secondly the considerable measure of localisation of function; and thirdly the considerable degree of generalised functioning.

A preliminary summary of Hebb's hypotheses is as follows. He postulates that any two or more cells or systems of cells, which are repeatedly active together, become functionally associated, so that activity in one facilitates, or tends to reinstate, activity of the others. Such a functionally associated system is termed a "cell assembly". The system is held to acquire a greater or lesser degree of association with other systems with varying degrees of integration.

Superordinate structures would arise, involving connections with many subsidiary systems. Accordingly systems of cells concerned with eye movements would become functionally associated with others concerned with the receipt of apparent visual stimulation and with yet others concerned with processes of a higher degree of abstraction. The temporal sequence of events in such interlocking systems is termed a "phase sequence."

Again the activation of part of the sequence, would tend to reactivate the whole. There are several implications worthy of note. The very first learning would be discriminative, and abstractional, because it would be those things which occurred in common, which would promote the formation of systems. Thus, as we have seen, if a mother

often fed her child in different surroundings, different cortical activity would occur on each occasion, except for that aroused by stimuli from the mother. Some cells which had been activated on previous occasions would not be so activated whilst further cells would become so. Ultimately a relatively constant core would result but always subject to change, to enlargement or contraction, or absorption into other systems. Later perceptions, attitudes and behaviour being based on earlier systems would be expected to retain many primitive features, as claimed by psychoanalysts. Furthermore, lack of appropriate experience at the right time might be expected to interfere with the normal development of cortical systems, in accordance with a critical period hypothesis.

Hebb's hypotheses can cope with each different thing as Pavlovian conditioning, trial and error learning of expectancies concept formation, and gestalt qualities of perception. Set, attention, and drive would all depend on arousal of a phase sequence. Hebb does not suggest that his systems develop on a blank slate, but rather that they differentiate out of previously autonomous rhythmic excitations of cortical cells, detectable in infant electroencephalograms. Nor does he deny the possibility of inborn connections between cells concerned with innate reflexes or instinctive behaviour patterns.

One further point has implications for any comparison between perception in lower orders of animal life and the higher primates. Hebb argues that the richer the network of cells in the brain, the longer it will take for stable systems to be formed. Likewise for Hebb secondary maturation is similar to primary, in that both involve the activation of phase sequences, which develop in the course of the individual's life history. It would follow that while all drive systems were subject to the effects of learning, historically speaking, new drive systems would develop out of old ones and retain some of the original features.

It is of general interest to note, as preparatory to our later discussion on the functional level of intelligence - that on the issue of the relevant importance of learning and maturation particularly on the verbal side there seems to be no necessary conflict with Piaget: he is dealing chiefly with higher level perceptual and conceptual processes based in considerable measure on early learning. His structures and schemata do not appear to be inconsistent with Hebb's concepts of cortical organisations of varying degrees of complexity and autonomy.

This complexity has been reflected in Bruner's paper on "Neural Mechanisms in Perception" when dealing with the three fundamental problems of the perceptual process he quotes Hebb as saying "the psychologist who avoids physiological conceptions merely succeeds in avoiding modern ones and is likely to have his thinking dominated by older ideas, vintage 1890 .

Of special interest to us in tracing the development of the thought processes in Bruner's comments on the various modalities, for example, "The perception of speech is full of such examples of differential ways of organising a temporal flow of stimulation. Since the pioneering work of De Saussure on the isolation of the phoneme and with the development of Jakobson and Halle's method of decomposing the phoneme into a set of distinctive features we know that the process of understanding speech involves a highly selective method of isolating certain ranges of speech sounds, treating these quite arbitrarily as equivalent and then using these as diacriteria by which words may be distinguished. There is often ambiguity in the process of segmentation, but this is rarely serious, for context almost always settles the issue - although the low comedy deaf clown of classical vaudeville testifies to how close a thing such settlement can be. It is a commonplace of psychological research that the organisation of a complex perception can be varied by varying the set of a person - by varying the thing for which he is looking or to use another common form of discourse, what we take in depends upon how our attention is directed. We will see during the course of our thesis that this latter point is extremely important in the use of language as a means of communication. This characteristic of "set" can also be used experimentally to illustrate certain truths in Hebb's hypotheses.

Bruner states that the following represent the three fundamental problems of perception . We would do well to hold these in our mind when we are dealing with the question of comparative philology in terms of functional intelligence viz.

- (a) How does perception represent the physical environment that constitutes stimulation.
- (b) What accounts for the fact that perception may remain relatively constant.
- (c) What accounts for the fact that perception may vary whilst the stimulus in part remains constant.

JEROME BRUNER: "Neural Mechanism in Perception,"
Psychological Review. Vol. 64 No. 6. 1957.

These are questions which are of particular interest to us in the field of comparative linguistics particularly when different children and indeed the same children react differently to identical forms of stimulation.

We find in fact that over simplified arguments using the Pavlovian S - R theory as a basis for explaining the facts of perception do not appear to be sufficiently detailed in their approach to the fundamental problem. Bruner has summarized the present position as follows. "The model of perception we have explored is one that is a drastic departure from the conventional stimulus - response, associational, or reflex-arc model that is the legacy to psychology from the neurophysiology of a past generation. It is a model which, to use the language of Fessard, there is a de-emphasis on transmission of impulses across synaptic segments and a shift in emphasis to integration and autogenic activity - a model including ample networks with the capacity to hold up and to alter the characteristics of impulses transmitted to them, and with the capacity to initiate activity that is transmitted elsewhere to effect control of afferent impulses travelling to the cortex and efferent impulses travelling away from it. It is a system that, to put it figuratively, can determine within considerable limits the nature of the effective excitation which results when a change in physical energy impinges upon a sense receptor. The tracing and manipulation of efferent fibres carrying impulses to synapses along receptor pathways and to sensory receptors themselves indicate that the neural model we shall be using is one in which centrally initiated control of sense data will play an increasing role. If the neurophysiology of a century ago forced psychology into a peripheralist mold, certainly the model emerging today corrects this bias and places a new emphasis on the role of central factors in perception. Most important of all, I have the impression that the neurological model of perception that is now emerging begins for the first time to conform to our knowledge of more complex forms of perception, both in humans and at infra human level".

Bruner has taken our reasoning a step further by making a plea for having a closer look at the facts and recognising at the same time the need to assess the complexity of the situation. In other words it is not enough to isolate the subject to be appraised in the hopes of observing a clear stimulus and a clear response - we also want to know what happens to the subject between the S and the R: we also want to know how the subject reacts in a different environmental set.

Allport has posed the problem briefly as follows:

"a perceptual act is really a dynamically operating structure that it presents the very picture of a self-delimited and self-contained structuring of on-goings and events. It appears as a structure that is closely knit, yet not isolated from surrounding happenings, that is built up of the events of on-going and interacting elements - events that have assembled, as it were through space and time, a structure that can endure, that is flexible and yet ordered and resistant to disruption, that has both a non-quantitative and a quantitative aspect that pools or averages its energies, that "gears in" with some adjacent structures and opposes or reduces others and that operates as self-closing or self-renewing cycles. In other words a perceptual act can be thought of as a structure that exhibits a kind of "geometry of dynamic self-closedness"; and through this geometric or "kinematic" aspect, together with its energies there accumulated and expanded it gives rise both to the many formal non-quantitative phenomena observed in perceptual studies and to the dimensional or variable properties for which it constitutes a necessary "format" as they covary according to quantitative laws. Allport continues by making an important suggestion by proposing the view that the phenomena of nature point invariably to the need of two kinds of statement in formulating natural laws.

- (a) The one type of law, universally known or investigated relates to quantities or dimensions and their relationship in the phenomena concerned.
- (b) the other type, which we have scarcely begun to understand or study, deal with its structural aspects.

The full story of science will thus be told not in terms of quantitative laws alone but only when these two types of laws have been discovered and their relationship clearly understood. These two types of laws, though always related are distinct; one must not be confused with the other or substituted for it".

This basic duality has been explored in another field by Miller, Galanter and Pribram in their brilliant attempt

to create hypothetical constructs to account for the vagaries of the human thought processes. In their book on "Plans and the Structure of Behaviour" they emphasise the need to break away from the old S-R theory which has circumscribed our psychological theorizing and prevents us from bridging the gap between "Image" and "Behaviour". They go on to say, "for years physicists assumed that the position and the velocity of a particle could be measured simultaneously to any required degree of accuracy. The men who discovered that the Plans for making these two measurements simultaneously were incompatible produced a revolution in our conception of the physical universe. The discovery that two plans are incompatible may require great intelligence and may completely revise the Image."

Miller et alia have also indicated that "human speech has provided man with a new mechanism of evolution that in a few brief centuries has set him apart from all other animals. The jealous guardian of Darwinian continuity merely blinds himself to obvious facts. Almost nothing we could say about the psychological importance of language could be too extravagant-previous speculations about the mechanism of hypnosis should suggest how crucial the present authors consider speech to be in controlling all the psychological processes in a human being." They continue to outline their thesis of learning theory in an attempt to supersede the old S - R theory as follows " The child is learning what to do with things. Or to put in our present language, the child is building up TOTE units by associating a perceptual Image used in the test phase with an action pattern used in the operational phase of the unit. The number of these TOTE units that a child must learn is enormous...." Miller et alia then continue their neuro-psychological theorizing upon lines not unlike Hebb by placing emphasis upon processes lying immediately behind action but not with action itself, "and as the understanding of these complex systems grows, the need to distinguish between introspectively derived and behaviourally derived concepts should decline - until eventually both our experience and our behaviour will be understood in the same terms. Then and only then will the psychologists have bridged the gap between Image and Behaviour".

Finally, let us consider their general summary "The reduction of thinking and problem solving to a matter of efficient techniques for searching is, of course, quite

G.A.MILLER; E.GALANTER: Plans and Structure of Behaviour"
p.143/168 and 195.
& K.H.PRIBRAM pub.Holt, U.S.A.1960.

attractive to anyone who takes our thesis seriously. We think of a test phase and an operational phase alternating until the operation turns up something that passes the test. Solving a problem is a matter of turning up a lot of likely hypotheses until either one satisfies the test or the stoprule is applied." It is our intention to consider certain of Hebb's hypotheses and test their validity.

But first let us summarize the position in which we now find ourselves in our discussion of the comparative philology of functional intelligence. We have been concerned with the neural structure of the brain, and the part which it plays in promoting or inhibiting perception through motivation or learning. We have given thought to the way in which perception reflects itself in action namely in intelligence. In due course we will consider the hierarchical structure and inner dimensions of intelligence by attempting to resolve the apparent dichotomy of the qualitative and quantitative assessment. Our concern will be to have a closer look at the operational and symbolic process of intelligence expressed in verbal and mathematical language. The design of our experiment will attempt to explore the gap between Image and Behaviour and show possibly that Hebb's neuropsychological theory is not incompatible with Miller, Galanter and Pibram's TOTE organisation, but supplies an excellent series of hypothetical constructs upon which to base the difference between introspectively derived and behaviourally derived concepts.

Our aim, therefore, will be to test a number of hypotheses in the applied field of comparative linguistics. This will involve us in a consideration of the nature of the bilingual problem as it affects a whole year group of English and Welsh speaking children. It will call for a descriptive analysis of two matched samples one of bilinguals (first language Welsh) and one of bilingual children (first language English) as well as a control group. From the results of our findings it is hoped to test the following three hypotheses based on Hebb's "Organisation of Behaviour" viz:

- (i) PRIMARY: - that performance in Welsh remains superior owing to early learning in Welsh - providing that English and Welsh are maintained on equal terms later on.

- (ii) SECONDARY: that learning proceeds by the taking over of associative (unspecified) areas of the cerebral cortex from the adjacent sensory projection areas. This would lead one to expect that free associative responses to auditory stimuli would tend to be in the language learned by auditory channels whereas response to visual stimuli might show a greater proportion of words from the second language learned in part through reading and writing: i.e. Welsh speaking children should give a difference between auditory and visual lists of words in terms of Welsh responses.
- (iii) TERTIARY: that by putting forward the new concept (hypothetical construct) of the "Functional Level" of a child's intelligence in terms of comparative philology and in accordance with a synchronic description of individual bilingualism one can then postulate Hebb's third hypothesis, namely:
that the influence of the pre-existent central activity on the next link of the phase sequence chain would lead one to expect specific English and/or Welsh responses in accordance with the language(s) learned early and/or later,
i.e. the subject is presented with a stimulus that can arouse different central activities each meaning a different motor response (in different modalities) - which one will occur is in part determined by excitation from cell-assemblies already active.

Furthermore, consideration will be given to Drever's overall critique of Hebb that "The findings seem to point to the existence of certain basic skills which are built up over a period of years, and underlie performance in ways not unlike those suggested for abilities by workers in the field of mental testing. In the cases studied these skills seem to have been built up early and later learning has little effect."

CHAPTER II

COGNITIVE AND RELATED ASPECTS OF FUNCTIONAL INTELLIGENCE

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A preliminary study of Hebb's neuropsychological theory would be incomplete without giving consideration to his views on the "two meanings of intelligence". Thus according to Hebb, "most of the disagreement in recent years over the nature of "intelligence" concerns the relation of A, innate potential, to B, the estimated level of functioning at maturity. If A determines B fully, "intelligence" is a matter of heredity and motivation only; the I.Q. is not dependent upon experience. But if intelligence is only one of the conditions of Intelligence B, not the sole determinant, what then?. Intelligence A is still hereditary, and it would be true to say that "Intelligence" (without qualification) is influenced by experience: only Intelligence B is so affected".

In view of the many factors that produce variable results in the testing of a child's reasoning power and attainment, it is suggested that it would be better to speak of the "functional level of intelligence" rather than of the "intelligence estimate" (I.Q.) per se. Such a concept enables teachers in the classroom and psychologists during their clinical examinations to keep an open mind about results obtained from tests whether they be group or individual.

I was first concerned with the need for a reappraisal of the theory of intelligence upon leaving the Armed Forces after the World War II when using the Healy Pictorial Completion Test as a "shock absorber" as a preliminary to setting standardised tasks to a child in an effort to assess the functional level of his intelligence. I was struck by the apparent connection between the Healy Pictorial structure and those of the Terman and Merrill (Stanford-Binet) norms when including a comparison of the scores with mental ages. Healy suggests that his norms do not extend beyond a mental age of 9-10 years. A comparative study of hundreds of case histories by the present writer seemed to confirm the fact that the limit of the test appeared to be 9 plus years of age. The point which, therefore, arises is that it is not sufficient to ascribe an arbitrary quantity to a successful placing of a piece without making a qualitative assessment as to why the piece was placed in that particular way, that is, there is complementary need for both a qualitative and a quantitative assessment of both the stimulus and the response. Thus the right piece might be placed for the wrong illogical reasons or again two children might make the right contextual choice at different and higher levels of reasoning. In other words it is not sufficient to examine the observable data; it is also necessary to understand and assess what goes on

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between the stimulus and the response. One way of doing this is to assess the quality of the thinking which accompanies the action; it is by means of interpreting the introspective thoughts of the children that the placement of the pieces into Healy's Pictorial Completion Test takes on a new meaning because it is possible to define various levels of intelligent placement of pieces. Thus if one considers the problem of the "broken window" the following possibilities occur:

Piece	Reason given (English and/or Welsh)
(i) <u>Fish</u> , etc	No reason given at all.
(ii) <u>Lighted Candle</u> , etc.	For the boy to see in the home.
(iii) <u>Whole window</u>	It's the same as the window for the house.
(iv) <u>Broken Window</u>	Because that boy has broken the window and it's missing.

Closer examination of the four alternatives leads us to suggest that the various items chosen and the reasons given or withheld coincide with various levels of thinking, viz:

Piece	Functional level of Intelligence	Terman & Merrill
(i) <u>Fish</u> :	Random selection: sensori-motor level	M.A. 2-5
(ii) <u>Lighted Candle</u> :	Illogical Reasoning at perceptual level	M.A. 4-7
(ii) <u>Whole Window</u> :	Association of Ideas at perceptual level.	M.A. 6-8
(iv) <u>Broken Window</u> :	Relational Thinking at perceptual level.	M.A. 7-9+

It can be demonstrated that children with a mental age of 9 plus can successfully complete all the test items; because bright children complete the test successfully at a chronologically early age whilst slow children are much older before they reach a relational level of reasoning which enables them to complete the test successfully. I have, therefore, found that the Healy Pictorial Complete Test No. I, used in the manner just described extremely valuable both as a diagnostic instrument and as an opening gambit for the clinical examination of the ordinary and especially the Educationally Subnormal child. In other words it will be seen that Intelligence A depends to a demonstrable degree on native or innate ability whilst at the same time its functional level will depend on how far that Intelligence B is able to assimilate contextual clues.

For Hebb, " the clinical evidence has indicated, in effect, that there are two components in intelligence test performance and in any intelligent behaviour. One is diminished immediately by damage to the brain, and amounts to a factor of heredity; one is related more to experience, consisting of permanent changes in the organisation of pathways in the cerebrum (in the present theory these changes are the establishment first of assemblies of cells and secondly of interfacilitation between assemblies). The hereditary factor is essentially the capacity for elaborating perceptions and conceptual activities; the experimental factor is the degree to which such elaboration has occurred (and particularly when we speak of intelligence), the conceptual elaboration that is not specific to one occupation or situation, but that enters into many human activities; concepts of number, of casual relations of common human behaviour and so on". Here we have a broader and yet more clinically accurate picture of intelligence as we know it. Hebb's distinction between Intelligence A - genetic potentiality and Intelligence B - present mental efficiency is an extremely valuable hypothetical construct. The former represents the capacity of the nervous system for forming, retaining and recombining, what P.E. Vernon chooses to call schemata and it is ultimately determined by the genes; whereas the latter represents the cognitive abilities which have been built up during infancy and childhood and which do not fully develop in the absence of suitable environmental stimulation.

Let us return to Healy's Pictorial Completion Test for a moment. "The presentation of this test says Healy has much more important bearings than the establishment of its validity and norms. Several main principles for the interpretation of mental tests in general are involved." He is right on this point particularly when he later discusses the rational and irrational, the logical and illogical elements involved in processes of perception. Thus he continues "on account of its fundamental relation to general understanding and to intelligent control of behaviour, apperceptive ability is of vast importance. This wide recognition of the "Combinations Methode" of Ebbinghaus shows the general interest in the idea of estimating the power to make connection between different portions of the mental content." He is also right when he says "the performance gives a remarkably good chance to see the mind at work. Mental processes are peculiarly laid bare."

W. HEALY: Manual for Pictorial Completion Test I. (Cat No. 46251).
pub. Adrew Baird, Edinburgh.

Healy recognises the fact that he evidently has devised "a completion test for ability primarily adapted to the child type of mind. Every detail of meaning has proved to be understandable even by morons. Healy, however, has not worked up his findings completely, possibly because of the discrepancies he has noticed between child and adult norms. It would appear that the findings of this test can have wide implications of a qualitative nature than of a quantitative kind - an assessment where the theories of both Hebb and piaget play their part. Thus the results of the test can be described in terms of the hypothetical construct (cell assembly/phase-sequence idea) or again in concrete "operational" terms.

Healy recognizes the basic difficulties without quite being able to come to terms with them. "The idea of this completion method apparently is valid but our picture may not be at all the best that can be devised for establishing norms of apperceptive powers. For older persons and for other groups of subjects a different picture or set of pictures may be worked out with more difficult or easier tasks involved as in the Ebbinghaus texts. Perhaps the idea may prove valuable in several directions". Healy appears to be faced with the same order of difficulty as has created controversy in various fields of psychology, namely, difficulties in distinguishing the fact that there are two types of law the one related to quantities and dimensions and the other related to structural aspects. We will take up this argument at a later point in our discussion.

Another interesting feature of Healy's test is the difference shown between early and late learning, "As a test for mental age this complete picture seems to have as much substantial validity as most others, with this addition, that it is a real test of ability in itself, for it is done very little better in after years than when first the ability is developed. From the Tables of the private school group we learn that at 10 years the performance is as good as it is at 13 years. In fact at 9 years the results are not far behind. Back of that we get a large number of bad failures. It was so evident from the start that younger children as a rule failed but we have never worked up these negative findings." It is felt, however, that these latter findings are important and seem to delimit the pre from the post-sensori motor stage ranging from the early perceptual type of reasoning at the associative level to that of relational thinking again at the perceptual level.

Healy has also realised the importance of semantic organisation," but on account of the difficulties in comparing

justly individuals of many grades of ability and experience in handling our own and other languages, we have been obliged to reject almost totally the Ebbinghaus method of filling in vacant spaces of a visually presented text." We will see, however, in due course how a visually-presented verbally-neutral stimulus can produce findings which appear to corroborate Hebb's hypotheses and also shed light on the variability of Intelligence A as compared with Intelligence B. It would seem, therefore, that the difficulties with which we are faced in the field of perception, intelligence and language are quite complex: a definition of terms appears to be essential before an experiment can be designed to cover the facts in question.

For the purpose of our thesis and the testing of the hypotheses concerning the effect of early as opposed to late learning we must understand Hebb's basic concept of intelligence: "From his point of view it appears that the word "intelligence" has two valuable meanings. One is (A) an innate potential, the capacity for development, a fully innate property that amounts to the possession of a good brain and a good neural metabolism. The second is (B) the functioning of a brain in which development has gone on, determining an average level of performance or comprehension by the partly grown or mature person. Neither, of course, is observed directly; but intelligence B, a hypothetical level of development in brain function is a much more direct inference from behaviour than intelligence A the original potential. (I emphasize that these are not parallel kinds of intelligence, co-existent, but two different meanings of "intelligence"). It is true that estimating intelligence B requires a summation of observations of behaviour in many different situations, at different times; however, if we assume that such an estimate is possible, what we actually know about an intelligence-test score is that it is primarily related to intelligence B rather than Intelligence A. The relationship to A is less direct." We are left, therefore, with the same order of semantic difficulty as we discuss under the various philosophical interpretations of the term sensation and perception.

It is also important as far as our own argument is concerned to bring to the notice of the reader those co-ordinated aspects of Hebb's theory which support his contestation that the optimum development of the cognitive aspects of personality ultimately depends on the manner, and particularly the time when early learning takes place. In his discussion of the growth and decline of intelligence Hebb seeks to unravel the puzzle of the high intelligence-test

scores that are sometimes found after a surgeon has destroyed a large part of the human brain by putting forward a tentative explanation that those scores are due to a conceptual development which brain damage does not easily reverse. He cites various differences between early and late brain injury which give a valuable lead concerning the nature of intelligence - it arises from the discovery that an I.Q. of 160 or higher is possible even after the removal of one prefrontal lobe. It is this possibility says Hebb "that suggests a clue to the nature of adult intelligence and suggests a distinction between two quite different meanings of the term "intelligence"- distinctions that may help to resolve current theoretical disagreements". We must consider that "in certain essential respects "intelligence" does not decrease after the age of twenty or thirty, and the brain operated patient very frequently demonstrates an unimpaired level of functioning in his daily occupations".

What is important for us to hold in mind is the bearing which Hebb's findings as far as the influence which early or late learning has for the child as well as for the adult. Thus says Hebb "early injury may prevent the development of some intellectual capacities that an equally extensive injury, at maturity, would not have destroyed"....or again destruction of tissue outside the speech areas will prevent the development of verbal abilities, but the same destruction may not greatly affect these abilities once development has occurred". If we interpret Hebb right we cannot lay too great an emphasis on the value of early learning - on the assimilation of the right modes of behaviour in all the modalities otherwise one risks the general impairment of later personality development. This is particularly true in the field of language - or as Hebb has put it "organising such perceptual elements in the various sense modes would lay the foundation of all later responses to the environment. Secondly, there is a period of establishing simple associations, and with them conceptual sequences - the period in which meaning first begins to appear. Finally, the learning characteristics of the mature animal makes its appearance". In brief, it is suggested that there is an optimum time when learning takes place and that this learning can be facilitated by the introduction of the appropriate social milieu particularly in the field of language development.

I suggest, therefore, that Hebb's Intelligence A might be defined in terms of the qualitative structure whilst Intelligence B might be defined in terms of quantities and inner dimensions:

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What is the evidence for the concept of intelligence? - the answer has been given by Cyril Burt in his reply to current criticism. "The concept of intelligence and the attempt to measure intelligence by standardised tests, have of late furnished a target for vigorous attack. The objections he urges are partly practical and partly theoretical. Yet few of the critics have a clear understanding of what the term really designates or the reasons that have led to its introduction. He then proceeds to discuss two misconceptions which are widely current before posing the following questions namely,

- (i) how precisely should the term be defined?, and
- (ii) what evidence is there for believing that something really exists corresponding to the definition proposed.

Burt proceeds to answer these questions by putting forward the non-statistical evidence both observational and biological. He first deals with the historical aspect of Plato's basic distinction between 'nature' and 'nurture' ^{which} who then distinguishes three parts of aspects of the soul. Aristotle goes further and contrasts the actual and concrete activity with the hypothetical capacity on which it depends and thus introduces the idea of "ability". Plato's threefold classification is reduced to twofold what he terms "dianoetic" (cognitive or intellectual) and the "orectic" (emotional and moral). Finally, Cicero in an endeavour to supply a Latin terminology for Greek philosophy coins the new word "intelligentia". Here we have the origin of the concept and the terms - which we may compare with the historical differentiation between the words "sensation" and "perception".

On the biological side Herbert Spencer recognises two main aspects of mental life - the cognitive and the affective. During the evolution of the animal kingdom and during the growth of the individual child the fundamental capacity of cognition "progressively differentiates into a hierarchy of more specified abilities - sensory; perceptual associative and relational. To designate the basic characteristic he revives the word intelligence.

On the physiological side the work of Jackson, Sherrington and others based on the evidence of neurology have introduced a theory of general ability which gradually differentiates into more specific-functions. But the first to apply scientific methods to the problems of individual psychology was Galton who went farther than his predecessors and stated

CYRIL BURT: "The Evidence for a Concept of Intelligence".
The British Journal of Educational Psychology.
p.158 et seq. Vol XXV. Part III, Nov.1955.
pub.Methuen.

that not only were the basic capacities of the mind inherited but that the individual differences in these capacities were also innate.

Cyril Burt sums up the implied definition thus, "These converging lines of enquiry, therefore, furnished strong presumptive evidence for a mental trait of fundamental importance defined by three verifiable attributes: first it is a general quality; it enters into every form of mental activity; secondly it is (in a broad sense of the word) an intellectual quality - that is, it characterizes the cognitive rather than the affective or conative aspects of conscious behaviour; thirdly it is inherited or at least innate; differences in its strength or amount are due to differences in the individual's genetic constitution. We thus arrive at the concept of an innate, general cognitive ability, to which the term "intelligence" is given. Burt goes on to say that "apart from comparatively rare and abnormal variations, differences in intelligence as thus defined seem to depend on the combined action of numerous genes whose influence is similar, small and cumulative - a hypothesis that is fully borne out by the frequency-distributions obtained from parents and siblings as a whole. And on this hypothesis not only the similarities between relatives but also their dissimilarities will be largely due to genetic factors. He also indicates that it is essential to distinguish between intelligence as an abstract component of the individual's genetic constitution and intelligence as an observable and empirically measurable trait. He goes on to say that the evidence indicates at least 75 percent of the measurable variance (based on carefully checked assessments) as attributed to differences in genetic constitution and less than 25 percent to environmental conditions. We will, however, deal with the environmental conditions of our experiment in more detail in the next chapter.

Although one might, in certain circumstances, accept the validity of Burt's argument based upon his statistical findings one should at the same time be rather critical of the acceptance of such a broad generalisation as to the overall percentage relationship arising from the apparent dichotomy of the old nature-nurture type of theorizing. The results obtained by Burt may be true for the particular population from which he obtained his data in England but would it hold true for the negroes and "poor whites" in Southern U.S.A. or, on the other hand, for children in bilingual areas in let us say South Africa, Canada or nearer home in Switzerland or Wales. It is suggested that it would be more correct to describe cognitive assessment in terms of function where intelligence in action may find individual expression.

It is clear that intelligence may hold a different meaning for different persons but there is a common thread of meaning running through most of the definitions of intelligence. The power of independent and creative elaboration; the ability to make adaptations; the ability to handle abstractions; the capacity to adjust to the environment; these and similar abilities are a function of the individual's apprehension of relationships. The degree of success or failure in every behaviour response vary with the individual's ability to educe relationships whether the latter be concrete or abstract. The measurement of intelligent behaviour will be dependent upon the individual's successes or failures in the eduction, the apprehension and the reconstruction of relationships. This is not a definition of the nature of intelligence but a description of its manifestations.

Definitions vary from that of Burt to the two meanings of Hebb. Let us consider a few of some interest, namely:

Binet: to judge well, to comprehend well, to reason well: these are the essentials of intelligence.

Terman: an individual is intelligent in proportion as he is able to carry on abstract thinking.

Stoddard: intelligence is the ability to undertake activities that are characterised by -

(1) difficulty (2) complexity (3) abstractions
(4) economy (5) adaptiveness to a goal

na (6) social value and (7) emergence of originals.

Wechsler: intelligence is the aggregate or global capacity of an individual to act purposefully, to think rationally and to deal effectively with his environment. There are three important reasons for this -

- (1) the ultimate products of intelligent behaviour are not only a function of the number of abilities or their quality but also of the way in which they are combined, that is, upon their configuration.
- (2) factors other than intellectual ability, for example, those of drive and incentive enter into intelligent behaviour.
- (3) finally, while different orders of intelligent behaviour may require varying degrees of intellectual ability, an excess of any given ability may add relatively little to the effectiveness of the behaviour as a whole.

These definitions suffice to represent the general tenor of opinion: we will, however, confine ourselves to a discussion of certain psychologists in order to develop the trend of our argument.

Not the least among those who have contributed to the theoretical advance of knowledge is Spearman who put forward his Two-Factor Theory which has considerably influenced educational psychology. Spearman believed that there was a tendency for various abilities to overlap to some extent and at the same time to show differences: he suggested that there were two mathematically defined factors 'g' and 's' (general and specific): (g) was said to depend on a kind of general mental energy possessed by

each individual to a greater or less degree whilst 's' represented certain specific kinds of mental function. Spearman felt that 'g' was operationally definable - a factor which emerged from analysing the correlations between tests regardless of the particular abilities tested or the theories on which they were based. He also suggested that there existed a hierarchy of abilities in the sense that the more complex intellectual functions generally show stronger overlapping - or a greater involvement of his 'g' factor - than do the simpler, rote, cognitive functions and sensori motor capacities.

P.E. Vernon has indicated that beyond this Spearman "did not succeed in determining the nature of intelligence by statistical analysis. His approach broke down, both because the general factor obtained from any battery of tests is biased by the kinds of tests used and because it is entirely legitimate to emphasise - as Thurstone and Guilford do - the diversity as well as the generality of abilities. Different types of mental functions and different specialised aptitudes are at least partially distinguishable, despite their positive overlapping. Thus it is more consistent with the statistical evidence to regard intelligence as a fluid collection of abilities, ^{Thurstone} comprising the whole of mental life, though most prominently manifest is higher relational thinking. It is a kind of average which cannot be pinned down to any single mental faculty. either by psychological or statistical analysis and inevitably it is liable to differ somewhat according to what different psychologists choose to include within it. Probably, therefore, the best definition we can give is a rather simple, non-specific one, such as "all-round thinking capacities" or "mental efficiency" or as Ballard and Burt suggest "general mental ability". And so we have turned the full circle.

As we have seen the importance of the general factor 'g' was demonstrated by Spearman but this approach was criticised by Thomson in his "theory of bonds" but later additional types of ability or group-factors gradually emerged from the researches of Burt, Moursy, Kelley, El Kousy Stephenson and Alexander. On the one hand we have the hierarchical theory put forward which holds that there are certain main types of ability over and above 'g' (in particular the educational and practical types) and

that these themselves can be divided into numerous minor group factors. Thurstone, Guilford and other factorists in the U.S.A. have opposed the idea of a general factor and hierarchy; they showed that test inter-correlations can be accounted for by a number of independent types of ability - or multiple factors. During the course of this discussion, however, it will be suggested that hierarchical theory describes the structure of intelligence whilst the independent multiple factors describe the inner dimensions: in other words we are faced with Hebb's resolution of suggesting the hypothetical construct of intelligence A and B. It will suffice for the purpose of our argument to discuss the work of Spearman and Thomson together with Burt and Moursy.

In Vernon's excellent review of the development of factorial analysis with reference to Spearman's "Abilities of Man" he writes "In it he shows that neither the anarchic, nor what he calls the monarchic or oligarchic theories of the mind accord with the facts. The monarchic view reduces all abilities to a single capacity of general intelligence or "common sense". This would imply that they are all perfectly correlated and make no allowance for the unevenness of people's abilities along different lines. The oligarchic theory is the view that the mind is ruled by a number of separate powers. Spearman's "two-factor theory" satisfactorily explained the tendency for all abilities to overlap to some extent and yet to show considerable unevenness. This theory produces a logical basis for devising tests of 'g' although Spearman wisely refused to identify 'g' with intelligence but rather that it depends on mental energy. ?

At the time when Spearman was putting forward his theory which appeared to contradict Wissler's earlier original and more tentative findings other young British psychologists were supporting a conception which formed a means of reconciling the pluralistic assumptions of the "individual psychologists" and the monistic doctrines of the Academic psychologists". This idea formulated by Spencer on the basis of his evolutionary theory, that the mind was essentially characterised by a "hierarchical organisation" analogous to that discernible in what he called the social organism. According to the version adopted by Stout & McDougall mental processes might be regarded as consisting of systems within systems, each type

P.E. VERNON: "The Structure of Human Abilities". pub. Methuen 1950



Level

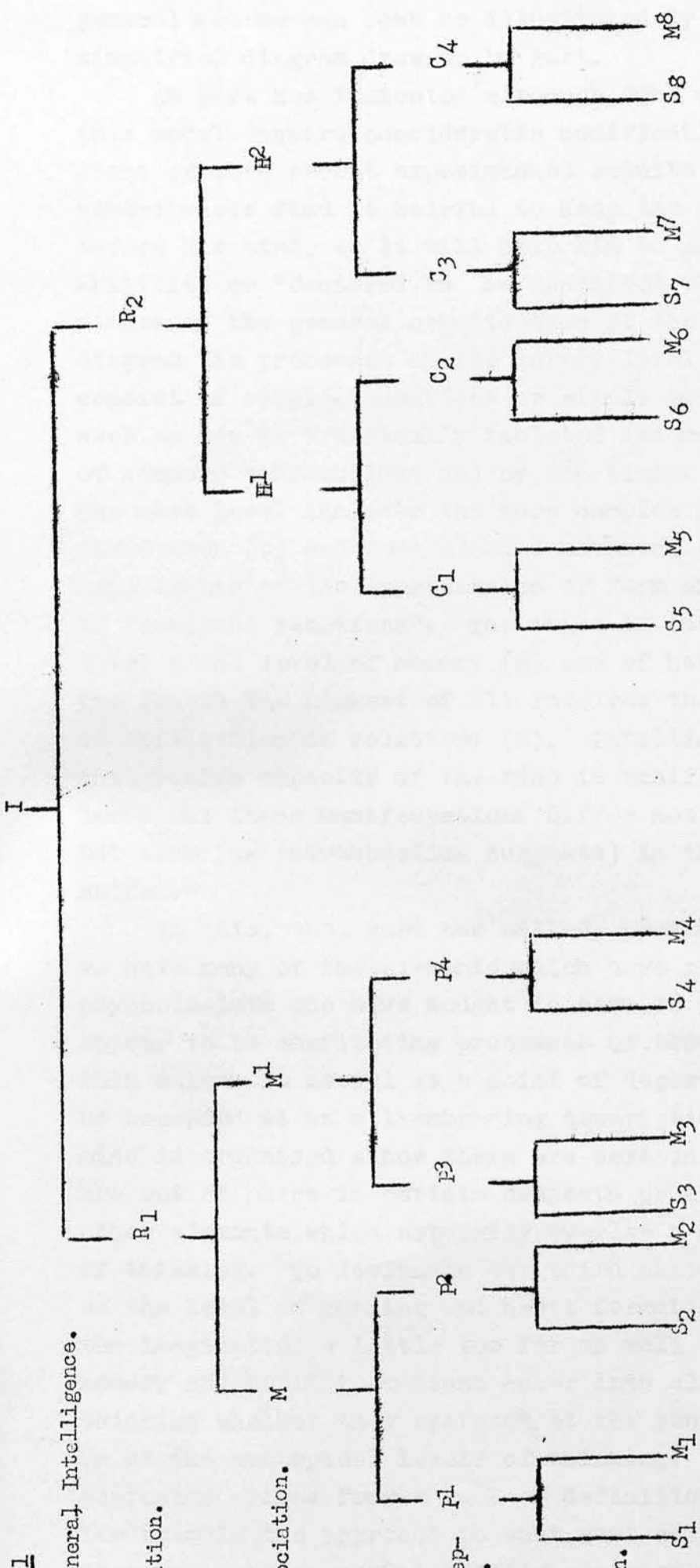
General Intelligence.

(iv) Relation.

(iii) Association.

(ii) Perception.

(i) Sensation.



(Stout, McDougall et alia).

HIERARCHICAL SCHEME OF MENTAL LEVELS

(after Stout)

of process being assignable according to its relative complexity to one or other of four main 'levels! The general scheme can best be illustrated by means of a simplified diagram drawn up by Burt.

As Burt has indicated "although "The details of this model require considerable modification in the light of more recent experimental results the reader will, nevertheless find it helpful to keep the general plan before his mind, as it will help him to give the various abilities or "factors" to be described their appropriate places in the general organisation of the mind. In the diagram the processes of the lowest level are assumed to consist of simple sensations or simple measurements (s.m.) such as can be artificially isolated and measured by tests of sensory "thresholds" and by the timing of simple reactions! The next level includes the more complex processes of perception (P) and co-ordinated movement (C) as in experiments on the apprehension of form and pattern or on "compound reactions". The third is the associative level - the level of memory (M) and of habit formation (H). The fourth, the highest of all involves the apprehension or application of relations (R), Intelligence (I), as the integrative capacity of the mind is manifested at every level but these manifestations differ not only in degree, but also (as introspection suggests) in their qualitative nature."

Ref.

In this, what Burt has called, provisional scheme we have many of the elements which have perplexed psychologists who have sought to come to terms with what appear to be conflicting processes of thought. Whilst this scheme is useful as a point of departure it cannot be accepted as an all-embracing description of how the mind is organised since there are certain elements which are out of place in certain contexts or again there are other elements which naturally overlap various modes of thinking. To designate the third associative level as the level of meaning and habit formation is to stretch the imagination a little too far as well as /forget that memory and habit formations enter into all levels of thinking whether they operated at the sensori-motor or at the conceptual levels of thinking. In some way the confusion arises from a lack of definition of terms: for example, the approach to what Burt calls "Content Factors" such as verbal ability needs of necessity be

?
k

different from what we term factors such as 'speed' and 'attention' which "appear to affect mental processes at early levels". It is felt that here again the source of the difficulties lies in not taking account of the difference between the two laws, the one of structure and the other of dimensions.

Vernon has indicated that the chief criticism that would be levelled at Spearman is that "he failed to allow sufficiently for types of ability which while less general than 'g' are certainly not specific. He admitted, indeed, that different number tests, also different mechanical and certain other types of test show residual correlations over and above 'g'. But he ascribed this to the presence of common factors and insisted that such specific overlap is very rare. Actually the notion of specific overlap is a contradiction in terms and towards the end of his life Spearman did begin to recognize the existence of broad group factors such as the verbal and spatial which arise from the overlapping of quite diverse S-factors". One of the strongest critics of Spearman's statistical techniques was Godfrey Thomson who suggested that although the "Two-Factor Theory" was possible it was not the only solution that could be inferred from the statistical findings of Multiple-Factor-Analysis.

Thomson makes his point thus, "It had, however, become clear that the Theory of Two Factors in its original form had been superseded by a theory of many factors, although the method of two factors remained as an analytic device for indicating their presence and for isolating them in comparative purity". He further stated that Thurstone's rule about rank included Spearman's hierarchy as a special case, "for in a hierarchy the tetrads vanish - that is the minors of order two - vanish. The rank is therefore one and a hierarchial set of tests can be analysed into one common factor plus a specific in each". He further added that "the difference in point of view between the sampling theory and the two-factor theory is that the latter looks upon 'g' as being part of the test, while the former looks upon the test as being part of 'g'".

Thomson sums up his own Sampling Theory of Bonds in the following way, "the writer is inclined to make a distinction in interpretation between the Spearman's general factor 'g' and the various other common factors, mostly if not all of less extent than 'g' which have been suggested.

GODFREY THOMSON: "Factorial Analysis of Human Ability" p.20. pub.U.C.P.1939/46.

When properly measured by a wide and varied hierarchical battery, 'g' appears to him to be an index of the whole mind, with common factors as only sub-pools, linkages among bonds. The former measures the whole number of bonds; the latter indicate the degree of structure among them. Some of the structure is innate; but more of it is probably due to environment and education and life." It is in this idea of isolating the term structure as opposed to inner dimensions that Thomson makes his greatest point for it raises the question of whether one can indeed attribute any real existence to factors of the mind.

He goes on to say "but the mind is very much more complex and also very much more an integrated whole than any naive interpretation of any one mathematical analysis might lead a reader to suppose. Far from being divided up into "unitary factors" the mind is a rich comparatively undifferentiated complex of innumerable influences - on the physiological side an intricate network of possibilities and intercommunication. Factors are fluid descriptive mathematical coefficients changing both with the tests used and with the sample of persons, unless we take refuge in sheer definition based upon psychological judgement, which definition would have to specify that particular battery of tests and the sample of persons as well as the method of analysis in order to fix any factor." Before the factor or group of factors are acceptable, therefore, there is a clear need for agreement between mathematics and psychology; "the whole process is one by which a definition of the primary factors is arrived at by satisfying simultaneously certain mathematical principles and psychological intuitions. When these two sides of the process click into agreement the worker has a sense of having made a definite step forward." The value of Thomson's contribution lies in the note of caution which he gives that the research worker must be clear in his aims and certain of his facts before making any claims other than tentative with regard to the organisation of the thought process.

Thomson is prepared to concede that as a hypothetical construct 'g' has value and a place in psychological theorizing "provided that 'g' is interpreted as a mathematical entity only and judgement is suspended as to whether it is anything more than that. The suggestion, however, that 'g' is "mental energy" of which there is only

a limited amount available, but available in any direction, and that the factors are the neural machines, is one to be considered with caution".

He then makes a comparison between psychology and the other sciences, thus, "even in physical or biological science, the things which are discussed and appear to have a very real existence to the scientist such as "energy" "electron", "neutron", "gene", are recognised by the really capable experimenter as being only measures of speech, easy ways of putting into comparatively concrete terms what are really only abstract ideas". He is at pains to point out that the danger lies in "reifying" such terms or such factors as "g" "V", etc., - and as far as this thesis is concerned "I.Q."

As Burt has indicated, however, whilst still bearing in mind the cautionary tale - most of the opponents of the "general factor" hypothesis have in their more recent writings more or less openly withdrawn their opposition. Brown for example ultimately acknowledged that "the evidence for a general factor now seems conclusive". Thomson himself one of the main opponents has constructed numerous booklets for testing intelligence. And Thurstone has proposed a scheme of "second order factors" which shall expressly include a "general factor" and so account for the correlations between "first order factors" or "primary abilities".

The discussion and disagreements, the agreements to differ and the points of contact where certain degrees of finality have been reached have all served to clear the decks as it were for concerted action in the uncharted seas of endeavour. Healthy discussion leads to a clarification of theoretical principles and hypotheses which although wrong can sometimes impede development but they can also provide a rallying point for new experiments.

As James Drever (Senior) has stated under the stimulus of the needs of practical everyday life knowledge of and control over natural phenomena rapidly extended until the new definition of psychology is "the science of the facts of human nature and human behaviour" or "the science of human behaviour in its relation to and dependence upon, mental process" with its consequent new discoveries in the pure and applied fields.

Burt's summing up of the same situation is as follows:

JAMES DREVER: "The Psychology of Industry". pub. Methuen 1921.

CYRIL BURT: "The Structure of the Mind". British Journal of Educational Psychology. Vol. XIX. Part III. Nov. 1949. p. 198.

"In the survey of the results of factor analysis which I attempted some twenty three years ago I suggested that there were four main questions which such investigations might hope to answer:

1. First, can the mind be analysed into anything, like the list of faculties which the traditional psychology assumed e.g. the "special aptitudes of Galton and Binet and the 'group factors' of later writers.
2. If so, what precisely are these faculties or factors and how does their nature differ from the traditional conceptions.
3. In particular are they regarded as innate or inheritable tendencies or abilities and if not, how far is each the product of the innate constitution or environmental and cultural influences, and finally
4. What is the general structure of the mind as thus empirically revealed. To each of these four questions the accumulated results of later research should now enable us to give at least a tentative answer.

He suggests that the controversies of the Two-Factor theory and the Sampling Theory have now lapsed and given place to an agreement that "at least eighteen factors and sub-factors can now be cited and established by three or more independent investigators whilst five factors - all of them of special importance in educational work, the verbal, the arithmetical, the spatial, the memory and speed factors have been independently corroborated by more than a dozen investigators." With reference to the second question the facts suggest that the mind has a far more complex and systematic structure than the Spearman -Thurstone experiments envisaged. It is felt that the mind is organised on an hierarchical basis: "there is first a comprehensive general factor covering all cognitive activities; next a small number of group factors, covering different activities classified according to their form and content; these in turn sub-divide into narrower group factors: and the whole series appears to be arranged on successive levels, the factors on the lowest level being the most specific and the most numerous of all." Furthermore, as to question three and the nature of the factors Burt has this to say: "a factor is not to be regarded as a simple isolated causal entity, much less as an elementary capacity, inherited as such and capable of spontaneous maturation, regardless of environmental influence (except when the environment is

definitely abnormal). A factor is primarily a principle of classification; it is not so much a concrete cause as an abstract component. Moreover unlike "faculties", "primary abilities" or "unitary traits" the factors discovered by the more recent methods of analysis prove to be in no way atomic or indivisible. On the contrary, they tend to split up into sub-factors - and these sub-factors into narrower factors still." Having dealt with the structure and inner dimensions of the mind Burt indicates that one of the most urgent problems calling for experimental study is the influence of heredity or genetic constitution thus every measurable ability is the product of a genetic potentiality interacting with certain post-natal and environmental conditions". He suggests that his review of the results of factor analysis is by no means final but rather serves as a working basis for further research. Burt's suggestions are not incompatible with Hebb's neuro-psychological theorizing but we will have more to say concerning the structure of the mind in the course of our subsequent discussion, and an attempt will be made to distinguish between different systems of factors which appear to be indirectly rather than directly related. The levels of cognitive ability represent one system whilst group factors such as the verbal, mathematical and spatial have a separate configuration whilst the factors of speed and memory are related to and are the product of or represent aspects of both systems of thought process within the mind structure.

The doctrine that the mind may be regarded as possessing a hierarchical structure has according to Burt been reached through four lines of approach:

- (1) the introspective analysis of mental processes.
- (2) the comparative study of their evolutionary development.
- (3) the investigation of their neurological bases.
- (4) the statistical comparison of similarities and differences.

We have previously discussed the introspective approach of Plato Aristotle and others to the problem of describing intelligence. We have dealt with the neurological theorizing of Hebb among others and we have likewise considered the findings of statistical analysis. On the evolutionary side of classification it is worth noting Spencer's approach. His classification accepts the broad distinction between "cognitions" and "feelings" and he directs them into the following classes:-

1. Presentative Cognitions (i.e. Pre-Symbolic).
 - (a) Presentative simply e.g. sensation.
 - (b) Presentative -Representative e.g. perception.

2. Representative Cognition (i.e. symbolic)

(c) Representative simple, e.g. recollection and represented sensations.

(d) Re-representative, e.g. abstract thought.

The unitary ability which differentiates in this way he terms intelligence. This approach of Spencer's is of particular interest in view of the preliminary discussion we have had on the nature of sensation and perception and this relationship to what has been termed intelligence.

Moursy in an admirable monograph on the "Hierarchical Organisation of Cognitive levels has developed the argument even further and has, it would appear, helped to clarify the field further by stating the case for both sides and also by making out his own case for the hierarchical structure. He sums up the controversy thus, "It will be seen that Spearman's attempted simplification was tantamount to a reversion to the older doctrine of serial development based on the idea of a unilinear 'scala naturae' in place of the more recent doctrine of divergent development, based on a branching 'arbor naturae' which the term hierarchy was intended to designate". In reality this appears to be a reformulation of the two kinds of statement of formulating natural laws the one dealing with dimensions and their relationship to others dealing with the structural aspects.

Moursy's experiment in reality concentrates on the structural side as opposed to the inner-dimensional. His concern has been to delimit the hierarchical levels of thinking (abilities), on the one hand, as compared with the unilateral but overlapping factors (aptitudes) on the other hand. This is an inference which can be made from his paper although it is not categorically stated.

In his preamble he continues "Nevertheless on both sides of the Atlantic there has been of late a renewed and increasing interest in the conception of a hierarchical organisation of mental capacities, particularly among writers interested in individual psychology. In America the conception has been adopted, a little tentatively perhaps, by Hollingworth: in contrast to Thorndike he maintains that intelligence "involves both" 'number of connections' and integration" and he describes mental activity as dependent upon a "hierarchy of adjustments" arising from a "hierarchy of potencies". Tolman speaks of the potentiality for a "hierarchy of responses" on which can be built up a hierarchy of 'habit families'. Allport has put forward "the conception of a hierarchy of levels produced by

integration" which he believes may provide "much help in understanding the development of personality." More recently still Piaget has described the mental development of the child as characterised by the appearance of a "hierarchy of operations" proceeding by developmental stages or 'levels' very similar to those outlined by Spencer. Burt's view of the results of statistical analysis, Vernon's description of test results obtained from the Fighting Services during the War, and the accounts given by Cattell and Eysenck of the organisation of personality, all support the need that factorial work reveals something like a hierarchical structure in the individual mind.

A brief description of Moursy's experiment is as follows: A set of twenty tests were employed, each constructed so that the results would depend as far as possible on the activity of a single cognitive level only, namely,

A. Sensori-Motor Level

1. Touch discrimination.
2. Weight Discrimination.
3. Simple Reaction Time with Auditory Stimuli.
4. Speed of writing.

B. Perceptual Level

5. Counting.
6. Checking Names and Numbers.
7. Sorting Shapes.
8. Perception of Parts.
9. Perception of Patterns.

C. Associative Level

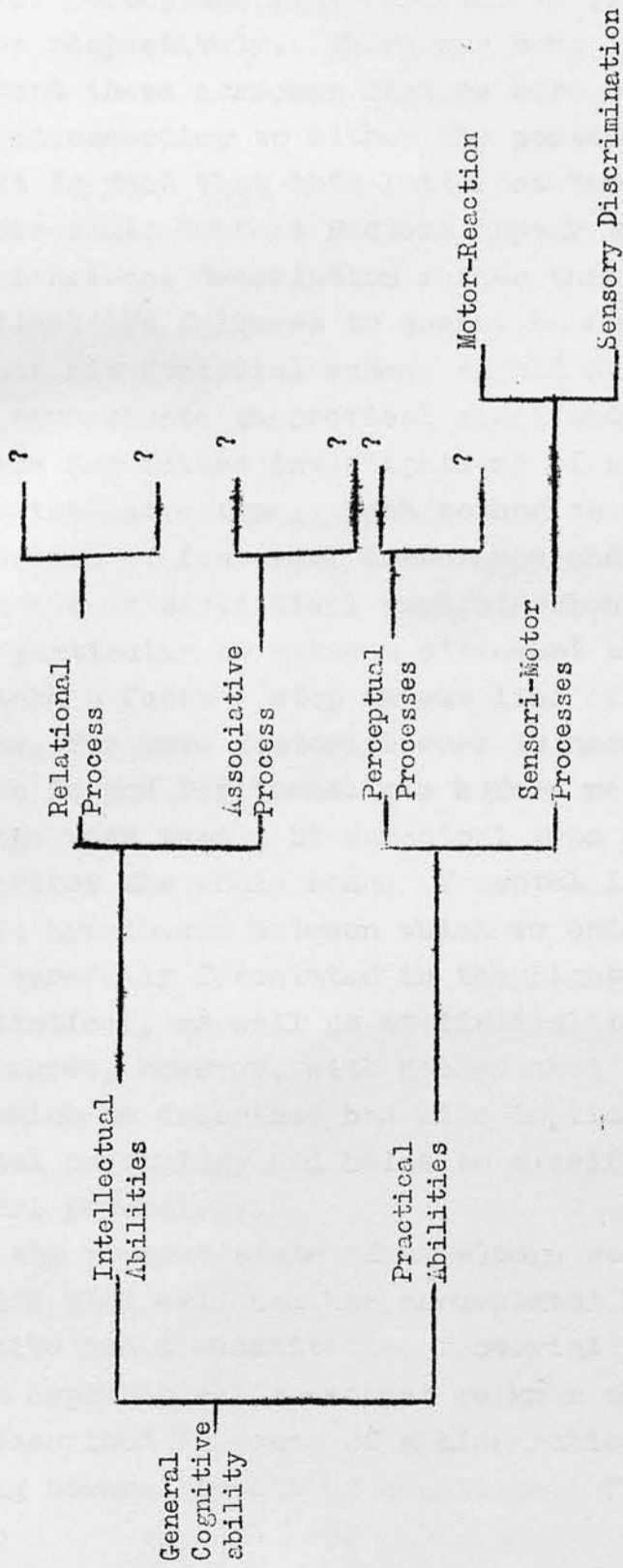
10. Memory for Numbers.
11. Memory for Shapes.
12. Visual Imagery.
13. Association.

D. Relational Level

14. Synonyms and Opposites.
15. Verbal Analysis.
16. Non-Verbal Analogies.
17. Completion.
18. Syllogisms.
19. Number Series.
20. General Intelligence.

The tests were applied to 166 boys aged 10.0. to 11.0. years.

E.M. MOURSY: "The Hierarchical Organisation of Cognitive Levels",
British Journal of Psychology: Statistical
Section Vol V Part III. Nov. 1952. p.151 and seq.



Hierarchical Scheme of Factors (Moursy)

The correlation table was analysed by all the main methods of factor analysis, namely, in terms of bipolar factors, of simple group factors, and of rotated group factors, both "undivided" and sub-divided. Thurstone's method of 'simple' structure, Holzinger's 'bifactor method', and Yale's 'triangular method' were also tried. All revealed a large general factor roughly identifiable with general cognitive ability or intelligence. Both the bipolar and the group factor analysis indicated the presence of two broad group factors provisionally identified with (1) practical and (2) intellectual abilities respectively; these were found to subdivide into narrower group factors for (1a) sensori motor (1b) perceptual (2a) associative (2b) relational processes respectively. There was some indication says Moursy that these narrower factors were still further subdivided according to either the content or form of the test. It is felt that this latter statement is open to conjecture since Content Factors appear to call for an inner-dimensional description rather than a structural description. In fairness to Moursy he has emphasised the point that his factorial scheme should be regarded as no more than an approximate theoretical model and as a suggestive foundation for future investigations of a more extensive and more intensive type. Such method should be based on a combination of factorial techniques and other modes of approach not on statistical analysis alone.

In particular he makes a statement which opens up the way to take a further step in our line of argument, namely, "Moreover, far more factorial work is needed on non-cognitive qualities in and for themselves before we can confidently accept the view that a hierarchical type of organisation characterizes the whole range of mental life. The more plausible hypotheses between which we endeavour to decide must be carefully formulated in the light of the latest non-statistical, as well as statistical investigations. We must agree, however, with Moursy that the conceptual scheme which he described has wide implications for individual psychology and helps to clarify certain aspects of general psychology.

In the present state of knowledge we can make a tentative suggestion that evidence has accumulated both from a qualitative and a quantitative factorial point of view that the hypothetical construct we know as general intelligence can be described in terms of a hierarchical structure involving several levels of cognition. The evidence to

support the existence of hierarchial "content" factors is not so strong indeed a case as can be made out for the existence of independent primary factors. This latter point will be discussed in due course when we consider the question of inner-dimensions. It suffices for the moment that Thomson's Theory of Bonds (which is not hierarchical) gives a useful explanation of 'g' and the appearance of ability group factors. Furthermore, if we accept Thomson's view and hold that factors over and above 'g' arise, partly perhaps from hereditary influences but mainly because an individual's upbringing and education imposes a certain grouping of bonds (or independent primary factors) then we are again more in alignment with our own statement of the double-law theory that intelligence has two meanings (a la Hebb) and can be described both in terms of structure (Moursy/Piaget) and in terms of inner dimensions (Thomson/Vernon). We will return to this problem later but first let us turn to Piaget's views of the mental processes which although they have been developed through different routes and in almost complete independence of British and American workers their conclusions are remarkably similar to that of Spencer's statement that all mental development, whether in the child or the race is essentially a progressive adjustment and readjustment of the organism to the environment". Intelligence, therefore, is depicted as consisting in "the advance and maintenance of this mutual adjustment by conscious needs".

Piaget's arguments are similar but they are not based on speculation but on first-hand observations of the actual behaviour of young children. We are told in all forms of conscious adaptation there are discernible two inseparable components - "feeling and knowing or in more technical terms affection and cognition". The affective components which for him include the conative have a threefold function: to prescribe the goals or ends of human behaviour, to assign value to these ends, and to furnish the energy needed for their pursuit. The cognitive processes (which are our main interests at the moment) provide the means to these ends in the form of "structural techniques". Thus every action must involve both an energetic (or affective aspect) and a structural (cognitive) aspect". It is this conscious or cognitive mode of "structuring" which makes up what we commonly term intelligence. Intelligence means understanding; and to understand is organise mentally to combine. We can compare this with Ebbinghaus "kombinations methode" which we discussed earlier in connection with Healy's

Pictorial Completion Test.

We arrive at Piaget's definition "intelligence is simply a generic term to indicate the superior forms of organisation or equilibrium, namely those which are achieved by cognitive structuring." As thus defined, intelligence, says Piaget, can no longer be regarded as a separate or higher intellectual faculty. To interpret intelligence in the way described is "to imply a complete continuity, from the lowest types of cognitive and motive adaptation to the highest forms of thought" - thus intelligence is "that quality of neural organisation which makes a given set of mental tasks easier for some individuals than others."

It is of interest to note how Piaget's theory ties up for example with our preceding discussion of Moursy's factorial analysis but equally worthy of note Piaget accepted Spearman's Two Factor Theory as a good mathematical representation of his own description of intelligence - for Spearman it will be remembered followed Spencer in insisting on the complete continuity of all cognitive processes or "g".

Burt bridges the gap between the quantitative factorial approach and Piaget's qualitative structural approach as follows: "Most recent work appears to show that these 'specific aptitudes' are not to be regarded as a more heterogeneous collection of distinct and separate faculties but rather as a 'hierarchy' of increasingly specialised capacities, differentiating and developing out of the older and more generalised forms. This comes much closer to Piaget's own hypothesis and seems to meet the criticism that he himself makes of Spearman. Further it is instructive to note that in his view, intelligent behaviour depends, not as Spearman and Spencer and other followers maintained, on mere discrimination, but on a structural integration of mental contents and activities. There again his conclusions agree with the results of recent factorial work." Ref.

Like Spencer and other evolutionists Piaget begins by distinguishing two broad stages - the 'presentative' and 'representative' or as he prefers to re-name them, the 'symbolic'. The presymbolic includes first simple sensory and motor activities on the lowest levels and secondly such processes as perception and learnt actions on a slightly higher level. The higher or symbolic stage covers a much longer duration and falls into four principal periods.

JEAN PIAGET: "The Psychology of Intelligence",
pub. Rutledge, Kegan Paul, London 1950.

Mental adaptation (analogous to biological adaptation) to environment

ASSIMILATING PROCESS

(Incorporation of objects into patterns of behaviour relating present to past data)

Primacy of assimilation

Characterised by play and symbolic behaviour (egocentric phase)

Structural organisation within mind of schemata (affective and intellectual) under mutual influence of assimilation and accommodation

Equilibrium between assimilation and accommodation

Characterised by intellectual behaviour (social, autonomous and operational phase)

ACCOMMODATING PROCESS

(The environment influence)

Primacy of accommodation

Characterised by imitative behaviour (egocentric phase)

(As long as there is disequilibrium in the cycle of organisation there is a 'feed-back' (compensatory adjustments or regulations)).

The dynamics of the Piagetian system. Theory of adaptation and organisation

Piaget sees development in terms of structures which are by definition systems of mental operations obeying definite laws of logico-mathematical order. He believes these structures to be as much physiological as mental (compare Hebb); hence his interest in cybernetics. Each stage in development is marked by two phases one in which the structures characteristic of the stage are forming and the other in which the completed structures are operating. During the latter period transformations are taking place which yield in time the structure of the subsequent stage.

Piaget has demonstrated three types of structure corresponding to three stages in development (the third stage is divided into two). Sensori-motor group structures characterize the first stage and are achieved by about $1\frac{1}{2}$ years of age. Structures of the second stage are forming up to 7 years of age and reach full achievement between 7 and 11 years. These are called concrete operation 'groupement' structures and mark a stage in development in which the child is now able to perform mental operations where previously he could only perform mental actions. These structures, however, are not to be confused with the structures of the final stage which are defined as 'group' and lattice' formal structures. These are developing between 11 and 14 years in formal operations which integrate the partial 'groupement' into structural wholes and culminate in the combined groups and lattices of formal thought at about 15 years.

In terms of the development of mental operations the first stage is characterised by the genesis of sensori-motor intelligence, resulting in the formation of a combination of reversible actions such as displacements in space which can be observed in children of 18 months. The second stage is marked by the genesis of representative intelligence; the first phase in this stage i.e. up to 7 years being determined by the formation of symbolic thought leading to representation; the second phase for 7-11 years being determined by the formation of concrete operations. During the first phase mental actions (i.e. internalised actions accompanied by representation) are irreversible yielding a certain rigidity in the systems of reference. In contrast during the second phase mental actions become reversible and can now be called mental operations, operations being by definition reversible mental actions.

Inhelder noted that after a slow continuous evolution the change from irreversibility to reversibility often occurs abruptly for a particular problem, but that concrete operations as a whole only very gradually impinge upon

reality; the age of seven marking only the beginning of reversibility. The achievement of reversibility marks a significant phase for the development of number since it makes possible the understanding of certain invariances which the child denies at an early age. In the "child's Conception of Number" Piaget shows that the child does not understand conservations of quantity circa 7 years. From there onwards he is able to perform operations with numbers, classifications, etc., but his researches in other fields show that it is not till a year later that time-space operations are achieved and the period up to 11 marks the development of a system of concrete operations which will serve as a basis for the formal operations of the third stage.

Some special features in Piaget's theory must be mentioned. Firstly, the stages of development are defined by structured wholes and not by isolated pieces of behaviour (cf. Hebb cell assembly/phase sequence), for example, the concrete 'groupement' structure of the second stage allows not only the solution of particular problems but all the elementary types of classifications, arrangements in series and conservation of numbers. They go beyond the operations actually carried out and are the base for a whole system of possible operations. It would seem then from the clear evidence of the presence of this structure in any child one would need to observe his operations in a variety of situations. Secondly, the order of succession of stages is constant by the age at which the structures appear is relative to the environment which can either impede or provide their appearance. The genetic development seems to follow a general law of the same type as the laws of organic growth but the age of realization cannot be fixed, it is always relative to the environment. Thirdly, according to Inhelder the influence of the environment can act in various ways - at one time through the content to be structured, at another by the possibilities of learning or again by the social intercourse itself. As an example of variance due to content a group of objects may be more or less easy to classify according to their particular perceptual qualities. With regard to learning it has been found that certain spatial representations are made easier by sensori-motor explorations. And as an example of the influence of social interexchange comparative studies have shown that in an environment of free exchange and discussions magical representations decline rapidly in favour of

rational representations whereas they persist much longer in an authoritative environment. Thus in Inhelders words, "These observations as a whole show the age margin which must be allowed for on our stages. Even if intellectual development follows a constant order its manifestations are subject to fluctuations".

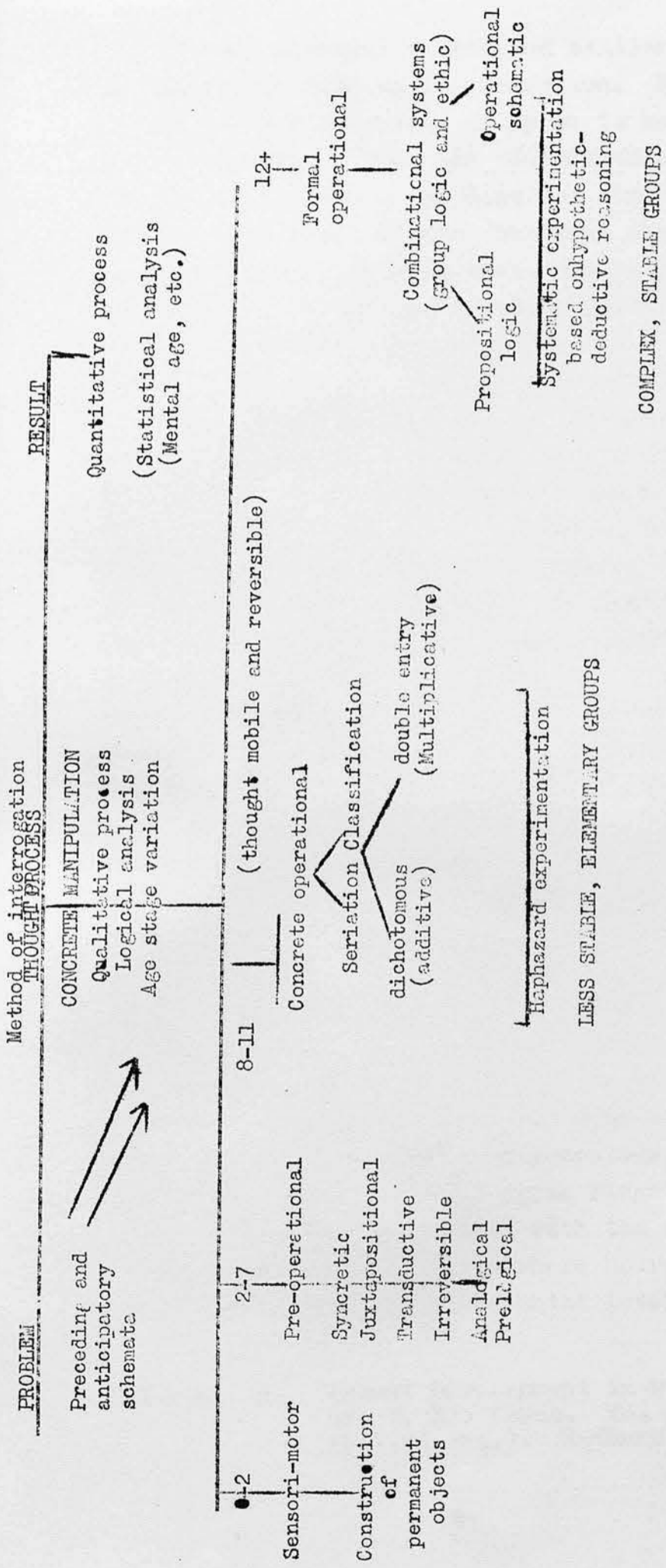
The statement clarifies one feature of Piaget's studies which is not always understood, namely, that he has not been concerned to establish a scale of development or to obtain precise determination of age as regard stages. He has been concerned rather "to understand the intellectual mechanism used in the solution of problems and to determine the mechanism of reasoning".

Anything wrong with this?

The four stages of this system of intellectual development each with an affective concomitant may be summarized as follows:-

- (1) Period of Sensori-Motor Intelligence (birth/2 years).
- (2) Period of Intuitive Thought. (4 - 7 years).
- (3) Period of Concrete Operations. (7 - 11 years) including:
 - (i) Classes
 - (ii) Relations.
 - (iii) Numbers (including "Groupements" (a) Closure (b) reversability (c) associativity (d) identity (e) tautology and iteration.
- (4) Period of Formal Operations. (11 - 15 years).

Berlyn in his excellent monograph on "Recent Development in Piaget's Work" has this to say: "His theory has become more detailed and more ambitious in scope, drawing on his knowledge of biology, logic, and history of science, all of them fields to which he has contributed. These developments can be summed up by saying that he has changed from being one of the most celebrated developmental psychologists into one of the most important of contemporary general psychologists. Like most contemporary psychologists Piaget starts from the biological concept of 'adaptation'. He sees adaptation as an interplay of two complementary processes, which he calls "assimilation" and "accommodation". Assimilation occurs when an organism uses its environment for an activity which is already part of its repertoire - wherever a situation evokes a particular pattern of behaviour because it resembles situations that have evoked it in the past, wherever something new is perceived or conceived in terms of something familiar wherever anything is vested with value or emotional importance. Accommodation, on the other hand, means the addition of new activities in response to the impact of environmental events".



Problem-solving by the Piagetian child. Possible clinic reference: learning disability.

Drever Secundus considered similar processes in connection with space perception. Piaget's answer is that awareness of space is based upon action in space. Thus the 'intuition of space' says Piaget is not a 'reading' or apprehension of the properties of objects, but from the very beginning an action performed upon them. It is precisely because it enriches and develops physical reality instead of merely extracting from it a set of ready-made structures that action is eventually able to transcend physical limitations and create operational schemata which can be formalised and made to function in a purely abstract deductive fashion." By action Piaget means in the first instance motor activity, "the fact of its continuous existence through all stages renders motor activity of tremendous importance for the understanding of spatial thinking". Drever goes on to say that this gives us a fairly concrete starting point. Piaget's theory of operations has troubled some as being rather abstract and philosophical but when he says that motor activity is "the fountain-head of the operations" he brings his position within the boundaries of empirical science. The advantage of starting with motor activity is that we may substitute known reflexes for hypothetical "unities and identities". This new approach to S-R psychology opens a wide field of research on the stimulus side of theory, for not only does it enable one to foster the empirical aspects of scientific psychology but it also allows us to enlist the help of related disciplines in the fields of neurology, linguistics and communication theory. Again Piaget's operational approach is not incompatible with the statistical findings of factor analysis where Moursy has for example described the hierarchial levels of mental

D.E.BERLYNE: "Recent Development in Piaget's Work",
Br. J. Ed. Psych. Vol XXVII Part I
(p.1.ct seq.). Methuen Feb. 1957.

development. This approach, too, is not unlike that of the present writer's postulate concerning the functional level of intelligence in a linguistic context. It remains for us to relate the findings of the J.A.W.L. Experiment to the current modes of thinking in the fields of perception and learning.

We have dealt with the qualitative aspect of Factor Theories of Burt, Moursy and others who suggest that intelligence is hierarchical in structure and that there are various levels of definable degrees of cognition: Piaget's qualitative approach also appears to confirm these findings. It is suggested that this analyses the genetic side of what has been termed by Hebb, Intelligence A. What then of Intelligence B which is more affected by environment. Here it is felt we are dealing with content factors - more after the fashion of Thomson's Theory of Bonds where by maximising and minimising the specifics we can statistically produce a different order of thinking. In Thomson's view factors over and above 'g' arise partly perhaps from hereditary influences but mainly because an individual's upbringing and education imposes a certain grouping on his bonds.

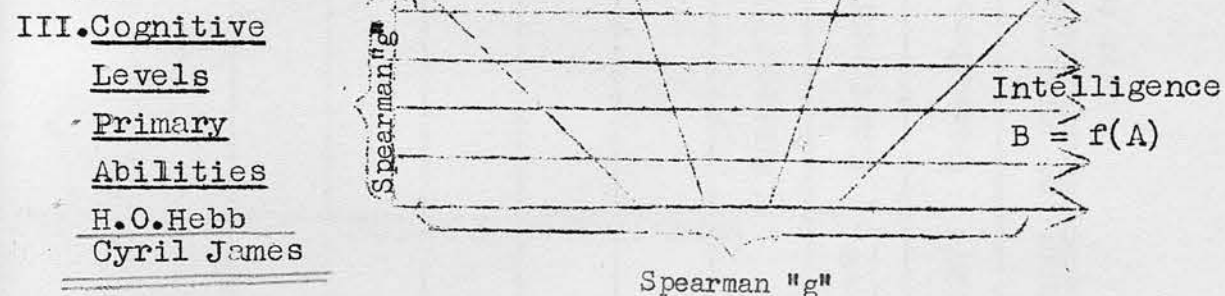
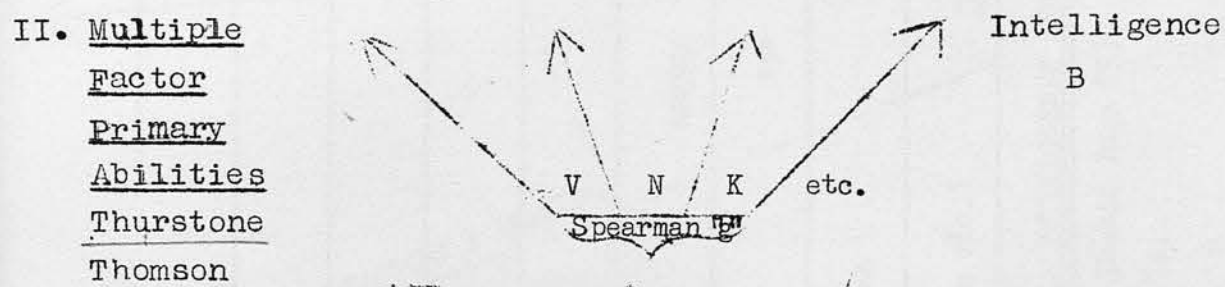
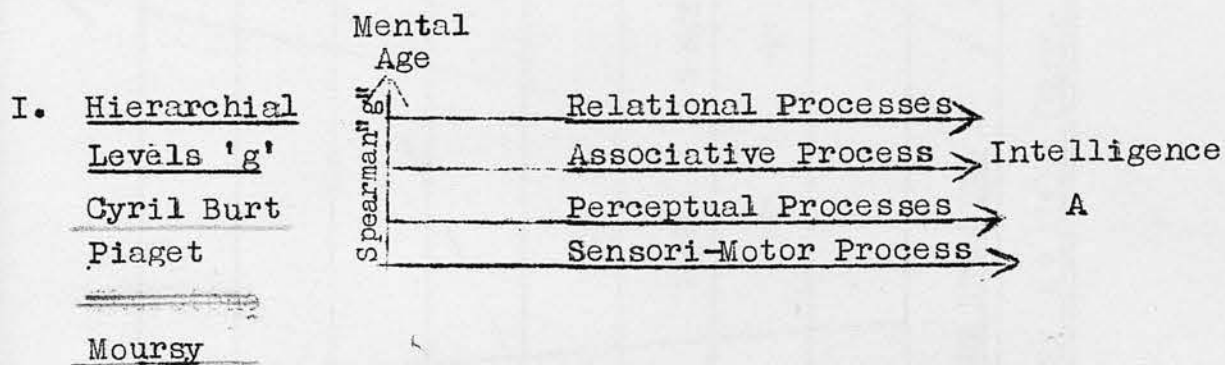
It is on this point that Vernon makes an important contribution "The V:ed" factor is, as we shall see a rather strongly unified group because our society gives a fairly uniform education to all its members. It does not readily break down into separate verbal, number, speed, reasoning, attention and other memory factors because the abilities under these names tend to be developed differently in different schools and homes though partially distinct minor factors can often be established, especially in fairly homogeneous groups such as university art students. On the practical side or "k:m" side there is as Anastasi points out, less cultural standardization: hence the k:m pole is more heterogenous and amorphous than "v:ed". It follows that there is no need to regard the hierarchical or genealogical principle as pre-eminent. Minor group factors are not always "descendants" of either "v:ed" or "k:m". And as we shall see later that several factors cut across this dichotomous grouping, scientific ability for example. Probably there are other group factors which are split off from 'g' but are not subdivisions of either type. In other words as Vernon has pointed out there is no essential

disagreement of mathematical points and provided that group and multi-factor analysis account equally well for the original correlations by means of the same limited number of factors they are equally legitimate. He continues to develop these aspects of difference by saying that "British workers recognize larger or more comprehensive group factors together with sub factors 'decended' from them, whereas American primary factors more often all possess much the same status and variance. Not only do such primary factors seem from our stand point, to carry some of the variance that could be better attributed to 'g' but also one or more of them (usually a reasoning factor) may consist wholly of 'g'.

Vernon although favouring the hierarchial theory is scrupulously fair in his succeeding argument and also draws attention to the fact that the hierarchy (and also the opposite effect) may well be a statistical artefact)- for example - "the notion of hierarchy arises merely because centroid factor, and group factors do not necessarily correspond to the bi-polars; any one group-factor often combines parts of the variance of the first factor and of two or more bi-polars. Finally, we have admitted that strict hierarchy is an over-simplification. For those readers, however, who wish to follow the various arguments in more detail recourse should be made to Vernon's work on the "Structure of Human Abilities".

How then do these various theories fit in with our line of argument. It will be seen both on quantitative and qualitative grounds that a general factor 'g' can be made available to both modes of reasoning - that is as a basis for both the group factor and the multiple-factor theories. Another tentative solution to these apparently contradictory findings might be as follows, that we deal with the problems as calling for two separate but related types of law - the one dealing with structure and the other with inner-dimensions. It is suggested that the Piagetian cognitive aspect of the mental process can be explained in terms of a hierarchical structural arrangement (compare Hebb's Intelligence (A) and that the Thurstone content aspect can be described in terms of related multiple factors (Intelligence B): both systems would have Spearman 'g' as a common denominator.

The inner-dimensional approach would thus overlay the structural (lattice fashion) or in other words the structural approach would depend upon the inner-dimensional factors (and vice-versa). The hierarchial side would be largely governed by hereditary influences but would be to some extent be affected, as Burt as indicated, by environment whilst the inner-dimensional side would be largely affected by upbringing and education although hereditary influences would play their part. The model can be shown schematically as follows:-



Although this may be an over-simplification it does meet the objections of both sides. It deals with the 'de facto' description of the human personality and at the same time gives free play to both the qualitative and quantitative aspects of the structure and the inner-dimensions of intelligence considered in terms of the hypothetical construct 'g' where Intelligence B is considered in terms of f(A).

Mental Age	Factor	Theory
21+	Creative Thinking Etc.	
15+	Abstract Thinking at Conceptual Level	
13+	Deductive Reasoning at Conceptual Level	
11+	Relational Thinking at Conceptual Level	
9+	Relational Thinking at Perceptual Level	
7+	Association of Ideas at Perceptual Level	
5+	Illogical Reasoning at Perceptual Level	
2+	Sensory - Motor Level	
C.A. = 0	<u>HIERARCHICAL STRUCTURE</u> (BURT/MOORSY/PIAGET)	

IQ = 140 plus

IQ = 70 minus

INDEPENDENT FACTORS : LEARNING

MATURATION : GROUP FACTORS

Etc.

NUMBER

VERBAL

SPACE

INNER DIMENSIONS :

"N"

"V"

"K"

(Thurstone/Thomson).

Plus Specifics

(Binet/Terman etc.)

WHERE $B = f(A)$: (HEBB - JAMES)

(Refer to Thesis Page 73).

It is tentatively suggested as the writer has previously indicated and will now emphasise by repeating that in view of the many factors that produce variable results in the testing of a child's (or an adult's) reasoning power and attainment it would be better to speak of the "functional level of intelligence rather than of the "intelligence estimate (I.Q.)" per se in other words we should estimate the functional level of the I.Q. in terms of both the underlying structure and the inner dimensions. Whilst it is suggested that the I.Q. (as a hypothetical construct) would then constitute a biographical cross section of the group - and multiple factorial arrangement inherent in the test battery concerned.

Sentence?

Some of the controversy concerning variations in test scores (as a result of coaching or the effect of environment as opposed to heredity, or urban as compared with rural background, or bilingual performance as contrasted with monoglot accomplishment) appears to spring from two main sources. There may be considerable difference between a child's performance on a group test of ability or of scholastic attainment and the estimate arrived at from clinical tests administered individually. In constructing a range of items for a test, one tries so to arrange them that differentiation is possible between levels of thinking shading gradually from the simple association of ideas at the perceptual level to relational thinking at the perceptual level and subsequently to conceptual thinking at the abstract level. As the present writer has pointed out in his critique, "Bilingualism and Non Verbal Reasoning" - when attempting to assess the personality of a child (or children) for purposes of research, or with a view to educational guidance one would do well to be careful in one's choice of measuring instruments particularly before arriving at broad generalisations which may have practical implications in the field of educational policy. Data which are both quantitative and qualitative can be equally valuable in reaching conclusions, whether such data be based on the results of group tests or teacher's estimates on the one hand, or on the individual test and clinical examination on the other.

Much of value can be obtained from the studied use of statistical method, but the value can be enhanced by the cross-fertilization of the quantitative-scholastic and the qualitative-therapeutic techniques through including both nomothetic and ideographic procedures. Only then can one make an adequate analysis and synthesis of relevant aetiological factors of the case which may be followed by a tentative diagnosis. This holds true whether we apply our techniques to the assessment of pupils with a "view to streaming" within classes, transferring them from primary to various types of secondary schools or the ascertainment of handicapped pupils in need of special educational treatment. In such circumstances one would use a variety of appropriate test instruments and weigh in the balance a multiplicity of factors including the influence of degrees of bilingualism as opposed to bilingual background.

In our discussion of the development of the mental processes of the many factors not the least important is verbal ability which in our case is particularly relevant to the question of assessing the effect of early versus late learning. The ability to speak is a mental function possessed by man and no other animal: it enters into all forms of higher intelligence in action. Burt has pointed out that "in most researches in the cognitive field, the factor which accounts for the greater part of the individual variance, after the first general factor has been removed, is a bi-polar-factor distinguishing verbal from non-verbal abilities. Burt was one of the earliest psychologists to recognise this factor (which was long denied by Spearman) and his scheme has been briefly set out as follows:

"It should be remarked that the 'factors' enumerated denote component tendencies only, not distinct abilities or separate processes located in definite centres; and it will be seen that the results of factorial research are on the whole in broad agreement with the views on speech mechanisms reached by Head on the basis of his tests and clinical observations - certainly they fit in much more closely with his account than with the artificial scheme of speech-centres favoured by the earlier school medical officers and by a good many contemporary psychiatrists - in short by those which Head has termed the diagram makers." Burt outlines his description of verbal abilities as follows:

I. Word Factor (dealing with words in isolation).

- A. Receptive Factor (factor for recognizing words and understanding ideas expressed).
(i) Visual (understanding printed or written words).
(ii) Audio -motor (understanding words heard or uttered).
- B. Executive (factor for finding or selecting the right word to express a given idea; cf. Head's nominal defects).
(i) Articulatory (in speech).
(ii) Graphic (in writing).

II. Language Factor (dealing with the words in their context).

- A. Receptive (factor for understanding statements: cf. Head's semantic defects).
- B. Executive (factor/literary expression, verbal fluency cf. Head's syntactical defects).

Burt's formulation of the factorial implications of verbal ability is valuable both from the point of view of clarifying one's ideas with reference to the structure as well as to indicate the complexity of the problem with which we have now to deal experimentally. It also highlights the new problem of the difference between verbal and non-verbal reasoning tests.

Vernon's account of the verbal and non-verbal factors present in intelligence tests is useful in this context. He pointed out that recent researches indicated that nearly half the communality of many group verbal intelligence tests consists of 'v' rather than 'g' but that some types of test are less 'v' saturated than others. For this reason it is important as far as our experiment is concerned to make use of the Non-Verbal Reasoning Test although one must agree that there is no clear dividing line between the two types of test - for Non-Verbal Reasoning Tests whether they be abstract or pictorial usually show a small spatial-perceptual element as well as what might be termed the effect of 'verbalisation'.

Vernon has indicated that there is a vast quantity of somewhat conflicting evidence concerning the factor-loadings of the non-verbal test. "At the same time the distinction between spatial and other non-verbal group tests is by no means as clear as El Kousy believed. Tests such as Cube Counting and Paper Formboard appear to involve imagination of shapes and have obtained large K-loadings in many experiments. Yet they were originally designed as parts of the Army Beta Test for measuring intelligence non-verbally and were included by Stephenson (1931) in the battery whose

inter correlations he attributed solely to 'g' Emmett (1949) recently analysed El Kousy's figures and showed that several visual tests together with mechanical tests and woodwork marks have almost as high K-loadings as the original eight tests. Though Alexander (1935) and Dean (1947) accept Spearman's and Stephensen's assumption that non-verbal 'g' tests depend only on 'g', their results accord at least as well with the view that they contain a small spatial component".

In his critique of Bilingualism and Non-Verbal Reasoning" the present writer has discussed in detail both the difficulties and the value of using non-verbal criteria in the scaling of Teachers' Estimates with a view to using them for purposes of research. In brief the non-verbal instrument is as good as any other test providing both the use to which it is put and the terms of reference of the experiment are relevant. The test chosen will depend on our preferential reasons, as Burt as indicated "when discussing the value of such tests as Moray House or Terman and Merrill, "others again prefer tests of non-verbal or performance type. Furthermore, all such tests have imperfect correlations both with each other and with independent estimates. Thus as far as other forms of psychological measurement, their results are largely affected by incidental influences irrelevant to our main purpose and are consequently disturbed to a far greater extent than physical measurements, by error. But if we have no antecedent definition of what we want to measure how can we distinguish what is irrelevant from what is not".

We are indeed faced with the same order of difficulty as that indicated by Hebb, in his neuro-psychological theory- the problem is the relation of qualitative to quantitative analysis and this is, in brief, the problem of the hen and the egg. We cannot profitably refine our quantitative to a much greater degree than the refinement of our qualitative conceptions. The two must develop hand in hand. Before one can measure profitably, one must learn what one is measuring, or find the right things to measure. In this sense qualitative analysis must precede quantitative. When the quantification is done, it is likely to react upon, and improve, that which preceded it. New qualitative analyses lead to better ideas of what to measure, and so forth Trying to short-circuit this process, when dealing with a system in which variables involve

a large number of dimensions inevitably makes rigid one's present theoretical ideas and tends to prevent growth rather than stimulate it. Precise qualifications with respect to theoretical entities should only be expected in late stages of development of science." We have seen how valuable Hebb's thesis is when we compared, for example, Piaget's qualitative description of the cognitive levels with Moursy's quantitative factorial analysis, Thomson's comparable dictum is, therefore, well worth remembering. "There are many other ways of explaining them, but let us adopt this one. We have thereby defined a factor 'g' mathematically. It is for the psychologist to say, from a consideration of the tests which define it, what name this factor shall bear and what its psychological description is."

We have had a preliminary discussion of Hebb's neuropsychological theory particularly with reference to the cortical hypothetical constructs (cell assembly/phase sequence) which he submits have a bearing on the influence of early as opposed to late learning. We have seen that his interpretation of the modes of human perception leads him to a bi-focal view of intelligence in accordance with the suggested laws of structure and inner dimensions. There appear to be both qualitative support (Piaget et al) and quantitative (Moursy et al) support for this type of theorizing. We can now see that this more complex form of intelligence process is more acceptable to our ideas of a TOPE organisation and which involves an interpretation of the symbolic function in a way far removed from the old S-R system. The use of the verbal factor assumes in these circumstances an important role particularly when our aim is to assess the functional level of intelligence rather than an estimated I.Q. The functional level is based on the assumption that both hereditary and environmental influences indissolubly affect the developing intelligence of a child. If, therefore, we are to conduct an experiment in comparative philology we have as far as possible to find two matched intellectual groups of bilinguals whose non-verbal reasoning powers are equally saturated with 'g' and 'v' (Welsh/English) in such a manner that their social background as individual groups do not differ radically the one from the other. Finally, having taken account of the factors of intelligence and environment our purpose will be to put Hebb's theory to the

Cannot follow this distinction

test by using the stimulus response technique in a number of modalities and languages. This would call for a neutral verbal stimulus and responses which would be so evidently differentiated as to indicate that there may be some substance in Hebb's theory of the effect of early as opposed to late learning.

Before we put the theory to the test, and having already dealt with questions of perception and of intelligence we must now consider the environment on the bilingual setting of the experiment for as Hebb has indicated, "there are two determinants of intellectual growth, a completely necessary innate potential (intelligence A) and a completely necessary stimulating environment. It is not to the point to ask which is the more important; hypothetically we might suppose that intelligence will rise to the limit set by heredity or environment, whatever is lower. Given a perfect environment the inherited constitution will set the pace; given the heredity of a genius, the environment will do so. The essentials of this environmental influence cannot be specified. Though we know that wealth, prolonged schooling or "intelligent" parents (that is with Intelligence B) are not essential, these things may contribute. Since the guess has been made that the essential is exposure to intelligence B, it is presumably true that the child must either have intelligent parents or intelligent acquaintances and teachers. Schooling is also becoming more and more necessary to an understanding of adult problems in this society; and a certain amount of wealth and freedom from economic pressure, may be necessary to full intellectual development. The fact is, however, that we know almost nothing specific about the matter. The country may be full of potential geniuses for all we know, and it should be a pressing concern for psychology to discover the conditions that will develop whatever potentialities a child may have".

It will not be out of place to remind ourselves for a moment that a multiplicity of influences, other than intellectual and linguistic, affect the development of personality and that bilingualism - or comparative philology - as such, are but a few of the many influences which affect a child's educational progress and mental health and in turn inhibit or promote the functional level of the underlying structure of intelligence.

Thomson points out that growing up as we do into a society speaking our mother tongue and daily using thousands of phrases and catchwords which imply judgments we are very liable to acquire the phrases and catchwords without any real

consideration of the judgment involved. So we become like Englishmen , or Frenchmen, Turks or Prussians; so we become little Liberals and little Conservatives.

The Welsh Department of the Ministry of Education speaking of the special characteristics of Welsh Culture stresses the wider influence "that each country reveals in its beliefs, manners, customs and literature; elements that are peculiar to it alone. It is by developing these, by creating conditions whereby the best that lies in the particular genius of the nation can flourish". Hence research into the comparative philology of the functional level of a child's intellectual development involves the psychologist in an appraisal, not merely of the relative qualitative and quantitative effects of socio-economic, emotional and intellectual factors in addition to the linguistic, but in an analysis of the very culture (or cross cultures) that shapes the structure of his thoughts and beliefs.

GODFREY THOMSON: "Instinct, Intelligence and Character",
pub. Allen and Unwin, 1949.

H.M.S.O: "The Place of English and Welsh in the
Schools of Wales".
Report of the Central Advisory Council
for Education, Wales, 1953.

CHAPTER III

COGNITIVE AND ENVIRONMENTAL ASPECTS OF FUNCTIONAL INTELLIGENCE

An appraisal of the relative influences of early as opposed to late learning has led us from a discussion of the neuro-psychological aspects of functional-intelligence to the cognitive and related aspects of semantic systems in the thought processes of children and adults. We have seen how the individual reflects and is affected by the many social and linguistic milieus in which he finds himself. Such an individual according to E.T. Miller in his "Principles of Sociology (1933) is an "organism with its innate physical and mental capacities. We are individual at birth but we become persons when we acquire status in a group, a reputation, a role, and a conception of our place among our associates and even among our contemporaries generally". In many recent researches on the relationship between bilingualism and intelligence the socio-economic factor has been either overlooked or ignored although the present writer in his "Comparative Study of General Performance between Bilingual and Monoglot Children in South Wales" (1947) drew attention to the need to assess the socio-economic, cultural and scholastic influences affecting experimental and control groups before carrying out a statistical analysis of their results.

CYRIL JAMES: "A Comparative Study of General Performance between Bilingual and Monoglot Children in South Wales", B.Ed.Thesis, Edinburgh University, 1947.

Hebb has put this point succinctly as follows:

"As to the abilities or intelligence, it is now generally accepted that races and peoples cannot be compared in heredity endowment since low scores may be due to cultural background. That the level of problem solving at maturity, then, may be permanently influenced by childhood experience is an accepted psychological principle despite a certain inconsistency of the theorists who think that the Negro's low I.Q. is to be explained so, but seem to have forgotten that the poor abilities may be in the same class." This statement follows upon his attempt to define the general relationship of first learning to later learning in terms of behavioural evidence.

Cultural influences, therefore, have a direct influence on the various stages of learning and as Edward Reuter has pointed out - a culture has a high degree of continuity a tendency to resist change and to change but slowly unless it is profoundly disorganised. This stability remained in the presence of heterogeneous biological changes of type. Heterogeneous types may be carriers of homogeneous cultures: all of Western, Central and Eastern Europe represents a general homogeneity of culture but a heterogeneity of racial type. In a smaller area, such as France or the United States the same fact is yet more obvious. The same is true of the various elements of culture that migrate separately. The English language, for example, persists in spite of the fact that it is used and transmitted by a large percentage of the world and by the most diverse racial type. As we have already seen language belongs both to the individual and society - we cannot put it into any category of human facts because we cannot discover its unity. Similarly, an individual may express himself in several languages whilst a particular society may also make use of one or more languages as modes of communication. It goes without saying that such a situation must profoundly affect the learning processes of the child. In Wales in particular we see that the need to assimilate two languages has various educational, political and cultural repercussions - as well as personal implications for the child.

Hebb has indicated that "there seem to be two main factors that would make for some consistency in the activity of the association areas at different times. One can be referred to as the intrinsic organisation in that activity; the other is the steadily increasing influence of the infants environment". The former we have already discussed in fair detail: let us now turn our attention to the significance of the latter in the development of the learning capacity.

Our treatment of the environment relevant to our experiment will be developed as follows. Firstly, a description of Welsh background and its concomitant linguistic structure, a similar but less detailed statement concerning the place of English since it will be assumed that the structure of English will be more familiar to the general reader. The place of English will, therefore, be treated only in so far as it affects the general policy of the Ministry of Education and the local Authorities. Secondly, a discussion of Wales in general and Carmarthenshire (where the experiment takes place) in particular will help to give the reader the setting of the problem. This will be followed, thirdly, by a consideration of language policies within and outside the United Kingdom together with fourthly a summary of the effect of linguistic differences on the policy of the local Education Committee in regard to the education of the individual child, on the one hand, with reference to his age, aptitude and ability and on the other concerning the special educational treatment of the handicapped child and in particular the educationally sub-normal. And finally a description of the local Education Authority's method of implementing its policy in terms of scholastic organisation and methodology. This will in effect be a resume of the socio-economic background of the experiment.

The intrinsic organisation of a child's mental activity will, therefore, be directly affected by two major factors, namely,

- (1) the education which he has received.
- (2) the less tangible effect of social intercourse through -

EDWARD REUTER:

"Principles of Sociology" p: 136
pub. Barnes and Robb, New York 1955.

(a)"Kultur Mischung" (overlapping of cultures).

(b)"Sprach Mischung"(admixture of languages).

Of particular interest to our experiment will be the latter since a judicious comparison of two linguistically orientated groups (matched for intelligence and socio-economic background) will enable us to study the relative effects of early vs opposed to late learning whilst the control group will be made up of monoglot English children of similar background.

Our first task will be to make a comparative linguistic study of the place of English and Welsh in our experimental environment. As an introduction to our discussion we may consider Whatmough's lucid summary of the treatment of language study: "Those who occupy themselves with structural linguistics are concerned to reduce the welter of data derived from discourse, the stream of speech, the neat economical statements of the systems of sounds (phonology), of forms and words (morphology) and the arrangements of order of the latter (syntax). Such systems are then compared with one another and with systems of divergent types, such as pure logical systems, but this also is a task which structural linguists decline. It is all the more encouraging that initial steps toward the analysis of discourse, as such (i.e. not as phonology, morphology and syntax) are being taken by a few devotees of symbolic logic." He goes on to say that "languages after having been analysed by this technique may be classified as to structural type. That part of linguistics which has to do with descriptive or structural analysis on a synchronic level falls into four subdivisions pertaining to (i) speech sounds (phonematics) (ii) Forms (morphomatics) (iii) Arrangements of Forms (syntactics) and (iv) Meanings (Lexicology - the underlying procedure is always contrast and comparison. This follows from the fact that we are dealing with systems of linguistic symbols and with the distribution of the symbols within each system. The system is a construct which formulates the mutual relations of the symbols - the acts of speech or utterances that express state of awareness." Since the language learned is a set of speech habits and an acquired skill it is important for the researcher to be aware of the background against which that and related skills were acquired because language is an aspect of human behaviour which directly reflects environmental

JOSHUA WHATMOUGH: "Language: A Modern Synthesis", pub.
New American Library Mentor Book, 1957.

influences and involves learning. It is of interest for us to glance briefly at the way these new systems of language develop and affect the individual.

Welsh is a member of the Celtic branch of the Indo-European family of languages, its closest relations are Cornish and Breton. Celtic languages are divided as a matter of convenience into two broad divisions of Continental Celtic (or Gaulish), which disappeared in the early Christian era Insular Celtic. Such a geographical division, however, tends to obscure certain fundamental differences of phonology within the insular group: it does, however, serve our present purpose.

Gaulish is a term which is usually used loosely to denote the remains of Celtic speech scattered widely on the Continent in Cisalpine and Transalpine Gaul, the Iberian Peninsula, Central Europe to the Black Sea, and Galatia in Asia Minor following the settlement of the Celtic Galatae in Northern Phrygia, as a result of their incursion into the Balkans. Most of the material which survives comes from Gaul and very little is known of the Celtic dialect spoken farther east.

"Insular Celtic" as is implied by the term, refers to two varieties of Celtic Speech introduced into Britain and Ireland, namely, Gaelic and British (or Brythonic). Gaelic was the parent language of (a) Irish (b) Scottish Gaelic (in the Highland of Scotland and the Western Isles), derived from the Irish Speech (or Common Gaelic, as it is sometimes called) brought to Scotland at the end of the fifth century by the Dalroideic colonists from north-east Ireland who settled in Argyll and (c) Manx, which is similarly derived from the speech of Irish settlers who arrived in Man approximately in the fourth century. This latter language is now virtually extinct.

British or (Brythonic), the other variety of Celtic speech which was introduced into this island was the parent language of (a) Welsh (b) Cornish, which was in grave danger of becoming extinct even as early as the latter part of the eighteenth century and (c) Breton, taken over by British emigrants who, as a result of Anglo-Saxon pressure fled in successive waves to the Armorican Peninsula from the middle of the fifth century to the early seventh. The fact that many of the refugees particularly during the middle and second half of the sixth century, came from Devon and Cornwall, accounts for the close relationship between

Cornish and Breton and for the various phonological and morphological features which during successive periods in their development these two languages shared to the exclusion of Welsh.

Those two varieties of Insular Celtic represent what have been termed the P and Q branches of the Common Celtic distinguished by the way they treated the Indo-European labio-velar consonant q^u . This in Gaelic labio-velar q^u was preserved but in English, on the other hand, Indo-European (and Common Celtic) q^u became P.

Welsh, then, belongs to the P branch of Celtic, being a descendant of British (or Brythonic), the language or group of related dialects spoken by the Celtic inhabitants of Britain both before and during the Roman occupation of Britain. Those who spoke this language were called Brittonēs (> Welsh Brython), and their language Brittonika (> W. Brythoneg). The Welsh, however, now call their national language Cymraeg (accented on the final syllable - (Cym-ra-eg), and they refer to themselves as Cymry (Brit. Kombrogi 'men of the same region, fellow countrymen), singular Cymro (> Brit. Kombrogos, compare with the first element in Cumber-land). This name, however, only became current as a national appellation after the Britons of Wales had been effectively separated from those of the Dumnonian peninsula by the English penetration into the Severn Valley, which followed the battle of Deorham (or Dyrham) near Bath, in 577. The name probably became current on this connotation during the latter struggle in which the Welsh participated with the Britons of Strathclyde against the encroaching English, a struggle which culminated in the fateful battles of Chester (613) and Winwaed Field (655) which finally separated the Welsh from their north-western compatriots.

The British language was thus spoken throughout the areas now known as England and Wales and in parts of Southern Scotland, before the Roman occupation. And it continued to be spoken in Roman Britain, in both the Highland and Lowland Zone. The old catastrophic picture of the complete disappearance of British speech over large areas of the Province has now been abandoned. Latin must have been the language of government, of civil and military administration, of trade and commerce, of education and the Christian religion, and to a marked degree, of the great civil settlements as well as of the market and garrison towns. But the vast

majority of the rural peasantry probably spoke British and this is certainly true of the less intensively Romanized regions of the Highland West.

As British was thus spoken over so wide an area, there must inevitably have been some dialectical variations. Unfortunately hardly anything is known of the British language or dialects spoken in eastern Britain. In the west, on the other hand, it is possible on phonological grounds to distinguish between a West and South Western dialect of British. The former was the parent of Welsh and the closely related speech of Cumbria, whilst south-western British was the ancestor of Cornish and Breton. It was probably not until the fifth and sixth centuries that these dialects began clearly to diverge, although according to the most recent work on the phonology of the British languages, there are some slight indications of possible dialectical differentiation as early as the first century (Jackson 1953). It is impossible, however, to pass confident judgment on any phonological differentiation during this early period, as the direct information for studying British is extremely meagre - our knowledge being largely obtained by inference. Not one sentence of British has survived nor is there any inscription written entirely in that language. Apart from the information that can be gleaned from the inscriptions on the coins which were occasionally minted by pre-Roman Kings and Princes, our direct knowledge of Early British is confined to Place-Names, personal and tribal names and a few common words which occur in Classical sources.

Fortunately, however, there is one source of inestimable importance for understanding the structure and development of British, namely, the Latin words which were borrowed by the ancient Britons during the Roman occupation and which have survived in the vocabularies of Welsh, Cornish and Breton. When British decayed and became Welsh, etc., the loan-words underwent the same phonetic developments as the basic Celtic vocabulary. By comparing the Latin words with the forms into which they subsequently developed, the philologist can deduce what were the regular phonetic changes which ultimately transformed the dialects of British into Welsh, Cornish and Breton. With this information at his disposal, and guided further by the overall picture presented by the Celtic remains on the Continent, it is possible for the philologist to trace the various elements in the Welsh,
KENNETH JACKSON: "Language and History in Early Britain."
Edinburgh. 1953.

Cornish and Breton vocabularies back to their original forms and thus reconstruct hypothetically certain features of the parent British language.

According to the picture thus created, British was a synthetic language in the same stage of development as Latin, to which it bore some striking resemblances in its sound system and morphology, so that the borrowing of Latin words could have presented no great difficulty for the ancient Britons. (A study of Old Irish, however, presents us with the salutary warning that there must also have been fundamental differences between the two languages). British was no doubt a fairly stable language in the first century and as such it could not have been drastically dissimilar in its phonology from Common Celtic. It was the Roman occupation which probably led in the first instance to its gradual deterioration a fact which has been ascribed to the loss of official status and cultural prestige suffered by the native inflected language during this period, as well as to the removal, as a result of the political degradation of the British upper classes, of any conservative influence which may formerly have been exercised on the native speech, so that greater freedom was given for the increasing percolation of the more 'developed' and corrupt type of British spoken by the lower orders.

According to some authorities the collapse of Roman organisation in the early fifth century and the social upheaval caused by the Anglo-Saxon conquest and settlement acted as a catalyst in the phonetic developments of the first four centuries, thus leading to a considerable acceleration in the rate of linguistic change, and ultimately to the complete transformation of British into Welsh, Cornish and Breton.

Similarly, the drastic linguistic changes which marked the transition from Old to Middle Irish can be attributed to the disruption of the old order under the impact of the Norse invasion while the subsequent change to Modern Irish is usually connected with the advent of the Anglo-Romans.

Students of English are familiar with the thesis that impact of the Roman Conquest was in a large measure responsible for the rapid deterioration of Anglo-Saxon and the change to Middle English.

The various phonetic changes which ultimately transformed a dialect of British into Welsh are clearly reflected in the development of Latin loan-words in British. The most important of these were (i) a series of vowel changes (ii) a series of consonant mutations (iii) vowel affection, a phenomenon analogous in certain aspects to the Germanic umlaut, whereby a short vowel in British (and in Latin loan-words) was affected by a sound in a succeeding syllable (iv) the loss of final and unstressed initial syllables including the syncope of unstressed composition vowels. For those who are interested in following up these suggestions reference can be made to Ceri Lewis' monograph in the survey of the Cardiff Region made by the British Association for the Advancement of Science.

Without doubt the most important of all the various phonological changes which characterised the transition of the Western dialect of British into Welsh was the disappearance of final and unstressed internal syllables, a process which resulted in the complete disintegration of the British case-terminations and which inevitably brought about a profound transformation in the whole syntactical and morphological character of the language. These linguistic changes did not all occur simultaneously, and they were of course, gradual developments albeit quickened in some measure, according to some authorities by the disturbed conditions of the immediate post Roman period, which brought the various phonological changes to their culmination so that the old synthetic British language gave rise to the new analytic language Welsh.

It is clear, therefore, that the real fundamental changes in the history and development of the Welsh language were those involved in its evolution from the synthetic parent tongue. No changes of comparable magnitude have occurred since. This is not to imply that the language has since ceased to change and develop. Indeed it is convenient for purposes of study to divide the language into the following periods:

- (1) Early Welsh from the time when the language had developed from British to the end of the eighth century. More fragments survive from this period such as forms Car Legion (for Caerlleon - Chester).

CERI LEWIS: "The Welsh Language" for the Cardiff Region: Survey drawn up by the Br.Assoc.for the Advancement of Science. pub.University of Wales Press, Cardiff 1960.

(ii) Old Welsh from the beginning of the ninth to approximately the end of the eleventh century the 'Computus Fragment', a passage of prose written in the tenth century as a commentary on one of Bede's astronomical tables, proves conclusively that the language was already a fitting medium for the precise and lucid exposition of the most abstruse subjects.

(iii) Medieval Welsh, from approximately the beginning of the twelfth to the end of the fourteenth century and in some instances somewhat later. There was a considerable variation in the orthography of this period, from which a wealth of material both prose and poetry have survived. The best known examples of Medieval Welsh are probably the eleven stories traditionally called the Mabinogion which are preserved in the White Book of Rhydderch (Llyfr Gwyn Rhydderch), written down c.1300-25 and now in the possession of the National Library of Wales, Aberystwyth, and in the Red Book of Hergest (Llyfr Coch Hergest) c.1375-1425 now preserved in the Library of Jesus College, Oxford.

(iv) Early Modern Welsh from the 'cywyddau' of Dafydd ap Gwilym (1340-70) to the sixteenth century.

(v) Late Modern Welsh, from the sixteenth century (the translation of the Bible in 1588 to the present day.

It is of interest to note, that whatever differences may divide these periods from one another, they are by no means as drastic or as fundamental as those which divided Old English from Middle English or both from the English Language to the modern period. 87

A situation gradually developed where the original Welsh came into competition with the encroaching English institutions - social, religious and political - with the balance weighing heavily in favour of the latter as their power grew particularly after the Roman invasion when French customs became gradually identified with the ruling English hierarchy, although the latinised Norman-French language also had its influence on Welsh. In spite of the growing linguistic power of English the Welsh language was still retained by the ordinary people as its mode of communication although in recent years as a result of the mass media of linguistic intercourse, namely newspaper, and television, English has begun to play an increasingly important role both inside and outside the United Kingdom

A word on the development of the English Language would in this context not be out of place although its history is more familiar to the general reader than that of Welsh. Before recorded history the Indo-European speaking people had gone their different ways and their language had differentiated into dialects. About the beginning of the Christian era one of these dialects, known as Primitive Germanic or Teutonic, in its turn began to split up into dialects and it is from these that the modern Germanic languages are descended. From the West Germanic dialect branched low German and then English.

The Germanic language known variously as Old English or Anglo-Saxon was introduced into Britain by the Anglo-Saxon infiltration and the history of the language after that time is usually divided chronologically into three main periods of development:-

- (1) Old English from the time of earliest records to 1150.
- (2) Middle English from 1150 to 1500.
- (3) Modern English from 1500 onwards.

These dates are of necessity arbitrary since it is not possible to mark off precise epochs. These periods are for the sake of convenience further subdivided into:- Primitive Old English - before the time of the earliest written records - and into Early and Late Old English (before and after 900), and the Middle and Modern periods are also often subdivided into Early and Late, though such subdivisions should not perhaps be taken too seriously.

The Anglo-Saxon invaders of circa 500 tended towards the middle of the century, as the Romans withdrew from Britain, to meet Celtic speakers rather than Latin. The Anglo-Saxons originally used the Runic Alphabet which persisted in use throughout the Old English period but for ordinary purposes it gave place after the conversion to Christianity to a form of handwriting which was an adaptation of the Roman Alphabet in use among the Irish and which was passed on to the English by Christian missionaries from that nation. As for vocabulary the greatest number of loan-words in Old English come from Latin, and can be divided into those borrowed while the pre-English tribes were still on the continent and those borrowed in England. To these may perhaps be added a third class consisting of words borrowed in England from Latin-speaking Celts. The number of words assimilated

from the Celtic language itself is, however, strictly limited. The next important influence in the vocabulary was that of the Scandinavian invaders who settled in England during the ninth, tenth and eleventh centuries though the effects are not noticeable before the Middle English period. Moreover old Norse affected not only the vocabulary but extended to matters of grammar and syntax.

The Norman Conquest marked an important stage in the history of the English language: numerous French loan-words were borrowed. Furthermore, the literary supremacy of West Saxon was lost. The increasing importance of London during the M.E. period meant that henceforth the dialect of the capital would be supreme so that Modern Standard English is derived from East Mercian rather than from West Saxon dialect. The Conquest had an effect on the orthography. With the breakdown of the old spelling a new orthography was developed based on the actual spoken language. As a result sound changes which had taken place in old English, but had not been represented in the written language were first regularly recorded in the more phonetic spelling of the post Conquest scribes who adopted the new Carolingian script which remained in use with some changes until the fifteenth and sixteenth centuries. Many sound changes took place and in most M.E. dialects grammatical gender appears to have been lost early in the period. Many other changes also took place. As for vocabulary the most important influence during the M.E. period was from both the Norman-French and the literary central French dialect. The languages of the Low Countries - Flemish, Dutch and German - also formed an important source of loan-words.

By the second half of the fifteenth century London English had been accepted as a standard literary language. It is, of course, only one of a variety of forms of spoken English which can be divided into three classes (1) received standard English i.e. the English of the educated classes used without self consciousness (2) modified standard i.e. a compromise between the former and some regional or occupational dialect and regional dialects, i.e. those of localised use in rural areas. One of the most important influences in establishing London English as the standard literary language was the introduction of printing in 1476. Nevertheless the standard was not fixed until far into the seventeenth century and even then the pronunciation was not as certain

for most of the words as it is today for from the sixteenth to the eighteenth century considerable variations in pronunciation existed. The Modern period also saw the development of a fixed spelling. It was in the eighteenth century that the Gothic or "black letter" type usually used by the early printers gave place to the Roman characters and the long S was thus replaced by the ordinary S. During the modern period the most notable addition to the vocabulary has been the influx of words from classical sources and in recent times the coming of new scientific terms.

All the while the developing English language ran alongside and sometimes counter to the more ancient Welsh language which continued to maintain its virile independence despite its loss of official status to the English.

There were, therefore, three broad literary traditions which affected the people who lived in Wales - the Latin the Welsh and the English. It is clear that such strong traditions must of necessity have a direct relationship the one with the other especially as regards vocabulary and imaginative content. One celebrated example of the Latin tradition was the "Historia Regnum Britanniae" by Geoffrey Monmouth who in the twelfth century gave to medieval Europe one of its major writers of creative literature in the Latin tongue. This "History of the Kings of Britain" is a chronicle purporting to give the history of the Britons from the time of Brutus, who according to legend flourished over a thousand years before Christ, to the death of Cadwalader in the seventh century A.D. In the field of medieval literature the widespread influence of the 'Historia' was largely due to the part devoted to Arthur. It can be said that Geoffrey's two outstanding specific contributions to the literature of Europe are his portrait of Arthur and his court which has affected a long line of poetic followers and also the story of Lear - later to be dramatized by Shakespeare. Earlier references to Arthur in 'historical' sources such as Nennius and the Annales Cambriae had been meagre, while in Saga and in traditional verse in the Welsh language he was portrayed as a beneficent giant. Some traces of the Arthur of folklore remain in Geoffrey's account of him but the general picture is that of a contemporary feudal ruler, and this conception of Arthur passed through the work of Geoffrey's popularisers, such as Wace and Layamon into the main stream of European vernacular literature during the twelfth and thirteenth century.

The Welsh literary tradition remained strong even though Wales fell into the hands of the Normans in the twelfth century. This was for example a period of great literary activity when the bards sang in the halls of Welsh princes and as we have seen the period of Arthurian romances, when the 'cyfarwyddiad' (the story tellers) told the old legendary tales the period when so many Latin and French texts were translated into Welsh. Scholars are agreed that many of the manuscripts which contain this prose literature were written in South Wales monasteries and that most of the texts contain forms and expressions which strongly suggest that the authors and translators spoke the South Wales dialect. This was the period of the great court poetry of Gwynedd, Powys and Deheubarth when the struggle for independence led to a poetic revival. Between the fifteenth and seventeenth centuries Welsh poets formed themselves into professional bodies and they became the custodians of the cultural traditions of the nation. They were not admitted unless they had received formal training and the teachers, the 'penceirddiad' had to testify as to the attainment of their pupils. They had to master all the intricacies of Welsh metrics, the four and twenty strict metres and 'cynghanedd' that complicated system of consonantal correspondencies and internal rhyme which had been perfected in the fourteenth and fifteenth centuries. They were also the recognised authorities on the genealogies of the noble families. This bardic system retained an unbroken continuity until the seventeenth century when it finally disintegrated. But in the first half of the eighteenth century rose a new generation of scholars who began to revive old traditions which strangely enough led to the establishment of Welsh societies in London. This movement spread to Wales in the early years of the nineteenth century and received a great welcome in the new industrial areas leading eventually to the establishment of the eisteddfod. This summary is brief but gives an indication of the live nature of the language which is still a first language among one third of the pupils of Carmarthenshire, the abler among whom can pursue their studies to university level in their own language.

The English literary tradition has grown steadily stronger with the years particularly since in recent times economic incentives prevail upon parents whose first language is Welsh to bring up their children in the English

tongue. Such an incentive first became most evident when the provisions of the Acts of 1536 and 1542 made it illegal to conduct any part of the King's official business in Welsh - this can be regarded as the significant starting point of the English tradition in Wales. Once the Tudor gentry educated their sons in English schools and in the English language one section of the community was placed in touch with the main stream of English literature. The process of assimilation is shown to be complete in the works of Sir John Stradling (of St. Donat's 1583-1637); his Latin epigrams and epitaphs are written mainly for well known Elizabethan authors and writers; his translations of Lucian reflects a typical Elizabethan activity; and although 'Divine Poemes' anticipated the theme of Milton's two epic poems, they also follow the current fashion for imitating Du Bartas. In fact so unmistakable is his Englishness that his writings could be used as adequate illustrations of the trends and fashion of ideas and literary taste among late Elizabethan and Jacobean writers. A detached account of the English tradition would include an account of the relationship between the English tradition which lies behind the Civil War pamphlets, written by Quakers and Dissenters and the late seventeenth and early eighteenth century Grub Street habit of writing comical pseudo-Welsh satirical pamphlets. This habit persisted until the 1720's when on and off the English stage the Scot and the Irishman replace Taffy as a comic butt for the then rapidly crystalizing ^{father} figure of John Bull. When Thomas Gray's Pindaric Ode "The Bard" was published (1757) Wales which had ancient legends and poetry had taken a firm hold on the imagination of English writers. The Gembro-Breton had pushed Fluellen and Taffy into the wings. With the coming of the nineteenth century the establishment of an English based education at primary, secondary and university level strengthened the tide of the English literary tradition whilst in recent times political and economic pressures have strengthened the hand of English writers to the gradual exclusion of Welsh albeit there is a new interest in attempting to hold an educational policy of bilingualism.

It is clear that with the strengthening of the hold of English upon the general linguistic character of the population many English words were assimilated into Welsh so that today in many places a strange dialectical admixture is spoken where the syntax is Welsh but the morphology is English. It does not surprise the reader, therefore, to

learn that the most prolific source of borrowing has been English, from the Anglo-Saxon period right down to the present day. So much so that it would be quite impossible to enumerate or to classify here hundreds of words borrowed in the modern period especially those which are of a distinctly technical or scientific nature. Some of the very early borrowings retain unmistakable traces of the Old English inflectional system. Thus for example 'tarian' (shield), 'cwpan' (cup), 'sidan' (silk), 'capan' (cape, cloak, cope, surcoat) and 'hosan' (hose, stocking) reflect quite clearly the Old English - an ending of the so-called "weak declensions" being derived from one of the oblique cases of Old English targe, cuppe, side, capa, and hosa respectively. Another interesting feature is that Welsh forms often retain sounds and occasionally preserve meanings which have disappeared or changed in the source forms. Thus in Welsh cnoc < English knock or canf < Middle English knave or cnafe, the hard c < is clearly pronounced. Compare also rhonc 'rank' (adjective), 'out and rut', stark < Middle English, ronke and ronk, and clep 'babble', chatter, gossip, bang 'clap' < Middle Welsh cleppe 'clap', noise, chatter. An interesting way in which the Welsh form has preserved the older meaning, while that of the English has changed in Welsh sad, 'firm, steady' cf. Middle English sad, sadde. Again words which have become obsolete in English or now which survive only in some dialects still occur as being forms in Welsh cf., barclod 'apron' Old English bearm clap, or llidiart 'gate' < Old English (the intrusive 'r' in the Welsh form can be attributed, according to some authorities to the influence of English in some form or another. This brief discussion of the influence of English upon which Welsh is of direct interest to our argument for during the examination of the results of our experiment we will see that the same effects are taking place today. Furthermore, it is of interest to note that a study of comparative philology in the novel way in which this writer intends to present it can also throw light on the functional level of a child's intelligence as well as on his thought processes.

These cross cultural influences have a direct effect on the present daily life of the people who use one or both languages as a regular mode of communication but the people

too, are themselves affected by the current events of political policy. "It is a recognised fact," says Jac Williams, "that the fate of a language depends in the main on historical events. Such events, from the time of the Saxon advance and the Norman conquest to the present day, have greatly affected the position of the Welsh language in Wales. All in all the impending plight of a small nation which has not in modern times developed into a politically autonomous unit seems to be that of gradually losing all its remaining native characteristics, including its language and in due course of time reaching a stage of complete disintegration." Such a stage has, of course, not yet been reached in Wales; in North Wales the language is holding its own and also in South Wales - West of Swansea Valley and roughly north of the line drawn from Solva through Haverfordwest to Carmarthen and Llanelly although there is evidence that English is gaining ground and having an effect on the morphological if not the syntactical aspects of the Welsh language. In the West, therefore, and in Carmarthenshire in particular, where the language is spoken naturally, we have what is admirable for the purpose of our experiment. The Welsh language flourishes alongside the English language in Carmarthenshire largely as a result of the Local Education Authority's enlightened policy of teaching the language of the hearth - both English and Welsh. The Welsh language, as such, is also maintained not only through the conscientious work of the teachers but also through the ministrations of the churches and chapels where Welsh is still taught in the steps of the master "Circulating Schools".

How then did this situation of mixed bilingualism arise? The Welsh language, as we know it today, developed when the inhabitants of Wales were separated from those of Cornwall and Cumberland following the gradual penetration of Anglo-Saxon power to the West coast of Britain in the sixth and seventh centuries A. D. Thereafter few alien groups settled in Wales and the Danish incursions and settlements were confined to the coastal districts (as centuries later were the Flemings in the South). There was no interference with the linguistic unity of the principality until the Welsh social pattern, known to us through the preservation of the Welsh laws codified in the tenth century were disrupted by the Anglo-Norman invasions that culminated in the Edwardian Conquest of 1282. Thereafter until the Act of Union, as we have already seen the literary tradition was Welsh as witness the works of the wandering bards and scholars.

After the Acts of Union, however, which sought to make Wales "for ever henceforth incorporated, united and annexed to the realm of England" it was decreed that English should be the only official language in Wales. The inevitable result of such an official policy on the part of those in power meant that advancement on the fringes of the hierarchy could only be achieved by those who knew the English language or in certain circumstances could prove themselves to be of Anglo-Saxon descent. In such circumstances it would be natural that there would be a strong incentive for clerks, traders, retainers and their ilk to learn English; the same incentives hold good today but for a greater number of people since English paves the way to a higher education and hence to social advancement.

Language, therefore, is a social phenomenon and is geared to the daily needs of the people - people who vary in functional intelligence from the low grade, whose acquaintance with the language will never be more than a nodding one to the high grade who will produce linguistic works of creative imagination. The survival of the language will depend in part, therefore, on how far those of limited intelligence can assimilate their chosen mode of communication, and how often works of art produced by the native creative genius. We have already seen how Welsh poetry such as that of Aneurin and legal formulae flourished from the sixth to the sixteenth century whilst alongside these writings other erudite

theses such as Geoffrey of Monmouth's "Historia" also appeared. With the decline of Latin as the 'lingua franca' (despite its retention in academic and ecclesiastical spheres) English took its place - largely because English was easier for the lower down and higher ups" to assimilate. In poetry for example English knew no intricate rules of 'cyngannedd' - in current speech there were no complicated mutations which made it difficult for the uninitiated to converse. The result was that under the influence of both internal and external agencies the English language was fostered at the expense of Welsh decline.

The conquering powers, therefore, must naturally pursue a policy of favouring its own language of administration and in so doing spread its own culture from the centre to the periphery. The same is true of colonial powers although the long term results may differ, for example, in North America where English became the official language of the administration and of the indigenous people its spread was rapid with the result that the "Indian" tongues receded; in India on the other hand where English was the language

of the conqueror it never percolated through to the millions because they largely retained their own mode of life whilst the British hierarchy had contact only with the leading princes. This would tend to promote an indigenous native 'elite', with a double culture, but ostensibly favourably inclined towards the dominant power, as for example in the various African colonies developed by Britain, France, Belgium, Portugal and Spain. There would follow a natural desire for the more ambitious to learn the language of the superior power and to pursue a form of higher education: thus as we have seen the vernacular Ibo, the commercial language Hausa supplemented by English as a means of advancement. In practice, therefore, one may be able to discern various levels of discourse and in a mixed milieu the trend of linguistic development will depend on the varying degrees of emphasis placed on the languages concerned. In other words similar factors may be operating but different results will be produced in accordance with how far the political, social, economic and educational ends coalesce. In the U.S.A. and Canada (with the notable exception of French backed by another high European culture) the new linguistic culture was too strong and single minded for the scattered native tribes: in India English does not seem to have progressed further than the hierarchical fringe whilst in Africa the politically emergent nations may create conditions where English is not acceptable as other than a temporary "modus operandi". These factors have also been operative in Wales where a state of diminishing bilingualism has been in force.

In the United Kingdom there has been a community of interest which despite local distractions in the form of internecine warfare the English, Welsh, Scots, and Irish have produced an economic synthesis where despite the current spate of Nationalist tendencies it would in certain circumstances be difficult to tell the one from the other. Indeed it is this very synthesis which has enriched the genius of the British race. It is to be marvelled at that such a small island can have produced such broad effects of world-wide significance. It is possible that with the coalescing of the Common Market we may again see a new flourishing of European culture with federated countries, instead of squandering their wealth on internal warfare, concentrating their energies on increasing the standard of

life of the indigenous people whilst at the same time fostering a community of interest with their English, French and Dutch partners overseas. In a debate in the House of Lords (November, 1958), for example, a former Colonial Secretary, Lord Ogmores, pointed out to this wider significance of bilingual policy, not only in Europe but in Asia and Africa "One of the most vexed questions, he said, with which statesmen have to deal is that concerning the stage at which the vernacular language should be taught and when one should teach the international language - English, French or whatever might be the tongue of the colonial power."

It will be seen, therefore, that the subject of our thesis - the relative influence of early as opposed to late learning has both direct and indirect interest of a kind which is affecting the general policy of European governments today.

Both internal and external factors are operating in Wales today: unless these factors are chronicled very soon it may well be too late, for the breath of linguistic life may well leave part of the corporate body. Historically, then in our search for the growth of bilingualism it is of interest to note that with the passing of the Anglo-Norman hierarchy a Tudor dynasty of basically Welsh lineage came to the throne of England: This in its way completed the subtle shift of power for not only did the Principality become more than ever part of the bigger area of increasing Anglicisation but the Tudor dynasty broke with its ecclesiastically latinized past and entered into a new phase of peripheral development as far as the Roman influence was concerned.

As far as Wales was concerned the grammar schools that were established in the Principality during the reign of Elizabeth I placed their emphasis on English and as time went on Welsh played a minor part educationally, indeed during the latter part of the nineteenth century the Welsh language was actually persecuted by the introduction of a system which encouraged the use of the "Welsh Not." This is of singular interest to the student of the sociology of language for the Welsh Not was a block of wood, attached to a piece of string which was carried during school hours by a child who had been heard to speak Welsh instead of English. The child was allowed to pass it on to another child who had been heard talking Welsh; the child who carried the block at the end of the school day was given that day's punishment for speaking Welsh. Such ill-conceived methods were the

product of the general position in which the Welsh language found itself in relation to English - and we should in fairness add that such a procedure would not be initiated unless the parents too were to some extent party to the procedure. Nevertheless as O.M. Edwards first Chief Inspector of Schools to the Welsh Department has pointed out this treatment which was not unknown in his schooldays could hardly be described as a good way of producing the desired effect.

Another influence which has affected the shift of language to the detriment of Welsh has been the large influx of English, Scots and Irish workers into Wales during the period of industrialisation particularly into the mining valleys of Glamorganshire and Monmouthshire with the result that today there is little or no Welsh spoken in these valleys. The prevailing language is now English: it is of interest, en passant, to note the use on this area of "do" as a modal auxiliary - a colloquial example of the modification of English syntactical structure. But whereas industrial affluence had a bad effect on Welsh, so industrial depression also left behind a train of difficulties other than economic to cite but two examples: when the lead mines of Cardiganshire were exhausted many Welshmen left for the Americas and elsewhere whilst after the World War I the decline of the mining industry forced many families to look for work in England and abroad. Thus what with the English speaking people moving in and Welsh speaking people moving out there was a constant drain on the reservoir of language.

E.G. Bowen, Professor of Geography and Anthropology at Aberystwyth University has drawn our attention to this important factor in his lecture to the British Association thus: "the distribution of man is the most important distribution of all. It follows, therefore, that population studies must be of the greatest concern to us all, and no study of population can be complete without some analysis of migration its causes, extent and meaning in population adjustments. The extent of human migration in modern times is frequently overlooked. It has been calculated for example, that concealed beneath national figures movements of migration throughout the world affected some five million people annually in the years preceding the first World War. The part Wales played in such vast movements was of course infinitesimally small, yet there has grown up an extensive literature on the historical aspects of the matter from a geographical point of view". What the "extent and meaning in population adjustments" these migrations had for Wales from the period of the Anglo-Saxon

and Romans to the recent times of the "Latter Day Saints" and Missionary Societies is hard to conjecture but one thing is clear the spread of English and decline of the national language has been supplemented by the social mobility of the twentieth century where mixed marriages are the rule rather than exception with the resulting tendency for the more highly calibrated language to win the day".

Developments such as we have just outlined caused a drop in the percentage of Welsh-speakers in Wales from eighty per cent in the early nineteenth century, when the English-speaking population consisted entirely of English and Irish immigrants to industrial areas and a small Anglicised upper class to about fifty per cent at the present time. The number of Welsh speakers in Wales in 1951 according to census returns was 715,000 persons aged three years and over compared with 909,000 in 1931. Jac Williams in his monograph on "The National Language in the Social Pattern in Wales" has estimated that "it is doubtful whether the total number of Welsh-speakers, including Welshmen living in England and other countries and in the small Welsh settlement of Patagonia now amounts to one million. The steady decline in the percentage of Welsh speakers in the population of Wales is shown in the following tables based upon Census Returns".

Date	% of population aged 3 years and over speaking Welsh only	% of population speaking both Welsh & English	% of population able to speak Welsh
1901	15.1	34.8	49.9
1911	8.5	35.0	43.5
1921	6.3	30.8	37.1
1931	4.0	32.8	36.8
1951	1.7	27.2	28.9

An analysis of the incidence of ability to speak Welsh in the population of Wales in 1951 according to age groups suggested that this decline is likely to continue and the evidence may be tabulated as follows:-

Age Group	No. able to speak Welsh only	No. able to speak Welsh and English	% total age group able to speak Welsh
3-4	5,800	6,400	15%
5-9	8,900	28,400	20%
10-14	3,700	34,700	21%
15-24	3,000	73,200	23%
25-64	18,400	411,000	30%
Over 65	11,300	97,500	40%

JAC WILLIAMS: "The National Language in the Social Pattern of Wales (p.248) from "Studies" Autumn 1958.

The manifest decline of one language in the face of an onset from another is nowhere more evident than in Wales. In several counties of the Principality the deterioration is complete; in Carmarthenshire, however, where the Welsh language lives naturally alongside the English the process of decay had been arrested. A study of the eleven-plus year group where the facts are authoritative shows that in Carmarthenshire one child in every three is first language Welsh, one third first language English whilst the remaining third are bilingual in varying degree.

The history of Carmarthenshire reveals in fact the same trends which we have discussed hitherto, albeit that the Welsh language has retained its strength on account of the fact that the agrarian rural communities have remained true to their heritage and in some ways because of their former remoteness has kept their language and their customs. A quick glance at Carmarthenshire would show us a large self-contained area of farmland through which runs the river Towy. The area is bounded in the north by mountains and in the south by the sea whilst on the east and west it lies adjacent to two relatively anglicised counties of industrialised Glamorganshire and rural Pembrokeshire. At strategic points along the river Towy lie the castles of Llanstephan, Carmarthen, Dryslwyn, (Dinefwr) Llandeilo and Carregcennen dominating the mouth and the crossings in accordance with the strategy of the Anglo-Normans. The market towns which have grown up around three of the castles have formed enclaves of anglicisation in a surrounding rural area which is still basically Welsh. A closer look at the Welsh area and we can go still further back historically for we find traces and vestiges of more ancient culture of the Roman occupation, the Iron Age and the Beaker-Folk. Allied to the Northern castles can still be seen a system of crenellated church military towers serving the ecclesiastical authorities as points of administrative advantage and the people with rallying toxins in time of incursion or disorder. The remains of monasteries and abbeys still exist and some buildings still bear witness to the ancient laws of Hywel Dda enacted at Ty-Gwyn-ar-Daf. The Welsh and Latin lore of the past has been transmitted to the present by continuous tenuous links. It

was at the ancient church of Llanddowror for example that the first of the circulating schools in Wales began - a light is still burning in this church to commemorate the fact. And to bring education up to date - in Carmarthen, itself stands a new building opened in 1960 by Her Majesty Queen Elizabeth II hundreds of years after the Queen Elizabeth Grammar School was founded in the reign of the Tudors. It is not out of place, therefore, that our experiment should take place in Carmarthen - an experiment which is not carried out in the splendid isolation of an academic "Tour d'ivoire" but based on statistics and facts which are subject to the closest scrutiny in the cold light of day. But before making a detailed qualitative and quantitative appraisal of the data appertaining to Carmarthenshire let us see how our general principles have been applied both abroad and in the United Kingdom.

In the foregoing discussion we have noted the multiplicity of factors which must perforce be taken into account in assessing the efficiency of a bilingual policy in Wales. "Mutatis mutandis," similar educational problems are present in other countries where two languages and two cultures exist side by side. Hence, a better perspective of the total picture is gained by paying some attention to aspects of bilingualism in other countries and at the same time bearing in mind that small "linguistic islands" occur in the larger cosmopolitan cities of the U.S.A. and elsewhere.

O'Doherty, writing on the Educational Aspects of Bilingualism in Ireland, has stated that the difference between the Irish situation and that in Wales, the Scottish Highlands, the Belgian Walloons, Spanish Catalan - speaking children and of Breton speaking-children in France, is that the plan for bilingualism in those countries rests primarily on consideration of the child's welfare and on sound psychological principles. This is given expression, for example, in the principle enshrined in the Belgian constitution Article 20: "Dans toutes les écoles communales adoptées ou adoptables, la langue maternelle des enfants est la langue véhiculaire aux divers degrés de l'enseignement." In Ireland, however, states O'Doherty, "in one sentence what it comes to is this, our present pseudo-bilingual policy is based on emotional, political and historical factors, to the neglect of pedagogical, psychological and Social considerations." On the other hand, Dommallain,

Inspector of Schools, testifies to the success of the bilingual educational policy in the twenty six counties of Eire. As a result, he says, there is no doubt that an astounding degree of success has been achieved in restoring the Irish language in the schools, even if no comparable success has been achieved in reviving it outside the educational system.

What does this mean

The nature and background of bilingualism in Finland has been the subject of an article by Denison who describes how Finnish and Swedish flourish side by side in the face of political pressure from Russia. He concludes, that of Finland it is certainly true to say that the cultural pressures played a greater part than the political, though it would be difficult to say whether the rise of linguistic and cultural patriotism in Finland would have been as spectacular, or indeed possible, without the accident of political separation from Sweden. From the point of view of national psychology it is of interest to note that the period which saw the most rapid development and the most intense cultivation of Finish during the years preceding 1900 and continuing up to the first World War, coincided with the Czar's efforts at Russification.

A situation report on linguistic organisation in South Africa by Liebenburg, Chief Inspector for Cape Town, indicated that the variations and combinations occurring at the various levels in the class structure of school administration in order to foster Afrikaans and English, is such that pupils become so proficient in their understanding of both languages that it is immaterial to them afterwards through which language the instruction is given.

In Belgium the policy is that French and Flemish have equal status and "the legal position is that the head of the family shall decide which of the languages French or Flemish is the mother tongue or habitual language of the child; but this decision may be set aside by the school, the State Inspectorate or an official linguistic commission who have the power of modifying the effect of the decision made by the head of the family."

In Switzerland the four official languages are German, French, Italian and Romansh. Language teaching is of particular importance since professional and businessmen at least find that a minimum facility of comprehension in the three main official languages is essential for ease and efficiency in their work. In addition, English is

considered an essential part of their linguistic equipment.

We have already made oblique references to the linguistic policy of the former European colonial powers and it is of interest to note the policy of the two major powers who have inherited some of their problems namely the U.S.S.R. and U.S.A. As is not unexpected their policies differ. It is of interest and of importance to note that their approaches are fundamentally opposed to each other in so far as according to Natalie Darcy in a discussion on bilingualism during her visit to certain Carmarthenshire schools in 1960 the accredited policy of the U.S.A. is to favour one language namely English since the question of fostering other languages does not arise; the plain aim is to assimilate the multilingual migrant groups into one English speaking whole for it is assumed that this would produce a more stable community. The policy of the U.S.S.R., however, according to G.P. Serdyuchenko who stated during his attendance at the U.N.E.S.C.O. meeting at Aberystwyth (Wales) that the policy of their government was to foster the development of the seventy languages of the minority groups in order to preserve their identities and culture.

As far as the U.S.S.R. was concerned Serdyuchenko indicated that the main problem was to raise the general level of culture through the only way possible, namely, through the development of language. He pointed out that such a policy served to unite the Russian people and he was proud of this fact. The U.S.S.R. appreciates the role of the Russian language but maintains that instruction should be given in many languages, for example, he tended to think that in Nigeria where there are three languages if instruction were given in English the indigenous population would still consider that culture as alien to their way of life. He stated that in their opinion one principle was of prime importance that one should adopt the policy of the equality of rights of all languages of all national groups: if this principle is adopted it goes without saying that there is a need to build up national schools. Furthermore, alongside the Russian language itself, students in Russia studied English, French, Hindi, Chinese and Arabic. In brief he considered that the Russian policy of favouring the development of all national languages and cultures equally to be the right policy.

It is extremely important for ^{us} we Europeans to be aware of the divergent policies of both the U.S.A. and U.S.S.R for the findings of their research will be of necessity be coloured by their national linguistic policies; this will tend to be true both of Darcy for example in the U.S.A. and of Luria in the U.S.S.R.

Having given a certain consideration to Serdyuchenko one must needs touch a little more upon the work of Darcy who in her "Review of the Literature on the Effects of Bilingualism upon the Measurement of Intelligence" has made a fairly useful summary of the cognitive aspects of the problem. She has classified studies under three headings those where the influence of bilingualism on intelligence had (1) a favourable effect (2) an unfavourable effect and (3) no effect - although the reader will now readily concede Hebb's suggestion that the functional level of intelligence must in varying degrees be affected by bilingualism: this effect can equally well be ascribed to socio-economic and other factors which operate against the same bilingual background. In this monograph, however, Darcy does not put forward any views of her own concerning the summary of research findings of other investigators. She has been content to record their verdict. She does, however, confirm according to her own findings what we already suspect to be true that "since the monolingual and bilingual subjects in this investigation were closely matched as to number, sex, socio-economic status and age within six-month intervals and since the performance of the bilingual subjects was significantly inferior to that of the monolingual subjects on the Stanford-Binet Scale but significantly superior on the Atkins Object-Fitting Test it may be concluded that the bilingual subjects of this investigation suffered from a language handicap in their performance on the Stanford-Binet Scale". This is, of course, what one would expect since the test is heavily weighted with a verbal factor which must of necessity operate in favour of the English speaking subject.

The main point which is made by the investigators is that the degree of linguistic fluency does one way or another affect the functional level of a person's intelligence: it is essential, therefore, for any serious researcher to use a test of non-verbal reasoning where

NATALIE DARCY: "A Review of the Literature on the Effects of Bilingualism upon the Measurement of Intelligence". Journal of Genetic Psychology 1953. p.82, 21-57.

the verbalisation and the instructions do not favour one language more than the other - in other words as long as the instructions are, let us say, given in both English and Welsh then a state of neutrality has been observed which is fair to both speakers and will allow the investigator to probe certain aspects of the given problem having first made sure that his groups are matched not only for sex, age, socio-economic status but also for intelligence.

We have seen, according to Hebb, that Intelligence can be described as category A (innate potential) and B (the estimated level of functioning at maturity); the latter is largely shaped by the influence of the home, neighbourhood and school - this environment might be complicated by a bilingual regime whose effect may be favourable, unfavourable or neutral in accordance with the individual's personality structure. There would be levels of genetic development shot through with the factorial influences of verbal, number and space corresponding to the effects of different linguistic milieux.

There was an early stage when gabbling and jingling with words gave joy to children on the sensori-motor level. This was a stage when children were bilingual without knowing it, the two languages would be as one, without necessarily being confused. The early development would depend initially on the language or languages of the parents but those would be later differentiated in terms of receptive and productive skills, thus

Skills	Receptive	Productive
Spoken Word	Understanding	Speaking
Written Word	Reading	Writing

In addition the reality principle in children was expressed in concrete actions of doing and there was a constant switch of language dependent upon the language of the parents. Such 'code switching' occurred frequently and would in children depend upon a meaningful context and on their language of play since speaking in a child might be considered as a form of experimental play.

The child's admixture of language may be compared with "Pidgin English": this form persists in a child beyond the early stage in such a way that false speech structures may be introduced.

In defining bilingualism, therefore, there was a need to differentiate between genetic stages and degrees of attainment including an assessment of the effect of receptive and productive skills: there was as we have seen the need for a definition in terms of function to include the acquisition of these skills as well as the complex question of achievement.

The first stage, therefore, could be defined in terms of a pre-productive "Non-linguistic bilingualism" at both subconscious and conscious levels in mixed and differentiated linguistic milieux. This personal activity of the child could be described as the Pre-School Genetic Stage of Proto-Bilingualism where the language content was low, vocabulary limited and structures few. The stage of proto-bilingualism might be described as that where the child has resources of two or more languages and is able but does not discriminate between them. The stage of conscious bilingualism may only come at a point where 'x' number of words and structures had been acquired; thus paucity of vocabulary and structures was a pre-requisite of stage one. ?

This early linguistic stage can now be related to the developmental levels of intelligence we discussed in the preceding chapter. As far as Wales and Carmarthenshire is concerned the language learned at the hearth will determine largely that which will be taught at school.

Before deciding on the methodology of teaching minority linguistic groups it should be necessary to ascertain the aspirations of the minority as to whether they wish to foster the minor language or not. Thus, for example, whereas there is a need to foster Polish and German in the U.S.A. there is little need for Ukrainian in Canada: similarly in North and South America many refugees have fled from Europe as a result of political and religious persecution and no longer wish to associate themselves with their former linguistic tradition but wish to be assimilated into their new promised land. Again the decision to uphold a language will depend, as in Russia, ^{upon} which language is to be officially fostered or as in France in regard to Breton ^{upon} whether the decision should be held in abeyance. In view of the complexity of the situation, the following suggested criteria were formulated at the U.N.E.S.C.O. Seminar:-

- (i) Account should be taken of the desires of the indigenous population (on the presumption that external advisors on the choice of the vernacular may not necessarily be right).
- (ii) The parents' choice of language may not necessarily be right.
- (iii) The Government concerned must consider and not neglect the issue but must arrive at a studied decision as to fostering or otherwise ignoring a particular language.
- (iv) The language chosen should be that ^{which?} as would perpetuate the traditions of the minority group.

The methods of teaching the chosen language or languages in a bilingual area will of necessity vary with the differing circumstances prevailing regionally, for example, what holds good for Switzerland may not be true for Wales or Kenya. Differences in teaching technique such as those sponsored by the Bureau D'Etude et de Liaison pour L'enseignement du Francais dans le Monde, at Paris will depend on supporting background and there may be need in certain circumstances to introduce supports, such as films and tapes of subjects intimately connected with the local culture. Thus some languages can only be taught as a subject, for example, Hausa and later English when it becomes a means of higher education as in Ghana. Again as in Kenya there must be a specific formal level of instruction with a basic vocabulary subject to later consideration.

The situation is further complicated where there are two competing languages (Italian and German) as in Bolzano, Italy, one has to sacrifice fluency in some aspects of one language in order to foster another. The degree of mastery of the chosen language will depend on motivation. Thus in this district the Germans are more anxious to learn Italian than vice versa although it is of interest that the minority Ladin speaking groups learn both Italian and German equally well. This sacrifice in terms of linguistic purity may be offset by a gain in unity of thought and feeling which in turn promotes good human relationships and can well be a factor in the defence of Europe against possible hostile intentions. On the other hand languages can be learned for more prosaic reasons whilst some people refuse to learn a particular language for the simple reason that they were antagonistic towards it, as for example Luxemburgers preferred to learn French rather than German because of lingering memories of the occupation. In brief, learning a language could depend on the prevalent attitude.

In order to teach a language there was a need both to study the right methodology and to assemble the right material concerning the language structure and specialized vocabulary; good examples for such procedure were basic English and Français Fondamentale. This would ensure that the mother tongue would be taught to children, as previously discussed as a means of the realization of the self and the world around them. In Kenya assurance as to using the appropriate technique was safe-guarded by training qualified language teachers; parts of Italy however, were not quite as fortunate for certain teaching standards had been debased with obvious effect on the pupils. Equally important was the proviso that the teaching of the world language did not destroy the vernacular.

In brief, there did not appear to be any royal road or any ideal method; the type of methodology would be conditioned.

by the linguistic milieu although personal motivation in individual cases could achieve a degree of proficiency over and above that expected from the prevailing circumstances.

In the last analysis the question became reduced to one of personal choice which was as true in Wales and the United Kingdom as for other countries. In the bilingual situation it was a matter of choice between (i) the vernacular and (ii) the utilitarian tongue (lingua franca); in the trilingual situation the choice lay between (i) the vernacular (ii) the utilitarian tongue (lingua franca) and (iii) the world language.

In the U.S.S.R. we have seen that the policy was first to teach the vernacular and only secondly without compulsion the lingua franca, Russian. In Italy such a policy could not hold true since, whereas people wished in varying degree to learn Italian and German they did not wish to learn Ladin largely because Ladin had no economic value. There would thus appear to be many influences which lead to language acceptance or rejection.

People's choices had some basic purpose or ulterior motive for example political. Were one to look at the matter scientifically one should survey the prevailing situation first before coming to a decision since politics were ostensibly no concern of the linguist. Nevertheless one should acknowledge the fact, unpalatable or otherwise, that politics did have a part to play in making a decision as to whether a particular language should be officially fostered or allowed to regress.

The situation could be resummarized by asking the following questions:-

- (i) In what circumstances is it better to adopt the world tongue and/or the lingua franca.
- (ii) What is the position of the vernacular in such a situation
- (iii) Where there is already (a) a vernacular and (b) a world language what is the place of the third language.

A fourth series of supplementary questions would then arise

- (iv) (a) at what age and (b) stage should the second language be taught and likewise (c) at what age and (d) stage should the third language be taught.

And finally what evidence was there in terms of early and late learning for the adoption of one language or two as proposed by the adoption of a particular official policy of bilingualism.

The answer to these questions could not be given categorically without making a close study of the prevailing factors affecting the choice of policy: such factors might be personal for example (i) emotional and (ii) altruistic (for the good of the child) or on the other hand they might be official (iii) political (iv) administrative (v) traditional (vi) historical (vii) literary (viii) scientific. The choice of a language could also be fortuitous as well as the subject of weighty considerations. The choice of (a) a regionally dominant language or (b) a world language was fraught with dangers and difficulties - not the least being the choice by an antagonistic government of a language not acceptable or contrary to the wishes of the people concerned. Indeed the very choice of language will itself give rise to the following questions:-

- (i) How can a second language be fostered as a medium of instruction.
- (ii)(a) Should the language be used as a medium for other subjects.
- (b) What stage.
- (iii) Should knowledge of the subject be sacrificed for the sake of fluency of language.

The Report of the Central Advisory Council for Education (Wales) - "Lle'r Gymraeg a'r Saesneg yn Ysgolion Cymru" - "The Place of Welsh and English in the schools of Wales" is only one of a series of documents drawing attention to the problems of bilingualism in Wales. "The study of bilingualism" says the report "is of considerable general interest, especially to psychologists, sociologists and students of education. But in Wales on account of the great danger ⁱⁿ which the Welsh language finds itself, bilingualism has more than a general or academic interest: it has become a matter of national concern" Wales, as we have seen is a country with a language of its own and a literature which has a history of over a thousand years, but it is nevertheless linked to England by geographic, economic and political ties. In the principality, the two languages English and Welsh, exist side by side. Hence educational policy has rightly been based upon the acceptance of both.

The Central Advisory Council for Education (Wales) suggests that the primary school should safeguard the home language of the child and encourage its use as a medium

H.M.S.O.: "The Place of Welsh and English in the schools of Wales", Report of the Central Advisory Council for Education (Wales) 1953.

of his education, whilst the second language should not be taught formally until the child has left the infant school. Emphasis is also placed on the necessity to ensure continuity of policy between primary and secondary schools in the same area, with regard to the teaching of the two languages and their use as a medium of instruction.

In recent times great administrative changes have taken place in the field of education which have in many ways reflected the change of public opinion in the United Kingdom and the Principality of Wales. A range of enactments .from the Fisher Act 1918 to the Butler Act ^{of} 1944 brought into evidence the need to concentrate on a child centred education and get away from the discredited system of payment by results. The Report on the "The Teaching of English in England (1919) was a great step forward for it made clear that language is "Not merely the discovery of ourselves in our native environment." And later as a similar report on Welsh stated "It is clear, therefore, that although activities other than language, and other aspects of a child's development may have received increasing emphasis of recent years, and though the stress on language itself may in comparison have appeared to become weaker, in actual fact language development, and the problems related to it, are still considered to be, if not the fundamental consideration, at least the most important."

Furthermore as more attention was paid to the scientific assessment of educational policy the Ministry of Education realized, "At the same time the value of psychology as a means of understanding and as an aid to solving educational problems has become clearer, with a result ~~that~~ education is conceived as a process affecting the development of the whole organism, body and mind, emotion as well as intellect. In consequence of these two factors - the emergence of the concept of organism and the refinement of psychology ~~as an~~ instrument - a gradual, imperceptible but very real shift of emphasis has occurred from the teacher's ability to teach, to the child's ability and desire to learn. The ability to inject knowledge in the abstract has been discounted: instead has come the realization of the necessity to stimulate interest, to guide the enquiring mind and to provide appropriate means of satisfying curiosity. The curriculum has come to be regarded "in terms of activity and experience

rather than of knowledge to be acquired and facts to be stored. The emotions are seen to be important, not only as an aspect of the whole child that requires training and refinement but also has powers that need to be brought into play and to be exploited as motive forces from the process of learning." It will be seen, therefore, that from the subject of our thesis the relative importance of early as to late learning has implications over and above that directly related to our bilingual experiment.

Let us summarize the situation in the light of our preceding discussions and look at the influences which affect the child's developing personality - Allport, for example, has defined this "Personality as the dynamic organisation within the individual of those psycho-physical systems which determine his unique adjustment to his environment." These developmental influences may be broadly described as five (i) physical (ii) intellectual (iii) educational (iv) emotional (v) environmental. The underlying physical development of a child pre determines his constitutional ability to cope with the stresses and strains imposed by life. With the fortunate he may rank as an ordinary child but one would do well to remember that a substantial number of children are born with physical imperfections; thus some are (a) deaf or (b) partially deaf (c) blind or (d) partially blind (e) spastic (f) epileptic (g) diabetic (h) speech defective whilst others suffer from multiple handicaps. Furthermore the educational progress that children make will be closely related to the mental capacity which ranges in terms of I.Q. from below 50 to above 140. The child with an I.Q. below 50 is deemed to be subnormal and not capable of profiting from an ordinary school. The slow learning child is characterised as Educationally Subnormal, that is, he is unable to keep up with the other children in his year group; the following three types of slow learners are described in ranges of intelligence, namely,

Educationally Subnormal	{	Retarded = I.Q. 90 - 140+
		Backward = I.Q. 75 - 85
		Dull = I.Q. 50 - 75

PHYSICAL	EMOTIONAL	SOCIOLOGICAL	EDUCATIONAL	INTELLECTUAL
BLIND	DISORDERS			
PARTIALLY BLIND	NERVOUS	MALADJUSTED	GIFTED	I. Q. 180+
DEAF	HABIT		SUPERIOR DEVT.	120-140+
PARTIALLY DEAF	BEHAVIOR	DEPRIVED	(S. I. L.)	
DIABETIC	ORGANIC		NORMAL DEVT.	50-110+
SPASTIC	PSYCHOTIC	J. DELINQUENT	(N. I. D.)	
EPILEPTIC			EDUCATIONALLY (RETARDED)	90-140+
SPEECH DEFECT		VOCATIONAL	SUBNORMAL	70-85+
MULTIPLE DEFECT		DIFFICULTIES	(E. S. N.)	50-70
SEXUAL DEVT.			SUBNORMAL (M. D.)	150

SUMMARY OF DEVELOPMENTAL FACTORS INFLUENCING FUNCTIONAL LEVEL OF INTELLIGENCE: where $B = f(A)$.

Such children find difficulty in coping with the verbal aspects of their curriculum. The bulk of children, however, make relatively satisfactory progress although only some 30% or thereabouts are capable of dealing with a more academic curriculum, of whom still fewer are able to continue with College, University or Technological training. Occasionally too the gifted child of high mental capacity appears and he too has his developmental difficulties usually on the emotional side. These emotional difficulties which affect children in the whole range of mental capacity (vide appendix) may be classified in terms of the following disorders (a) nervous (b) habit (c) behaviour (d) organic (e) psychotic and (f) educational cum vocational. A child who suffers from emotional disorders has been called maladjusted; his maladjustment often springs from environmental causes such as insecurity associated with defective child-parent relationship and ambivalent attitudes. Children may also be described as Deprived or Delinquent; these are almost invariably from unstable homes. All these factors must be taken into account in any piece of research particularly when an attempt is made to make an appraisal of the results, for often clinical evidence can provide useful data as to how linguistic abnormalities occur, for example, a study of Aphasia can help us in our theorizing. A glance at the accompanying diagram will help the reader to clarify his ideas concerning those aspects of the problems which are further complicated in adolescence by the onset of pubertal and sexual development, as well as bilingualism.

The relationship between the growth of language and the growth of concepts and hence between bilingualism and the functional level of intelligence must loom large in the mind of the research worker, particularly in regard to arrangements for suitable educational treatment for exceptional children. The education of the mentally handicapped child for example raises the problem of how far should such children pursue any formal study of a second language whilst the education of the highly intelligent child introduces the problem of how soon one should introduce the additional languages such as French, German, Russian which now seem to be displacing Latin and Greek.

The emotional factor also bears strongly on the problem of bilingualism for often children when disturbed find difficulty in expressing themselves and in making progress at school. Their whole development is adversely affected by the inhibiting influences of a social or emotional handicap whilst such maladjusted children with the various disorders are difficult to assess since the functional level of their performance varies with degree of impairment. It will be seen, therefore, that when carrying out research into bilingualism in Wales any aspect of semantic organisation may be obscured by influences other than purely linguistic. Account must be taken of the physical, emotional, intellectual, educational and social development of that 1-15 per cent of children who in one way or another, deviate markedly from normal. The sample of the population chosen for the experiment must be thoroughly investigated and allowance must be made for these deviants in the distribution as well making sure that we are dealing with a truly representative cross-section of groups matched for intelligence, sex, age and socio economic background. It is only then that we can presume to proceed to put our hypotheses to the test. Loose.

The basic policy of the Local Education Authority will involve two basic assumptions, namely

- (a) that all pupils will receive the education according to their age, aptitude and ability, and
- (b) that handicapped pupils receive special educational treatment.

In a bilingual area the situation is complicated by the need to develop two media of instruction.

The policy of Welsh Local Education Authorities varies in accordance with its set of problems. As the Ministry of Education has pointed out, the language policy adopted by an Authority generally reflects the linguistic pattern of its area; where the Welsh language has receded, as in some of the border counties, for example the policy in the main is to acquiesce with varying degrees of reluctance to its fate. We say in the main, because some Authorities have reacted differently to the threat of anglicisation and their policy expresses determination to withstand rather than acquiesce. To some Authorities the process of anglicisation appears as a difficulty that can hardly be overcome, to others a challenge not to be refused - very largely according to the degree of anglicisation obtaining in their area. It is

possible, therefore, to recognize four kinds of language policy in the primary schools of Wales: in the first place there is the policy of teaching only English and of making no provision whatever for the teaching of Welsh, even on the very rare occasions when it may be required by parents. Fortunately such an attitude is not common; secondly there is the policy which we may call "contracting in" - the Authority will provide for the teaching of Welsh in any school where a sufficient number of pupils demand it. This again cannot be regarded as a satisfactory attitude if it is recognized that the Authority should be not merely providing but also an "educating" body. The third policy may be called "contracting out" - the Authority makes provision in all its schools for the teaching of Welsh and gives each child a specific opportunity to accept or not to accept instruction in the language. Finally there is the policy which aims at giving to the two languages an equal importance in the life of every child. Such is the policy of Carmarthenshire. As far as the secondary schools are concerned the pattern is in a sense simpler in that most Authorities allow each school to develop its own language policy in accordance with the linguistic distribution of the pupils concerned. The pattern, however, is in another sense more complex because a variety of subjects have to be taught - some in English others possibly in Welsh according to the individual needs of the pupils and the catchment area from which they came. This is particularly so in Carmarthenshire where the policy is one of fostering bilingualism. As far as further education is concerned Welsh can be pursued to an advanced stage in certain Teacher's Training Colleges and the University.

The general picture for Wales was given by Lord Brecon, Minister of State for Welsh Affairs, in a debate in the House of Lords (1958) that of seventeen local Authorities ten had adopted the Central Advisory Committee's policy on bilingualism, two had a modified policy and five had no policy at all. The magnitude of the problem becomes apparent when it is realised that of a total population of two and a half million according to the last census 714,000 (nearly one-third of the population) speak Welsh.

The Carmarthenshire Education Authority has accepted the recommendations of this Report with regard to bilingualism and has taken steps to implement it in accordance with recommendations that "having due regard to the varied aptitudes of pupils and of the varied linguistic patterns in which at present they live, the children of the

The degree of bilingualism possessed by pupils between 5 and 15 years of age in maintained primary and secondary schools.

Local Education Authority.	Pupils whose first Language is Welsh				Pupils whose first Language is English				GRAND TOTAL		
	I.	B	C	D	Total	A	B	C		D	Total
Anglesey	229	555	956	3,033	4,773	759	793	940	360	2,851	7,624
Breconshire	30	26	39	668	763	3,603	2,428	793	194	7,018	7,781
Caernarvonshire	608	907	1,872	5,540	8,927	1,537	2,185	1,432	1,429	6,583	15,510
Cardiganshire	344	358	906	2,565	4,173	908	629	798	546	2,881	7,054
Cardmarthenshire	978	917	1,749	6,454	10,098	3,888	4,803	1,780	1,721	12,192	22,290
Denbighshire	125	202	439	3,071	3,837	11,157	7,132	1,813	1,025	21,127	24,964
Flintshire	-	15	53	961	1,029	12,634	7,206	1,216	374	21,430	22,459
Glamorgan(including Rhondda)	48	102	263	3,034	3,447	83,483	21,483	3,825	1,032	109,638	113,085
Merioneth	207	350	810	2,066	3,433	487	384	424	480	1,775	5,208
Monmouthshire	-	-	-	33	33	51,321	131	58	19	51,529	51,562
Montgomeryshire	48	90	158	830	1,126	3,545	1,564	208	144	5,461	6,587
Pembrokeshire	99	146	364	1,199	1,808	10,781	704	378	404	12,267	14,075
Radnorshire	-	-	-	9	9	2,602	17	14	7	2,640	2,649
Cardiff	-	1	4	202	207	16,938	21,597	1,356	99	39,990	40,197
Merthyr Tydfil	-	-	-	49	49	8,169	453	176	63	8,861	8,910
Newport	-	-	1	9	10	16,026	97	7	10	16,140	16,150
Swansea	2	6	3	403	414	16,753	4,962	1,113	191	23,039	23,453
T O T A L	2,718	3,675	7,617	30,126	44,136	244,405	76,568	16,351	8,098	345,422	389,558

Categories of attainment

are defined as:-

- A Children who have no knowledge of the second language
- B Children who can understand but are unable to speak the second language
- C Children who understand lessons given in the second language in such subjects as History, Geography or Nature Study, and can conduct elementary conversation in the Second language.
- D Children who can express themselves with fair fluency in the second language.

whole of Wales, including Monmouthshire, should be taught Welsh and English according to their ability to profit from such instruction. This policy would result in making all but few exceptions among the pupils bilingual.

The main concern of the teacher says the report should be to establish every child securely in control of his mother tongue Welsh or English. It is an essential part of the work of the schools to relate all children to the two cultures that exist here side by side. To do this schools will have to teach two languages.

The Report of the County Language Advisor made to the Carmarthenshire Education Committee runs as follows: it is the good fortune of the children born in Carmarthenshire, that they can throughout their lives, participate in two national cultures, both of which form part of the Western European pattern of civilisation and which have been associated with one another for many centuries. One of the central language aims of our schools must be to extend to our children the benefits of association with England and its language and literature and of participating in its intellectual achievements; and at one and the same time, to maintain and nurture their respect and affection for the best in their Welsh heritage.

The Council clearly assumed that a responsible nation will always strive to preserve its language. It is agreed that in Wales this means the Welsh language; because it is, in a special way the link of the Welsh people with their past. It is the vehicle for committing much of their heritage to the future and represents a valuable element in the contemporary culture of the county. The Council concludes that the language policies of the education authorities should recognise this situation and pay regard not only to the past but take due responsibility for the future, using the language not only as a traditional means of communication but as an adequate instrument for contemporary life.

The pronouncement of the Advisory Council carries with it far-reaching implications, not the least of which ^{is} the organisation of schools. The Report says "Where English or Welsh is the dominant language of the area the organisation of the schools is relatively simple: the dominant language being the mother tongue of all or nearly all the pupils becomes the medium of instruction and the other is taught as a second language.

C A R M A R T H E N S H I R E : L A N G U A G E S U R V E Y 1 9 6 1

Age Group	1st Language Welsh					1st Language English					GRAND TOTAL
	A	B	C	D	Total	A	B	C	D	Total	
5-6	299	276	148	244	967	888	183	80	41	1,192	2,159
6-7	165	263	225	268	921	649	186	117	76	1,028	1,949
7-8	91	193	386	288	963	654	375	107	92	1,228	2,191
8-9	35	85	383	523	1,026	370	539	150	142	1,201	2,227
9-10	16	40	234	663	953	359	522	200	220	1,301	2,254
10-11	15	30	158	763	971	245	572	172	264	1,253	2,224
Total 5-11	621	892	1,534	2,754	5,801	3,165	2,377	826	835	7,203	13,004
11-12	87	7	71	784	949	214	553	206	212	1,185	2,134
12-13	81	12	49	965	1,107	116	585	251	227	1,179	2,286
13-14	93	4	53	999	1,149	176	652	241	212	1,281	2,430
14-15	96	2	42	952	1,092	217	636	256	235	1,344	2,436
Total 11-15	357	25	215	3,700	4,297	723	2,426	954	886	4,989	9,286
15-16	12	-	13	393	418	73	150	154	109	486	904
16-17	9	-	-	333	342	48	120	142	91	401	743
17-18	5	-	-	213	218	26	92	51	43	212	430
Total 15-18	26	-	13	939	978	147	362	347	243	1,099	2,077
GRAND TOTAL	1,004	917	1,762	7,393	11,076	4,035	5,165	2,127	1,964	13,291	24,367

W E L S H J O I N T E D U C A T I O N C O M M I T T E E
Y C Y D - B W Y L L G O R A D D Y S G C Y M R E I G .

Where the linguistic background is complex, however, the organisation of the school becomes relatively difficult. The principle underlying the organisation is clear and simple - it should provide as far as possible groups that are homogenous in respect of home language (or language attainment in later stages). Bearing this in mind some schools, where the numbers are evenly balanced provide separate streams within the same school, even where this entails the combining of more than one age group. Where it is possible, however, it is thought preferable that the two streams should become separate schools for only so, it is maintained, can an appropriate Welsh or English atmosphere be created.

In those areas where Welsh speaking children are a small minority, it may be found desirable to set up two separate schools centrally to which the one or two Welsh speaking children in each of the English medium schools can be transferred. This makes the organisation of the English medium schools simple and provides the Welsh speaking children with an appropriate education in the mother tongue."

There has been some criticism to the effect that the separation of English and Welsh children is likely to accentuate and perpetuate the considerable cleavage in Welsh Society. " There may be some truth in this" says the Report " but against it must be set the fact that the separation of the children is not the cause but the result of an already existing cleavage. Moreover, the only result of not creating such schools would be to remove the possibilities of Welsh being used as a first language in those areas since the tide of English would undoubtedly completely overwhelm it. We have no doubt whatever about the value of such schools or of the wisdom of establishing them where they are desired."

The principle of establishing schools for Welsh children in anglicised areas had already been adnumbrated in the Carmarthenshire Authority's policy. Six years previous to the publication of the Report of the Advisory Council (1953) the Carmarthenshire Education Committee had made educational history by establishing the first L.E.A. Welsh School in Wales. The policy has been further implemented by the establishing of other schools in Brynsierfel and Carmarthen. The general educational progress of the pupils of these schools, and in

CARMARTHENSHIRE L.E.A: County Language Advisor's Report
to the Primary Schools Sub-Committee
24/1/61.

particular their linguistic development in both languages Welsh and English has fully justified the Authority's pioneer work in this field. visitors from overseas who have visited these schools have been impressed by the atmosphere of these schools and have been convinced of the possibility of the practical implementation of a bilingual policy administered by a progressive local education authority. What follows is a summary of the organisation, curriculum and requirements of the schools in accordance with the Garmarthenshire Committee's policy.

Statistical analysis of the present language position in the county:

1. Schools

Number of Infants Schools in the County Area	14
" " " " " " Llanelly Division	- 17
Number of Junior Schools in the County Area	- 13
" " " " " " Llanelly Division	- 18
Number of Primary (Infant & Junior) in the County Area	-122
" " " " " " Llanelly Division	- 11
Number of Nursery Schools in the County Area	- 1
" " " " " " Llanelly Division	- 1

2. Language policy in the primary schools.

- (a) Number of schools where Welsh is the medium of instruction and English is taught as a second language.

County Area - 57
Llanelly Division - 2 Infants 2 primary.

- (b) Number of schools where English is the medium of instructions and Welsh is taught as a second language.

County Area - 14
Llanelly Division - 27

- (c) Number of schools where parallel classification throughout is operative.

County Area - 12
Llanelly Division - 9

- (d) Number of schools where parallel classification up to the last year is operative.

County Area - 37
Llanelly Division - Nil.

- (f) Number of schools which have a mixed linguistic organisation based on (a) and (e) above.

County Area - 29
Llanelly Division - 2

(g) Miscellaneous classification.

COUNTY AREA

(a)	(b)	(e)	1
	(b)	(e)	2
	(c)	(e)	1
	(b)	(c)	1

LLANELLY DIVISION

(b)	(e)	1
(a)	(c)	1
(c)	(d)	1

The following observations are relevant to the problem.

(a) Welsh first Language English Second Language Schools.

The majority of rural schools are of this type. Welsh is taught as a subject and is used as the main medium of instruction.

Much of the work in these schools was very good. Schemes of work have been prepared by headteachers in consultation with their staffs and these showed an enlightened and forward trend in primary education, with an attempt to synthesize much of the work and co-ordinate the subject matter and to use material from all fields of knowledge to develop the pupils' control of language in its various aspects. There were, however, some signs that the best standards of oral Welsh were not being preserved in the classroom and that insufficient attention was being paid to correct syntactical constructions.

The standard of teaching English as a second language was very satisfactory. The children were able to express themselves freely and often attractively in writing. The degree of oral fluency varied according to the opportunity presented to the children by their environment of hearing English spoken as a natural medium of communication.

Problems arise in these schools on the arrival of pupils who have a different language and culture. However, most of these schools where the number of immigrants is small appear to be able to solve this problem by the grouping of the tutorial system. Where the problem is, however, more acute, it can only be solved by more generous staffing.

(b) English first Language Welsh second Language Schools

As with the Welsh first language schools most of the work done in these schools was very commendable. The children enjoying a varied well-balanced curriculum were provided with ever widening experience and knowledge and increasing power over their first language. A good supply of books for the study of the English language together with a variety of general reading books was easily accessible.

The quality of the Welsh second language varied from school to school and indeed from class to class and of the various aspects of language learning in the county this is the least satisfactory. Many factors contribute to this condition amongst them the following:-
the lack of progressive development in the work from class to class and a tendency to protract unduly the elementary stages; the lack of knowledge of varied teaching techniques in second language work, which lays constant emphasis on lively and interesting interchanges of ideas rather than the acquisition of a store of unrelated or memorised learning; the lack of incidental use of the language both in the Welsh lessons themselves and outside in the general life of the school - in other words isolating of Welsh to a school subject instead of teaching it as a bilingual language to be used and enjoyed.

It must be added, however, that there were some schools in which much excellent work was done and the children left the school with a satisfactory command of the language. It is felt, too, that the inadequacy of the work done in other schools points more to the need of frequent assistance for teachers in schemes and methods. Visits by teachers to schools within the county area where the work is eminently successful should have beneficial results.

(c) parallel classification schools

The standards of work achieved by schools in categories (a) and (b) above prevail also in the schools where parallel classification on a language basis is operative. Although there seems to be a gradual increase in the number of Welsh first language pupils in the schools where this classification has been recently implemented and ^{although} that it seems advantageous as a short-term policy, there is a considerable decrease in the number of Welsh first language pupils in the older established streamed schools. The attention of the authority is drawn to the recommendations of the Report of the Central Advisory Council in respect of these schools.

(d) one school has a parallel classification up to its last year only.

(e) Schools where the dual medium is operative, that is where both English and Welsh are used as media of instruction.

These schools are confined to the county Area and are situated in the main in those locations which have become more urban in character. These schools together with those listed below present the most difficult problem of all. They

range in character from those where the numbers of Welsh speaking children are in the majority and which could in fact belong to the category of Welsh first language schools, to those schools where there is an ever increasing number of English speaking pupils. Each school presents its own individual problems and it would be difficult to make any general comments which would apply to all of them.

A number of these schools have an effective language classification at the Infant stage but this is not developed throughout, with the result that Welsh ceases to be the main medium of instructions for Welsh-speaking children and becomes a second language in a school which serves in a predominantly Welsh area. Such schools are not carrying out the Authority's policy of education through the mother tongue. In this connection, also, it has been noted by the external assessors of the Secondary Allocation Tests that some schools in these areas would be better to prepare their pupils as first language Welsh candidates. Attention must, therefore, be drawn to the fact that some schools in this classification do not, and in some cases because of inadequately qualified staff, cannot conform to the language policy laid down by the Authority.

(f) and (g) Schools which have Miscellaneous Classification

The linguistic pattern of these schools is so complex that the problems must be studied in their individual context. They have, however, one problem in common with the previous category - that of adequate staffing.

3. The following detailed Analysis of Staffing has been prepared both to indicate the present position and to serve as a guide for future requirements. Since ability to teach English and though the medium of English is a prerequisite of Training colleges certificates in general, thus ensuring that all teachers have been adequately instructed in English, the analysis is concerned with qualifications in Welsh since it is assumed that the teachers are all qualified to teach in English.

Primary Schools Staffing

(a) Total number of Teachers.

County Area - 539
Llanelly Division - 281

(b) Teachers who have a degree in Welsh

County Area - 9 (1.7%)
Llanelly Division - 10 (3.6%).

(c) Teachers who have obtained the Advanced Certificate in Welsh at a Training College

County Area - 105 (19.6%)
Llanelly Area - 24 (8.5%)

(d) Teachers who obtained a pass at Ordinary level in Welsh at a Training College

County Area - 133 (24.7%)
Llanelly Area - 64 (22.5%)

(e) Teachers who can speak Welsh but have none of the qualifications listed above

County Area - 273 (50.6%)
Llanelly Area - 158 (56.2%)

(f) Number of Teachers who do not speak Welsh

County Area - 18 (3.4%)
Llanelly Area - 26 (9.2%)

4. Pupils: First Language statistics

County Area - 9612
Division Area - 6065
Total 15,677

First Language Welsh pupils:

County Area - 5747
Division Area - 1390
Total 7137

First Language English pupils

County Area - 3865
Division Area - 4675
Total 8540

Percentage of Welsh First Language Children - 45.5%
Percentage of English First Language Children - 54.5%
(N.B. Many of the English children also speak Welsh).

It is understood that many of the first language Welsh children have a varying degree of proficiency in Welsh.

The following is an analysis of the present language position in the schools. The most significant is the decline in the percentage of the first language Welsh children in the Authority's Schools in 1960. This may be attributed largely to the operation of socio-economic factors such as rural depopulation (which has resulted) in the closure of a number of schools in Welsh speaking areas), the anglicising tendencies of cultural forces such as television, radio, cinema, newspapers

Where?

Since when?

and periodicals, wartime evacuation and mixed linguistic marriages, especially among young people in the forces and many other factors which are outside the scope of this survey.

There are, however, pointers to the possibility that this decline is slowing down and that positive action by the Authority is bringing about a halt and even a reversal in the tendency and our own survey has shown that there is a considerable number of Welsh speaking children who are not first language Welsh: there is a possibility that these too in due course with adequate teaching can become fluent in both English and Welsh. This can be done by fostering high standards in respect of both languages on the part of the teachers in accordance with the recommendations of the U.N.E.S.C.O. Seminar held at Ceylon in 1953, which also laid stress on "an introduction to educational psychology and to the theoretical and practical problems of teaching with special attention to methods and techniques of teaching languages and the use of visual aids."

A bilingual policy, therefore, implies the intention to maintain if not to increase the number and proficiency of those speaking both languages. As may be seen from the remark cited earlier from Eire, this does not apparently depend solely upon educational policy, important though this is. Confirmation comes from two studies of incidence. One by Jennie Thomas, surveying Gaernarvonshire in 1952, noted that no significant change in the language pattern of the county has taken place since the surveys of 1944 and 1948. She reported that the maintenance of the Welsh-speaking percentage at a uniformly high level in spite of the powerful anglicising forces which were potent throughout the county, could be attributed to two vital forces. The first was the bilingual policy enunciated by the L.E.A. and carried out by successive Directors of Education in association with generations of teachers. The second she attributed to the wide spread, virile social and religious life which existed in all cultural institutions in both urban and rural areas. The existence of this strong influence was reflected in the local and national press and ultimately in the live Welsh language spoken in the majority of homes.

over only 8 years

In South Wales, however, the opposite tendency has been noted not only by Jones in the previously cited report but by Davies, who in his work on "The Decline of the Welsh

language in a sample of the Faculty Area" stated that there had been a continued deterioration in the position of the Welsh language in the communities concerned. There had been a similar decline in the power of the Welsh cultural agencies, particularly in the areas of the greatest concentration of population. Many causes had been enumerated for the disappointing results of the Teaching of Welsh in schools as a second language - the shortage of adequately trained teachers, lack of enthusiasm, faulty methods and the supremacy of the English language outside the classroom. Serious thought would have to be given to this aspect of language teaching if bilingual policy in the schools is to achieve any measure of success: but it would be foolish to neglect also the interaction between language teaching and learning and the general quality and liveliness of the surviving culture.

Here is a field, therefore, where the local Education Authority and the research worker in Applied psychology can profitably work hand in hand. Clearly, too, bilingualism is an additional hazard of which account must be taken when attempting to assess the personality and the potentialities of a child. It is at this point that some research workers have confused the issue by attempting to apply purely statistical techniques (rather than experimental) in order to partial out the effects of certain of the variables under discussion. Not the least of the difficulties which the research worker has to face is, in fact, the effect of varying degrees of bilingualism (within the environment and in the child himself) on the semantic organisation of different children. These differences, which are reflected in mental functioning and structure, can hardly be dealt with by mainly statistical means. We are faced with the same order of problem as makes cross-cultural research difficult.

From the point of view of the research worker in Wales, then, the factor of bilingualism, complicated by the varying degrees of linguistic facility achieved by various children ranging from high to low intelligence and affected by different socio-economic influences makes it extremely difficult to design an experiment to ascertain the most effective method and curriculum for teaching any particular bilingual child.

DAVIES J.A.: "The decline of the Welsh language in a sample of the Faculty Area", Bulletin No.6.
University College, Aberystwyth.

THOMAS J: "Third Language survey of Caernarvonshire Schools"
Caernarvon, 1952.

Argument?
Surely the attack is
less properly directed
at statistical methods
than at weakmen's
experimental design?

Yes

It is, however, evident that research into the problem of bilingualism is important for the teacher and the psychologist, for the administrator and the medical officer, if indeed education and guidance are to be employed to the best advantage of Welsh and English children. But it is well to remember that language serves but as a vehicle to convey the cognitive, conative expressions of the individual, that the individual himself may, in turn, be subject to a variety of influences which promote or inhibit the development of his personality and the degree with which he will cope successfully with his environment will depend on his emotional development and the functional level of his intellectual capacity to overcome any socio-economic or other difficulties which he may have to face.

Under the direction of Emeritus Professor Idwal Jones the Collegiate Faculty of Education at Aberystwyth published "A Review of Problems for Research into Bilingualism and Allied Topics" based on the investigations by the research assistant (Dynamllt Morgan) into the schools of the Faculty area and the detailed work of the former advisory officer (A. Pinsent). The preface states that not only should this statement serve as a programme of work for the Collegiate Area as opportunities arose, but as a "blue-print" for all research work connected with bilingualism in Wales. So much has been written in purely general terms about two-language teaching and learning and so little exact work done, that a planned layout of the problems involved is both timely and salutary and workers in the field will be helped to find specific projects and to see how their work might be co-ordinated.

So detailed are the recommendations of this pamphlet and so imaginative its suggestions for topics of research that a summary would not do it justice. However, the following will be helpful to the general reader. In brief, it states ^{that} the scope of research work might legitimately include experimental investigations, surveys of conditions as they exist at the present time, historical studies, and the collection and arrangement of bibliographic and other source material for ready reference by research workers and teachers.

JONES I: "A Review of Problems of Research into Bilingualism and Allied Topics". Pamphlet No.1.
University College, Faculty of Education,
Aberystwyth, 1953.

Among the many topics for research, the pamphlet suggests the following:

- (a) the need to construct the necessary "tools" for investigation, such as standardised tests of reasoning, attainment and attitude.
- (b) studies requiring the use of such special "tools", including,
 - (1) definition of concepts. case studies.
 - (2) studies of intelligence test performance in relation to degree of Welsh linguistic background.
 - (3) studies of development of educational attainment in relation to Welsh linguistic background.
 - (4) surveys or studies to determine the comparative efficiency of alternative methods of language teaching.
 - (5) studies of "language mixture" and its effects on learning.
 - (6) Methods of selection for, and allocation to, types of secondary education in mixed language areas.
 - (7) studies of attitudes and incentives in connection with teaching and learning Welsh/English.
- (c) investigations not requiring research tools - ranging from studies of word frequencies to the curriculum, methodology and sociological background of the schools.

Though not exhaustive this list of problems does enable the student of semantic organisation to have the right perspective in regard to his particular field of work.

A study of the various aspects of bilingualism can, then, shed some light on the development of the human personality. A study of the comparative philology of functional intelligence will be useful in so far as hypotheses which hold true for one language should hold true for another - if their findings thus confirmed are to be of general value and to be applied in the general field of psychology.

W.R. Jones who has done sterling work on bilingualism has stated in his monograph on non-verbal intelligence "The investigation of Jones (1933) James (1947) and Jones and Stewart (1951) show considerable advances, not only in the application of statistical techniques to the bilingual problem, but also in the adoption of various methods for quantitatively assessing the linguistic background of the children tested." Jones has also made a statement in his monograph "Bilingualism and Intelligence" (1959) which substantiated certain important assumptions which the present writer made in his own "Comparative study of general performance between bilingual and monoglot children in south Wales" (1947) namely, "It would, therefore, appear that

W.R. JONES: "A critical study of Bilingualism and Non-verbal Intelligence" p.71. Br.J. of Ed. psych. Vol XXX Part I, pub. 1960.

various groups of monoglot and bilingual children do not differ significantly in intelligence, provided that they are also of similar socio-economic status as indicated by parental occupations. It is concluded that bilingualism as such need not have an adverse effect on performance in a non-verbal test of intelligence.

In 1947 the present writer introduced for the first time the statistical technique of Analysis of Variance in the treatment of the bilingual problem: this technique has subsequently been used by many investigators although until recently some have failed to take certain qualitative safeguards before completing the design of their experiment.

In order to clarify a controversy which has gone on for a period of ten years and as a necessary preamble to our present Associative Word List Experiment the following summary of James' 1947 technique will be of interest - "the investigation took place in 1946. The initial problem was (i) to find a school from which a suitable random sample of children could be drawn (ii) to establish two groups of children, viz, (a) monoglot and (b) bilingual who were of similar age and sex (iii) to make sure that they were of similar socio-economic background (iv) but differing only in the criteria to be examined.

Finally, it was necessary for the present writer to make the assumption, subsequently fully substantiated by later investigators as well as by the writer himself that monoglot English and Bilingual English/Welsh children were of equal intelligence as adjudged by non-verbal criteria.

Before carrying out his statistical analysis, however, James clearly made the following basic assumptions as a necessary pre-requisite to the design of his experiment (quote):

- "(i) The Monoglot and Bilingual groups have a similar socio-economic background.
- (ii) The difference between the overall intelligence of the two groups is not significant.
- (iii) We are therefore in a position to make a fair comparison between the general performance of Monoglot and Bilingual groups on the basis of Teachers' Assessments".

Having first established the three above principles it was possible to carry out the statistical analysis in detail - an analysis which has a direct bearing on our present experiment. We will, therefore, quote a verbatim summary "The basic proposition is that from any set of 'R'

assumption?

groups of 'N' cases each, we may on the hypothesis that all groups are random samples from the same population derive two independent estimates of the population variance.

- (a) One of which is based on the variance of the group means.
- (b) The other on the average variance within groups.

The Test of this hypothesis, then, consists of determining whether or not the Ratio. (F) between these estimates lies below the value in the table (Fisher) for 'F' that corresponds to the selected level of significance. To make the comparison of these due results (i.e. between the General performance of sets of Monoglots and Bilingual children) we consult Fisher and Yates tables entering with the appropriate degrees of freedom. We compare the variance Ratio between "The difference between M and B sets within groups" and the Error with the F numbers found in the table. Thus we note that the difference between the Monoglots and the Bilinguals (Variance Ratio 2.5) is not significant at the five percent level (Fisher 2.87). The same procedure was carried out using Intelligence Quotients obtained when the 'non-verbal' test was administered in English to the monoglots and in Welsh to the bilinguals. The results were almost similar - the Variance Ratio obtained in this case being 2.4 (i.e. not significant at the requisite levels) *identical?*

Difference	'S.Sqs.	Degree of Freedom	Mean Square	F.Movement		Comment
				Agst	Agst	
Between Groups	591.48	3	197016	833.5	761.8	NS
Between Tests	5491267.23	5	1098253.23			S
Residue	12503.27	15	833.5			
Within Groups	5504361.98	23				
Test Table						
Between M & B Sets within Groups	7892.50	4	1973.12			2.87 @ 5%
Errors	15236.00	20	761.8	2.5		4.43 @ 1%
TOTALS	5527490.48	47				

In order to obtain a finer estimate of the difference of general performance between the Monoglot and Bilingual sets of children we can go further by making analysis which uses up the information obtained from the scores of individual children, thus:-

Difference	S.Sqs.	Degrees of Freedom	Mean Square	F.measured		Comment
				Agst	Agst	
Betw. M & B Sets	80.59	5	16.118	1	1	Not significant
Between Tests	132281.89	1				
Residue	138.25	5	27.45			
Within Test Set Table	132449.73	11	12040.88			S.S.
Betw. children within Sets	4670.94	22	212.31	2.8		
Error	8095.56	110	23.59			
TOTAL	145266.23	143				

We note that with this finer estimate, using the information obtained from the scores of the individual children, the F. ratio is less than one and in consequence the difference in general performance between monoglot and bilingual sets is not significant. It is of interest to notice that the difference between the individual children within the sets is shown by the Variance Ratio. to be (2.8), that is significant at five per cent level (Fisher 1.6) and at one per cent (Fisher 2.0).

The next table gives the results of the Analysis of Variance making use of all the scores of all the children within the groups.

Analyses	Difference Between	S.Sqs.	Degrees of Freedom	Mean.Sq.	F.Measured		Comment	
					Agst	Agst		
English 1a	Monoglot	80.59	5	16.118	27.45	1	73.59	1 NS
English 1b	Bilingual Set	100.00	5	20.00	133.91	1	27.4	1 NS
Admin.1c	(within	434.03	5	86.80	73.87	1	31.17	2.5 NS
Admin.1d	Groups)	39.05	5	7.81	121.16	1	21.87	1 NS
English 2a	Monoglot	65.66	5	13.13	17.7	1	118.1	1 NS
Welsh 2b	Bilingual Sets	130.34	5	26.06	174.11	1	49.6	1 NS
Admin.2c	(Within	315.06	5	63.01	55.0	1	44.6	1.4 NS
Admin.2d	Groups)	17.36	5	3.47	93.63	1	56.96	1 NS

We note that the difference in General Performance between the Monoglot and Bilingual sets is, in all cases not significant (N.S.)

Summing up the main conclusions of the various investigations on bilingualism made (among others) by Saer, Smith, Hughes, Barke, Jones and Stewart in Wales, Morrison in Scotland, Decroly in Belgium, Starke in Ireland and Arsenian and D'Arcy in the U.S.A., we have found ^a certain

degree of unanimity in diversity in so far as the findings of the present writer's enquiries agreed with them on the following points:

- (1) The (nonsignificant) difference between monoglot and bilingual groups, when measured by a non-verbal test of intelligence remained almost constant when the administration of the test was carried out, in the first instance in English/English and in the second English/Welsh i.e. Bilingualism in itself does not seem to affect mental development adversely as judged by non-verbal criteria.
- (2) The younger (and correspondingly less developed) children experienced certain language-mixture difficulties but the more intelligent children tended to derive a benefit from two languages.
 - (a) With the corresponding development of intelligence with age the child is better able to gain command of both languages without undue emotional or mental strain.
 - (b) The educationally subnormal child tends to experience linguistic difficulties with both languages.
- (3) Bilingualism, being the external expression of two distinct cultures (or where a synthesis has taken place of one bi-focal culture) had an affective tone whose influence for good or evil will depend on the degree of integration of the individual personality.

The findings of this preliminary experiment at the primary level of education has subsequently, as indicated, been amply substantiated even to the satisfaction of the critics. The investigation, made by the present writer, which we have described in detail serves the double purpose of summing up the complexity of a psycho-semantic phenomenon called bilingualism or as Hebb would have said "we can then regard this stage of primary learning as the period of establishing a first environmental control over the association areas."

In brief we have drawn together the various threads of the neuro-psychological, cognitive, environmental and orotic aspects of functional intelligence, using Hebb's frame of reference as a loom on which to weave the general design of our experiment. Thus he described the patch-work quilt of life in the following terms "organizing such elements in the various sense modes would lay the foundation of all later responses to the environment. Secondly, there is a

period of establishing simple associations and with them conceptual sequence - the period in which meaning first begins to appear. Finally, the learning characteristics of the mature animal makes its appearance".

We are, therefore, in order to test our three previously outlined hypotheses, faced with the following kind of problem which makes cross-cultural research difficult: we must -

- (1) carry out a scientific survey of the setting of the experiment.
- (2) establish by statistical analysis the functional intellectual equality of the monoglot and bilingual groups of similar socio-economic and educational background.
- (3) make, thereafter, a qualitative and quantitative assessment of Hebb's proposition as to the efficiency, or otherwise, of the effect of early as opposed to late learning.

CHAPTER IV

JAMES ASSOCIATIVE WORD LIST EXPERIMENT

We have seen how two broad English and Welsh linguistic streams have converged to produce a mixed milieu against which the James Associative Word List Experiment will be enacted in an attempt to assess those factors in comparative philology which influence the functional level of intelligence.

Benjamin Farrington in his work on "Greek Science" states "The bilingualism of the Graeco-Roman world means that from 100 B.C. European science had two tongues but the work was unequally distributed between them..... One consequence of this relation between Roman and Greek science is that grammar, one of the last sciences to be constituted by the Greeks was the first in which the Romans achieved mastery..... It was the need for studying the second language that made the Romans grammarians..... The debt of culture to Roman grammarians is immense. Linguistic phenomena have not proved the easiest sort of material for science to analyse". That this is so will become readily apparent as our experiment proceeds.

In order to further our scientific study of bilingual phenomena we first propose to make a statistical analysis of the 1960 Year Group of Pupils in Carmarthenshire at the age of eleven plus

BENJAMIN FARRINGTON: "Greek Science: Its meaning for us", reprinted with revisions, Nicholas & Co.Ltd., 1961.

after having first proved the efficacy of our method by discussing the findings of our 1958 pilot survey when it was shown that,

- (1) using a non-verbal criterion there was no significant statistical difference in the functional level of intelligence of children who are basically of Welsh bilingual background and those who are fundamentally monoglot English.
- (2) that headteachers and their staff could make a reliable qualitative assessment of their pupils' academic capacities.

Having considered the 1960 year group in detail we propose to select two "Matched groups" of bilingual children with the following criteria, namely,

- (i) 100 Bilingual children (50 boys and 50 girls) whose first language is Welsh as an Experimental Group.
- (ii) 100 Bilingual children (50 boys and 50 girls) whose first language is English as an Experimental Group.
- (iii) 50 Monoglot English children (25 boys and 25 girls) to act as a control group.

These groups will be matched for (a) age, (b) sex
(c) functional intelligence (d) socio economic background
(e) educational development (scholastic influence, etc).

These three groups of children will then be subjected to a series of neutral auditory and visual stimuli (viz. the James Associative Word Lists) in order to ascertain what their natural linguistic responses will be. It is hoped that the results will throw light on the relative effect of early as opposed to late learning.

The design of the experiment will be such as to make the most felicitous use of both quantitative and qualitative procedures in an attempt to make a general appraisal of Hebb's neuro-psychological theory and in particular to test the efficacy of the three hypotheses (Previously outlined) based on Hebb's work.

The Carmarthenshire Education Committee in accordance with its statutory duties recently considered the procedures governing the transfer of pupils from primary to secondary schools at the age of eleven plus with a view to:-

1. Ensuring that every child is given the opportunity of developing to the full his aptitudes and abilities in an establishment providing secondary education.

2. Removing any element of 'chance' or 'finality' in the transfer at eleven-plus.
3. providing adequate safeguards for late developers.
4. Alleviating the anxieties of parents and pupils concerning the future education of the pupils.
5. offering facilities for secondary education founded on sound educational principles adequate to meet the wide diversity of abilities of pupils and capable of adapting itself to the needs of a rapidly expanding and changing society.

The committee in its policy statement "Keeping Open the Door of Educational Opportunity", went on to say that it had been decided to review the whole question of 'secondary selection' at the age of eleven years and substitute for the previous one-day examination a method of educational guidance or 'allocation' based on cumulative school records, which would take into consideration the ability and aptitude of all pupils, the slow as well as the quick, in order to provide them with a variety of facilities designed to promote their scholastic progress and the full development of their personality.

The Authority regarded the secondary stage of education 'as a single whole' within which there should be a variety of types of education supplied, but which would be characterised by the aim of providing for the "needs of children passing through the stages of adolescence", a period which had such marked and profound changes during which it was imperative that a child be placed in the school which would afford the right sort of education during his next period of growth. conscious of its duty in this respect, the Authority decided to alter the present method of selection for Grammar Schools to one of 'allocation' of pupils to secondary schools.

The present system of selection, based on unstandardised tests in Arithmetic, Language and Essay had served its purpose well. But in the light of the present requirements of the 1944 Education Act to afford every child a secondary education, an urgent need had arisen to re-assess the current procedures concerned with the transfer of pupils from primary to secondary schools.

CARMARTHENSHIRE L.E.A: "Keeping Open the Door of Educational Opportunity", pub. Mercury printing press, Llanelly. Dec. 1957.

It is obvious, that qualities other than intelligence such as qualities of character and temperament as well as attainment in school subjects needed to be taken into account before efficient educational guidance could be given. The Authority introduced the new procedure in 1959 (after due consideration had been given to a Pilot Scheme). The principle of allocation required the assessment of the full power and personality of the child: all the trustworthy evidence that was available about the pupils would be used to determine the school in which he was most likely to succeed happily and ultimately educational guidance would be universal and continuous throughout the child's school life.

The procedure for allocation is as follows: a more detailed statement of the tests used will be given later during the course of the experiment.

In Stage I, the Authority obtained from the headteachers of all primary schools in the county an Order of Merit List of all pupils aged eleven years on the first day of September of the current school year.

The Order of Merit List drawn up by the headteachers in consultation with their staff was based upon their assessment of the pupils:

- (i) Abilities in Reading, Language, Comprehension and Composition.
- (ii) Abilities in Arithmetic.
- (iii) Abilities in General Knowledge.
- (iv) Personal characteristics, e.g. perseverance and emotional stability.

It was considered that the evidence showed that no person was more competent to assess the abilities of the children than the teacher; no one could discharge that duty better than the teacher. The Authority was, therefore, confident that this professional responsibility would be one that would be accepted by the teachers of the County and that they would make their assessments objectively, fairly and without fear or favour. But it was considered that as objectively and as fairly as the Authority believed the teachers would undertake the work of assessment, it was aware, as indeed were the teachers themselves, that the assessments from different schools might vary, for example, the assessments of a teacher in a small rural school might differ from those of the teacher in the urban school. Such a difficulty could be offset by the next stage of the procedure.

In Stage II the Order of Merit List would be scaled by Officers of the Authority in order that the headteachers' assessments from various schools could be made comparable. The method used was that evolved and proved by the National Foundation of Educational Research who had carried out considerable investigation into the problem. Every pupil in the age group would undergo a Non-verbal Reasoning Test which would be administered and marked by headteachers and their staff. Such tests would, therefore, be introduced into the ordinary routine of the school in the same manner as certain standard tests of English, Welsh and Arithmetic could be used as a quantitative aid in stage one.

In Stage III a standardised test of Arithmetic as well as unstandardised papers in English and Welsh language (comprehension and composition) would be taken by the children in their own schools under the supervision of visiting staffs of adjacent schools. This arrangement should prove advantageous to the children since they would feel more at home in a familiar environment. It was hoped that this would reduce the need for any special preparation.

In Stage IV the language tests would be marked externally and recorded alongside the scaled teachers assessments and the arithmetic scores. The Internal Assessments, the scaled Teachers' Assessments and the External Assessments would then be synthesised as individual profiles as a result of which the children in the year group would be classified

on a fifteen-point scale, thus:- A+, A, A-, B+, B, etc.

In stage V in accordance with their grading all the pupils in the year group would be placed in an Order of Merit from which the pupils would be allocated to a Secondary School as follows:-

Grammar School A.B/C/D.

Secondary Modern Schools A.B./C/D Forms.

Establishments for Special Educational Treatment.

In brief, every child in the eleven-plus year group would have been considered individually and in the case of handicapped pupils the psychologist would take into account such clinical records as were available for certain handicapped pupils who would then receive suitable special educational treatment in remedial units and special schools.

Once the allocation had been made pupils would be transferred to such secondary schools as were suitable for their age, aptitude and ability. The allocation at eleven-plus, however, would not be final since the policy of the Carmarthenshire Authority was that of "Keeping Open the Door of Educational Opportunity": this was achieved by introducing a common curriculum for the "C and D" forms of the grammar schools and the "A" Forms of the secondary modern schools. The pupils of these Forms would follow this common curriculum for two years, that is from the age of 11+ to 13+. This two year period would serve as a probationary or diagnostic period. At the end of this period certain pupils from the grammar school (that is, the lowest in the Order of Merit) and the pupils in the "A" Stream of the secondary modern school would be reassessed and reviewed. For the purposes of this reassessment there would be a close consultation between the Authority's Officers and the Headteachers of the Secondary Schools. It is of interest to note that the first re-assessment was successfully carried out in the year 1961 when some children were transferred from the Grammar School to the Secondary Modern and vice versa.

After this re-assessment certain pupils in the "A" Forms of the Secondary Modern Schools who had developed an ability and aptitude for taking a wide group of subjects at the General Certificate Examination 'Ordinary Level' were transferred to the Grammar Schools. These pupils in the "C" and "D" Forms of the Grammar Schools who had shown themselves unable to profit from a course leading to a wide group of subjects at the G.C.E."O" level were transferred to the "A" Forms of the Secondary Modern Schools. Such

transfers would put right any "errors of hindsight" which had taken place in the original eleven-plus allocation.

After the age of 13+ pupils in the 'A' Streams of the Secondary Modern Schools could still be able to carry on with the G.C.E. 'O' Level Course in a limited number of subjects. This course had been carefully adapted to the special needs of Secondary Modern School pupils. In these 'A' Forms there would of necessity be pupils of good average intelligence and they would be given the chance to show powers of leadership and ability which would tend to be obscured by the work of the intellectually more capable children of the Grammar Schools. Any disappointment which the pupils or parents might naturally feel as a result of the transfer from the 'C' or 'D' Form of the Grammar School would be alleviated by continuing with a G.C.E. 'O' Level Course and the pupils would be able to retrieve their position by aiming first at the Ordinary Level of the General Certificate. Anyone who did sufficiently well at the 'O' Level would if he or she so desired be transferred to a Grammar School to follow a course leading to the Advanced Level of the General Certificate Examination.

The curriculum of the Secondary Modern Schools would cover not only the requirements of the G.C.E. at 'O' Level on a limited number of subjects, but it would also cover the requirements of the technical type of examinations. The headteachers of the schools concerned would advise the pupils and parents which examinations to take.

The experiment upon which we are now engaged has theoretical and practical implications. For this reason the foregoing summary of the policy of the Carmarthenshire Education Committee throws light on the educational background in which the schools work.

It is important for the researcher to be aware of this background in order that the socio-economic and other influences can be assessed within the right context.

Not the least important among factors operating in the Carmarthenshire procedure for the allocation of pupils to secondary schools are the various degrees of bilingualism found among children in such a linguistically mixed area. It should be remembered too, that the language policy of the Authority should not determine its allocation procedure - but that account should be taken in the procedure of these variations of language since they form one of the fundamental aspects of child development.

Hitherto much difficulty has been experienced in coming to terms with the 'bilingual problem' as it was called on account of the fact that no way had been devised to assess the comparative philology of functional intelligence arising from the interplay of the two languages - English and Welsh. This problem was resolved by calling upon the headteachers to draw up an Order of Merit List where the First language Welsh-speaking children were interleaved with the first-language English-speaking pupils. This Order of Merit as we have seen depended on the assessment of verbal and number factors by using both the qualitative and quantitative methods. The "pooled teachers' estimates" were then reconsidered by the headteacher who drew a line above which the children were considered to be of potential grammar school calibre, and another line below which the pupils were considered to be of secondary modern school calibre - the children who appeared between the two lines were considered to be borderline and merited closer consideration.

The Order of Merit was then scaled by the psychologist using the procedure devised by Messrs Pidgeon and Yates of the National Foundation of Educational Research. Before the scaling could be carried out it became necessary to construct a suitable

test. In view of the fact that Carmarthenshire was a bilingual area it was not possible to use a Verbal Reasoning Test; it was, therefore, decided to use Non-Verbal Reasoning Test. Whilst the present writer is aware that a test of non-verbal reasoning is not a good predictor of grammar school success it has other values insofar as it does a different job from the Verbal Test. The Non-Verbal Test can add something new to the battery -

(1) by acting as a scaling instrument. X

(2) by pin-pointing such pupils who although functionally low in the academic order of merit may nevertheless have a high I.Q. Furthermore, since W.G.Emmett has shown that the Teachers' Assessment is a good predictor (a fact subsequently confirmed by the N.F.E.R.) the use of the Non-Verbal Reasoning Test makes the best use of both worlds for we are aware that the Verbal Reasoning Test and the Teacher's Assessment tend to measure the same thing whilst the test of Non-Verbal Reasoning not only tells us something more but has added value as a Scaling Instrument. The weakness of the Non-Verbal Test as a predictor is offset by the qualitative and quantitative assessments already made by the teacher in his internal assessment and by the Officers of the Authority in their external assessment of the children's abilities in English, Welsh and (standardised) Arithmetic. It is of interest to note in this context W.G.Emmett's statement on his "Enquiry into the prediction of Secondary School Success"^{that} evidence is accumulating that an assessment by teachers in the primary schools gives at least as good a prediction as any of the papers in an admission examination and it is to be hoped that such assessments will be given more and more consideration in the near future, once it is found possible to co-ordinate the assessments from different schools. A knowledge of a child's work and abilities extending over several years must necessarily have a large measure of prognostic value and this valuable source of information should not be neglected". Indeed, in Carmarthenshire this valuable source of information has not been neglected particularly since it was essential to assess the degrees of bilingualism in individual children. It has been found possible by using the Non-Verbal Reasoning Test as a scaling instrument to co-ordinate the assessments, drawn from various schools, with the result that the fullest information is available concerning every child. The efficiency of this system has been proved in a follow-up study which shows that the eleven-plus procedure outlined

above is doing the job for which it is intended. The results of our experimental samples will be drawn from the eleven-plus findings of the 1960 year group. But first let us consider their Pilot Scheme findings with regard to the Non-Verbal Reasoning Test.

It is clear that when attempting to assess the personality of a child one should be extremely careful in one's approach and particularly in one's findings. One would do well to bear in mind the words of admonition given by Sir Cyril Burt in his Criticism of a Critique by G. Lewis on the Distribution of Intelligence when he states, "in practice, however, to define intelligence in the circular manner is as helpful and as uninformative as it would be to define temperature as the physical characteristics that thermometers measure. To begin with how are we to determine what can be accepted as tests of intelligence and what cannot?" Mr Lewis seems to regard Moray House Tests as the best and most typical; others would take the Terman and Merrill Tests as their standard; others again prefer the non-verbal or performance type. Furthermore, all such tests have imperfect correlations both with each other and with independent assessments. Thus, as with other forms of psychological measurement, their results are largely affected by incidental influences irrelevant to our main purpose, and are consequently disturbed to a far greater extent than physical measurements by error. But if we have no antecedent definition of what we want to measure, how can we distinguish what is irrelevant from what is not?"

In brief, one should be clear about one's definition and terms of reference and particularly about one's aims before determining the design of the experiment. As far as we are concerned the non-verbal instrument has proved to be valuable both as a scaling instrument and as a means of supplying supplementary information. It can also serve another useful purpose in the bilingual milieu. Whilst it is generally agreed that a verbal element does enter into the factorization of a non-verbal test, this element is minimised and specifics are maximised: likewise, both the Welsh and the English children are (to use a familiar sporting term) similarly handicapped in regard to the verbal element when they have to understand simple instructions in their own

SIR CYRIL BURT: "Criticism of a Critique by G. Lewis
on the Distribution of Intelligence".
Vol 48/Part 3, p.162-3 August, 1957.
Br. J. Ed. Psych

respective languages. The difficulty can be overcome by giving the instructions in both English and Welsh and thus making sure that they have an equal opportunity of understanding what is requested of them in solving a series of problems. We shall see from the following statistical analysis what a useful purpose can be served by the right use of the non-verbal instrument in a bilingual context - where it is valuable for differentiating between monoglot and bilingual pupils.

As a preliminary to our experiment it was necessary to standardize a non-verbal reasoning test on the population of Carmarthenshire. This was done during the Pilot Scheme survey which comprised the complete age group (Eleven-Twelve years on the first of September, 1958). This was also done in order that this test could be used as a scaling instrument. The test selected for adaptation was the Lee and Jenkins Non verbal Intelligence Test; in this respect close consultation took place between the Officers of the National Foundation of Educational Research and the present writer. Thanks are therefore, recorded in favour of Dr. Wall, the director and to Messrs Pidgeon and Yates who co-operated in making an independent appraisal of the bilingual sample; such an unbiased opinion would serve an extremely useful service in making an authoritative statement in favour of the non-verbal instrument in certain circumstances such as we will now describe.

The Lee/Jenkins test was readapted with bilingual instruction (see below and Appendix). A new format was devised by the present writer, through the good offices of Mr. Iorwerth Howells, Director of Education for Carmarthenshire and the test was administered to the following children in their own schools by the Officers of the Authority:-

category	Boys	Girls	Total
First Language Welsh	385	408	793
First Language English	789	730	1519
Total -	1174	1138	2312

The general impression gained was that the children thoroughly enjoyed their new experience of doing the non-verbal test which was to a varying extent well within the compass of all the children both the quick and the slow.

For the first time in Carmarthenshire it had been made possible to make a group survey of intelligence which would enable one to assess the distribution of ability, on the one hand, and determine largely what manner of provision should be made with a view to finding an adequate number of secondary school places.

The following interpretation of statistical data was obtained as a result of the Survey.

- (i) There was no significant difference between the mean scores of boys and girls where first language was English
- (ii) There was a significant difference between the means of these children where the first language was Welsh.
- (iii) When the sexes were grouped together there was a significant difference between the children with different first languages.
- (iv) The difference between girls first language English and girls first language Welsh was significant at the .05 level.
- (v) Thus it does appear as if the main difference between the two language groups is not confined to boys.

	First Language English		First Language Welsh.	
	Boys	Girls	Boys	Girls
N.	789	730	385	408
Mean Score	42.96	43.61	38.42	41.67
S.D.	13.76	13.82	14.81	12.70
S.E. of Mean	.490	.512	.755	.629
Difference betw. Means (Girls - Boys)	.065		(Girls-Boys) 3.25	
S.E. of difference	0.71		0.98	

i.e. Difference Boys-Girls not significant Significant Difference.

The analysis was carried out for the boys plus the girls thus.

Boys and girls.

Mean	43.27	N=1519	40.09	N=793
S.D.	13.79		13.85	
S.E.	0.354		0.492	
Difference between means	3.18			
S.E. of difference	0.16			

i.e. significant difference.

Tests of significance carried out on the age regression co-efficients showed that none of the differences was significant. It was therefore, possible to produce one conversion table (See Appendix) for transforming the Raw Scores into standardised scores for the purpose of continuing our experiment.

At this point a word would not be out of place on methods of expressing the test scores for if one is to take account of as many factors as possible when estimating the functional level of intelligence not the least will be the need to acknowledge discrepancies arising from the artefacts of test construction.

We have chosen to interpret operational intelligence statistically in terms of the I.Q. We know such an interpretation will have its weakness but so too will an interpretation using other statistical methods which seek to transform raw scores on a test into some meaningful form which lends itself to the treatment of comparative results. Such results could have been as easily expressed in terms of standard deviations, percentages, "percentile ranks", "standardised scores" or "Z scores"; it is also customary in this country to incorporate a system of age allowances in the process of standardisation.

But as far as we are concerned it is the factors which enter into the interpretation of test scores which are relevant to the argument for most measurements are subject to error. Pidgeon has rightly pointed out that "so far as tests are concerned it is difficult if not impossible to distinguish between errors arising from variability in children's performances and those arising in faults in the construction of the test. No test is perfect and the fluctuations in the performance of children are well known to every teacher". Likewise errors may arise from inadequate standardisation of a test especially where a sample is too small or not representative, or again errors may arise from faulty administration or marking. Nevertheless as Pidgeon has pointed out the "periodic use of standardised tests, by enabling the teacher to express the assessment of his pupil in a meaningful form can be invaluable for passing on relevant information for school records" or drawing up an Order of Merit List such as we have done.

A valuable note of caution is voiced by Hardie on the problem of inference in educational research and where he questions the validity of certain results based on the Techniques of random sampling and probability, where he says, "This means that more care should be taken by experimenters in education in planning their experiments and they should not automatically apply statistical tests to the data they obtain. Indeed such application may well be opposed to the way in which progress has, in general, been made in the sciences since the time of Bacon. Suppose that most children learn something taught by Method A better than if taught by Method B while the minority learn better by Method B than by Method A. If random samples

D.A.PIDGEON: "The Design, Construction and Use of Standardised Tests and The Interpretation of Test Scores. Vols III & IV. Educational Research N.F.E.R. Journal, Feb. and Nov. 1961.

C.D.HARDIE "Research Note on the Problem of Inference in Educational Research". Br.J.Ed.Psych. Vol XXXII, Part I, Feb. 1962.

of children taught by the two methods are obtained then a significant difference will probably be found in favour of the sample taught by Method A. So far so good, but what often happens then is that text-books and lecturers pronounce that Method A should be superseded by Method B in the Schools, and the matter rests there until someone suggests Method C. But whereas in the conditions under which learning takes place so many factors are involved, it is surely naive to leave the matter there. What is required is to find those factors in the situation which are associated with better learning under Method A and those factors which are associated with better learning under Method B. In this way further research is stimulated and more useful generalisations obtained". It has been our endeavour to ascertain a little more of those factors attendant upon comparative philology which affect the functional level of intelligence - and assess them qualitatively as well as quantitatively.

Let us return to a consideration of the factors operating on the performance of children in the standardisation of a Non-Verbal Reasoning Test on Carmarthenshire pupils as a necessary preliminary to our experiment. Over and above the artefacts of test construction and experimental design are those other factors obliquely referred to in our synchronic description of individual bilingualism. Thus in Carmarthenshire where the Local Education Authority pursues a bilingual policy account must be taken of those factors which promote or otherwise militate against the learning of two languages. The functional level of intelligence will be affected by both the intrinsic conditions of learning such as sex, age, emotional associations and orctic features of the human personality as well as by these extrinsic conditions of learning such as the relative incidence of bilingual population, frequency of contact, language and language skills used, the status of the language itself, the aptitude for and attitude towards learning, the age of introduction and amount of each language used and the relative standards obtaining in them. Similarly, the duration of the conditions together with the subjects taught and these teaching methods used in these languages have a direct bearing both on formal and informal learning situation in terms of classroom or private estate. Finally, the context of use and group pressures on learning are highly relevant to the performance of boys and girls in a bilingual environment.

with what?

?

It is of interest, en passant, to suggest a possible reason for the discrepancy between boys and girls results, namely that there is a tendency for the brighter Welsh children, particularly in anglicised areas to become bilingual (English/Welsh) and then to adopt English as their first language during the eleven-plus assessment and later for the purpose of continuing their education whilst retaining Welsh as the medium of communication at the social - domestic level.

Amplify

The Mean Raw scores obtained from our results were then converted into standardised scores at Mean Age for the complete year group at eleven-plus, as follows:-

	Boys	Girls
Welsh speaking groups	95.3	98.1
English speaking groups	99.3	99.9

(It is to be noted that the values all worked out below 100 since in constructing the conversion table median scores and not mean scores were used.)

Having thus standardised the non-verbal test on the complete year groups of the local population it was possible to proceed to the next stage and to use the test results for the scaling procedure.

A school was selected at random where the bilingual problem was most acute and a detailed analysis of results was carried out as follows:-

- (i) the average non-verbal test score for first language English children and the first language Welsh children, viz
 - (a) First language English 110.4
 - (b) First language Welsh 104.3
- (ii) this agreed with the general analysis of the Welsh test (as above) that the first language English do better than first language Welsh.
- (iii) the non-verbal test scores were used for scaling the teacher's Order of Merit.
- (iv) The mean quantified headteachers' assessments for first language English and first language Welsh were
 - (a) First language English 107.9
 - (b) First language Welsh 107.0

(v) This indicated that difference in performance on the non-verbal tests became ironed out after scaling.

But the scaling was applied to teachers' assessment

From the above it will be realised that before considering the comparative philology of functional intelligence one must consider the use of a suitable research tool - in this case the non-verbal reasoning test (with bilingual instructions). It then follows that this test must be standardised on the particular age group where the experiment will take place, namely, Carmarthenshire. Furthermore, one has to take account not only of the age group but, as we have seen, of sex differences, as well as the relative influence which the educational organisational factor has in producing discrepancies in results. As previously pointed out the bright first language Welsh children although they are equally fluent tend to opt to do the eleven-plus papers in English in the anglicised areas (particularly in the Amman Valley). Once these differences have been ironed out, however, we are in a position to use the Non-Verbal Reasoning Test as a neutral instrument for our crucial experiment.

Let us first discuss other relevant points namely the comparison between the headteachers' internal assessment and the L.E.A. external assessment in order to satisfy ourselves that Emmett's opinion is amply corroborated. A comparison was, therefore, made of the Internal Assessment i.e. headteachers' Order of Merit Lists (scaled on the non-verbal Reasoning Test), with the External Assessment made up of the scores of children in unstandardized tests of English, Welsh and Arithmetic.

Eighteen (18) schools were selected from various types of areas throughout the County ranging from complete First Language English through linguistically mixed schools, to First Language Welsh Schools.

The Order of Merit Lists were drawn up separately for boys and girls but the first language English and the first language Welsh boys (girls separately) were "interleaved" for purposes of comparison within the schools Order of Merit Lists. This procedure proved to be singularly effective (as shown below). Furthermore, all rank correlations between the teachers' Order of Merit and the total examination scores proved to be highly significant, as the following table shows:

Rank Correlations between the Teachers' Order of Merit
and the Total Examination Scores

<u>School</u>	<u>No.</u>	<u>Rank Correlation</u>	<u>No.</u>	<u>Rank Correlation</u>
Gwendraeth C.P.	19	0.89	12	0.97
Ponthenry C.P.	13	0.97	12	0.96
St. Clears C.P.	7	1.00	7	0.89
Ammanford C.P.	32	0.96	23	0.93
Brynamman C.P.	18	0.86	18	0.90
Parcyrhun C.P.	21	0.91	19	0.95
Garnant C.P.	23	0.92	14	0.93
Llandeilo C.P.	10	0.85	12	0.97
Whitland C.P.	13	0.95	13	0.87
Pentrepoeth C.P., Carmarthen.	24	0.93	24	0.95
Ysgol Gymraeg, Carmarthen.	8	0.90	14	0.98
Laugharne	17	0.92	4	1.00
Model & Practising V(C) P.	27	0.96	24	0.90
Old Road C.P.	23	0.96	32	0.93
Llwynhendy C.P.	40	0.95	32	0.81
Hendy C.P.	15	0.91	21	0.98
Ysgol Gymraeg(Llanelly)(D.E.)	15	0.92	15	0.91
Ysgol Brynsierfel.	15	0.95	19	0.97

It will be seen, therefore, that the Teachers Scaled Order of Merit is an excellent instrument for use, in conjunction with the External Assessment as a means of assessing the suitability of pupils, on the basis of individual performance (i.e. functional level of intelligence) for various types of secondary school.

In brief, the writers findings (in association with the National Foundation of Educational Research) has indicated that the best predictors (as far as a bilingual area is concerned) from a battery of tests are the following in order of value:-

- (i) Teachers' Order of Merit Scaled (on a Non-Verbal Reasoning Test).
- (ii) Verbal Intelligence Test.
- (iii) English Test (in the case of Welsh children it may be Welsh).
- (iv) Arithmetic Test (English and Welsh Version).

Since the Verbal Reasoning Test is correlated so highly with the Teachers' Order of Merit (and tends to measure the same thing) it can of necessity be omitted, whilst the old type (unstandardised) English test, tends to minimize "back-wash" effect to the school curriculum is best retained in the battery. The Arithmetic adds little to the prediction (unless combined with Non-Verbal Reasoning Test for scaling purposes) but it is necessary to retain it because it measures number attainment per se.

It is of interest to note, therefore, that the Non-verbal Reasoning Test, although its predictive value in itself is not high, has several advantages other than its use as a scaling procedure, viz.

(i) Children scoring high on the Non-verbal Reasoning Test tend, as expected to cluster at the top of the order of Merit List.

(ii) Children who appear in the headteachers' order of Merit List on the border line (i.e. between the lines) often explain their presence by having low attainment but relatively high non-verbal scores.

(iii) Some children with exceptionally high non-verbal scores and extremely limited attainment figure low on the order of Merit List and may be diagnosed as educationally retarded. (i.e. late developers): such children the functional level of whose intelligence is low may be given special educational treatment by way of remedial teaching after having received a full scale medical and psychological examination at the child guidance diagnostic unit. *This will not do without evidence.*

In brief, therefore, a qualitative interpretation of the statistical results would show that the method of allocation used in Garmarthenshire tends to give a fairly accurate picture of the child's functional level of intelligence at eleven-plus and although the predictive value is high (as substantiated by the 1961 thirteen-plus follow up) certain errors of hindsight which occur can be considered as deviants and their individual cases can be considered by the psychologist within the Authority's scheme for the educational guidance of pupils involving re-assessment at thirteen-plus and fifteen-plus. The breakdown of figures of children allocated to various types of secondary schools in the eleven-plus year group tends to correspond to the theoretical (see appendix). Furthermore, the scheme as envisaged is sufficiently flexible to lend itself to any form of school organisation on the one hand, as well as to give every child the means of being individually assessed on the other. Finally the use of the Teachers' Assessment and the Non-verbal Reasoning Test has been proved valuable particularly in a bilingual context. Our discussion of the test procedure and the standardisation of the Non-verbal Reasoning Test has also paved the way for the next stages in our experiment namely, that of considering the statistical break-down of comparative philology of functional intelligence results of the 1960

ALLOCATION OF PUPILS TO SECONDARY SCHOOLS 1960

Pupils allocated to Grammar Schools and Secondary Modern Schools

	Total Grammar Children	GRAMMAR												A.S.M.		SECONDARY MODERN						Total Sec.Mod. Children 11+		Total No. of children who undertook allocation procedure		Total No. of children
		11+		A		A-		B+		U.G.		(B) C.G.		C+		C		D		E		Eng.	Wel.	Eng.	Wel.	
		Eng.	Wel.	Eng.	Wel.	Eng.	Wel.	Eng.	Wel.	Eng.	Wel.	Eng.	Wel.	Eng.	Wel.	Eng.	Wel.	Eng.	Wel.	Eng.	Wel.					
AMMAN VALLEY	Boys	37	15	3	1	10	8	14	2	27	11	10	4	11	2	25	8	17	7	7	6	60	23	97	38	135
	Girls	49	9	2	-	8	3	17	2	27	5	22	4	13	2	18	3	33	5	7	3	71	13	120	22	142
		86	24	5	1	18	11	31	4	54	16	32	8	24	4	43	11	50	12	14	9	131	36	217	60	277
QUEEN ELIZABETH	Boys	56	37	5	1	7	6	25	15	37	22	19	15	18	8	22	11	26	12	12	9	78	40	134	77	211
QUEEN ELIZABETH	Girls	52	38	2	-	12	6	20	11	34	17	18	21	20	15	17	10	32	19	8	6	77	50	129	88	217
GWENDRAETH VALLEY	Boys	18	42	2	2	2	4	10	24	14	30	4	12	5	4	7	13	9	21	8	2	29	40	47	82	129
	Girls	14	32	-	2	1	9	5	9	9	20	5	12	3	18	5	6	17	16	8	7	33	47	47	79	126
		32	74	2	4	3	13	15	33	23	50	9	24	8	22	12	19	26	37	16	9	62	87	94	161	255
LLANDEILO	Boys	20	9	1	-	4	1	10	6	15	7	5	2	8	6	14	9	9	18	9	3	40	36	60	45	105
	Girls	17	20	-	1	4	1	3	8	7	10	10	10	6	10	4	7	9	14	5	4	24	35	41	55	96
		37	29	1	1	8	2	13	14	22	17	15	12	14	16	18	16	18	32	14	7	64	71	101	100	201
LLANDYSSUL	Boys	9	10	-	-	1	-	8	6	9	6	-	4	2	6	1	6	1	9	2	5	6	26	15	36	51
	Girls	3	8	-	-	-	-	2	5	2	5	1	3	3	6	1	5	1	6	-	1	5	18	8	26	34
		12	18	-	-	1	-	10	11	11	11	1	7	5	12	2	11	2	15	2	6	11	44	23	62	85
WHITLAND	Boys	19	13	-	-	7	-	6	4	13	4	6	9	2	3	5	6	8	9	5	3	20	21	39	34	73
	Girls	15	16	-	-	6	2	7	8	13	10	2	6	-	1	4	6	14	14	3	3	21	24	36	40	76
		34	29	-	-	13	2	13	12	26	14	8	15	2	4	9	12	22	23	8	6	41	45	75	74	149
LAMPETER	Boys	2	2	-	-	-	-	-	-	-	-	2	2	2	7	1	3	2	6	-	2	5	18	7	20	27
	Girls	3	3	-	-	-	-	1	-	1	-	2	3	4	2	-	4	-	3	-	-	4	9	7	12	19
		5	5	-	-	-	-	1	-	1	-	4	5	6	9	1	7	2	9	-	2	9	27	14	32	46
LLANDOVERY	Boys	8	8	-	-	-	-	3	1	3	1	5	7	5	3	3	5	5	6	-	2	13	16	21	24	45
	Girls	7	11	-	-	-	1	3	4	3	5	4	6	7	2	2	4	7	5	2	1	18	12	25	23	48
		15	19	-	-	-	1	6	5	6	6	9	13	12	5	5	9	12	11	2	3	31	28	46	47	93
TOTAL COUNTY	BOYS	169	136	11	4	31	19	76	58	118	81	51	55	53	39	78	61	77	88	43	32	251	220	420	356	776
TOTAL COUNTY	GIRLS	160	137	4	3	34	22	58	47	96	72	64	65	56	56	51	45	113	82	33	25	253	208	413	345	758
TOTAL COUNTY (B & G)		329	273	15	7	65	41	134	105	214	153	115	120	109	95	129	106	190	170	76	57	504	428	833	701	1534
LLANELLY	BOYS	112	25	17	2	28	8	33	9	78	19	34	6	55	12	48	6	92	26	56	7	251	51	363	76	439
LLANELLY	GIRLS	124	17	5	1	34	3	41	6	80	10	44	7	51	18	48	10	103	15	31	8	233	51	357	68	425
TOTAL DIV. EXEC BOYS & GIRLS		236	42	22	3	62	11	74	15	158	29	78	13	106	30	96	16	195	41	87	15	484	102	720	144	864
TOTAL COUNTY BOYS & GIRLS		329	273	15	7	65	41	134	105	214	153	115	120	109	95	129	106	190	170	76	57	504	428	833	701	1534
TOTAL DIV. EXEC. BOYS & GIRLS		236	42	22	3	62	11	74	15	158	29	78	13	106	30	96	16	195	41	87	15	484	102	720	144	864
GRAND TOTALS		565	315	37	10	127	52	208	120	372	182	193	133	215	125	225	122	385	211	163	72	988	530	1553	845	2398

Eleven-plus year group from which our Matched Samples will be drawn for purposes of experimentation.

Inspection of the attached table gives an unusually complete picture of the distribution of intelligence and bilingual attainment of the whole 1960 Eleven-plus year group for Carmarthenshire, based on (A) Internal Assessment (B) Scaled Teachers' Estimate (C) External Assessment. Within the statistical analysis is hidden the qualitative effects of the diversified educational system previously discussed in Chapter III where the internal organisation of the school and the staffing ratio is modified to suit both the type of linguistic milieu as well as to suit the individual child according to his age, aptitude and ability - furthermore as previously indicated (Vide Appendix on the Psychologist's Report 1960 on the School Psychological Service) detailed clinical records are also available of these handicapped pupils. A cross fertilisation of the two procedures the scholastic and the therapeutic, therefore, gives us a complete picture of the educational background against which our experiment is conducted. Briefly, the number of children involved is as follows:-

Table: Allocation of Pupils to Secondary Schools
Linguistic Pattern (English/Welsh)

Areas	Boys		Girls		Total
	English	Welsh	English	Welsh	
County Area	420	356	413	345	1534
Division Executive	363	76	357	68	864
Grand Total	783	432	770	413	2398

Areas	English	Welsh	Total
Total County - Boys and Girls	833	701	1534
Total Div. Executive - Boys and Girls	720	144	864
Grand Total	1553	845	2398

It will be seen that the rural/county area is still fairly equally divided between first language English and first language Welsh speakers but the ratio in the anglicised industrial Llanelly Divisional Executive Areas has fallen to exactly five English children to one Welsh child - although it must be remembered that all the First Language Welsh children are bilingual, that is, they are also fluent in English.

It is clear, from this overall picture that any worker in the field of bilingual research must take account of both the educational and socio-economic factor as the present writer indicated in his original research in 1947.

From our 1960 Eleven-plus Year-Group we are now in a position to select our Matched and Control Groups but first let us consider in detail the technique of assessment including the particular tests used in addition to qualitative schedules, questionnaires and attitude scales. Basically our selection technique for the experiment involved as we have already seen -

- (1) An Internal Assessment.
- (2) A Scaling Procedure.
- (3) An External Assessment.
- (4) A Fifteen-point Scale Profile.

The Initial Assessment called for both a qualitative and a quantitative assessment of English, Welsh, Arithmetic, General Knowledge and Personal Characteristics carried out by the headteachers and their staffs. Let us consider them in turn. Firstly, the qualitative assessment made by the headteacher would be conditioned by the years of his experience as a teacher including the manner in which he drew up unstandardised tests of attainment in reading and writing, etc., both for weekly and term reports of the child's educational progress. The weakness of the qualitative approach is that the estimate made by the teacher, being a personal one, would vary from school to school: it was, therefore, doubly necessary because of the need to maintain professional standards and to foster public esteem, to use standardized tests of attainment as a routine school procedure to iron out the discrepancies which appear from school to school when the relative merits of pupils are discussed. The children, therefore, are separated into first language Welsh and first language English pupils on the basis of the teachers' knowledge of the linguistic and socio-economic background coupled with the progress in the particular subject at school (as well as by their chances of being successful at the eleven-plus stage). The English and Welsh Language assessments involved an appraisal of the following skills:

- (i) Reading Age.
- (ii) Comprehension $\begin{cases} (a) & \text{Oral.} \\ (b) & \text{Written.} \end{cases}$
- (iii) Composition.

Let us consider these tests used in conjunction with the Welsh language. In the first place the Graded Word Vocabulary was assessed by means of the Prawf Geiriau Darllen drawn up by G.E.Evans. The instructions for the administration of this test are exactly the same as those given in English Tests. Generally speaking, therefore, they follow (with a few exceptions) that of Vernon's "Standardisation of an English Graded Vocabulary Test" (see appendix).

The instructions for obtaining the Reading Age (Amcangyfrif Oed Darllen) in Welsh is as follows: "Cyffelyber 'N' i nifer y geiriau a ddarllenwyd - unrhyw eiriau a adawyd allan ar ddechreu'r prawf am yrystyrid eu bod yn rhy hawdd iddo. Yna Oed Darllen yn $5 + \frac{N}{10}$. Os dymuna'r arholwr benderfynu'r Cyniferydd Darllen, yna dylid defnyddio'r rheol arferol a phlant 13 mlwydd oed neu lai:

$$\text{Cyniferydd Darllen} = \frac{100 \text{ oed Darllen}}{\text{Oed Cywir}}$$

Rhaid cofio na ddylid rhoi coel cyfangwbl ar ganlyniadau plant bach rhwng 6-7 oed a phlant hyn rhwng 13-14 oed".

It was found during the Pilot Scheme, referred to above, that the Evans test was somewhat too easy for the first language Welsh children although it proved popular with some teachers as far as the second language was concerned, particularly in the anglicised areas.

In view of this fact it was decided to substitute for the test another Welsh Graded Vocabulary Test by J.L.Brace constructed under the auspices of the Aberystwyth University Faculty of Education. Here the instructions are amended slightly, thus: (see appendix). "A child able to read one's work correctly has a reading age of 5 years 6 months and the age increases at the rate of 1 month for each word read correctly".

"This test has been standardised on a sample of over 7,000 children in 181 schools in eight predominantly Welsh-speaking counties. The home language of all these pupils was Welsh and they were taught up to about 10 years, mainly through the medium of Welsh. It follows that the test is suitable only for those children who conform to these linguistic conditions". It is clear that as far as "Second language Welsh" children are concerned the recorded

GWILYM EVANS: "Prawf Geiriau Darllen" pub. Gwilym Evans Press, Caernarfon.

J.E.BRACE: "Prawf Darllen Geiriau Gymraeg". Cyfadran Addysg Coleg y Brifysgol, Aberystwyth.

reading - age will be related to their linguistic peers and that a qualitative account will be taken of the particular child's socio - economic and educational background in the subject concerned.

The teachers' assessments of oral and written comprehension together with composition were made on a five-point scale, (A,B,C,D,E) and depended largely on the teacher's standard of values as well as on the way he drew up various school tests within the ordinary routine of the curriculum.

The qualitative assessment, however, could be supplemented by the administration of the "PRAWF CYMRAEG" (Welsh Language Test) which lasted 45 minutes. This test included a passage of comprehension and various questions arranged systematically to test the child's familiarity with the structure, vocabulary and syntax of the Welsh language, for example

- (1) Y mae'r cwestiynau canlynol am yr hyn a ddarllenasoch. Rhwch linell o dan yr ateb cywir yn y cromfachau.
- (2) Rhwch linell yn y cromfachau o dan y frawddeg sydd yn rhoi'r ystyr gorau i gwblhau'r rhan gyntaf.
- (3) Rhwch linell o dan y gair sydd a'i ystyr agosaf at yr ymadrodd.....
- (4) Drwy roi llythrennau o flaen pob un o'r geiriau dilynol, gellir gwneud gair newydd sydd yn groes ei ystyr i'r gair cyntaf.....
- (5) Rhwch llinell o dan yr UN frawddeg sydd agosaf ei hystyr at yr un mewn llythrennau breision.....
- (6) Fe welwch fod y geiriau mewn priflythrennau yn y rhif unigol; Ysgrifennwch odanynt y geiriau cywir yn y rhif lluosog.

This test was standardised on the Carmarthenshire population and was constructed specifically by the Aberystwyth University Faculty of Education to further the development of more accurate assessments of the Welsh Language.

In addition, a Welsh Verbal Reasoning Test (Prawf Rhesymu Geiriol) together with a Preliminary Practice Test (Prawf ymarfer) was available to the teacher's to enable them to have a quantitative assessment of the mental capacity of their pupils. This test also took 45 minutes to administer and the instructions followed closely upon similar English versions. The following few examples of questions will suffice to indicate the format of the test which comprised some 100 items based upon a Moray House test of intelligence:

1. Pa llythyren a ddaw hanner ffordd rhwng B a F yn y wyddor?
2. Ysgrifennwch y drydedd lythyren yn enw'r mis a ddaw yn syth ar ôl Mehefin.
3. Mae tân a gwres fy lamp a (fflam, kannwyll, gweled, golau, llwch, tywyll)
4. Y mae gan aderyn bob amser un o'r rhain (wy, pryf, cawell, pig, nyth)
5. Ffeindiwch y ddau sydd mewn rhyw fodd yn debycaf i'w gilydd a thynnwch llinell odanynt. (Inc, petrol, llaeth, paent, paraffin.)
6. Tynnwch llinell o dan y gair o fewn y cromfachau sydd a'i ystyr bron a bod yn wrthwyneb i'r gair mewn llythrennau mawr:
GARW (gwastad/caled/diaddurn/miniog/crwn/llyfn).
7. Os yw C,F,H,P,D, yn sefyll am "llathen, y mae F,P,H, yn sefyll am (llan/fod/cath/peth/llen/aeth)

By making use of standardised tests in Welsh as well as their own general estimate of a pupils abilities the teacher was able to draw up an order of Merit for this subject which was both internally consistent and relatively comparable with that drawn up by other schools.

The English estimates were supplemented by standardised tests of a varied kind, graded vocabulary, oral and written comprehensions as well as of verbal reasoning. The two tests used were

- (i) Burt/vernon graded vocabulary test.
- (ii) schonell's graded reading vocabulary test (Form A)

The instructions for the latter were somewhat similar to the welsh tests, viz "From your check card you will find the total number of words the pupil has read correctly. The reading age of each testee may be calculated from the following formula:

$$\text{Reading Age} = \frac{\text{number of words correctly read} + 5 \text{ years}}{10}$$

If the test is commenced at a point beyond the first - ten words the testee is given the credit for earlier words and care should be taken to add these to the total score. It will be noted that results from this test are obtained in years and tenths of/year, but for recording purposes it is advisable to keep all test scores in years and months by using the conversion Table."

P.E. VERNON: "The standardisation of a graded word reading test" pub of the scottish council for research in education university of London press 1938.

At this point the value of keeping School Records is noted for the systematic compilation of data indicating the development (or lack of progress) of a child has proved to be extremely valuable in compiling the Order of Merit List. The assessment of progress in English has been made much easier on the quantitative side in view of the fact that a far wider range of tests was available. Teachers were able, for example, to use the following Schonell tests to supplement their findings.

R.2. Simple prose Reading Test.

R.3/4 Silent Reading Tests (Forms A. and B.)

S1/2 Graded Word Spelling Tests (Forms A. and B)

In addition to the above the National Foundation of Educational Research have made available to teachers tests of a confidential nature which can be used to strengthen their own assessments on a comparative basis so that they are related between one school and another: such a test is the English Test 8 where the following examples are given.

1. Fill in each of the blank spaces with the most suitable word. "The buildings are not () any means modern.
2. Write one complete sentence in answer to each of the following questions.
"What is your first name?....."
3. Find out the missing word
"He is as proud as a (P.....)"
4. Put in the word which means nearly the same as the word in capitals.
I am going to BUY a house (repaint/purchase/sell/rent/burn/inspect.)
5. Turn round each sentence to produce another sentence of your own which has the same meaning:
"The tall fielder caught the ball": "The ball....."
6. The word you write must be made from the words in capitals.....EASY: "she won the race with (.....)"

This test takes 50 minutes to administer and may be compared with that described for use in the Welsh assessment. The format does not differ very much from that of the Moray House Test upon which the former was based.

N.F.E.R. "Educational guidance in schools" standardised tests for the use of teachers pub Newnes Ed. publishing company 1961.

A comparable test of Verbal Reasoning (Verbal Test 8A) and a Preliminary Practice Test has also been made available to teachers to facilitate the drawing up of their Order of Merit List. The preliminary test has a time of 10 minutes and the main test a timing of 45 minutes.

The following are specimen questions:

1. Underline TWO words, one from each set of brackets, which are most nearly OPPOSITE in meaning:
(Worse, right, funny) (wrong, worse, silly)
2. Underline the TWO words which are different from the others
(short/dog/horse/tiger/cow/swallow)
3. Underline ONE word that will complete the sentence.
SHEEP is to LAMB as Dog is to (calf/horse/wool/puppy/field).
4. Underline ONE word in the brackets that will continue the order of words on the left.
Wednesday/Thursday/Friday. (Monday/Saturday/Sunday/Tuesday).
Right.
5. Answer the questions below by writing in the brackets at the end of the line the word that the code letters mean.
6. If NONXTIPX means ELEPHANT, what does XNZIO mean? (PETAL)
7. The missing letters form a new word WITHOUT REARRANGEMENT
Write down THE NEW WORD at the end of the sentence.
"The cata shouted to the crew (...pin.....)

The employment of these standardised tests of language and verbal reasoning both in English and in Welsh gives us more detailed information for our survey as well as for the sample selected for our experiment.

For the general reader unfamiliar with the two languages a comparison of the items listed above in English and in Welsh serves the purpose of enlightening the teacher as to the method used by the Carmarthenshire Authority for dealing with the problem of bilingualism; it also indicates how very much alive the Welsh language still is in this particular area of Wales - so much so that account must still be taken of it both in terms of educational and political policy. It is clear, that justice must be done, in terms of assessment, to both the monoglot children and to the bilinguals. This can only be obtained through *achieved.* a studied use of School Records.

Let us now turn to the assessment of arithmetic in the primary school where we are faced with a different order of problem. At the Infant Level arithmetic is taught (as far as appears necessary) in English to the first language English children and in Welsh to the first language Welsh children. In the early stages the teaching of *meaning?* number is essentially a linguistic matter. The concept

of number in terms of differentiating between 1 and 4 does not appear until the child has reached a mental age of five years: the ability to differentiate between 5/7 and 9 does not generally appear until the child has a mental age of 6 years (due allowance being made for the effect of maturation and learning). In the Junior School after the age of seven-plus the tendency is, even for Welsh children to be taught arithmetic in English; this is probably due to fact that the numerical notation (as well as the four rules) is easier to teach in English because the Welsh system is a little more cumbersome as far as expressive language is concerned. To thus have an apparent anomaly where First Language Welsh children who actually work their eleven-plus language papers in Welsh do their arithmetical calculations including problems in English. Although the Welsh children complete their standardised arithmetic tests in English a Welsh version (See Appendix) of the same test is also given them in order that they may refer to it to clarify any linguistic point with which they are not familiar. All the research evidence points to the fact there is no statistical significance between the performance of monoglot English children and bilingual Welsh children. Headteachers are, therefore, able to use N.F.E.R. tests to improve the accuracy of their internal assessments.

This raises another question which has a direct bearing on our third hypothesis - how far is the response to given stimuli affected by set? We will have more to say on this point in due course. The fact that the Welsh child does his Arithmetic in English is remarkable in so far as it substantiates the importance of learning in the development of a child's number sense, for example, out of 845 number of Welsh pupils in the 1960 year group only twelve children chose to do their paper in their own language - the others coped successfully with it in English. Not only can we then stipulate that there are different functional levels of intelligence in the different modalities in terms of skill - we can specify in this case varying functional levels in different factors of personality development e.g. in the number sense when regarded as a primary ability.

The Internal Assessment also includes an assessment on a five-point scale (A,B,C,D,E) of the child's "General Knowledge". This is based on the headteacher's conception of what is relevant in terms of knowledge for a given child at a particular age. In fact, it incorporates such subjects as history, geography and general science of the elementary kind with which one would expect a child to be familiar. The bright child usually shows a flair for gleaning facts of current interest but it must be borne in mind that different areas may introduce facts of varying importance to individual children, for example, sheep-rearing facts will, as we shall see presently, be more readily available in the mind of a Welsh child from Caio, whilst coal will figure more largely in the every-day world of the pupil in Garnant - although both areas will have a strong Welsh flavour as opposed let us say to the English rural background of the former sea-port of Laugharne and as compared with the anglicised area of Llanelly with its thriving industrial urbanized community and varied economy.

Finally, we have to consider the assessment of personal characteristics, namely, perseverance and stability. The former looms largely in the mind of the teacher whilst the latter has more interest for the psychologist. Both these assessments depend largely on a subjective assessment (on a five-point scale). A child of average intelligence may have qualities of perseverance which may stretch him to the limits of his mental capacity - a situation which may produce certain emotional difficulties if the level of aspiration of the child and particularly of the parents, is high. The assessment of stability on the other hand, is related to the degree of adjustment or maladjustment - a matter which may call for possible reference to the medical officer and psychologist.

The assessment of the child's emotional stability was tabulated as follows with category N regarded as normal.

- N - -: Pupil never disturbed by strain and excitement/
emotionally apathetic.
- N - : Pupil of indifferent response/inclined to be apathetic.
- N : Pupil usually calm and collected: generally stable
in ordinary routine.
- N + : Pupil fairly easily flustered and worried.
- N + +: Pupil definitely unstable: very changeable and excitable.

In addition, the headteacher had to establish whether the child was first language English or first language Welsh as well as to assess the pupil's linguistic fluency in first and second language thus,

(A = very fluent.

(B = fluent.

English	Welsh
A	C

(C = average fluency/adequate command of language.

(D = fair command of language.

(E = poor command/lacking fluency.

In this manner it was possible to have a detailed appraisal of the relative fluency of both languages which also reflected itself in the other aspects of attainment which we have already discussed.

The Internal Assessment was, thereafter completed when the headteacher weighed in the balance the child's performance in English, Welsh, Arithmetic and General Knowledge and Personal Characteristics in order to make a final prognosis that the pupil was either a potential grammar school child capable of following a wider curriculum or perhaps a "borderline case" where abilities were not sufficiently marked to make a firm pronouncement. If, however, he was strongly of the opinion that the child could not cope with the grammar school education he recommended him either for a secondary modern type of school or perhaps for special treatment on account of educational subnormality.

After these elements had been synthesised into a series of assessments of individual pupils the "Order of Merit", thus produced, was scaled by means of a non-verbal reasoning test standardised on the eleven-plus year groups in Carmarthenshire (see above).

The new form of the Non-Verbal Reasoning Test was adapted, by the present writer in association with the officers of the National Foundation of Educational Research, from the Non-Verbal Test II constructed by Lee and Jenkins. The English-Welsh Bilingual Version (Cyfathasiad Dwyiaethog Cymraeg-Saesneg), together with a Preliminary Practice Test (Prawf Ymarfer) were arranged in such a way that their bilingual format did not favour one language or the other so that both the English and the Welsh children were equally "handicapped". The instructions were given in both languages: there were also two versions one for the first language Welsh children and the other for the first language English pupils (see appendix). The test was divided into five sub-sections with the instructions as follows:-

ENGLISH

On the left of each of the rows below there are three figures which are alike. On the right there are five more figures. FIND WHICH ONE OF THESE IS MOST LIKE THE THREE FIGURES ON THE LEFT, AND DRAW A LINE UNDER IT.

(The first one has been done for you).

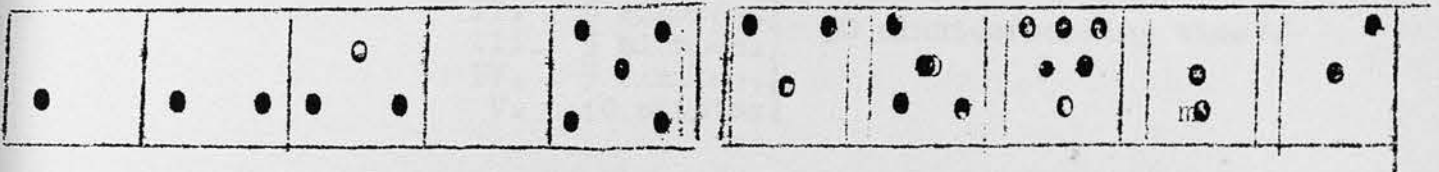
EXAMPLE/ENGHRAIFFT



To the left in each of the lines below there are five squares arranged in order. ONE of these squares has been left empty. FIND WHICH ONE OF THE SQUARES ON THE RIGHT SHOULD TAKE THE PLACE OF THE EMPTY SQUARE AND DRAW A LINE UNDER IT.

(The first one has been done for you).

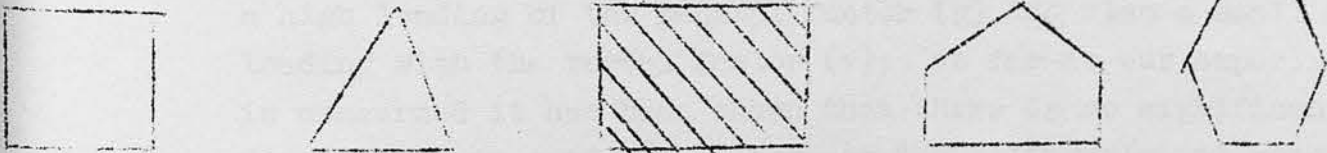
EXAMPLE/ENGHRAIFFT



In each of the rows below there are five figures. FIND ONE FIGURE IN EACH ROW WHICH IS MOST UNLIKE THE OTHER FOUR AND DRAW A LINE UNDER IT.

(The first one has been done for you).

EXAMPLE (ENGHRAIFFT).



Each of the sets of figures below can be arranged in order.

THINK OF EACH SET ARRANGED IN ORDER AND DRAW A LINE UNDER THE ONE WHICH COMES IN THE MIDDLE.

(The first has been done for you).

EXAMPLE/ENGHRAIFFT



WELSH

Ar yr ochr chwith ymhob rhes isod fe welwch dri ffigur sydd yn debyg i'w gilydd. Ar yr ochr dde y mae pum ffigur arall.

PA UN O'R RHAIN YW'R MWYAF TEBYG I'R TRI FFIGUR AR YR OCHR CHWITH? TYNNWCH LINELL O DANO.

(Atebwyd y cyntaf i chwi yn barod).

II

Ar yr ochr chwith ymhob rhes isod fe welwch bum sgwâr wedi ei gosod yn ôl ei trefn. Gadawyd Un sgwar yn wag.

PA UN O'R PUM SGWÂR AR YR OCHR DDE A DDYLID EI RHOI YN LLE'R SGWAR GWAG?. TYNNWCH LINELL O DANO.

(Atebwyd y cyntaf i chwi yn barod).

III.

Ym mhob rhes isod fe welwch bum ffigur. YM MHOB RHES CHWILIWCH AM UN FFIGUR, YR UN MWYAF ANNHEBYG I'R PEDWAR ARALL A THYNNWCH LINELL O DANO.

(Atebwyd y cyntaf i chwi yn barod).

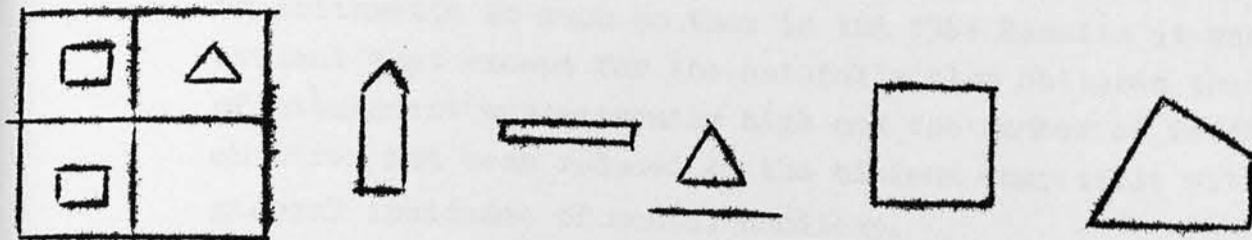
Gelli'r gosod y ffigurau sydd ym mhob rhes isod mewn trefn arbennig. MEDDILIWCH FOD POB RHES WEDI EI THREFNU FELLY, A THYNNWCH LINELL O DAN Y FFIGUR A FYDD YN Y CANOL YM MHOB RHES. (Atebwyd y cyntaf i chwi yn barod).



In the big square on the left of each line below, one of the four small squares has been left empty.

ONE OF THE FIVE FIGURES TO THE RIGHT SHOULD FILL THE EMPTY SQUARE
FIND THIS FIGURE AND DRAW A LINE UNDER IT.
(The first one has been done for you).

EXAMPLE/ENGHRAIFFT



Yn y sgwâr mawr ar yr ochr chwith ym mhob rhes y mae un o'r pedwar sgwâr bach yn wag.
FE DDYIAI UN O'R PUM FFIGUR SYDD AR YR OCHR DDE LENWI'R SGWÂR GWAG HWN.
CHWILIWCH AM Y FFIGUR HWN A THYNNWCH LINELL O DANO.
(Atebwyd y cyntaf i chwi yn barod).

These instructions in both English and Welsh were easily assimilated by the monoglot and bilingual children particularly since a lengthy preliminary practice test was administered to make sure that every child had grasped the essentials of the problem and to iron out any influence arising from test sophistication.

The timing of the sub-tests was as follows:-

I.	5 minutes.	} 30 minutes (working time).
II.	5 minutes.	
III.	5 minutes.	
IV.	5 minutes.	
V.	10 minutes.	

This test was given to the complete 1960 Eleven-plus year group and from the tabulated results were chosen the pair of Matched Groups and Control Groups.

This Non-Verbal Scale of Mental Ability is, as we have seen diagrammatic in character and consists of 85 items arranged in five sub-tests separately timed. It is of interest to note that Emmett (1949) has shown that as part of a battery of verbal and spatial tests, the test has a high loading of the general factor (g) and also a small loading with the verbal factor (v); as far as our experiment is concerned it has been shown that there is no significant differences in performance between the bilinguals and monoglots and in any case the pupils concerned in the experiment are equally "handicapped" verbally since the instructions have been given in both English and Welsh, there are sufficient practice items and finally the test has been standardised on the complete year group of the Carmarthenshire population.

An External Assessment was also established in order to offset the Scaled Teacher's Internal Assessment. The degrees of bilingualism found amongst children particularly on the Welsh language side precluded the authority from using a standardised test of language. Furthermore, the retention of the unstandardised type of paper also helped to

reduce the "backwash effect" of circumscribing the curriculum through confining subject teaching to the elements of the eleven-plus. It must be stated in favour of the Carmarthenshire teachers that the new regime has helped to maintain the high standard of work both in the two languages and particularly in Arithmetic so much so that in the 1961 Results it was evident that except for the naturally slow children the level of attainment was extremely high and the number of retarded children had been reduced to the minimum compatible with the general incidence of mental handicap.

The English consisted of an Essay Paper (time half^{an} hour) and a Language Paper (one hour and a half). The Language Paper included a passage of comprehension which called for the completion of sentences and the explanation of meanings of words and phrases, such as "cradle, desperate, conflict, preservation, erected, hero". This was followed by four compulsory questions covering elementary syntax, grammar and proverbs as well as two compulsory questions in Welsh made up of a simple piece of comprehension together with a test of the use of easy every day phrases.

The Welsh Paper was carefully balanced for difficulty against the English Paper. Its format was similar - an Essay (Traethawd) and a Language Paper (Papur Iaith). The latter included a passage of comprehension (Prawf Deall) and called for the use of such words and phrases as, "gweithfeydd, marchnad, traeth, bryncyn gwyrddlas, lyffrgell." The four questions of Welsh grammar, syntax, and proverbs bore ~~same~~ relation of difficulty to the English Paper. The children were also required to answer two questions in English one being a passage of comprehension and the other a simple essay. Both Language Papers (see appendix) were marked externally. The Order of Merit thus produced did not differ in its essentials from the Headteachers' scaled estimate.

The External Assessment also included an Arithmetic Test (No.8) constructed and standardised by the National Foundation of Educational Research. This test did not differ in format from the present accepted lay-out of such papers. It was divided into two sections; Section one was made up of 32 mechanical problems applying the four rules to the various measures and section two consisted of 60 items which sounded the child's all round ability in number. The test had a mean of 100 and a standard deviation of 15.

These scores were similar to Intelligence Quotients in their distribution. The reliability coefficient of this test was calculated from an answer pattern drawn up from a random sample of 252 scripts obtained from one of the standardisation samples. The value was found to be .984 (Kuder-Richardson formula 20). This led to the value of 1.9 for the Standard Error (S.E.) of the test. The timing of the test was 20 minutes for the first and 30 minutes for the second. (Vide Appendix).

As previously indicated a similar order of difficulty arose concerning the use of this English Version by the bilingual children - with this difference. Arithmetic tended to ^{be} taught to First Language Welsh children in English; the reasons for this apparent anomaly have already been explained. Nevertheless, to avoid any possible hardships for the Welsh child a Welsh translation was made (Prawf Rhifyddeg Rhif 8); this supplementary test was laid alongside the copy in order that a Welsh child could refer to it as and when (or if) he found it necessary. In the main, however, all the Welsh children were familiar with the English version and with the methodology since their text books were in English.

The Arithmetic Test was administered to the complete year group and again there were no striking differences between this External Test and the Order of Merit produced by the headteachers. Furthermore the Welsh children experienced little or no difficulty in reaching the same standard as the English pupils and their general attitudes towards the tests were also similar. The following summary will help to clarify the preceding testing programme.

A. INTERNAL ASSESSMENT: Headteacher's Estimate based on School Records plus:

- (i) English (Reading Age (a) Schonell Tests A and B
(b) Burt Vernon Graded Vocabulary.
(Oral and Comprehension (a) Qualitative Assessment.
(Written (5 point scale) (b) N.F.E.R. and
Schonell Tests.
(Comprehension: Qualitative Assessment (5 point
Scale)
(Group Test: N.F.E.R. English Test 8, etc.
- (ii) Welsh (Reading Age (a) Gwilym Evans Test (b) Aberystwyth
Prawf Darllen Geiriau.
(Oral and / Comprehension (Qualitative Assessment
Written (5 point scale).
(Comprehension: Qualitative Assessment
(5 point scale).
(Group Test: Aberystwyth University, Prawf
Cymraeg (Ci).

- iii. Arithmetic: (Mechanical & Problem) N.F.E.R. standardised Tests for use of teachers e.g. Arithmetic Progress Tests C1/C2 etc.
- iv. General Knowledge: Qualitative assessment made by Headteacher based on History/Geography/General Science/ etc.
- v. Personal Characteristics: (a) perseverance: five point scale
(b) emotional stability: five point scale.
- vi. verbal Intelligence: (English: verbal Test 8A (N.F.E.R.)
(Welsh: Prawf rhesymu Geiriol/ (Aberystwyth/Moray House)

B SCALED TEACHERS' ASSESSMENT.

- (English/Welsh bilingual version Non verbal Reasoning Test (N.F.E.R.)
- (Cyfathasiad dwyiaethog Cymraeg - saesneg profion Dealltwriaeth di-Iaith (N.F.E.R.)

C EXTERNAL ASSESSMENT

- (English: Unstandardised Essay and Language paper.
- (Welsh: Unstandardised Essay and Language paper.
- (Arithmetic: N.F.E.R. Test 8 (English and Welsh version).

The James Associative Ward List (J.A.W.L.) Experiment called for further information; using the Non-verbal Reasoning Test as a criterion of intellectual ability and the Teachers' Scaled Estimate as an indication of their functional level of the Educational progress of the pupils it was possible to select two Matched Bilingual Groups and a control group; in addition, thereafter it was necessary to establish the category of the individual pupil's socio-economic and bilingual background. To this end the following schedules and questionnaires were administered to the experimental groups.

- (1) Attitude scale (i.e. Arithmetic and Preferred Language)
- (2) Linguistic Background Questionnaire (English/Welsh)
- (3) Socio - Economic schedule.

On the basis of the above criteria it was possible to complete the quantitative and qualitative description of the Experimental sample in preparation for testing the three hypotheses.

Furthermore, by placing these groups in their natural scholastic setting within the 1960 Eleven-plus Survey it was possible to see the practical value of the experiment. What it meant, in fact, was that 2398 boys and girls - 1553 of them being English and 845 Welsh - having been carefully studied, had received Educational guidance and many of them had been recommended for and received special Educational treatment. Against this broad fifteen-point-scale background it was possible to visualize how the individual pupils of the Matched and control groups fitted in; how each pupil had his or her

own personal range of factors and how each pupil was juxtaposed in relation to his or her fellow having regard to sex, varying intelligence and attainment in English, Welsh, Arithmetic, and General Knowledge as well as Socio-economic status.

It was only after such a detached over-all appraisal that it became possible to study the reactions of the pupils in the four skills and various modalities, to the neutral linguistic stimuli; only then could the interpretation of the reactions become meaningful and only then could one creatively recognize what hypothetical constructs accounted for the facts which mediated between the excitation of the cerebral cortex and the eventual semantic organisation of the bilingual thought processes.

The use of an Attitude Scale (Graddfa Agwedd) to sound the pupil's disposition towards a particular language or languages has proved valuable in assessing the emotional tone which accompanies a linguistic stimulus; on the one hand, it might also reflect the degree of a child's competence since the liking or disliking of a subject is often associated with dislike - let us say - of Welsh might well reflect the prejudices of parents towards the acquisition of a language on the grounds, for example, that it had no economic value.

The Attitude Scale (see appendix) consisted of a number of questions designed to ascertain the degree of interest taken in the subject. In the first place the questions concerned Arithmetic but these served but as a preliminary to the test proper which sought after the real feeling for or against a particular language thus:

"On this page you are to place a tick (✓) beside the ONE sentence which most nearly describes your own real feelings about English (Welsh) lessons in which you learn to listen, speak, read and write in English (Welsh) - that is - where you do your exercise, learn spelling, write compositions, and talk and write about what you have read e.g.

Question (a) English is the subject I like best of all....etc".

The Welsh version runs as follows:-

"Ar y tudalen hwn, rhwch farc (✓) ar ol yr UN frawddeg sydd yn disgrifio orau eich gwir deimladau chwi tuag at Saesneg (Gymraeg) a gwersi Saesneg (Cymraeg). yn y gwersi hyn, yr ydych yn dysgu siarad, darllen a ysgrifennu Saesneg (Cymraeg) - hynny yw yn gwneud ymarferion, yn dysgu sillafu, yn ysgrifennu traethodau, ac yn siarad a ysgrifennu am yr hyn a ddarllenasoch, e.e. - Cwestiwn (a) Saesneg yw'r pwnc yr wyf yn ei hoffi fwyaf.....etc".

This Attitude Test serves the useful purpose of probing the presence or absence of linguistic preferences or prejudices which might foster or militate against the development of a child's first and/or second languages. These attitudes, as we have seen in our Synchronic Description of Individual Bilingualism, play an important part in the formative stages of the acquisition of language, particularly in regard to the effect of early as opposed to late learning.

The Linguistic Background Questionnaire used as a complementary instrument to the Attitude Scale serves to ascertain what linguistic influences have affected the child's general development particularly in the early stages where the language of the hearth is that usually spoken by the parents. It is important to realize, however, that this is a questionnaire and not a test of ability in a language since the fact that parents speak a particular language is not a guarantee that the children understand and speak it - still less does it imply that the children are able to read and write the language. Indeed, our experimental results will throw light on the independent and yet related aspects of the four skills. This questionnaire, therefore, can only give a general picture of the extent to which a child is Welsh/English speaking. It is of interest to note for example, that many German children whose parents are employed by the Thyssen-Shaft Sinking firm in the new Cynheidre Anthracite Colliery have become fluent in both Welsh and English as well as retained their German.

The following are representative questions taken from the questionnaire.

- (i)(a) Do you speak Welsh to your Father/Mother/Brother/Sister?
Always/Mostly/About half the time/not often/never.
- (b) A fyddwch chi yn siarad Cymraeg a'ch Tad/Mam/Brawd/Chwaer.
Bob amser/rhan Amlaf/Tuaghanner amser/Pdim yn aml/Byth
- (ii)(a) Is Welsh spoken in your school/Church/Chapel/Sunday School?
- (b) A fydd Cymraeg yn cael ei siared yn eich Ysgol/Ysgol Sul/Capel etc?
- (iii)(a) Write down the names of the Welsh papers, magazines, books that you read.
- (b) Ysgrifennwch enwau'r Papurau, Cylchgronau a llyfrau Cymraeg y fyddwch yn eu ddarllen.

A similar questionnaire is completed for the use of English (See Appendix.)

The questionnaire is scored on the number of answers which are acceptable. At one extreme a child answering "Always" to all the questions answered (in the first half only) would obtain a score of +100, but at the other extreme a child answering "Never" to all these questions would obtain a percentage score of -100. All children therefore, from homes, where Welsh is habitually spoken would have scores of, or near 100; while all from homes where Welsh is seldom if ever, spoken would have scores of, or near, -100. Questionnaire scores not near either of these limits would represent intermediate grades of linguistic background.

For the purpose of a general assessment the questionnaire forms a useful guide to the teacher as to which language the child favours: from the point of view of our experiment its value lies in its use in conjunction with the Attitude Scale and particularly with the Socio-Economic Questionnaire (question nineteen) in establishing an account of the early linguistic habits of a child. This aspect of the assessment is important for our experimental data in selecting the Matched and Control Groups which will be based on our findings from these questionnaires.

Not the least among criticisms levelled against researchers in the field of semantic organisation has been that they have failed to take account of the influence of the Socio-Economic factors. With the exception of the present writer's "Comparative Study of General Performance between Bilingual and Monoglot Children in South Wales" (1947) it must be agreed that this is largely true. Nevertheless, if we accept Hebb's basic definition of intelligence (in terms of A and B) it is clear that the Socio-Economic factor will be operating throughout any synchronic description of the comparative philology of functional intelligence.

As far back as 1909 Burt recorded wider differences in average performance between pupils at an ordinary elementary school and boys from the higher professional classes attending preparatory school. In 1942 and 1946 as a result of systematic surveys of pupils attending London County Council Schools he stated that the average I.Q. of children classified according to parental occupations varied widely from 89 for of unskilled workers to 120 for those of professional classes. The findings of the Scottish Mental Survey (1947), which paid particular attention to the

relationship between test score and occupation, that when the children were grouped according to occupational category of their parents the range of average test score between the class was very considerable. Thus occupational classes arranged according to the size of their average test score took on the following order:

- (i) Professional and large employers.
- (ii) salaried employers.
- (iii) Non Manual wage earners.
- (iv) small employers.
- (v) skilled manual wage-earners.
- (vi) farmers.
- (vii) semi-skilled manual wage earners.
- (viii) Agricultural workers.
- (ix) unskilled manual wage earners.

That such differences of intelligence exist between occupational classes we must clearly accept and that such class differences do in turn have an effect on the progeny is also not only self evident but supported by the results of scientific researches. One must, however, remember that the results only show mean trends and that bright children may come from the manual classes and slow children from the professional groups - research findings merely show that there is a greater chance of a bright child appearing in a professional family than vice versa. In Wales, however, the chances that the parents of children in the manual classes are less keen on education than those of professional people is not necessarily true - as the perennial incidence of "grammar-school-phobia" bears mute witness. One may accept, however, that whilst no single measure can serve as a sufficient indicator of social class, occupation serves better than any other. But although variations of intelligence occur with age, occupation and locality Vernon has shown that these three factors overlap to such a degree that there is considerable difficulty in assessing their evident independent functions although in his experiment with Royal Navy Recruits the effect of occupation and Area were inter-connected but that the age distribution was constant in all occupational-area sub-groups.

CYRIL BURT: "Experimental Tests of general performance".
B.J. psychol. III p.94-77, 1909.

CYRIL BURT: "Intelligence and Fertility" papers on Eugenics,
No.2. Hamish Hamilton, 1946.

S.C.R.E; "social implications of the 1947 scottish mental survey", Univ. of London press, 1953.

As far as the socio-economic factor is concerned it is also important for the Carmarthenshire sample to mention the possible difference in intelligence between urban and rural children. One of the most specific papers on this subject and the one which has drawn upon results from the biggest sample in England is the monograph by W.G. Emmett who analysed statistics from twenty five County and twenty two County Borough Education Authorities. In brief, he established that "the mean I.Q. of Rural Districts is 1.79 points below the joint figure for Municipal Boroughs and Urban Districts and this difference is highly significant. But there appears to be no association between these differences and the location of the counties or their degree of industrialisation". It suffices for our purpose to note this phenomenon of social structure without attempting to account for the origin of the class differences in intelligence which spring from the effect of both genetic and environmental factors.

As far as Wales is concerned Jones has put the problem of the socio-economic factors succinctly as follows in an excellent monograph on "Bilingualism and Intelligence". "It appears that out of seven investigations in which non-verbal tests of intelligence and adequate statistical criteria have been used three report favourably (Jones 1933; James 1947 and Jones 1953) and four unfavourably (Jones and Stewart 1951, Jones 1955, Jones et al. 1957 and Morgan 1957) on the performance of bilingual groups. One cannot doubt the significance of the mean differences and general trend in test scores which have been discovered between various linguistic groups in the more recent surveys, although one would hesitate at this stage to draw from them the conclusion that bilingualism as such is a source of disadvantage in non-verbal test situations. It is evident that the results need closer examination, particularly with reference to certain sociological variables which are known to influence test performance". As far as the present research is concerned it has again been shown that providing that certain safeguards are taken and that the test is standardised on the local population, then the Non-Verbal Reasoning instrument can be a valuable neutral source of information as far as Welsh and English speaking pupils are concerned, that is, if the test is administered carefully with bilingual instructions.

P.E.VERNON: "The Variations of Intelligence with Occupation, Age and Locality", Br.J.of Psych.(Statistical Section, Vo.I., Part I, Oct.,1947).

W.G.EMMETT: "The Intelligence of Urban and Rural Children", Population Studies, Vol.VII, No.3., March,1954.

Again to study and to offset the influence of the socio-economic factor a detailed questionnaire was administered to all the children in the Matched and Control Groups of similar age and Mean I.Q. This was done by qualified School Welfare Officers (all of whom held accredited University Social Service Diplomas).

As a result it was possible to carry out two basic procedures fundamental to this piece of research, viz., (i) to produce Matched groups of similar socio-economic background.

(ii) to establish which language was learned early (before the age of five) and which camelater.

This evidence was also supported and corroborated by the Linguistic Background Questionnaires.

It will be seen from the following analysis of data, based on the father's occupation, that the Control and Experimental Groups are well-balanced from the point of view of socio-economic status, thus:

Socio-Economic Status	Monoglot Control			Bilingual			Bilingual		
	Boy	Girl	Total	First Lang. Welsh		Total	First Lang. English		Total
	Boy	Girl	Total	Boy	Girl	Total	Boy	Girl	Total
Professional	3	3	6	9	2	11	6	5	11
Self-Employed	1	0	1	-	1	1	1	0	1
Clerical	1	1	2	2	2	4	-	4	4
Manual(Skilled)	12	13	25	26	29	55	28	27	55
Manual(Unskilled)	6	4	10	9	12	21	11	10	21
Deceased	2	1	3	1	2	3	2	1	3
Unemployed	0	2	2	2	1	3	1	2	3
Miscellaneous	0	1	1	1	1	2	1	1	2
	25	25	50	50	50	100	50	50	100

SOCIO-ECONOMIC BACKGROUND

Strictly Confidential

School Classification

1. Place of residence of parents when child was born.....
2. Is child living in or near birthplace?. YES/NO.....
3. Number of schools previously attended by child.....
(If same school attended twice count as two schools)
4. Number of children in family (including child). No.of boys.....
No.of girls.....
5. Child's position in family (First, second, third).....
6. Is child living with own mother? YES/NO.....
If adopted please write ADOPTED.....
7. Occupation of father or guardian.....
8. Occupation of mother.....
9. How many rooms have you? (not including bathroom).....
Have you a bathroom?.....
Have you an inside toilet? YES/NO.....
Have you an outside toilet? YES/NO.....
How many people live in the home? (include everyone who
normally lives with you).....
10. Has the father been unemployed in this last year?. YES/NO.
For how many weeks?.....
11. Has the mother been unemployed in this last year?. YES/NO.
For how many weeks?.....
12. What serious illnesses has child suffered?.....
13. What serious illnesses have parents suffered?.....
14. Is the child deaf or partially deaf?.....
Has child suffered any ear trouble?.....
15. Has child suffered with poor eyes?. YES/NO.....
16. Have you a radio? YES/NO.....
Have you a T.V. set? YES/NO.....
What newspapers do you take?. (include those on Sunday).....
.....
What magazines do you read?.....
What comics do you take?.....
What books do you prefer to read?. Crime, Romance, Westerns,
Science, Fiction, Biographies, Historical, Any other type.....
.....
17. Do you belong to any Clubs? YES/NO. Which type?. Political,
Social, Religious, Ex-Servicemen's, Women's Institute,
Any other.....
18. What language(s) do you speak in the home?. Welsh, English,
any other..... (Please indicate which)
19. What was this child's first language:
(i) before entering school, i.e. before age of five,
WELSH or ENGLISH.....
(ii) any other language:
(iii) general statement on language background:
20. Any further comments:

It will be seen from this questionnaire on Socio-Economic Background that an assessment is made of the child's position in the family and material circumstances. A statement on the occupational status of both the mother and father is requested as well as a question posed as to whether the child is in any way handicapped; we have already shown that in the assessment of personality the ascertainment of any physical or mental observations plays an important part. Above all, however, a description of early linguistic background is made - this statement on the quality and kind of early learning experienced by the child is fundamental to our discussion of Hebb's neuro-psychological theory and particularly in regard to the establishment of two Groups - matched for age, intelligence education and socio-economic background, as well as sex.

We have now made our dispositions: we have discussed the neuro-psychological aspects of perception as well as the related cognitive and socio-economic aspects of functional intelligence. We have established two Matched Bilingual Groups and a Monoglot Control Group; it but remains to put our experiment to the test by introducing the James Associative Word List as a linguistically neutral stimulus in order to examine the semantic organisation and probe the thought process posed by Hebb, "It has already been emphasized that perception is affected by past experience (Gibson 1929, Carmichael Hogan and Walter 1932; Leeper, 1935; Zangwill, 1937; Karchevsky, 1938). What is learned is in terms of what is perceived; what is not perceived can hardly be remembered. Koffka(1935) has emphasized that patterns may be seen and remembered by the arousal of "older trace systems"; Woodworth (1938) says that all perceiving is "schema with corrections", that is, in terms of earlier perceptual habits. How do these habits get established in the first place?. What are the properties of learning that sets up the "older trace systems", of learning in its first stages, before there are any earlier habits to help along?. These questions cannot be completely answered at present but even the skimpy evidence we have is enough to reorientate the whole problem of learning.

The next stage of our experiment, therefore, is to introduce the stimulus, in the form of the James Associative Word List, and examine the responses of the experimental groups to a choice of words made from this list in an effort to establish the relative effect of early as opposed to late learning. As to our chosen method the following statement by Hebb is curiously appropriate, "We must remember both kinds of learning: the set-influenced and non-set influenced. The reaction against early switch-board theory and connections, and the current dogma that learning occurs only with special conditions of motivation, have both tended to draw attention away from a kind of learning that, once established is little affected by set and does not seem to need reinforcement".

In order to draw up the James Associative Word List recourse was made initially to the Lorge and Thorndike "Semantic Count of English Words" (1938). This book, in manuscript, was borrowed from the Division of Documents of the Library of Congress, Washington in January, 1958. From this Lorge and Thorndike made up their "Teacher's Word Book of Twenty Thousand Words" found most frequently and widely used in general reading for children and young people. The findings of this word count were also incorporated into the 1944 edition of the same book entitled "The Teacher's Word Book of 30,000 Words". Recourse was made to this list in order to ensure that the majority, indeed almost all, the children in the Control and both Experimental Groups were familiar with at least the words in their first language.

Among the Welsh Books and lists of words that were consulted to produce the James Associative Word List in addition to the English and Welsh Language and Essay Papers of the Eleven Plus Year Group were the following:-

- (1) Geirfa Pwyllgor Addysg Sir y Flint (Cynllun) Dysgu Cymraeg fel Ail Iaith i Ysgolion Babanod ac Ysgolion Cynradd).
- (2) B.B.C. Broadcasts: English/Welsh Vocabulary.
- (3) B.B.C. Learning Welsh: Series 1958-59.
- (4) "Geirfa Natur", Gwasg Prifysgol Cymru, 1945.
- (5) "Termau Egwyddorion Addysg", Gwasg Prifysgol Cymru, 1958.
- (6) "Welsh made Easy" by A.D. Smith, pub. Hughes & Son, Cardiff, 1925.
- (7) "Teach Yourself Welsh" by J.T. Bowen & T.J.R. Jones, English Universities Press Ltd., London, 1960.

I. LORGE & E.L. THORNDIKE; "A Semantic Count of English Words" pub. with the assistance of the Institute of Educational Research Teachers College Columbia University, New York, 1938.

- (8) "Y Geiriadur Newydd" (New Welsh Dictionary) by H.M.Evans & W.O.Thomas, et alia pub. Llyfrau'r Dryw, Llandybie, 1953.
- (9) "Pywllgor Addysg Sir Gaerfyrddin": Awgrymiadau ar gyfer Cynlluniau gwaith mewn Cymraeg fel Ail Iaith mewn Ysgolion Cynradd ac Uwchradd- Paratowyd gan Banel o Athrawon Ysgolion Cylch Llanelli.

The James Associative Word Lists, both auditory and visual, were drawn from the above. Preliminary groupings of words were tested out on various children and schools in Carmarthenshire in order to ascertain that the words from the Lorge-Thorndike Semantic Count were equally familiar to both the English and Welsh children in the various modalities. In order to ascertain the age range of the words comparisons were made with a list of First Language Pupils' Welsh Words drawn up by Mr R.Evans, headmaster of Llansaint C.P.School (age range 5 to 7+) and another Mr M.Jones, headmaster of Gorslas C.P.School (age range 8-9 years). Finally the James Bilingual Blank: Mark I (Auditory) and the James Bilingual Blank: Mark II (Visual) was tried out on a random sample of English Monoglots and English/Welsh Bilinguals of the 1959 Eleven Plus Year Group in order to ascertain whether these neutral stimuli were of graded difficulty and familiar to the whole intellectual range of children. The Final Lists were drawn up from these Pilot Trial Results.

On the basis of these results and findings in various schools certain "Semantically Loaded" Key words were included in the list in order to highlight the possible influence of linguistic set on the responses to apparently neutral stimuli, for example, the visual stimulus word DULL (English) has the same meaning as HURT (Welsh). It was of interest in respect of these words to note the factors operating in producing different code switching responses in accordance as to whether the pupils tested were either first language English or first language Welsh.

In addition the word 'PLAID' was included in order to establish the degree of English/Welsh background because this same word served the useful purpose of bringing out the ambivalent value of the visual stimulus. Thus 'PLAID' could be interpreted as meaning "party"(Welsh) "Cloth pattern" (English). But as a visual cue some of the English and Welsh slower children interpreted the stimulus auditorily as the English word "played" indicating the predominantly influence of that modality.

A preliminary set of words was first administered to the pupils followed by the test proper. The instructions were given in both English and Welsh as follows:-

For the auditory stimulus list of words the instructions ran:

"When I say a word I want you to write the first words or sentences that come to your mind. You will have one minute for each word".

"Pan yr wyf yn dweud gair ysgrifennwch geiriau neu brawddegau cyntaf a ddaw i'ch meddwl. Y mae gennych munud am bob gair".

For the visual stimulus List of Words the instructions were given as a word written on a card was shown:-

When I show a word I want you to write the first words or sentences that come to your mind. You will have a minute for each word".

"Pan yr wyf yn dangos gair, ysgrifennwch y geiriau neu brawddegau cyntaf a ddaw i'ch meddwl. Y mae gennych munud am bob gair".

The following neutral stimuli were included in the James Bilingual Blank: Mark 1 (Auditory) -

1. PEN
2. PLANT
3. PANT
4. MAN
5. COT
6. MOR (MORE)
7. CAN
8. CARU (CARRY)
9. CAMP
10. CI (KEY)
11. BRAT
12. COL (COAL)
13. PEL (PALE)
14. TO (TOE)
15. TY (TEA)
16. SWN (SOON)
17. CYW (QUEUE)
18. PYS (PEACE)
19. COF (COVE)
20. COR (CORE)
21. MAEN (MINE)
22. SWILL (SWILL)
23. HAF (HALVE)
24. MEN (MANE)
25. MIL (MEAL)

These words were administered orally to all the children in the Experimental Groups: the children wrote down their responses to these words in either English or Welsh according to their manner. The results have been tabulated separately and the findings are discussed in the next chapter. The test was preceded by the preliminary list, viz - "ffa (far), dysg (disc) and lon (loan).

JAMES ASSOCIATIVE WORD LIST (ENGLISH/WELSH)

BILINGUAL BLANK: MARK I (AUDITORY)

BRAT	EIL (AISLE)	PWL (POOL)
CAN	(ISLE)	PWT (PUT)
COL (COAL)	FFA (FAR)	PUMP (PIMP)
CANT	GOR (GORE)	SWIL (SWILL)
CAMP	GRYM (GRIM)	SWN (SOON)
COT	HAF (HALVE)	SEL (SALE)
CLAP	HOL (OIL)	TO (TOE)
CAST	HOI (HOLE)	TY (TEA)
CI (KEY)	GWLYB (GLEBE)	
CEN (KEN)	IMP	
CAP	LWC (LOOK)	
CAR	LON (LOAN/LONE)	
CLOS (CLOSE)		
COEL (COIL)	MAEN (MINE)	
COF (COVE)	MAI (MY)	
COR (CORE)	MAT	
COD (CODE)	MEL (MALE)	
COS (COURSE/COARSE)	MEN (MANE)	
CRYD (CREED)	MES (MACE)	
CUL (KEEL)	MIL (MEAL)	
CYN (KEEN)	MIN (MEAN)	
CYW (QUEUE)	MOR (MORE)	
CIST (KISSED)	MAN	
CARU (CARRY)	OD (ODE)	
CRYS (CREASE)	OD (ODD)	
DEL (DALE)	PEL (PALE)	
DIL (DEAL)	PIANO	
DOL (DOLE)	PANG	
DOL (DOLL)	PLANT	
DROS (DROSS)	PANT	
DYN (DEAN)	HAN	
DYSG (DISC)	PYS (PEACE)	
DO (DOOR)	PWL (PULL)	

The following neutral stimuli were included in the James Bilingual Blank: Mark II (Visual):-

- | | |
|-----------|-----------|
| 1. PIC | 14. DARN |
| 2. PUMP | 15. DULL |
| 3. PUNT | 16. CLOD |
| 4. MARCH | 17. FRY |
| 5. HEN | 18. CALL |
| 6. CRIB | 19. COD |
| 7. BLEW | 20. DRAW |
| 8. BAD | 21. DAWN |
| 9. SAIL | 22. CORN |
| 10. BORE | 23. BRAIN |
| 11. TOES | 24. HAD |
| 12. TON | 25. PLAID |
| 13. HURT. | |

These words were administered visually to all the children in the Experimental Groups: the children again wrote down their responses to these words in English and Welsh according to their choice. The results have also been tabulated separately and the findings are discussed in the next chapter. In this case, too, the test was preceded by a preliminary practice list, viz. "MUD/BARN/NOD.

These Bilingual Blanks were administered personally by the present writer to the pupils of the Experimental Groups in the various schools selected at random as representative of the various types of diverse educational organisation. The children received their instructions in both English and Welsh and were invited to write their responses in words or sentences as came immediately to mind when they either heard or saw the stimulus. They were given exactly one minute per stimulus word to complete their response: the timing was carefully adhered to by reference to a stop-watch. The Bilingual Blank Mark I (Auditory) was administered first and after a break of a quarter-of-an-hour the Bilingual Blank Mark II (Visual) was given. The pupils sat at separate desks and were given complete freedom of individual expression.

JAMES ASSOCIATIVE WORD LIST (ENGLISH/WELSH)

BILINGUAL BLANK: MARK II (VISUAL)

AFRAID	CLAMP	HUG	SAIL
BAD	CLAP	HOE	SAWS
BAN	CLOD	IMP	STORM
BARN	CLOG	MAN	STOP
BATH	COB	MARCH	SIR
BAWD	COT	MEN	TAIL
BLEW	CAMP	MORON	TON
BORE	CAP	MAT	TORCH
BRAG	CAR	MIL	TO
BUN	CARP	MAIN	TRUTH
BRAT	DARN	NOD	TOR
BRIG	DAWN	PEN	TOP
BROTH	DAWNS	DIG	TRAP
BRAWL	DIAL	PLANT	THUS
BRAIN	DIG	PUMP	TROT
CAN	DOE	PAIR	TAP
COG	DULL	PALL	TRIP
CRIB	DRAW	PERSON	TOES
CUT	DUG	PERT	US
CAD	DO	POST	UNION
CALL	DIAS	PUNT	
CAWS	FRY	PANT	
CIST	FAINT	PANG	
COD	GO		
CORN	GEM	PEG	
COST	HAD	PROBLEM	
CUR	HEN	PORCH	
CURIO	HURT	PLAID	
CWT	HAWS	PARCH	
CANT	HELM	SAD	
CAST	HER	SANG	

The stage is now set for a consideration of the findings of our experiment. Let us, however, summarize our progress to date. We have made a complete survey of the Carmarthenshire Eleven-Plus Year Group in order to define our experimental setting; we have, thus, examined the distribution of the children in detail according to their age, aptitude and ability with particular reference to their degree of monoglot or bilingual accomplishment. To this end we have administered a battery of tests in order to obtain both a qualitative and quantitative assessment based on the Teacher's Internal Assessment, scaled against a Non-Verbal Reasoning Test criterion, specially adapted and standardised for the purpose, and on the External Assessment. From this complete survey of pupils it was possible to select two Matched Bilingual and Control Groups of equal functional intelligence. In like manner they were of similar sex, ^{and} age as well as ^{being} of comparable educational and socio-economic background as demonstrated by means of an Attitude Scale, a Linguistic Background Questionnaire and a Socio-Economic Schedule.

Two James Bilingual Blanks:- Mark I (Auditory) and Mark II (Visual) drawn from the James Associative Word List were administered to the pupils of the experimental groups. The results were tabulated separately. Furthermore a follow up study was made of these groups and the James Semantic Blank Mark III was also administered to a sample taken from the Experimental Groups in order to study more closely the effect of language learning on the comparative philology of functional intelligence.

It now but remains to discuss the results and findings in the next chapter and to relate them to our previously formulated hypotheses.

In other words we will examine Hebb's "General Proposition that it is of course a truism that learning is often influenced by earlier training. Innumerable experiments have shown such a "transfer of training".

Learning A may be speeded up, hindered, or qualitatively changed by having learned B before. The question for debate is how great the effect may be in general behavioural development (as distinct from the effect of some one specific habit on some other) and what theoretical use is made of it".

Hebb's general proposition is reformulated in the light of the present writer's findings concerning his new concept of the comparative philology of functional intelligence in the James Associative Word List Experiment.

CHAPTER V

FINDINGS AND DISCUSSION OF THE J.A.W.L. EXPERIMENT

Drever Secundus in his monograph on "Early Learning and the Perception of Space" indicated that "Hebb has drawn a distinction between early and late learning. During early learning, he suggests, organisation occurs in non-specialised cortical areas and this organisation acts as a basis for the perceptual skills and insight upon which later learning in part depends. Though of wide generality this suggestion is not merely speculative in that it can be used to make predictions about subjects who have or have not had opportunity for certain kinds of early learning".

Such a view is not incompatible with that of the present writer's description of the human personality in terms of the comparative philology of functional intelligence which in turn presupposes a multi-dimensional hypothetico-structural approach to the factorial assessment of individual differences.

As a preamble to a discussion of the findings of the J.A.W.L. Experiment let us consider a case-history which exemplifies the new approach to stimulus-response theory put forward by Drever and James which underlines the effect of early influences on later learning. In this case - history both the structural and inner-dimensional aspects of the boy's mental processes are affected by an early physical disability similar to those cited by Hebb.

Case History: R.L.T. (date of birth - 22.6.50)(see appendix).

Early History of virtual blindness resulting from cataracts to both eyes.

Late in walking, talking and bladder control (nocturnal enuresis)

Age Five: Hospital Diagnosis: Galactosaemia and Cataract.

- present a very considerable degree of mental defect operation to remove cataracts. Partially sighted and indistinct speech: Prognosis very uncertain. Special Educational Treatment not recommended. | Why not?

Age Six: Attending School and making definite educational progress.

Age Eight: Recommended for admission to Residential Special School for Blind but retained at home and at ordinary school at request of parents. Supplied with telescopic eye lenses.

Age Nine: Medical Inspection Report: improving a bright boy but slow developer.

Headteacher's Report: remarkable progress educationally. His speech is deliberate clear and precise. Remain extra year in primary school.

Age Ten: Psychologist's (R.H.B.) Report: Estimated I.Q. 92.

Auditory memory good but responses slow and it takes him a long time to grasp what is said.

Recommendation: Remedial Teaching.

New type of lenses supplied: improved vision.

Age Eleven: Psychologist's (L.E.A.) Report: (present writer, (2.4.62)).

This boy is of at least average intelligence - (TM/FL: CA = $11\frac{9}{12}$: MA = $12\frac{4}{12}$: I.Q. = 105+).

- but his functional level has been adversely affected at an early age. He has improved steadily over the years (5-10) until he has now come to terms with his disability and is seeking to reach the Eleven Plus standard for entry to a Grammar School or Residential Special School.

It will be seen from the detailed case history (see appendix) compiled, and the clinical examination carried out by the present writer that the adverse effect of cataracts from birth (as indicated by M.Von Senden) produced in this boy a situation akin to mental defect where the functional level of his intelligence was inhibited by impaired auditory and complete lack of visual clues at the sensori-motor and perceptual stages of mental development. As the boy's physical condition improved and as his disability was corrected by operation and the supply of telescopic lenses there came a radical change of outlook as well as better expression in the various modalities together with a rapid development in the symbolic processes - leading to a psychological assessment suggesting that the boy was of at least average plus intelligence.

In the case of this boy his semantic organisation was adversely affected to such a degree as to belie his latent capabilities. Even at the age of eleven there was still evidence that auditory and visual clues were perceived with greater difficulty than ^{by} the normal child whilst his responses to such stimuli were less rapid and his thinking could be described as more ponderous, # so much so # that an appraisal of the functional level of this boy's intelligence called for a qualitative as well as quantitative description before a recommendation could be made in respect of the type of secondary education which was best suited to his age, aptitude and ability. In this case the clinical records were dovetailed with those of school records and surveys before a decision was reached. His performance in the J.A.W.L.Blanks (Marks I, II and III) proved to be that of an average English Monoglot.

Hebb's theory which depended upon similar evidence as the case cited above is on surer ground however, when the results of the J.A.W.L. Experiment are considered with reference to bilingual children for here the effect (not lack) of early learning is compared with that of later learning.

Evidence in favour of Hebb's neuro-psychological theory, based on both qualitative and quantitative findings of the present writer's experiment, appears to be fairly strong - so much so, that although the experiment has been designed to produce a quantitative result, a qualitative appraisal of factors in the manner suggested by C.D. Hardie, more than suffices to bring out the influence of early learning on the comparative philology of functional intelligence. Indeed the results are so striking, in the various modalities that they call for a reorientation of the old concept of stimulus-response theory which appears to be somewhat outmoded as far as the assessment of the development of the human thought processes are concerned.

The crux of the problem of ascertaining degrees of difference between the influence of early and late learning can be clarified by reference, for example, to the two opposing linguistic points of view concerning grammatical interference. Thus Antoine Meillet states that "the grammatical systems of two languages are impenetrable to one another" whereas Hugo Schuchardt makes the claim that "Even closely knit structures (*dichte zusammenschlüsse*) like inflectional endings are not secure against invasion of foreign material". It would appear from the findings of the J.A.W.L. Experiment that we are here concerned with the same order of problem as that discussed by Saussure that the language ("Langue") itself would remain fairly constant in its presentation although the expression of an individual in terms of human speech ("Langage") would vary considerably in accordance with the multiplicity of factors affecting the manner in which he initially assimilated the two languages and according to the functional level of his intelligence.

ANTOINE MEILLET: *Linguistique historique et linguistique générale* - (collection linguistique publiée par la Société linguistique de Paris, 2 Vols, Paris - 1921, 1938).

HUGO SCHUCHARDT: "Hugo Schuchardt Brevier".
- Ed., Spitzer, Halle 1928.

Inspection of the results of the First Language Welsh children (Bilingual Group) shows that they tend to respond to the neutral auditory and visual stimuli in Welsh although some children are expected also to make use of some English phrases despite the fact that they are predominantly Welsh. The following reproduction of responses to the J.A.W.L. Auditory Blank I and the Visual Blank II are typical of the findings both in the case of boys and girls.

FIRST LANGUAGE WELSH BILINGUAL: J.A.W.L. BLANK MARK I AUDITORY

- (a) Bywti'r ffa bron ym mhob man.
Dysg athro blant mewn ysgol bob dydd
- Stimulus Y mae lon yn brydferth yng nghanol blodau.
- PEN 1 Dyfnyddir pen i ysgrifennu mewn ysgol.
PLANT 2 Does dim llawer o blant yn mynd i ysgolion y wlad.
PANT 3 I'r pant y rhed y dwr.
MAN 4 Ym mhob man y megir glew.
COT 5 Bydd bob plentyn yn dod a chot i'r ysgol yn y gaeaf.
MOR 6 Bydd pawb yn hoffi mynd i'r mor yn yr Haf.
CAN 7 Defnyddir can i wneud bara.
CARU 8 Dylau pawb garu Iâsu Grist.
CAMP 9 Amser gwyliau'r haf bydd plant yn mynd i gampio.
CI 10 Mae pob ffermwr yn hoffi cael ci i waethio.
BRAT 11 Bydd pob benyw yn gwisgo brat i olchi.
COL 12 Daeth y fam at y baban i'w sigl yn ei chol.
PEL 13 Bydd pob plentyn yn hoffi cael pel i chwarae.
TO 14 Y mae ystlymod yn nythu o dan to tai.
TY 15 Teulu sy'n byew mewn ty.
SWN 16 Y mae swn gydag peirianau'r gwaith dwr.
CYW 17 Dos dim un cyw bach gyda ni yn awr.
PYS 18 Bydd pys yn tyfu ym mhob man.
COF 19 Y mae'n rhwyddach i anghofio nac i gofio.
COR 20 Daeth cor Cwmdwr i'r pentref yma o'r blaen.
MAEN 21 Mae gan y gof faen hogi.
SWIL 22 Yr oeddwn n'n swil pan oeddwn yn fach.
HAF 23 Yn yr haf bydd pawb yn brysur wrth y gwair.
MEN 24 Yr oedd y dyn yn fen.
MUL 25 R'oedd gan fy nhad ful o'r blaen.

J.A.W.L. BLANK: MARK II (VISUAL)

- (a) Yr oedd yn ddyn mud.
Yr oedd barn y dyn yn anghywir.
- Stimulus R'oedd y nodyn yn y lle anghywir.
- PIG 1 R'oedd pig yr aderyn yn goch gyda gwaed.
PUMP 2 Yr oedd yn bump o'r gloch arno'n cyrraedd gartref.
PUNT 3 Cafodd punt o anreg gyda'i fam.
MARCH 4 Y mae gan Mr Thomas farch mawr melyn.
HEN 5 Yr oedd yr hen wr yn sionc iawn.
CRIB 6 Bu Muriel yn criboi gwallt y bore yma.
BLEW 7 Y mae gan ysgarnogod bach flew yn ifanc.
BAD 8 Bu'n rhwyfo bad a'r yr afon y bore yma.
SAIL 9 R'oedd sail y ty yn wael iawn.
BORE 10 Cododd yn fore y bore hwnnw i ddal y tren.
TOES 11 Y mae'n rhaid cael toes i wneud bara.
TON 12 Cododd ton y mor yn uchel dros y muriau.
HURT 13 Safodd y dyn yn hurt o flaen y ty.
DARN 14 Bwytoedd y lygoden darn o'r caws.
DULL 15 R'oedd dull y dyn yn anghywir.
CLOD 16 Cafodd y ferch glod am fod yn dda yn yr ysgol.
FRY 17 Aeth yr awyren yn uchel fry i'r awyr.
CALL 18 Yr oedd yn ddyn call iawn.
COD 19 'Cod yn uchelach" dywedodd y tad wrth ei fachgen.
DRAW 20 Draw yn y pellter yr oedd y goeden dderw.

DAWN	21	R'oedd u ddawn yn swynol.
CORN	22	Cafodd corn y fuwch ei thorri i ffwrdd.
BRAIN	23	Bu'r brain yn cyffwrdd a'r yd yn cae.
HAD	24	Aeth y ffermwr i hau'r had yn y cae.
PLAID	25	Daeth plaid o ddefaid i lawr y ffordd.

FIRST LANGUAGE WELSH BILINGUAL: J.A.W.L.BLANK: MARK I(AUDITORY)

- (a) Y mae'r ffa yn tyddi yn yr ardd.
Dysg yr athro y plant yn yr ysgol.

Stimulus Yr oedd lon yn croesi'r cae.

PEN	1	Y mae pen i gael gan bob un.
PLANT	2	Gosododd fy mam y cinio ar y plat.
PANT	3	Ir pant rhed y dwr.
MAN	4	Enw chwedl yw Llyn y Fan.
COT	5	Gwisgais fy ngot cyn mynd allan i'r glaw.
MOR	6	Yr oedd y mor yn arw.
CAN	7	Yr ydym yn defnyddio can i wneud fara.
CARU	8	Yr oedd y fam yn caru ei phlentyn.
CAMP	9	Nid wyf yn hoffi cysgu mewn camp.
CI	10	Yr oedd yn gi ffyddlon.
BRAT	11	Prynodd fy mam frat yn y siop.
COL	12	Magodd y fam ei phlentyn yn ei chol.
PEL	13	Ciciodd y bachgen y bel dros y clawdd.
TO	14	Yr oedd aderyn yn gwneud ei nyth yn y to.
TY	15	Deg ystafell sydd yn ein ty ni.
SWN	16	Dychrynais pan glywais swn y dryll.
CYW	17	Nid oedd y iar yn fodlon i neb gyfwrdd ai chyw.
PYS	18	Yr wyf yn hodd iawn o bys.
COF	19	Nid oes cof dan gennyf.
COR	20	Yr oedd y fywch wedi neidio dros y cor.
MAEN	21	Dyn tywyll a main ydoedd.
SWILn	22	Yr oedd y bachgen yn swil.
HAF	23	Bydd y ffermwr yn mynd i mewn ar gwair yn yr haf.
MEN	24	Yr oedd yn fachgen men.
MIL	25	Yr oedd ganddo fil o binnai.

J.A.W.L.BLANK: MARK II (VISUAL)

- (a) Yr oedd y bachgen yn fud.

Stimulus: Dywedodd y dyn ei farn.

Yr wyf wedi dysgu y nod.

PIG	1	Y mae'r adar yn dal y pryfed yn ei pig.
PUMP	2	Pump bys sydd ar fy llaw.
PUNT	3	Cefais bunt am wneud yr ardd.
MARCH	4	Yr oedd y march yn wyllt.
HEN	5	Yr oedd yn hen iawn.
CRIB	6	Prynais grib newydd.
BLEW	7	Yr oedd blew trwchus ar y ceffyl.
BAD	8	Aeth y badachub i lawr i'r twll.
SAIL	9	Rhododd fy nhad sail yn y sied.
BORE	10	Yr wyf yn codi fore i fynd i'r ysgol.
TOES	11	Gwnaeth fy mam docs er mwyn gwneud bara.
TON	12	
HURT	13	Yr oedd y bachgen yn hurt.
DARN	14	Dysgais y darn.
DULL	15	Yr wyf yn gwybod y dull.
CLOD	16	Yr oedd llawn ei glod o arian.
FRY	17	Aeth y bachgen lan fry.
CALL	18	Yr oedd yn gi call.
COD	19	Dywedodd fy mam "cod or gwely".
DRAW	20	Gwelais gadno men draw.
DAWN	21	Dawn i'r ysgol mewn bws.
CORN	22	Canodd ei gorn.
BRAIN	23	Saethodd y dyn y brain.
HAD	24	Rhododd y ffermwr yr had yn y ddae.
PLAID	25	Gwelais blaid o ddefaid.

But although the main tendency is naturally for Welsh children to respond in Welsh there is fascinating evidence to show that (a) Phonic (b) Lexical and (c) Grammatical interference takes place in such a way that the early learning of Welsh directly and often permanently affects the child's expression in English. Let us consider these findings in detail where all examples cited are taken from the Bilingual (First Language Welsh) Experimental Group.

Let us first consider phonic interference which in point of fact constitutes an example of the effect of early learning on the development of the thought process. Phonic interference concerns the manner in which a speaker perceives and reproduces the sounds of one language which might be designated secondary in terms of another called primary. Again, interference arises when a bilingual identifies a phoneme of the secondary system with one in the primary system and in reproducing it subjects it to phonetic rules of the primary language. This might involve the under - or over - differentiation of phonemes the former occurs when two sounds of the secondary system whose counter-parts are not distinguished in the secondary system are confused whilst the latter involves the imposition of phonemic distinctions from the primary system on the sounds of the secondary system where they are not required.

The following are excellent examples from the J.A.W.L. Experimental Results:-

- (1) e.g. "Roedd eisiau rhagor o goal are y teili yn ein stryt ni".
(More coal was needed by the family in our street).
Neutral auditory stimulus COL (COAL) is interpreted as English word in a Welsh context and the English word COAL is even mutated to goal (where c > g) according to the linguistic requirements of Welsh mutation.
- (2) Although the visual stimulus PIG and BLEW are interpreted as English in meaning the spelling of the sound "u" is reproduced as Welsh vowel "y".
e.g. (a) "The pig grynted".
(b) "The man blew a trympet".
or again (c) "Have yw had a bike"
(Welsh form "yw" replaces "you").
- (3) The visual stimulus "bore" is interpreted as "boar" and reproduced in a sentence which is phonemically Welsh where "killed > cield".
"The man cield the bore".
- (4) Auditory stimulus "CARU" retains Welsh meaning "to love" but English spelling, thus -
"Gwelais ddyn yn carry neithiwr ar y teledy".
(I saw the man making love last night on the television).

All this points to the influence of early learning as affecting later learning.

Lexical interference represents another way in which early learning directly affects later learning. The ways in which one vocabulary can interfere with another one varies. Given two languages W and E, morphemes may be transferred from W into E or E- morphemes may be used in new designative functions on the model of W.- morphemes with whose content they are identified, finally in the case of compound lexical elements both processes may be combined.

Since the vocabulary of a language is much more loosely structured than its phonemics and its grammar, it is beyond doubt the domain of learning par excellence. It will be seen that the bilingual (Welsh First Language) child always has ready on hand another language (English) to supply a word as needed for lexical innovations although the visual stimulus produces a Welsh sentence structure to include a borrowed English word thus:

(1) Visual Stimulus "DULL"

Dywedodd yr athro ei fod yn dull iawn o hyd.
(The teacher said he was always dull).

(2) Visual Stimulus "COT" > English "COAT"

"Y mae coat newydd gan y ferch!"
(The girl has a new coat).

(3) Visual Stimulus "MEN" > English "MEAN".

"Y mae rhai plant mean yw gael yn y wlad hon".
(There are some mean children in this country).

(4) Auditory Stimulus "COL" (English "LAP")
English COAL (Welsh GLO)

"Y mae'r babi yn coal ei fam."
(The baby is on his mother's lap).

(5) Auditory Stimulus "PYS" (English Peas) of English PEACE.

"Yr ydym yn tyfu peas yn yr ardd."
(We grow peas in the garden).

(6) Auditory Stimulus "PEN" (English "HEAD")

"Yr oedd pen y bachgen yn rhy fawr i ddod allan o'r railings"
(The boy's head was too big to come out of the railings).

7(a) Auditory Stimulus "MOR" (Welsh "SEA") English "MORE"

"Y mae llawer o people yn mynd i'r mor".
(Many people go to the sea).

(b) Compare with the same child's use of the Welsh word "pobl" as response to mil (English thousand) English "MEAL"

"Yr oedd mil o fobl yno".
(A thousand people were there).
i.e. this proves he also knows the right Welsh word for "people".

(8) The same subject makes use of the direct translation of both the auditory and visual stimulus into Welsh.

(a) "Coal iw glo yng Cymraeg". (where "glo" = coal).
(b) "Pig iw mochyn sydd ar y fferm". (where "mochyn" = pig.
or again

(a) "Yr oedd y dyn yn gweithio yn y pwll glo."
(The man was working in the coal mine).
(b) Y mae mochyn yn y cae.
(The pig was in the field).

(9) The stimulus "SAIL" (Welsh "threshold) interpreted as English "SAILOR".
"Yr oedd y sailor yn dda iawn.
(The sailor was very good).

All the examples taken from the J.A.W.L. scripts of Bilingual (First Language Welsh) children indicate that their mode of thinking is still basically Welsh although they have received four years of English teaching and recognize the borrowed English word which is incorporated naturally into their basic Welsh vocabulary structure.

Interference in Grammatical Relations is another way in which we see how basic structures are retained, often in an English context. This involves the application of a grammatical relation of word order from one language (let us say Welsh) to morphemes in another (such as English). Such interference in the domain of grammatical relations is extremely common in the speech of bilinguals. Interference is of several types where -

- (a) the replica of the relation of another language explicitly conveys an unintended meaning (sometimes producing the opposite meaning).
- (b) the replica of the relation of another language violates an existing relation pattern producing nonsense or a statement only understandable by implication.
- (c) the inference is theoretical consisting in the unnecessary imposition of a relation to a language where no obligatory relations exist in the equivalent domain e.g. if the English speaker always maintained the subject + verb + object type of speech in a Welsh speaking context.

In such a context (i.e. segments of utterances, including prosodic features which differentiate simple morphemes) are distinguished from grammatical relationships, including such features (a) order (b) agreement, dependence and similar relations between grammatical units (c) modulations of stress and pitch. This distinction is of significance here because grammatical functions which are performed in one language by morphemes may be identified by bilinguals with relations of another language.

We have seen how the First Language Welsh Bilinguals retain Welsh as their natural response but also incorporate items of English vocabulary which they have assimilated during the course of later learning, for example:

Auditory Stimulus "MAN" (Welsh "PLACE") produces the following response.

"Yr oedd y dyn yn byw mewn bwythyn.
(The man lived in a cottage).

- where English "MAN" - Welsh "DYN" (despite the fact that the Welsh word "MAN" = PLACE).

Let us examine the manner in which English responses are couched in a Welsh turn of speech. The following will serve as examples taken from First Language Welsh children in the J.A.W.L. Experiment:-

- (1) (a) Visual Stimulus "MARCH" gives rise to Welsh-type verbal/adverbial forms.
"Dr Barbara Moore did a march from John of Groat's to Land's End".
(b) They marched good around the field.
- (2) Visual Stimulus "HURT" produces a literal translation of the Welsh phrase "cael dolur" (to be injured) thus:-
"The boy had hurt when he fell".
- (3) Visual Stimulus "DULL" is interpreted in a colloquial form of anglicised Welsh.
(a) "The man was dull to cross the road with a car coming.
(cf. Yr oedd y dyn yn ffôl i groesi yr heol a char yn dod)
(b) "The boy was dull with the loss of his pet falcon".
(cf. (i) Aeth y bachgen yn ddwl ar golli ei geryll bach or (ii) Yr oedd y bachgen yn ddwl wrth golli ei geryll bach).
- (4) (a) Visual Stimulus "FRY" (Welsh connotation "on high").
"My mother fried fish to me".
This can be compared with the colloquial Welsh construction "i fi": or again another colloquial form (see 1(b) above)
(b) Visual Stimulus "TON" (Welsh "Wave") English "ton weight".
"The coal man comes round our house to sell coal".

(5) The following replicas which can only be understood through inference are of prime importance when one comes to study the influence of pre-conceived patterns which appear in response to apparently neutral stimuli:-

- (a) "There was a pig in the style".
- (b) "I saw a mice coming into the barn to fetch corn".
- (c) "The man blew through the corn of a bull".

This latter form is extremely interesting for "corn of a bull" is a literal translation of "corn y tarw" (a bull's horn) where again the association is made with the use of the "horn" as a musical instrument.

(6) Of equal interest is the colloquial use of Welsh form of English where the adjective "bad" is taken to mean "sick, thus we find the following response to - Visual Stimulus "bad" (opposite of "good") (cf. Welsh "boaf")
"He was a bad man so he was taken to hospital".

It will be seen from the foregoing that the influence of early learning works in two ways:-

- (1) It causes the First Language Welsh/Bilingual children to retain their natural fluency in their mother tongue whilst at the same time assimilating foreign English elements into its structure - often with strange results.

(2) If the second language English is not properly learned or learned too late it becomes "gallicised," thus the Welsh structure is retained and often turned directly into English - with picturesque effect.

Where both languages are learned carefully in the various modalities where in the James-Hebb sense the cell-assemblies and phase sequences are well developed into differentiated linguistic systems confusion is less likely to arise ^{except} other than with children who suffer from some physical or mental handicap which militates against their educational progress and affects the functional level of their intelligence. (see case history).

Let us now consider the relevant J.A.W.L. Experimental data taken from the responses of the First Language English/Bilingual Group where we note a similar tendency in reverse - a tendency which not only supports our primary and secondary hypotheses but also supports our tertiary hypothesis concerning the functional level of intelligence namely that the influence of pre-existent central activity on the next link of the phase sequence chain would lead one to expect specific responses in accordance with the language learned early or late.

These children taken from a sample of the 1960 Eleven Plus Group have been designated by their own personal choice and by that of their teacher as first language English although they are also fluent Welsh speakers despite the fact that their preferred language is English. On the oral side it would be true to say that in every day life they would tend to respond to the particular Welsh or English auditory stimulus which was most akin to the context with which they are most familiar, for example, a bilingual child who attended a Welsh chapel or church would reproduce Welsh religious references despite the fact that the general run of the child's preferred language was English. A case in point is that of the attached example which is typical of the tendency of children to respond in Welsh to a familiar auditory stimulus and in English to a visual stimulus which has become familiar to them through the later learning of the scholastic process. Although Welsh is retained, however, there is evidence that mutations are lost.

The following religious citations taken from the attached script throw light on one of the important influences which affect a person's style of thinking as far as Wales is concerned, thus:

- (a) "Yn wlad y Bibl y mae'r pobl gallu eistedd ar y tô."
- (b) "Cefais pys a iar i cinio un Dydd Sul."
- (c) "Ar y ffordd i Bethlehem yr oedd mam Iesu Grist yn eistedd ar mel."

One notices that Welsh is retained but the influence of English is also seen clearly in the mode of expression.

FIRST LANGUAGE ENGLISH BILINGUAL. J.A.W.L. BLANK: MARK I
AUDITORY

- (a) Yr wyf yn bwyta ffa i cinic yn yr Hydref.
(b) Yn yr ysgol y mae yr athrawon yn dysgu'r plant.
Stimulus (c) Ar y lon welais dail fel carped brown.

- PEN 1. Welais plyf o bob llyw ar pen y bachgen bach.
PLANT 2. Nid oedd sen yn yr ystafell, yr oedd y plant yn ddistaw.
PANT 3. Yr oedd y ceffylau yn neidio dros y pant.
MAN 4. Yn y fan hyn, welais y fuwch.
COT 5. Cot hir, du, oedd gan yr hen wr mwyn.
MOR 6. Yn y mor cefais deg pysgod ar ol pysgota.
CAN 7. Ar ol cael gwenyth, cawn can, a wedyn bara.
CARU 8. Yr oedd y ferch fach tlus yn caru ei mam.
CAMP 9. Yn y camp cefais amser ardderchog yn byw fel sipswn.
CI 10. Aneifael fyddlon yw'r ci.
BRAT 11. Gwysgair brat fach melyn a coch i'r te.
COL 12. Eisteddais ar col fy mam pryd yr oeddwn yn fabu.
PEL 13. Yr oedd y pel fach glas yn cael ei bwrw ar y mur.
TO 14. Yn wlad y Bibl y mae'r pobl gallu eistedd ar y to.
TY 15. Yr wyf yn byw mewn ty hanner mylltir o'r ysgol.
SWN 16. Pryd y mae'r adar yn canu y mae swn ardderchog.
CYW: 17. Ar y fferm yr oedd y cywion bach yn eistedd gyda'i mam.
PYS 18. Cefais pys a iar i cinion Dydd Sul.
COF 19. Nid oes cof da gyda fi.
COR 20. Cor Rhydaman yw'r cor gore yr urdd.
MAEN 21. Yn y mur welais maen gyda enw arno.
SWIL 22. Bachgen swil oedd y bachgen bach.
HAF 23. Yn yr Haf yr wyf yn mynd i'r mor i nofio.
MEN 24. Dynon men oedd y lladron o'r wlad.
MUL 25. Ar y ffordd i Bethlehem yr oedd mam Iesu Crist yn eistedd ar mel.

J.A.W.L. BLANK: MARK II (VISUAL)

- (a) The sturdy horses galloped through the mud.
Yr oedd fy mam yn mud.
(b) In the old barn the children had great times.
Barn da oedd gan y dyn ato.
(c) The dumb people nod their heads if they mean yes..
Daeth y bachgen a nod i'r athrawes.

- PIG 1. The dirty pigs grunted in their pig-sty.
Pig melyn oedd gan y bachgen, yn mynd i'r ysgol.
PUMP 2. When the petrol was being pumped into the car, the dial of the pump went round.
Pump yw'r oedran bachgen y fferm.
PUNT 3. It is hard work to guide a punt.
Roddaist punt am y cot newydd i'r babu.
MARCH 4. The soldiers marched along the road to their barracks.
Yr oedd marchogion Arthur yn dynion dewr.
HEN 5. We get our breakfast from a hen when they lay eggs.
Hen wr mwyn oedd y dyn yn byw ar y bryn.
CRIB 6. A mother sometimes rocks her baby in the crib.
Crib melyn oedd gan y ferch prydferth.
BLEW 7. The howling wind blew fiercely around the house.
Welais blewyn ar ddesg yr athro.
BAD 8. The bad boy was severely punished by his father.
Yr oedd y bad bach ar y mor.
SAIL 9. We could see the sails of the little boats on the sea.
Yr oedd rail y drws yn hen iawn.
BORE 10. The fat boy was a dreadful bore.
Amser y bore yw'r amser gore.

- TOES 11. The model had red nail varnish on her toes.
Dododd mam toes yn y bara.
- TON 12. We received one ton of coal.
Clywais tonnau y mor o'r ty.
- HURT 13. The boy was dreadfully hurt in the accident.
Yr oedd y dyn yn hurt.
- DARN 14. The old woman darned my sock beautifully.
Clywais darn o'r hen wr am cawr.
- DULL 15. When we walked to school it was very dull.
Yr oedd dillad newydd arno.
- CLOD 16. We separated the clods of earth with a fork.
Yr oeddwn y rhoi clod i'r dyn.
- FRY 17. We fried the bacon on a small fire.
Yr oedd y fenyw ar fry.
- CALL 18. We called at a shop but we did not see her.
Dyn call oedd dyn y fair.
- COD 19. We all enjoy cod for our dinner.
Cododd y plant yn gynnar i fynd i'r wlad.
- DRAW 20. We have our art lessons we usually draw.
Draw ar y bryn welais coedwig mawr.
- DAWN 21. The sun rises in the morning with the dawn.
Yr oedd dawn canu gan y ferch.
- CORN 22. In the fields grew the golden corn.
Gan y fuwch oedd corn mawr.
- BRAIN 23. The brain controls all the human body.
Welais brain y cymmerid hwyad o'r ddaer.
- HAD 24. I had a very beautiful doll.
Yn tyfu yn y cae oedd had.
- PLAID 25. For my birthday I received a plaid skirt which
I adore.
Yr wyf yn byw yn plaid Cymru.

Phonic interference represents one of the strongest arguments in support of the James-Hebb hypothesis for the Welsh language learned first auditorily and expressed orally is reproduced in an English context. Whereas, as far as the First Language Welsh Bilinguals are concerned, phonic interference does occur it is nowhere as prevalent as the incidence of such interference among First Language English Bilinguals who have also learned Welsh at an early age. The examples are infinite both in their number and complexity. Let us consider but a few.

FIRST LANGUAGE ENGLISH (BILINGUAL)

J.A.W.L. BLANK: MARK I. AUDITORY.

- (a) ffa - bwyd (broad beans) (solfa).
Ni hoffair bachgen ffa'r ardd.
- (b) dysg - athraw yn dysgu. ysgol.
Y mae fy nhad yn dysgu Cymraeg yn yr ysgol.
- (c) lon - (path) stryd fechan.
Cerddodd y dyn i lawr y lon fechan.

-
1. PEN-INK Ysgrifennodd a phen nid a phensil.
PEN Cafodd y carcharor ei ben i ffwrdd am ei waith cas.
2. PLANT Cerddodd y plant allan o'r ysgol ac adref yn hapus iawn, ar ol y dydd caled.
3. PANT Yn y pant y rhed y dwr (hole-valley).
Yr oedd pant yn y bel.
4. MAN Yr oeddynt yn byw man unig yn y wlad.
5. COT wlanan, botwm:- Gwisgodd y dyn ei got newydd i fynd i'r capel.
6. MOR dwr, halen, tonnau:- Cafodd y llong ei distriwyo ar y mor.
7. CAN bara, gwyn, gwenyth: Aeth y ffermwr i nol y can o'r felyn.
8. CARU Yr oedd yr hen bar yn caru ei gilydd yn fawr iawn. (hoffi: love).
9. CAMP tent: Eithum i a fy ffrind ar ein gwyliau mewn camp. (mabolgampau, gwersyll).
10. CI cyfarth, anifail: Rhedodd y ci ar ol y gwningen mor gyflym ar gwynt.
11. BRAT ffedog: Gwisgodd yr hen fenyw ei brat i wneud ei teisenod.
12. COL lap: Eisteddodd y baban y nghol ei fam.
13. PEL Cicioodd y bachgen y bel yn galed iawn ac aeth hi drwy'r ffenestr. round, gron.
14. TO ty, slaten: Syrthiodd to y ty i mewn ar ol y storm.
15. TY Cafodd dy mawr ei adeiladu ar y cae (house, bricen, simne).
16. SWN Yr oedd swm mawr yn dod o gyfeiriad cell y mwnciod. (noise).
17. CYW bach, giar: Cafodd y iar ddu chwe cyw gwyn ac un cyw du.
18. PYS bwyd, rhesed o bys (peas): Dyma'r brain yn bwyta'r pys i gyd.
19. COF memory: Er ei fod yn hen ddyn y mae cof rhagorol ganddo.
20. COR canu caneuon: Enillodd y cor yn yr Eisteddfod am ddatganiad gwych.
21. MAEN tenau - carreg: Gwelais ddyn mawr maen yn dod tuag ataf.
22. SWIL shy: Yr oedd y ferch fach yn swil iawn ar y llwyfan.
23. HAF summer, haul: Yn yr haf y gwelwn ni'r haul.
24. MEN meenest: Efe oedd y bachgen mwyaf men yn y dosbarth.
25. MUL Gwelodd Samson ful o Philistiaed yn aros di flaen ac ar unwaith cydiodd mewn asgwrn oddi a'r y llawr.

J.A.W.L. BLANK: MARK II. VISUAL

- (a) mud - The football pitch was full of mud after the game.
(Welsh - mud = ddim yn gallu siarad).
Cafodd y dyn ei fwrw'n fud ar ol yr rhyfel.
- (b) barn - The barn was full of hay after the harvesting.
Rhoddodd y dyn ei farn ar y cais yn y cwrt.
- (c) nod - The horse nodded towards his master.
1. PIG The old sow look at her young pigs happily.
Pigodd yr aderyn fwyaren ddu gyda'i big.
2. PUMP The men pumped the water out of the overflowing river with their new pump.
Yr oedd pump o fechgyn yn eisfau yn y dosbarth.
3. PUNT The punt was pushed along the riverbank steadily.
(Also: punt the ball).
Cafodd y fenyw bunt am ennill gwobr ar y teledu.
4. MARCH The sergeant-major shouted to his band, "Quick march!".
Rhoddodd y march ras rhagorol ond ni ennillodd: ceffyl, marchog.
5. HEN The old hen was gone the next morning but we finally caught the fox.
Teilwr yw'r hen ddyn. (old).
6. CRIB The baby was fast asleep in the crib.
Cribodd y ddynes ei gwallt, hir, melyn, a'i chrib. (comb).
7. BLEW The happy minstrel took out his flute and blew on it, before the King.
Llyw blew y gath yw melyn.
8. BAD Oliver Twist was considered to be a bad little boy.
Rhwyfodd y dyn y bad allan i'r mor.
9. SAIL We used to sail out to sea every afternoon on our holiday.
Cwmpodd yr hen ddyn a'r sail y drws.
10. BORE He was bored when he returned from the fair.
Codais, dim ond i weld pobeth yn wlyb yn y bore bach. (mornin)
11. TOES The toes of his feet were freezing after the match.
Defnyddiodd y fenyw toes i wneud bara.
12. TON A ton of coal was outside our house when I arrived home.
Cannodd y cor don fach o Gymru i'r Gynilleudfa. (tone, song).
13. HURT He hurt himself while climbing the rocky crevass.
Daeth dyn hurt allan o'r tafarn.
14. DARN "Darn it", shouted the woman after the needle had pricked her finger.
Gefais ddarn o fara gan y dyn caredig. (a piece of something)
15. DULL It was a dull Autumn morning for the great match.
Yr oedd yna ddull newydd allan o wneud bara.
16. GLOD (a piece of earth). Clods were thrown at the tramp for stealing the apples.
Rhoddodd y dyn glod i'r bobl am ei dewder.
17. FRY "Have you fried the egg?", asked the man.
"Fry yn y nefoedd lan", aeth y pregethwr ymlaen.
18. CALL "Call that brother of yours", said the woman.
Yr oedd yr athro yn ddyn call iawn.
19. COD Although I didn't like fish I had cod for supper.
"Cod", dywedodd y Frenhines ar ol iddi enwi'r marchog.
20. DRAW The draw was made for the semi final.
"Tyrd draw yma", dywedodd yr athro.
21. DAWN It was dawn when I woke up from my long night sleep.
Cafodd ddawn am ganu mor hyfryd. (gift).
22. CORN The farmer went to the mill to receive his corn.
Y mae llawer o gorn ar droed fy mam.
23. BRAIN It was found that in the accident his brain had been affected severely.
Yr oedd y brain yn cawcian yn ddi-stop.
24. HAD "I had it", replied the boy but now it seems to be lost.
Aeth yr heuwr i'r cae i hau.
25. PLAID The young girl wore her native plaid costume which was pretty.
Y mae fy nhad yn Lywydd i Blaid Cymru ac heddiw y mae wedi mynd i gyfarfod.

The First Language English Bilingual tends to speak a colloquial Welsh; this fact added to paucity of experience in the latter written forms of Welsh and sometimes English produces a strange admixture of language.

(1). Auditory Stimulus "FYSS" (PEAS) produces the following colloquial response:-

(a) "Y mae pease yn gardd trusnesa".

Although the basic structure of this sentence may be termed Welsh the words "pease" and trusnesa" are really colloquial attempts to put sound on paper.

(There are peas in the garden next door).

The same process is at work in the following colloquial rendering

(b) "Prynodd fy mam dined o pis yn shop o grocer".

This response can be considered as a classical example of mixed bilingual expression where early-learned auditory stimuli are related directly to later learned visual stimuli such as "shop" and "grocer" (The form in which this is couched is still Welsh i.e. "shop y grocer not ~~grocer's~~ shop).

(My mother bought a tin of peas in the grocer's shop).

The following examples are also typical of this type of thought process:-

(c) Visual Stimulus "PLAID"

"The gambler plaid his hand by sheating" (note ch > sh).

(d) Visual Stimulus "PUNT". English "PINT" and in turn related to llaeth = Welsh - Milk.

"Yr oedd ar y sill punt o lath!"

(On the window-sill there was a pint of milk).

(e) Auditory Stimulus "CAN" (English translation "flour").

"Y mae fy nhad yn wneud bara mas o can".

The influence of early learned colloquial Welsh is seen clearly in the form "mas o can" whilst the English connotation of can is couched in Welsh sentence structure.

(My father makes bread out of flour).

(f) Auditory Stimulus "PANT" (English = hollow).

"Cwnpodd y ferch i mewn i'r pant oedd ar ochr y rhewl fawr".

(The girl fell into the ditch which was at the side of the big road).

Here we notice the interesting speech development which can be compared with the Old English process where "a nadder" becoming "an adder". In Welsh the colloquial form "yr rhewl" has displaced the accepted written form "yr heol". It is this "blurring" of phonemic structure occasioned by early learning which wreaks havoc on the later learning of written linguistic concepts both in Welsh and in English particularly when the language which is learned in part by early listening and speaking is not, or only partially, reinforced in the different modalities by reading and writing.

In its most weakened form we note the following example where the spoken replica bears no relation to the literary language.

(g) Auditory Stimulus "TO" (English roof)

"Aeth beder slaten of on ti ni amser y gwent mawr".

Here the first language English Bilingual retains the early auditorily acquired structure in a completely unsophisticated form.

(h) Visual Stimulus "MUD"

The same influence of early learned Welsh forms is seen in the following where the Welsh word 'MUD' (English "Deaf") is interpreted as English MUD but the Welsh vowel sound "y" is retained in place of English "u":-

"Y mae plant yn chwarae yn y myd."

(The children are playing in the mud).

(i) The same kind of confusion arises from phonic interference affecting the following examples where the auditory Welsh stimulus is reproduced by an English morpheme or where the English morpheme is interpreted as a Welsh phoneme, thus:

(i) Auditory Stimulus "SWN" (English "sound").

"Y mae'r lorry yn cadw soon.
(The lorry makes a noise).

or again

(ii) Visual Stimulus "CLOD" (English "praise").

The poor ill beggar was clod in a tattered dress".
The word "clod" becomes an auditory English stimulus "clothed".

and again

(iii) Visual Stimulus "SAIL" (English "Threshold")

Here the visual stimulus 'SAIL' is interpreted as the Welsh stimulus sâl (sick), thus:

"Y mae y dyn yn sail"
(The man was ill).

This audio/visual confusion which is typical of the effect of the early learning of Welsh as far as the Bilingual First Language English pupils are concerned introduces us to what may be termed a "linguistic no-man's-land" where we are introduced to a "phonic-cum-lexical" category of interference where:-

(j) (i) Visual Stimulus "PLAID" is confused with the word "Plague"
"The people of the village had the plaid and died".

(ii) Visual Stimulus "BLEW" interpreted as "glue"
"I stikt the paper with blew".

(iii) Visual stimulus "FRY" becomes "Free"
"The man was sent fry from geil".

(iv) Visual Stimulus "PLAID" interpreted as English "ploughed"
"The farmer plaid his field".

(v) Visual "MARCH" perceived as "Marsh".
"They tramped across the marsh in heavy rain".

(vi) Visual "BLEW" accepted as "blue"
"The boy was hit until he saw blew".

This latter is extremely interesting on account of the fact that the Welsh phonetic form as both an auditory and visual stimulus resembles the English sound "BLEW" (to blow) very closely.

Lexical interference in the First Language English Bilinguals constitutes another form of early learning influence which demonstrates the manner in which a response will occur is in part determined by excitation from cell-assemblies already present before the neutral stimulus is administered. This form of lexical borrowing is prolific as the following examples taken from the J.A.W.L. Experimental data will show e.g.

I. Response to the neutral stimulus is couched in Welsh structure but uses the English meaning of the word.

- (i) Auditory Stimulus PEL (Welsh "ball") of English "PALE"
"Yr oedd y ferch yn disgwyl yn pale".
(The girl looked pale).
- (ii) Visual Stimulus PUNT (Welsh "pound note")
"Yr wyf yn mynd i dodi punt ar y mor".
(I am going to put the punt on the sea).
- (iii) Auditory Stimulus TY (Welsh "House") of English "TEA"
"Dyma'r fam yn sarni tea ar ei chol".
(Here is the mother upsetting tea on her lap).
- (iv) Auditory Stimulus "MAEN" (English "Stone")
English Stimulus "MINE"
"Yr oedd fy nhad yn gweithio mewn mine glo".
(My father works in a coal mine).
- (v) Visual Stimulus "SAIL" (Welsh = "threshold")
 - (a) "Yr oedd gan y llong sail".
(The ship had a sail)
 - (b) "Yr oedd eisiau sail newydd ar y boat".
(The boat had need of a new sail).
- (vi) Auditory Stimulus "TO" (English "roof")
"Yr oedd yr aderyn wedi gwneud nest yn y to".
(The bird made a nest in the roof).
- (vii) Auditory Stimulus "CI" (English = DOG):
English structure "KEY"
 - (a) "Y mae'r ci yn y kennel".
(The dog is in the kennel).
 - (b) "Y mae y key yn y drws".
(The key is in the door).
- (viii) Visual Stimulus "CORN" (Welsh "Horn")
"Y mae corn ar fe traed yn sor".
(The corn on my feet is sore).
- (ix) Visual Stimulus "BRAIN" (Welsh = crows)
"Yr oedd scarecrow yn yr ardd yn hala ofn ar y brain".
(The scarecrow in the garden frightens the crows).
- (x) Visual Stimulus "PIG" (English = "Beak")
 - (a) "Yr oedd y pig yn y ae".
(The pig was in the field).
 - (b) Yr wyf yn pigo blackberries i mam".
(I am picking blackberries for mother).
- (xi) Visual Stimulus "CRIB" (English = "Comb")
"Y mae y baby yn cysgu yn y crib".
(The baby is sleeping in the crib).
- (xii) Visual Stimulus "PUMP" (English = "Five")
"Yr oedd pump bachgen yn absent or dosbarth".
(Five boys were absent from the class).

All the above illustrate the strength of the early Welsh learned language stimulus which produces Welsh responses at both auditory and visual levels and at the same time uses English loan words. One should not, however, assume that a straight forward word count will of necessity give us truly independent assessments of linguistic responses to auditory and visual stimuli for the influence of the early learning of Welsh produces some bizarre responses in English which are directly attributed to the early learning of Welsh.

Such an example is observed when the stimulus is accepted to be Welsh although the response is couched in English whilst retaining the colloquial Welsh meaning.

- (i) Visual Stimulus "TON" (English = WAVE and "TUNE")
 - (a) "The ton on the sea was very rough".
(-i.e. the wave on the sea was very rough).
 - (b) "There is a ton on the piano".
(- i.e. there is a tune on the piano.
or - a tune is being played on the piano).
- (ii) Visual Stimulus "BAD" (English = BOAT) Colloquial - "SICK"
 - "In the schools many children are bad with fly".
 - (In the schools many children are ill with influenza ('flu).

But the classical example of the influence of set is that where the Welsh stimulus word is interpreted as having an English meaning although the response is couched in Welsh. Thus:

- (i) Auditory Stimulus "PIG" (English = "beak") cf. English "PIG"
 - (a) Rhedodd y mochyn dros y bont ar fy ngol i.
(The pig ran after me over the bridge).
 - (b) "Yr oedd y mochyn yn byw yn y cwt".
(The pig lived in the sty).
- (ii) Auditory Stimulus "MEN" (English = MEAN) cf. English "MANE"
 - "Y mae men y ceffyl yn hongion".
(The horse's mane hangs down).
- (iii) Auditory Stimulus "PEL" (English = "BALL") cf. English "PALE"
 - "Yr oedd y dyn yn edrych yn sâl iawn".
(The man looked very ill).
- (iv) Auditory Stimulus "MAN" (English = PLACE) cf. English "MAN"
 - "Yr oedd y dyn yn eistedd yn y parc yn darllen eu bapur.
(The man was sitting in the park reading his paper).

Another aspect underlying the influence of the early learning of Welsh is noticed where the response to the neutral stimulus is couched in Welsh but includes an English spelled word whilst still retaining its Welsh meaning, thus:

(iii) Visual Stimulus "CALL"

"The detective had to do many phone calls before he had any clues.

The use of "do" as a modal auxiliary is common in Glamorganshire.

One of the most popular ways in which First Language English Bilinguals extend their use of Welsh grammatical structures is by adopting English Words to a Welsh verbal form by adding the ending - "o". The following serve as two typical examples of the method adopted:-

(i) Auditory Stimulus "MAEN" (English = STONE)

"Y mae maen y drws wedi cael ei wero i lawr".
(The door-step has been worn down).

i.e. the English word "wear" has been adapted to a Welsh structure.

(ii) Auditory Stimulus "SWN" (English = sound/noise)

"Y mae swn y piano ddim yn sowndion dda.
(The sound of the piano does not sound well)

i.e. the English word "sound" has been adapted to a Welsh verbal form.

Finally the influence of Welsh structures which have been learned early and often retained at different levels of speech especially as colloquial jargon, are also evidence of the way in which later learned English expressions are affected - to cite but one example:

the Visual Stimulus "DULL" elicited the following response -

"He is as dull as the wall" which in turn is a literal translation of the Welsh idiomatic phrase "mor dwp ar wal" which is in current colloquial use.

In brief, the First Language English Bilingual children, as in the case of the First Language Welsh Bilingual children, in their responses to neutral auditory and visual stimuli continue to display the influence of linguistic concepts learned early and which are perpetuated in the form of phonic, lexical and grammatical interference - as well as in the straightforward reproduction of independent responses in two different languages carefully assimilated in the various modalities.

It would therefore not be inappropriate, in view of the nature of the findings of the present James Associative Word List Experiment, to state at the outset that there is as we have seen reasonable evidence to support the three hypotheses which we originally set out to test, namely,

- (1). PRIMARY: that performance in Welsh remains superior owing to the early learning of Welsh - providing that English and Welsh are maintained on equal terms later on.

- (2) SECONDARY: that learning proceeds by the taking over of associative (unspecified) areas of the cerebral cortex from the adjacent sensory projection areas. This would lead one to expect that free associative responses to auditory stimuli would tend to be in the language learned by auditory channels whereas response to visual stimuli might show a greater proportion of words from the second language learned in part through reading and writing, i.e. Welsh children should give a difference between auditory and visual tests in terms of Welsh responses (and vice versa).
- (3) TERTIARY: that by putting forward the new concept of the Functional Level of a child's intelligence in terms of comparative philology and in accordance with a synchronic scale of individual bilingualism one can then postulate Hebb's hypothesis, namely - that the influence of the pre-existent central activity of the next link of the phase-sequence chain would lead one to expect specific English and/or Welsh responses in accordance with the language(s) learned early or late; the subject is presented with a neutral stimulus situation that can arouse different central activities each meaning a different motor response (in different modalities) - which one will occur is in part determined by cell-assemblies already present.

It would not be inappropriate at this point to reconsider our findings in relation to our new concept involving the comparative philology of functional intelligence.

We have seen that the functional level of intelligence (F.L.I.Q.) is directly affected by:-

- (a) Individual differences in the qualitative levels of reasoning ability.
- (b) Orectic factors which enhance or impair the development of the inherited constitution.
- (c) Sociological conditions favourable or unfavourable to physical and mental growth.

- (d) Scholastic conditions which militate for or against educational progress.
- (e) Nurture of natural endowment of verbal, number and space factors (to cite but three).
- (f) Intrinsic and extrinsic conditions which introduce linguistic phenomena such as phonic, lexical, stylistic and grammatical interference - and finally when it comes to attempting assessment.
- (g) Artefacts of test construction.

It has been suggested during the course of this thesis that the assessment of a child's thought process in terms of mathematically graduated stimuli (of test items) is not enough: there is also a need for a qualitative appraisal on the response side of S - R theory. This can best be illustrated by reference to the findings of the J.A.W.L. Experiment.

Let us assume that a Bilingual person is equally fluent in two languages English and Welsh. We have learned already that the functional level of his intelligence will vary in accordance with the ability of the language to discriminate between various shades of meaning or reasoning. The question which presents itself, therefore, is - what is to be considered the most meaningful response to a given stimulus? Clearly much will depend on the flexibility of the linguistic vehicle of expression chosen by an individual to elucidate his problem.

An example comes readily to mind when we cite from the J.A.W.L. Experiment the neutral word "BORE". In Welsh "bore" can mean straightforwardly "morning" or "early" according to the context thus, "codi yn fore" = get up early.

whilst, "codi yn y bore" = get up in the morning. In English, however, we are faced with a more complicated situation as witness the following variety of responses taken from the J.A.W.L. Experimental data:- (verbatim responses).

1. My friend has got a twelve bore shot-gun.
2. The man bore a hole in the wall.
3. My brother who is ill is bored.
4. The whole play was a bore.
5. The man at the lecture was a bore.
6. She bore the pain well.
7. His wife bore a child.
8. The tree in the orchard bore fruit.
9. There was a wild boar in the forest. (where bore - boar).

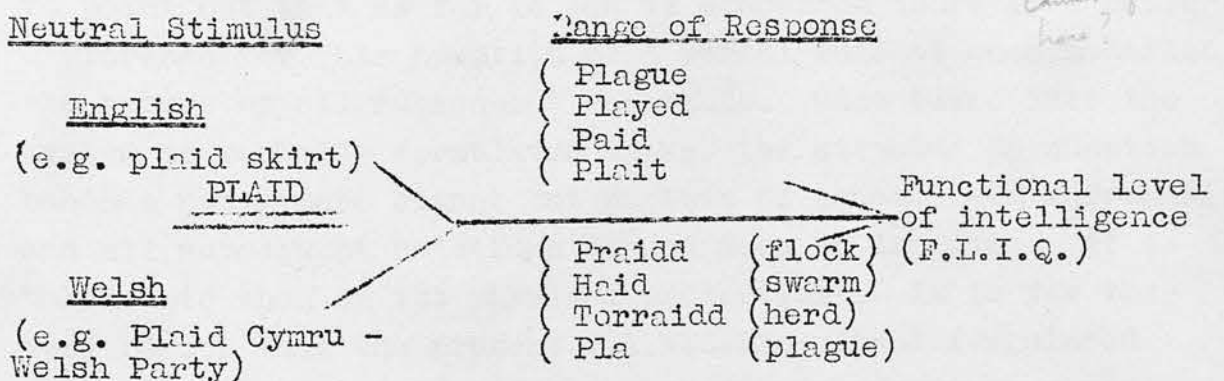
In terms of function the two are not strictly comparable. The Welsh connotation of 'BORE' (morning/early) can be confined strictly to the perceptual level of thinking, but the English connotation runs the whole gamut of perceptual, conceptual and abstract thinking. In like manner words which have an apparently simple reaction in English have a complicated one in Welsh - although by and large the very nature of the English language, deriving as we have seen from an Anglo-Saxon-Norman background a rich store of mixed linguistic concepts, does lend itself to the discussion and solution of a wide range of problems which call for nuances of meaning and subtleties of reasoning. It is suggested, therefore, that the functional level of a man's intelligence will in part depend on the right choice of a vehicle of expression as well as on the optimum use of that vehicle.

It will become evident that the optimum use of the vehicle or vehicles of expression will not only affect but also be affected by a man's functional level of intelligence (i.e., F.L.I.Q.) We have seen that the influence of early as opposed to late learning is of vital importance particularly if linguistic development is to be sponsored in the various modalities of listening, speaking, reading and writing. Similarly, auditory and visual stimuli will be affected respectively by the degree of hearing impairment on the one hand and by the spectrum of visual discrimination on the other. And clearly all these will in turn influence and be influenced by the qualitative - perceptual/relational/conceptual/deductive/abstract - levels of the particular thought processes which an individual can bring to bear on his own unique problems of responding to a **clge** - in our case we cite the neutral J.A.W.L. stimulus "PLAID."

How does hearing impairment come

Let us consider for a moment how this new evaluation of the stimulus-response technique can help us to clarify our concept of functional intelligence by considering that the neutral stimulus "PLAID" evokes a valuable range of responses in both English and Welsh, thus:

Cannot follow the logic here?



The word "PLAID" is less familiar to both English and Welsh children. It was deliberately introduced into the J.A.W.L. Experiment in order to ascertain the diversity and range of responses which such a stimulus was known (by introductory trial) to evoke. Thus the emphasis of the stimulus whether English

and/or Welsh was aimed at the most meaningful pre-existent central activity - thus the evoking strength of this visual stimulus "PLAID" depended on the individual's search for a known form of the word. The result of the search is tabulated in the above responses.

In brief, when the subject is presented with a neutral stimulus situation that can arouse different central activities each meaning can arouse different motor responses (in different modalities) which one will occur is in part determined by excitation from cell-assemblies already present. In other words the functional level of intelligence is affected by the related influences of early and late learning. We will have more to say on this matter when we consider the responses to the James Semantic Blank (Mark III) at a later point in our discussion.

The overall results of the experiments support the above hypotheses in general and particular cases will be cited (photo-stat copies included for inspection) in order that the grounds upon which the validity of the theory has been tested and proved may be preserved for future reference.

Stimulus-Response experiments of various kinds can, as Woodworth and Rappaport have shown, be extremely valuable as far as their end-products are concerned particularly when related to the fields of human endeavour - and aberration. Experiments of this kind in the animal field have also been useful although it is dangerous to assume that what is true of the animal can be translated into human activity, for example, Luria has recently stated that Pavlov's famous dog experiment does not necessarily apply to human beings, thus "Everyone knows how difficult it is to establish in a dog conditioned reflexes to a precise sequence of signals or - as Buytendijk and Revesz - to get an animal to react to each subsequent link in a chain of stimuli. That these laws are fundamental is beyond doubt. It is noteworthy, however, that none of them applies in full force when we come to analysing the process of the formation of new temporary links in human beings" for Luria is at pains to point out that as far as man is concerned there is a basic difference for "his adoption of a verbal rule at once modified the nature of all subsequent reactions. Once taken into the system of verbally formulated links, the stimulus in question becomes not a mere signal but an item of generalised information and all subsequent reactions depend more on the system it is taken into than on its physical properties". It is for this very reason that the present J.A.W.L. Experiment formulated within Hebb's frame of reference, and carried out on man's stimulus-response activity calls for a reappraisal of previous theory in favour and where more

notice must be taken of, perhaps, a TOTE, presentation along the lines indicated by Miller et al in their Plans and Structure of Behaviour at the Response end of the S-R sequence.

Muddled

Drever Secundus has put it succinctly thus, "the experimental study of learning and perception can justify itself on its own terms; but if, as seems reasonable, the naive S is a sort of hypothetical construct then we need some reliable bridge between him and the flesh and blood S, upon whom we experiment. In other words it would appear that genetic psychology is not a separate field but an integral part of any experimental study of high level functions. This is of course implied by Hebb's distinction between early and late learning, "and again by Piaget in his theory concerning the child's organisation of space.

Ref.

Our experiment, therefore, on the human level seeks to establish whether children who have learned Welsh before the age of 5 years will act differently from those who have learned another language or languages: in other words, one seeks the relationship between language structures and intellectual performance of subjects who use two or more languages, particularly when these have been learned early. As we have seen, however, the situation is quite complex since most multilingual subjects have learned their languages at different ages, by different means and use them in different context. To this end, each child's Socio-Economic background has been carefully assessed whilst the early linguistic milieu - including the language(s) first learned at the hearth - have been established in detail.

*I still find this
British somewhat
irrelevant to Hebb's theory
or vice versa.*

By using the stimulus - response technique as a method of studying the varying effect of bilingual influence we can study the processes related to learning through considering Hebb's discussion of attitude in accordance with modes of sensory - central interaction - involving the interplay of sensory and central facilitation. Hebb has indicated that the "phase sequence" persistently escapes from direct sensory control although this does not preclude the appearance of sensory influence. Hebb states, that by 'direct' control he means that the association-area activity is determined by the pattern of immediately preceding sensory stimulation but he is careful to point out that since this activity determines behaviour, a direct control would mean that with any given sensory stimulation an animal would respond in only one way

but we know that this does not occur in higher animals in a familiar environment although at the same time it is quite evident that there is a continual influence, of some kind, from sensation. These different types of influences can be clearly demonstrated in the present J.A.W.L. experiment where monoglot and bilingual children tend to respond in accordance with previously learned behaviour patterns - where the responses appear to be released by whether the language or languages have been learned early or relatively late.

Hebb's following statement can, therefore, be related in a general way to our experimental testing of the three hypotheses, namely "at each point in a conceptual series the ensuing activity is determined by the total pattern of sensation at the moment and by the residue of facilitation and negativity from the preceding central activity. In general terms this means that there are three possible ways in which sensory and central facilitations may interact (1) they may conflict, producing phase sequences that are mutually incompatible (2) they may have unrelated effects tending to set up independent phase sequences in parallel; and (3) they may reinforce one another's action both facilitating the same subsequent pattern of cortical action. The second and third of these possibilities deal respectively with attention to learning and the role of expectancy in a skilled motor performance. The first possibility, a conflict of facilitations, is related to the problem of emotional disturbance." It will be seen from the findings of our present experiment that the reactions to our neutral stimuli follow exactly the pattern outlined above.

The use of the word association technique lends itself well to the verbal nature of our experiment particularly in view of the fact that man's prime function is that of language communication: the study of language in a context of comparative philology introduces all the variables of which account must be taken when assessing the varying effects of bilingualism. Furthermore, the linguistic responses to the apparently neutral stimuli reflects a person's early and late learning more surely than any other medium - as Ben Jonson said - "Language springs out of the inmost parts of us. No glass renders a man's likeness so true as his speech".

The study of association, states, Woodworth, antedates by many centuries the beginnings of experimental psychology. Aristotle spoke of association by contiguity, by similarity and by contrast and these "laws of association"

were prominent in the psychology of ^{the} eighteenth and nineteenth centuries. The subsidiary laws of recency, frequency and vividness were formulated about the beginning of the nineteenth century (Brown 1830). The main aim of the associationist school of psychology was to reduce all the laws of association to a single one, association by contiguity in experience and to show that all mental operations could be explained as processes of association. ^Hebbs, however, pointed out from the very outset, that there would be a difficulty in this last reduction and that in the main one must draw a distinction between the experimenters who speak of "free" and "controlled" association.

Besides the associative reaction time we obtain, what is of value to us, namely the verbal response which can be examined from several points of view. In controlled association the response can be scored as right or wrong and in free association its character can be noted. There are five types of data to be obtained from the free association experiment.

1. The frequency or commonness of the response.
2. The logical or other relation of a response to the stimulus word.
3. The association reaction time.
4. Signs of embarrassment or suppression, indicative of emotional stress.
5. The introspective (retrospective) report of the experimental (O) which may reveal the origin of the association or the process of receiving the response. The latter type is of most interest to us.

Woodworth has proposed the following as a sound psychological classification for most of the responses of free association for experimental use:

- (1) definitions including synonyms and superordinates ("Arriving Response")
- (2) completion or prediction, broadly conceived: ("staying-by response")
- (3) Coordinates including contrasts: ("jumping-away Response")
- (4) valuations and personal associations ("essential Responses")

Cutting across this classification scale is another scale of meaningfulness versus superficiality. The steps in the scale are as follows:

- (1) Most meaningful: the stimulus word calls up a particular experience.
- (2) The stimulus words calls up a particular object, though not a particular experience of it.
- (3) The stimulus word calls up a meaningful associate without any help from speech habit or purely verbal association. 214

- (4) The stimulus word calls up a familiar verbal associate, as in phrase completion or word compounding.
- (5) Mere clang association: the most superficial response.

Whereas the two systems of classification indicated above are chiefly interested in the interpretation of content the new value of the association technique for the present experiment will be to establish the reigning linguistic medium or media in which the above operations take place.

It would not be out of place in this context to mention briefly that in addition to the above experimental approach Rapaport states that "The Word Association Test indicates the ideational content of the problems which stands in the focus of maladjustment"; in other words it was assumed that disturbing areas of ideation could be inferred from association disturbances on specific stimulus words. This aspect of the use of such a test does not concern us directly at present - but only insofar as the possibility does occur that a linguistic stimulus in one language might be interpreted differently in another or again a stimulus which is perfectly neutral for a monoglot may cause a degree of emotional disturbance in a bilingual where there are two conflicting meanings. From the point of view of the experiment, however, such a response will be linked with the primacy of one language learned early as opposed to another learned later.

It is of passing interest for the general reader to be familiar with what Rapaport has classified under the following kinds of association disturbances, viz:

(a) Blocking (b) Object Naming (c) Definitions (d) Attempted Definitions (e) Repetitions (f) Partial Repetitions (g) Clang Associations (h) Phrase Completion (i) Close Reaction Proper (j) Attributes (k) Images (l) Suspected Images (m) Self-reference (n) Perseveration (o) Multi-word Reaction (p) Unrelated Reaction (q) Distant Reaction (r) Mildly Distant Reaction (s) Neologism (t) Affective Reaction (u) Alternatives (v) Proper Nouns (w) Mis-hearing the stimulus word (y) Not knowing the stimulus word.

These forms of response could well be built into an association test along the lines of the J.A.W.L. Technique where the primary aim of the experiments might be to establish any emotional disturbance associated with the learning of a particular language or languages. Our original use of the association technique will differ from Woodworth and Rapaport

R.S. WOODWORTH: "Experimental Psychology" Chap XV pub. Holt, New York, 1938.

D. RAPAPORT: "Diagnostic Psychological Testing", Vol. II, Chap II, p.13 et seq, pub. Year Book Publishers, 1946.

From the above brief reference to Woodworth's experimental approach and Rapaport's clinical method it is clear that the Word Association technique can supply the experimenter with factual data which can be usefully applied to a wide range of problems. From the point of view of the present J.A.W.L. experiment one has but to indicate that these items of information are borne in mind whilst the main line of the experiment is pursued in the direction of differentiating linguistically between the possible effects of early versus late learning.

The J.A.W.L. Responses have, however, proved to be extremely fruitful, for after considering -

- (a) The Order of appearance of the words.
- (b) The number of words (amount per language).
- (c) The Developmental Level to which the words belong (Abstract/Relational/Association).
- (d) The fluency of presentation with reference to
- (e) Original or translated meaning in either one or both languages the evidence seems to weigh in favour of Hebb's hypotheses. Let us therefore consider the following typical cases taken from the two Bilingual Matched Groups and from the Control Groups as well as the three special cases which are of intrinsic interest and throw more light upon our experimental results.

The following cases which are typical of the particular Experimental Groups will be considered (see photo-stat copy) later in detail:

It is of interest to note that as far as the special cases are concerned the girl who is equally fluent in both languages is a child of high intelligence whose early background is bilingual and whose formal instruction has been continued systematically in both languages; her responses to both auditory and visual stimuli are of similar quality.

Hebb's theory is also substantiated by Cases No.8 and No.9. In the former a girl whose first learned language was German but whose later instruction was in English responded in both languages to the auditory stimulus and also replied largely in English (in addition to German) to the visual stimulus; in the latter case a girl whose early language was French but who had pursued her later instruction in English, French, and some Welsh but to the visual stimulus gave a preponderance of English with some French and a little Welsh.

It will be seen, therefore, that from the linguistic point of view two influences are important (a) the language first learned (i.e.early learning) and (b) the medium in which formal instruction follows.

Where the language first learned by listening and speaking is reinforced by formal instruction in reading and writing at an early age (6+) then the tendency is for that language to become dominant. Where formal instruction is not continued in one language or the other the first language e.g.Welsh tends to be retained for social intercourse in a bilingual area although English tends to supersede it for reading and writing; this is due in a large measure to the overwhelming influence of the mass media (radio, television, newspapers, books and periodicals for children). Nevertheless, in the face of all this opposition Welsh is still retained as a medium of expression in the bilingual area although there is a tendency for it to play a lesser part in a thoroughly anglicised milieu.

The picture which emerges is that the early informal learning through listening and speaking introduces the child to a lasting basic phonemic structure in one or both languages: this basic phonemic structure is strengthened when reinforced by the later skills of reading and writing. If a new language is introduced it does not tend to displace the original language unless the formal instruction in reading and writing of the former is discontinued at an early age.

If formal instruction is pursued in both languages then the bright child tends to become equilingual and whilst the average and slow child tends to retain the language first learned informally (auditorily) and then formally (visually tactile - and kinaesthetically). Where the child finds himself in a linguistically mixed area he tends to retain his Welsh for social purposes whilst his English becomes relatively stronger for reasons already enumerated. In an anglicised area, however, although the early learner of Welsh retains it in its modified spoken form, the tendency is, unless it is heavily reinforced by the media of reading and writing, for it to take second place to English and although it is not entirely forgotten it does become less accessible to stimulation. It must be noted, however, that even monoglot English children who have had early fragmentary experience of Welsh do retain some vocabulary and reflect occasional Celtic speech structures in their Anglo-Saxon-Norman vehicle of communication.

A complex way of referring to the same thing

Not reflecting but the kind of English that is common

It would appear, therefore, that Hebb's conception of learning has a sound basis in fact and as Drever has put it, "it has been established that certain perceptual abilities having to do with the objects in space seem to require a long apprenticeship either in the visual or in the tactile-kinaesthetic modalities and that once this apprenticeship has been served different amounts of later practice have no appreciable effect. We have in fact something rather like the kind of abilities identified by factorial studies of test performance". It becomes important, therefore, to relate our present findings in comparative philology to our preceding discussion in the chapter dealing with the neuro-psychological cognitive, orotic and environmental aspects of functional intelligence where the place of early and late learning is considered against a background of maturing perceptual skills whose semantic development can be demonstrated both qualitatively and quantitatively in terms of structure and inner dimensions in the form of the symbolic language of Hebb's stimulus - response theory of hypothetical constructs.

Ref.

Relevance not made clear

Let us first fashion the spearhead of our attack on the problem by sharpening our ideas on the nine cases just presented before broadening our advance on a front bounded by 250 children in the Experimental Groups - whose results tend to confirm the findings to which we have already referred.

The following cases which are typical of the particular Experimental Groups will be considered (see photo-stat copy) later in detail:-

EXPERIMENTAL CASES (EXAMPLES)

Case No.	Name of child	Type of Group	Stimulus	Responses
1.	J.L.(girl)	(C) Monoglot English	(a) auditory 179. (b) visual 200.	English English
2.	J.T.(boy)	(C) Monoglot English	(a) auditory 129 (b) visual 105	English English
3.	E.A.(girl)	(B) Bilingual (First Lang Welsh + English)	(a) auditory 174 (b) visual 199	Welsh Welsh
4.	E.T.(boy)	(B) Bilingual (First Lang Welsh + English)	(a) auditory 179 (b) visual 179	Welsh Welsh
5.	E.D.(boy)	(M) Mixed bilingual (Welsh + English)	(a) auditory 98 22 (b) visual 140 17	Welsh English English Welsh
6.	M.E.(girl)	(M) Mixed bilingual (English + Welsh)	(a) auditory 126 25 (b) visual 113 123	English Welsh English Welsh

SPECIAL CASES

7.	C.E.(girl)	(S) Equi-Lingual (Welsh/English)	(a) auditory 194 230 (b) visual 207 211	Welsh English Welsh English
8.	M.F.(girl)	(S) Bilingual (German/English)	(a) auditory 134 124 (b) visual 89 92	English German English German
9.	E.L.(girl)	(S) Tri-lingual (French/English/Welsh)	(a) auditory 25 339 17 (b) visual 171 22 11	English French Welsh English French Welsh

It will be seen from the above table that the Monoglot English children in the Control Group respond in English both to auditory and visual stimuli; The Bilingual Children whose first (learned language) is Welsh but who are also fluent in English respond both to auditory and visual stimuli in Welsh; the mixed bilingual children whose first learned language is English and/or Welsh respond to the auditory stimulus in either Welsh or English according to which language was learned first whereas they tend to respond to the visual stimulus in the language learned later in part through reading and writing.

This sort of generalization demands quantitative backing.

How fluent?

Difficult to follow the group distinction.

Joan Lewis

Langhorne V.C.

- (a) He was very far away because the bull chased him.
- (b) The sergeant won a disc for his bravery.
- (c) The man was very lone by himself.
1. You always fill a pen before you use it.
 2. Every year I plant a seed-bed.
 3. The man had to part very much after the mile race.
 4. The man went to see the doctor because of his rheumatism.
 5. The baby lay in its cot fast asleep.
 6. After the boy finished his dinner he wanted more.
 7. The children can run very fast.
 8. You cannot carry the milkbarn by yourself.
 9. The boy wants to go to camp every year.
 10. The man was waiting by the quay.
 11. He called him a rat.
 12. The woman said put more coal on the fire.
 13. The baby was looking very pale.
 14. The boy stepped on Mary's toe.
 15. "I think I will have some tea."
 16. Early,
 17. There was a big queue on the corner.
 18. ~~There is a lot~~ "Do you want another piece of cake?"
 19. The cow is very old.
 20. The core of the apple was thrown away.
 21. The coal mine is very dirty.
 22. "Give the snail to the pig" said mother.
 23. "Have the cake so that everyone gets a piece."
 24. Every horse has a name.
 25. There are four meals a day.

1. Mud is very dirty.
2. All the hay was stacked in the barn.
3. ~~Red off~~ "You always nod when you are sleepy" said Mother.

1. The pig grunted very loudly.
2. ~~They~~ People always pump water out of a pump.
3. I think we will go for a ride in the punt said Jane.
4. Start to March said the soldier.
5. The hen laid five eggs.
6. The calf eat hay from the crib.
7. The sergeant blew a blast from his trumpet.
8. ~~He~~ "You are a bad boy" shouted the man.
9. Hoist the sail called the sailor.
10. "You love me" said Jesus.
11. "Mind your toes" said Poreen.
12. "I will order a ton of coal with you."
13. Jimmy hurt his knee so badly that he had to go to hospital.
14. "Damn it" shouted John!
15. "It is a very dull day" snapped Steve in a very bad temper.
16. There ~~was~~ were a lot of worms on the clod.
17. "I think we will try some egg and chips for supper."
18. "Go and call Jimmy in for tea."
19. "I am going to have a cod for supper."
20. "I think" said the little boy "I will draw a boat."
21. It was the break of dawn when Daphne got up.
22. "Gather we will gather in the corn tomorrow."
23. "Use your brain" said the teacher.
24. "I had a blue purse but I lost it."
25. The Scottish people wear plaid kilts.

Geffrey Thomas Pentepoeth

(A) not distant
(B) record,
borrow, lend,

- 1 something, to write with.
- 2 men boy children women people girls
- 3 don't
- 4 work friends soldier
- 5 buttons clothes wardrobe material factory
- 6 ships, sailor, fish, beach rocks light house cliffs
- 7 holder water time metal
- 8 train cart suitcase carriage basket
- 9 scouts, fire, pots, pans, tents people fun woods
stream, well
- 10 cat animal puppy, kennel lead collar
- 11 mischief, trouble group
- 12 miners workers pits mines gas shafts cages
- 13 park game lawn children field grass
- 14 again visit
- 15 furniture table beds kitchen living room mat
fireplace electric or gas cooker
- 16 nose something
- 17 eggs, chicken turn, corn, farm
- 18 quite, rest, sleep
- 19 sea sand cliffs, caves, pools storm sea gulls
- 20 apple tree shop fruit
- 21 coal trucks trains shaft pit miners safety lamps
- 22 soap wash flannel bathroom tooth brush
tooth paste
- 23 flowers, sun, hay, swimming
- 24 noise, hair, jokey, rain, bit
- 25 food table, chairs. 2

- (a) dirt water
 (b) hay, mice, owls, rats
 (c) head
- 1 sty, trough, mouse, farm, piglets
 - 2 water, stream house, people, trees
 - 3 river boat people, holiday, shade of the trees
 - 4 gales, winds rain, roads full of puddles
 - 5 chickens hen, eggs, chicks
 - 6 baby, blankets, sheets, room
 - 7 wind storms, rain,
 - 8 naught, ignorant, cruel
 - 9 boat, sea, fun, steeze,
 - 10 carpenter, wood, drill
 - 11 feet, nails, shoes, socks
 - 12 lorry, coal, potatoes, weights
 - 13 cut, blood, fall, weep,
 - 14 hole, mend, needle, ~~cotton~~ cotton, wool,
 - 15 cloudy, boxing, miserable
 - 16 earth, grass, fight,
 - 17 cook, pan, food, pantry, fat,
 - 18 a message, a shout
 - 19 fish, net, trawler, fishermen
 - 20 picture, paints, crayons, paper.
 - 21 birds, ^{chirping} sunrise, morning
 - 22 ploughs, comb, hand, veter. farmer, fields
 - 23 work, heads, clever, intelligence
 - 24 did have, gave, present, a gift,
 - 25 hair

As previously indicated in our description of the experimental technique the neutral stimuli in the preliminary practice test were administered first orally and then visually to the ~~subjects~~. Thereafter they responded freely to the stimulus in accordance with their chosen language or languages.

In cases No.1 and No.2 from the Control Group comprising a Monoglot English girl and boy the result was remarkably clear. All the responses (as will be seen from the photo-stat copy) made to both the auditory and visual neutral stimuli were in English with the exception of one word, for example:

- (a) Auditory Stimulus: PEN evoked.
 - (i) Case No.1. "You always fill a pen before you use it".
 - (ii) Case No.2. "Something to write with".
 - (b) Auditory Stimulus COAL (COL) Evoked
 - (iii) Case No.1. "The woman said - Put more coal on the fire".
 - (iv) Case No.2. "Miners, works, pits, mines, gas, shafts cages".
- and again a further example -
- (c) Visual Stimulus PIG evoked
 - (v) Case No.1. "The Pig grunted very loudly".
 - (vi) Case No.2. "Sty, trough, noise, fferm, piglets".
 - (d) Visual Stimulus SAIL evoked.
 - (vii) Case No.1. "Hoist the Sail called the sailor".
 - (viii) Case No.2. "boat, ~~sea~~, fun, breeze".

All the stimulus words were followed directly in Case No.1. by English sentences and in Case No.2. by a list of Related English Words. Only one Welsh Residual Word "fferm" appeared in response to a Visual stimulus. Case No.1. gave 179 English words in response to auditory stimulus and 200 to the visual, Case No.2 gave 129 English words in response to auditory stimulus and 105 to the visual. The developmental level of all words ^{was} were at the perceptual level only; they were fluently presented and the basic English meaning of the stimuli was retained on each occasion. These two cases selected at random from the Monoglot English Control of 25 boys and 25 girls are typical of the remainder.

In Cases No3 and No.4 made up of a Bilingual boy and girl whose first language was Welsh but who were also fluent in English the following responses were elicited, wholly in the Welsh tongue, to the same stimulus words, for example:-

- (a) Yft seidd yf hwr wr yr fud.
- (b) Yft seidd y fan yr wr dda
- (c) Methodd y ferch a chyseidd y nod.
1. Pig du seidd gan y fan.
2. Gwelais lump neidr yn llithro twy't glaswells
3. Leffais bunt gan fy mam i fynd i'r siop.
4. Leffais seid dda. at gefn y match.
5. Yft seidd yr wrag yn hen sawn.
6. Sylwais fod crib goch sawn gan yr iat.
7. Yft seidd brown at y llygoden.
8. Luthwr allan am dro newn badi i'r môr glas.
9. Yft seidd sail y ty yn gadarn.
10. Yn y bore y mae gweld sodiad haul.
11. Maen rhaid tino toes i wrdd bara.
12. Yft seidd ewyn gwyr at y don.
13. Yft seidd y bachgen yn edrych yn hwt sawn
14. Leffais ddarn chue cheiriog i fynd i stryru hufen
15. Yft seidd ei ddull ef yr wahanol i baird atall
16. Lofedd y ~~bachgen~~ bachgen glod am a waith.
17. Gwelais yr edyd yn codi fry yr y mwr.
18. Mid seidd y dyn yn goll.
19. Yft seidd yr rhaid wr dyn ddilyn y cod.
20. Draw yr y pellter gwelais yr haul yr
machlud yn goch.
21. Yft seidd gan y ferch y ddawr o ganu.
22. Lelywais gotn yr helwrt yn caru'n goch.
23. Yft seidd y brain yn dilyn yr arad i
gasglu't alwydon.
24. Yft seidd yr had wedi synthio at dit da.
25. Y mae gan lymu blaidd.

CASE No 3 Ysgol Llywodd Lwyrbach

Ysgol Llywodd Lwyrbach

Ysgol Llywodd Lwyrbach

Ysgol Llywodd Lwyrbach

1. Bafodd y bachgen ddolud at ei ben pan syrthiodd i'r llawr.
2. Lwelaio y plant yn chwarae at y'r heol.
3. Mid oedd awel yn y pant.
4. Yt wyf yn byw mewn man unig iawn.
5. Lwyrqais fy nghol pan eulthum allan.
6. Aeth y plant i gyd i chwarae i'r mot.
7. Yt oedd y can yn llawn duft.
8. Lwelaio rhywun yn caru at y lôn gul.
9. Yt oedd yn dilyn a gamp i wreud y tric.
10. Y mae gennyf ddau gi.
11. Sylwais fod llinyn y llat wedi totti.
12. Cistoddodd y bachgen yng nghol ei faris.
13. Chwatacais gyda'r lili a gefais afael yn y torth.
14. Lwelaio y fran at y tō.
15. Rhedais i mewn i'r tŷ pan ddaeth i'r glaw.
16. Lelywais swn rhywbeth yn y pellter.
17. Yt oedd saith a cyw gan y'r iad.
18. Buryltais y pys a oedd yn y'r atdd.
19. Y mae gennyf gŵf da.
20. Mid wyf yn caru gyda'r cōt.
21. Gosodwyd maen at fedd y deyr enwog.
22. Yt oedd y farch fechan yn swil iawn.
23. Yn y'r haf cawr dywydd braf.
24. Yt oedd y teulu yn fer iawn.
25. Bum at gefn un mul at lôn y mot.
26. Yt oedd wi bachgen yn caru at y llwyfan.

Emyr Elfed Thomas.

Ysgol Gynradd bumlach.

Slysiawr Ardd: Pys. Tatura:

- (a) Slysiawr ardd yw ffa, ac y mae yn tyfymen
 (b) yn ydym yn dysgu mewn Ysgol.
 (c) Nid oes lôn gennym gartref.

- 1 Rydym yn ysgrifeny gyda phen yn yr ysgol.
 2 Mae llawer o blant mewn Ysgol Sir.
 3 Mae part ofnadury yng Nghyfrin Leredigion.
 4 Pwyl yn by mewn ffarm fawr.
 5 Mae gennyf gôt blastis i gadwy glawallor
 6 Mases aedd yr awr yr hun a gwasodd y ^{coch} mor.
 7 bar deg galwyn sydd yn cario'r lleth.
 8 Ryd yn rhy Teuarc i ddechrau caru.
 9 Raedd yn gamp i neidion uol.
 10 Mae gennyf gi gartref ai enw yw "Bel".
 11 Mae pob mam yn gwisgoi brat.
 12 Pan aeddum fach sisteddus yng ngol fy mam.
 13 Rydym yn chwarae pel yn yr ysgol.
 14 Rydym yn caell lloches dan dô lly.
 15 Mae gennyf dŷ hyfryd i fiw ynddo.
 16 Mae sun ofnadury yn slyndau gyda'r modur ^{on.}
 17 lle cnafar Jan y pigau cyu, hen ddihaneb.
 18 Mae pys yn hyfryd i fuyta.
 19 Raedd yr hen wr wedi colli ei gaf.
 20 barai lôn Bethania yn surynol iawn.
 21 barnag galed yw maen ai guelin mewn cae.
 22 Raedd y ferch ifanc yn swil iawn.
 23 Gunaeth hŷf durym iawn llynedd.
 24 Raedd yr hen wr cybyddlyd yn fer iawn.
 25 Mae gennyf getfyl, ond nid oes gennyf ful.

26 barodd y tri lachger yn hyfryd.

- (a) Raedd yr her wr yn fyd.
 (b) Barr y lannur oedd fod y dyn yn euog.
 (c) Rhaid i ni gynwedd y nod meun ysgol sin.
 1 Mae pig amhell aderyn yn felyr.
 2 Pumps llys sydd ar un llaw.
 3 Raedd y lleidir wedi dilyn punt.
 4 blustiau marsh oedd gan Tarch Amhinchion.
 5 Raedd y dyn dros heduar ugain a mae ef ^{han} yn.
 6 Mae gennyf grib i uned ein guall.
 7 Blew burm a gwyn sydd gan y ddafad.
 8 Aethom allan meun lad.
 9 Raedd sail y drws wedi torri.
 10 Maen fore lnd ebe Mrs. DAVIES with ei gwr.
 11 Mae mam yn gweud taes ar y tan.
 12 Teri Ton, Ton, Ton, ebe'r penill.
 13 Raedd y bachgen yn hunt iawn.
 14 Raedd Darn o'r ty wedi curmyso.
 15 Dull frunt oedd gan y bachgen o fwrta.
 16 Y clod ar mawl ar parch ar lri.
 17 Lly yr y ner, neu ar y llawr.
 18 Raedd yr bachgen coll iawn.
 19 bod yr haul yn y dyrrain.
 20 D raw ar y gorwel gwelun y fran yn gwr
 ud ei nyth.
 21 Darn od sydd gan y fran o afalu am ei
~~22~~ cheuion.
 22 born cryf sydd gan y fwrta.
 23 Du yw llyu y brain.
 24 Mae ffermyr yr ddy had yn y cae.
 25 ballodd Plaid bymru yr y Ty byffredin.

- (a) Auditory Stimulus PEN evoked
 - (i) Case No.3. "Cafodd y bachgen ddolur ar ei ben pan syrthiodd i'r llawr".
 - (ii) Case No.4. "Rydym yn ysgrifenu gyda phen yn yr ysgol.
- (b) Auditory Stimulus COAL (COL)
 - (iii) Case No.3. "Pan oeddwn fach eisteddwn yng ngol fy mam"
 - (iv) Case No.4. "Eisteddodd y bachgen yng ngol ei fam".
- ... and again another example:-
 - (b) Visual Stimulus FIG evoked
 - (v) Case No.3. "PIG du oedd gan y fran"
 - (vi) Case No.4. "Mae PIG ambell aderyn yn felyn".
 - (d) Visual Stimulus SAIL evoked
 - (vii) Case No.3. "Yr oedd SAIL y ty yn gadarn".
 - (viii) Case No.4. " 'Roedd SAIL y drws wedi torri".

It will be seen that although the neutral stimulus was each time the same as that presented to the English children the response was completely different (i.e. in Welsh). All the stimulus words were followed directly in Cases No.3 and No.4 by a regular series of well formulated Welsh sentences where the verbal context with the exception of one proverb was at the perceptual level. Case No.3. gave 174 Welsh words in response to auditory stimulus and 199 to the visual Case No. 4 gave 179 Welsh words in response to auditory stimulus and 179 to the visual. Again both children wrote fluently in Welsh and the basic Welsh meaning of each stimulus word was retained on every occasion. Furthermore not one English word appeared in this experimental context although both this boy and girl were able to understand, speak, read and write fluently in English. Again it must be stated that these two cases who were chosen at random from the Bilingual (First language Welsh) Experimental Group of 50 boys and 50 girls are typical of the remainder.

It is clear that the different order of English and Welsh responses to a neutral stimulus is striking.

Case No. 5 (boy) and Case No. 6 (girl) taken from the Mixed Bilingual Experimental Group exemplify the general tendency of the early Welsh-speaking monoglot child in a Bilingual area to retain Welsh but to become as fluent in English whilst the child who spoke both Welsh and some English before the age of five tends to increase his knowledge of English at the expense of Welsh particularly as a result of formal instruction in reading and writing - although he retains the use of Welsh for domestic and social purposes.

Eifion Davies

Pentrefeil Junior Mixed

- (a) ~~for~~, m, af.
- (b) cyngor, geriau, brathernau.
- (c) writh, trat, away, gone.

1. gwallt, llawiau, trosg, dustion, dannedd, tafod
2. tra, mam, hentyr, llaw, byach, pen, coesiau.
3. craeth, ddolwrn, gwela, caryn, coes.
4. head, feet, arm, tie, siri, sbet, legs, fingers.
5. bary, assef, crying, pillow, blankets.
6. mae-ill, papere, heart, earth.
7. you, ag, it, the, tractor repair, heus.
8. heavy, load, papere, baskets, water, potatoes.
9. food, sandwiches, ham, eggs, lettuce, tomatoes, cucumber, such.
10. ~~to~~ cwn, cwr, act, sefaid, farw, cest.
11. teiau, strap, pert, wrth, uneben, s. mawr, straps, cymru.
12. lwmf. black; mine, shage, gas, petrol,
13. Y maet, hee at goll, Luriff i adim yn gwobd.
14. Meth y fermwr ar ben y to i ei phant, du, dod, glas.
15. Y mae'n ty hi wrth, Y mae, deg ferst yn y to.
16. I'll be coming to see you soon, said the old man.
17. There was a huge one waiting for the bus.
18. Yn y second brofa wide, war we have had.
19. Y mae geron y i cor da. caio, gwela, cywed,
20. Y mae cor yn canu yn y chael am hanner awr ydi wrth heno.
21. Yn y set of scara ar min y ara my brother.
22. Yn reddwyt mi yn corl swel in mock or college.
23. awyn, mor, profiad, yndrochi, swel, tonnadu.
24. gwela, crys, neise, lacio.

25 eat, nice, horrible.

a) dirty, sit.

(b) hay, bales, lose, hayloadee, high, low.

(c) mud, go, after, before, when,

- 1 pigsty, pork, ears, female, male, dirty, kill, nice, eat.
- 2 water, pipe, run, trough, clear, drink.
- 3 water, clean, enjoyed, picnic, pop.
- 4 month, pretty, thing, year, birthday, thirty-one,
- 5 lay, eggs, brown, white, black, light Sussex.
- 6 cow shed, genny, yn arto fy mhwallt, ci, yn, y.
- 7 Mae blew ar blew, elephant, tiger.
- 8 He done his work very bad and wrong.
- 9 boat, river, sea, ship, Britannia, Queen.
- 10 jeans, pains, ^{crucified} crucified, dead, alive, dung, suffered.
- 11 dirty, clean, stinking, fire.
- 12 heavy, lorry, wheels, axle, driver, steering-wheel.
- 13 gangous, traffic, road fall, swing.
- 14 clothes, show, trousers, suit, wear.
- 15 clouds, mass, black, rain, torrente,
- 16 head, head, unconscious, hospital.
- 17 pork, bacon, eggs, lam, beef, liver, cow, horns, hen.
- 18 boy, six, woman, man, nephew, niece.
- 19 rear, back, where, pay, there, basket,
- 20 picture, artist, sewing, room.
- 21 rise, morning, rose, sun.
- 22 harvest, ripe, bread, woman.
- 23 think, speak, rear, drunk, trust, head, write.
- 24 white, ear, hat, eggs, bones, butcher, Tom Lloyd.
- 25 playground, rounders, cricket, golf, hockey, net-ball.

Margaret Elizabeth Evans. Ammanford C.P.

- a) ffa - ~~broadbeans~~ broadbeans I had beans for supper
 If wyff fi yn cael ~~cael~~ ffa ei super.
- b) Disc - record. If mae plant yn discyn yn y ysgol.
 the record was still playing.
- c) lon - The boy had a lon of the bag.
 If mae car ar y heul.
-
1. Per - If mae bachgen yn enoc ei per, the pen ran
 out of ink
2. Plant - children. If mae plant y chware yn y cae. The
 children play in the field.
3. Part, Did the dog part
4. Man, dyn. The man rode a bicycle, If mae dyn yn
 gyri bic.
5. Cot, coat, llun y cot yw gwrth, The colour
 of the coat was green.
6. Mor - sea, If mae plant yn y mor, The children
 are in the sea.
7. Car - can, The car was filled with water. If mae
 y car yn y ~~mor~~
8. Carry - cario, The children will carry ~~at the boat~~
 If mae plant yn cario bacet
9. Come - dod. They will come, If mae yn dod.
10. key, key The key was in the door. If mae y key
 yn y drws
11. Boat, The boat was in the shed.
12. Coal - glo, The coal was very hard, If mae glo
 yn hard.
13. Pal - ball, If mae pel yn y cae. The ball was in
 the field
14. Toe - his toe was bleeding. If mae y toe yn
15. Tea - te, He has had his tea. If mae ef yn cael
 ei te.
16. Soon - Soon he was there.

17. Que - There was a que outside. If mae que yn y stred.
18. Peace - pese; The peace was kept. If ~~it~~ mwyf fi yn cael pese ei super
19. Cove - The cove was deep
20. Core. The boys core was very good. If mae core y bachgen yn de iawn
21. Mine - The mine was dark and deep.
22. Swil - The boy had a swil. If mae y bachgen yn cael swil.
23. Slave - cael. They will have them. If mae yn cael era.
24. Mare - mog. The horses mare was black. If mae mog y ceffyl yn du.
25. Meal - ~~byd~~ byd. The had their meal. If mae yn cael ei byd.
-

- 1) Mud - Mudd. The children played in the mud. If mae plant yn chwarae yn y myd.
- 2) Barn - ~~barn~~ ^{barren} There were birds in the barn. If mae adar yn y ~~barren~~ barn.
- 3) Nod - nod. The boy will nod. If mae bachgen yn nod.
- 4) Pig - mochyn. The pig ran. If mae mochyn yn redeg.
- 5) Pumb - pumb. The pumb was black. If mae pumb yn du.
- 6) Punt, I'll go to see the punt. If myf fi yn gweld y punt.
- 7) March, marchu. They will march today. If mae ef yn marchu heno.
- 8) Hen - ier. The hen layed eggs. If mae ier yn cael rui.
- 9) Crib - cradle. The crib was on the floor. If mae cradle ar y llawr.
- 10) Blew - blaw. The wind blew the clothes. If mae gwynt yn blaw y dillard.
- 11) bad - drwg. If mae meched yn drwg. The girl was bad.
- 12) Soil - seil. The soil was white. If mae seil yn gwyn.
- 13) Bore - His wife bore a child. If mae ef yn bore y baban.
- 14) toes. His toes were small. If mae toes y bachgen re fach.
- 15) Ton - ton. They had a ton of coal. If mae toni mawr yn y mor.
- 16) Hurt. She will hurt herself.
- 17) Darn. The darn car would not stab. If mae motorcar ddim yn mynd.
- 18) Dull, The colour was dull. If mae lliw yn dul.
- 19) Clod. Praise. If mae berch yn clodio. The was praising.

17. Fry, fra, I will fry them.
18. Call - galw, I will call her. Y myf fi yn galw ef.
19. Cod - pyscod. The cod was in the river. If mae pyscod yn y dŵr.
20. Draw - draw, I will draw, If myf fi yn draw y darlun.
21. Dawn, The dawn came all at once. If mae dawn yn dod.
22. Corn - ~~of~~ corn If mae corn yn y cae. The corn was in the field.
23. Brain - breyn. The brain works, If mae breyn yn gweithio.
24. Had - cael, He had a bag.
25. Plaid - yndillard

to the auditory stimulus she has as many (120) Welsh words as (126) English and likewise in response to the visual stimulus as many (123) Welsh words as (125) English. The quality of the language is, however, different for example, the basic meaning of the stimulus words is not retained but often transposed and translated into a different language where the meaning may be coded in English and/or Welsh, for example:

AUDITORY Stimulus: CI(Welsh) = DOG(English) and KEY(English).
= ALLWEDD(Welsh).

Response: (a) The key was in the door.
and (b) Y mae key yn y drws.

i.e., the Welsh word ci(dog) is ignored and the English meaning substituted in a sentence whose structure is typically Welsh.

This is a good example of the way in which the Welsh language is deteriorating: the Welsh morphological and syntactical structure is retained since it was learned early in the skills of listening and speaking but the semantic aspect of the language is lost so that lexical changes take place. Just as the noun is replaced in the first example the adjective is replaced in the next, thus:

AUDITORY Stimulus: COL(Welsh) = LAP(English) and COAL(English).
= GLO(Welsh).

Response: (a) The coal was very hard.
(b) Y mae glo yn hard.

Furthermore, the Welsh sentences although retained were on a simpler perceptual level than English; it is of interest to note that in answer to the auditory stimulus 17 Welsh sentences began with "Y mae(English there is) whilst 20 sentences began with "Y mae in reply to the visual stimulus. The English sentences also showed a greater variety of syntactical structures. In addition, of the 25 neutral stimulus words 20 had English semantic responses and only 4 were given a basically Welsh ~~connotation~~.

In brief, these cases which are typical of the 100 other in the Mixed Bilingual Experimental Group suggest strongly that Hebb's general hypothesis concerning the importance of early *learning* as opposed to late is supported by scientific experimental evidence.

It is clear, too, that our third hypothesis, based on Hebb's reasoning also has a foundation based on factual data; we can, therefore, by putting forward the new concept of the "Functional Level" of a child's intelligence in terms of comparative philology and in accordance with a synchronic description of individual bilingualism, postulate that Hebb's third hypothesis appears to be correct, namely:- "That the

- (a) something
 (b) a long way away. Rhysbeth yn yr gardd
 (b) Disgu pethau. yn A disg is played on a gramophone
 (c) When I borrow something I have a tone. Yr wyf yn cerdded
 I write with my pen, but some ar y lon
 I write with my pen, but sheep go in some kinds
 Yr a mae fy gwallt yn tyfu ar fy mhen
 2 I planted seeds in the garden in spring, and now
 they are flowers. Yr aros llawer o plant yn yr ysgol
 3 The dog was panting after he had been running
 Yn aros a phantio fwrth pant yr stedegwr pant
 4 The man was walking up the road slowly
 Rhed yn dda yn symyd. ond y mae'n araf
 yn yr hen man
 5 I did not catch the ball, so it went
 over the hedge. Yr wyf yn gwisgo fy ngost yn yr ysgol
 6 I did not like my ~~dress~~ the cake so I did not
 ask for more I mber + mae yn llychis drasy
 7 I found a rusty can ~~at~~ by the side of the ^{road} ~~the~~
 Yr mae'r boll ar yr casa
 8 The baby was being carried by its mother's
 arms. Yr mae'r ff ddyn yn ceru ei phlan
 9 The Boy Scouts have gone to camp. Y
 Ygorau camp, camp dda
 10 I have lost the key to my ~~the~~ the cupboard
 Yr mae pedair ei yn y fferm, statwy fawr, a
 11 A naughty boy is some ~~one~~ ddwy fach
 11 A naughty boy is sometimes called a brat
 Yr mae pobl yn fy mam yn gwisgo brat yn
 12 We use a lot of coal in ~~the~~ y ty
 12 We use a lot of coal in the winter
 Yr mae'r baban yn col ei fam
 13 The little girl was pale with fright

Yr wyf wedi colli fy petel.

14 My big toe is much bigger than the others.

Y mae to ar y bot ty.

15 I do not like tea, but I like coffee.

Yr wyf i te yn fy ffrind gorau

16 Soon we shall be going to the seaside.

Y mae swn y gwyr yn y ffenestri y gwael

17 The letter before this is wrong.

17 The letter before this is wrong. Yr mae rwy'n
back yn mynd i'r ar.

18 I would like another piece of cake

Yr wyf yn mynd i'w ddi hysbysu i.

19 There is a little more nearby.

Yr wyf yn ddi hysbysu i'w ddi hysbysu i.

20 I have eaten the apple down to the core.

Y mae mae'r cor yn cael yn awr.

21 The book is mine but she still wants to borrow it.

Yn Maen awr i mi ffordd a dref.

22 I shall wash my hands now, because

I washed them earlier.

Yr ydych chi'n ddyrchu yn swil

23 I shall have a bath, and you shall.

Yr wyf yn hoffi mynd i'w mar yn yr
baf

24 I held on to the horses mane, as we
were riding on her back.

Rid wyf yn hoffi pobl maen

25 I had a very big meal. Yr oedd mil
o bobl yn y dref.

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maen
can & ian

- (a) If mae' r dyn yn med. I got stuck in the mud.
- (b) The hay is in the barn. If mae' r barnwr yn fo barnwr yn barnu.
- (c) I ~~was~~ nodded my head. If mae' r noddwr ~~wedi~~ ar y puno wedi storri.
- 1 The pig is in the pigsty. If mae pig yr aderyn wedi storri yn fawr.
- 2 The pump is broken so I shall get another. If mae pump ~~teser~~ ^{tai} ar yf y stroyd.
- 3 The punt is going down the river. If mae' r anohy yn costi punt.
- 4 The soldiers were marching down the road. If mae' r march yn cerdded ^{yn} ar y ffordde.
- 5 The hen has laid an ~~very~~ egg. If mae' r hen dy wed cwmpo.
- 6 The ~~old~~ baby was in the cradle. If yr wyf yn cribo fy ngwialt gyda cribs.
- 7 The man blew his whistle, and the train started. If mae blew ~~up~~ droo ~~up~~ fy ddiad ar ol fynd ar giff y celfyl.
- 8 The peach has gone bad because it was not eaten. If yr wyf yn cistedd yn y bad, os yn mynd i lawr yn afor.
- 9 ~~The~~ As the ship ~~sailed~~ ^{went} down the river the sails were hoisted, and the sailors stopped rowing. If yr wedd y dyria yn doddi sâl y ty yn cymtal.
- 10 He bore the weight of the heavy sask on his back. If yr wyf yn dod i' r ysgol yn y bore.
- 11 I have ten toes altogether. If yr wyf yn bwyta toes.
- 12 A ton is twenty hundredweights. If mae' r tonnan yn ~~to~~ ~~I~~ ~~dy~~ mynd ar bel is ynd.

at y kywood

13 I hurt my arm when I fell. If mae' r phlyng
plenty yn hurt.

14 My mother will darn my clothes if I break
them. If mae darn o papur ar y llawr

15 The weather was very dull. A ydyw'r dull
i wneud hon yn iawn

16 There is a ~~hole~~ clod of earth in the garden
with nothing growing in it. If mae fy main
a thad yn rhoi clod i mi beithiau

17 I like to have fried ~~fish~~ ham for
supper. If mae ~~fy~~ yr wyf yn dingo soed
yn ffrwythau.

18 I ~~do~~ call my friends when I want them
If mae' r dyn yn gall

19 There is a fish called cod. If mae mae
~~fy~~ yr wyf yn codi rhwberth trown iawn

20 I can not draw ~~as~~ at all well. If mae
y ddafad wedi mynd yntell ^{draw} ~~draw~~ y mynydd

21 At dawn the sun is in the east, but at
dusk it is in the west. Dawn ~~is~~
i chwarae gyda chor heno

22 The corn has been put into sheaves
If mae'r mwg yn mynd. Ie towg'r corn
23 Every one has a brain. If mae ~~fy~~
brain brain yn adan fawr ddu

24 I once had a little dog. If yr wyf
yn dodi had yn yr ardd

25 Skirts are sometimes plaid.
If mae plaid o ddefaid yn y cae

20: To was l.t. ...
...
... of shall ...

- (7) "As the ship went down the river the sails were hoisted and the sailors stopped rowing.
 (8) " Yr oedd y dynion yn dodi sail y ty yn cyntaf".

From the responses it will be seen that this girl is fluent in English and in Welsh although her Welsh mutations are at times unsure. Her responses to auditory stimuli are 230 English words and 194 Welsh but to the Visual Stimulus they run pretty closely (211 English and 207 Welsh) indicating that there is little to choose in the rate of responses after formal learning has taken place. The bilingual nature of her bent is admirably illustrated by the fact that the responses to both the 25 Auditory Stimulus Words and the 25 Visual Stimulus Words are all different - in short she attains a maximum combination of 100 meanings by retaining all her early learning and relating it to later learning both in Welsh and in English. Not only does she give a greater total number of bilingual responses than usual but her sentence structure is more complicated. There was also evidence of relational thinking at the perceptual level, as for example, "At dawn the sun is in the east but at dusk it is in the west".

This girl (Case No.8) is bilingual German/English. She spoke German before the age of five and received formal instruction in German up to the age of nine when she was admitted to a Carmarthenshire School (14.1.59) and was assessed with other children in the eleven-plus year. She tends to respond to the stimulus word in English and then translates it into German.

In this case the present writer gave the instructions to the Class in English, Welsh and German, with the following result:-

- (a) Auditory Stimulus : "PEN" evoked.
 (i) "I rot with a pen in my book".
 "I shreibe mit meinen fuller in meninem buch".
 (b) Auditory Stimulus: "COAL" (COL) evoked.
 (ii) "I fetsched the coll for my mother.
 "Ich holle die kolle fur meine mutter".
 (a) Visual Stimulus "PIG"
 (iii) "I sein a small pig".
 "Ich habe gesehen ein schwein".
 (B) Visual Stimulus: "SAIL" evoked
 (iv) No response.

Martha Fritsche

Five Loach C. P. Du 14 12 48

Atlantad 14.1.59.

- (a) Weit weg.
- (b) Schneiden seine platte.
- (c) A man was lonely. Ein man war alleine.
- (1) I got with a pen in my book, ich schneide mit meinem feiler in meinem buch.
- (2)
- (3)
- (4) A man goes to work in the morning
Ein man geht zur arbeit in in der fröhe
- (5) I got a bill which has been grown down.
- (6) I want more and more pencils to write with. Ich möchte more and more bleistifte zum schreiben.
- (7) Can I go out to see my friend I asked my mother and she said yes
can ich meine freunde gehen mutti ja
- (8) I carried a bag for an old woman
Ich trage seine tasche für eine alte frau.
- (9) We came for the week end why it was a nice day.
Wir kamen für die woche weil es schön war
- (10) I opened the door with a cry:
Ich öffnete die türe mit einem ruf
- (11)
- (12) I fetched the coal for my mother. ich habe die kohl für meine mutter.
- (13)
- (14) The thro is hurting me. Der zery is schmerzen mir.
- (15) I have my tea when I came from school.
Ich habe meinen tee wenn ich von der schule come

(16) I am getting my supper my mother said
Ich habe gleich meine Suppe meine Mutter
sagt.

(17)

(18) I want a piece of bread I told my mother
Ich möchte ein Stück Brot sagte ich meiner Mutter.

(19)

(20)

(21) It is my friend said. Is it my
meine Freundin sagt.

(22) I got a swell at my hand. Ich habe eine
Wunde an meiner Hand.

(23) I have a new acquaintance said my
friend. Ich habe einen neuen Bekannten meine
Freundin sagt.

24

(25) I have my meal in the shade always the
same time.

Ich habe mein Essen immer die selbe Zeit
in der shade

EW.

- (a) I know a boy he plays in mud.
 Ich weiss ein junge der spielt im matsch.
- b. An old man lives in a barn.
 Ein alte man bewohnt in einem
 Stalls.
- c. I scold myself. Ich
1. I seen a small pig. Ich habe gesehen ein
 schwein.
 2. The man pump out the water from
 a hole. Die maner pumpt das wasser
 aus einem loch
 - 3.
 4. My mother has her birthday in March
 meine Mutter hat geburtsdag im martz.
 5. I have seen a hole field of holes.
 Ich habe gesehen ein gaza field of. locher.
 - 6.
 7. The wind blew the paper away.
 Der wind best das papier weg.
 8. Bad is a boy my mother said.
 Schlecht ist ein junge on eine mutter sagt
 - 9.
 - 10.
 - 11.
 12. I put wood in the bon. sich tue strek in
 die tone.
 - 13.
 - 14.
 - 15.
 - 16.
 17. I am fry my friend said you are not
 coming to catch my away.
 Ich bin fry meine freundschaft sagt das er ist
 nicht hier.

18. I shall my friend. Ich rufe meine Freundin.
 19. I saw a man he had a fish. Ich habe
 gesehen einen Mann der einen Fisch gefangen
 hat.

20.
 21. Dawn he was a girl said then by you and
 she played again. Reiter er ist sagte ein Mädchen
 und ~~sie~~ ^{die} spielte weiter

22. The corn is beginning to be eat down
 Das Korn ist lang genug um abgegraben zu werden

23.
 24. A man had an accident. Ein Mann hat einen
 Unfall.

25.

It is of interest to note after upwards of eighteen months residence in Wales this girl had become sufficiently fluent to give the following responses to the same stimulus words, namely, 124 German words and 134 English in 'Reply to Auditory Stimulus' and 92 German and 89 English in answer to Visual stimulus. The spelling in accordance with expectation was modelled on German orthography whilst the sentence structure retained its German imprint, thus in response to the stimulus word "soon" -

"I sun get my supper my mother said"

" Ich habe gleich meine suppe meine mutter sagt".

The case of the girl illustrates the current dictum that the later a new language is learned the more difficult is it to establish new skills for they tend to be impaired by the previously learned skill - for example - the new language is affected by the semantic and morphological structure of the old.

Of equal interest is Case No.9 that of a French speaking girl of British parentage who after early schooling in France came to Wales at the age of nine and improved sufficiently in her linguistic attainment by her eleventh year to merit transfer to a Grammar School. Her estimated I.Q. was 129 (Terman and Merrill) although her functional intelligence was affected by linguistic difficulties. This girl spoke French at home to her mother and father but she received no formal instruction in that language. Where the skills of reading and writing were not reinforced there was a tendency for the new language to become predominant although the language learned early was still retained for domestic intercourse. Not only was this true of this particular girl who had been removed to a new environment; the same result obtained with many Welsh children who, although they were fluent Welsh speakers up to (and after) the age of five years, their language development was impaired by infrequent use and lack of reinforcement in the basic skills. Nevertheless as previously indicated - and specially illustrated in this case - the language was orally preserved even though it was less accessible than the new language - one could almost describe it as "fossilized."

The present writer gave the instructions to this girl in English, Welsh and French with the following result (vide Photo Stat Copy).

Elizabeth Ling

July 20th 1948

TRI-LINGUAL (FRENCH/ENGLISH/WELSH) AUDITORY

- (a) far loin
- (b) lone, toute seul, siman
- (c) disk, disc, une plaque con maes sur le gramophone

1. pen, crayon,
2. Plant, plante, brodyn.
3. Pant, ceure, dysg.
4. man, homme, din.
5. coté, côté, hin.
6. mör, la main, sea.
7. can, je suis, fusse
8. carry, je porte,
9. bamp, la table, ffordd.
10. ci, dog, chien. qui est celui la.
11. brat, apron, tablier
12. boal, charbon,
13. Pale, pale,
14. lœ, Pied,
15. tea, tœ, papier
16. Soon, bientôt, a bientôt, fore
17. Queu, queu, ti ôl
18. Peace, la pé, pyp (finger).
19. bof, sur les genou, on the laps of someone.
20. bor, choir, eglise.
21. mine, fait attention, look out.
22. swil, money, de l'argent.
23. haf, Summer. l'automne.
24. min, mean, sure diner (français).
25. meal, manger (dîner) cino
- 26.

- A. mud, de la boue,
- B. barn, la place où qu'on ten la paille. The barn usually belongs to the farm.
- C. mad, funny. deale. She is a funny girl.
- D. Pig. cochon, mochyn. The pig was in the pig sty.
2. Pump, pompe, fwp. The ~~pa~~ We drew water from the pump.
3. Pound. pound. l'argent. I had a pound to go to the fair.
4. March, mars (le mois) The month of March was a cold one.
5. Hen, yeu, old. He was a sensible old man.
6. Comb, feingre, combr. I comb my hair with a comb.
7. Blew, The trees with the wind.
8. Bad. meehan, The bad boy was canned.
9. Sail. maire, afon. The sail of the ship flew with the wind.
10. Bore, I was getting bored of the film.
11. Toes, pied, pe. My toe was squashed by the car.
12. Ton, tone, une tone, a tone of straw was weighed on the machine.
13. Hurt, malade, toure. My little brother hurt his finger yesterday.
14. Darn, coude, We darned the socks together.
15. Dull. hole, un trou, He had a hole in his fore head.
16. Dark, ~~blonde~~ claud, nuage. The cloud in the sky was dark.
17. Fry. cuisiner, We fried our egg in the frying-pan.
18. Call. appelle. We called for help.
19. Had. poison. We had had for dinner.
20. Draw. erise, dyspu. We drew on our sketch book.
21. Dawn. le soire, nes. Dawn was approaching us quickly.
22. Corn, du fuin, The corn was ready to cut.
23. Brain, The girl was very clever.
24. Had. fais, I had a lot of homework.
25. Play. fwise, wau. I played with my friends.

- (a) Auditory Stimulus - PEN evoked
- (i) "Pen, crayon"
- (b) Auditory Stimulus - COAL (COL) evoked
- (ii) "Coal, charbon"
- (c) Visual Stimulus - PIG evoked
- (iii) "Pig, cochon, mochyn - The pig was in the pigsty"
- (d) Visual Stimulus - SAIL evoked
- (iv) "Sail, maire, afon - The sail of the ship flew with the wind."

This case is of particular interest since it illustrates the trend of our argument so well. The number of responses made to the Auditory Stimulus was as follows:

French 39 : English 25 : Welsh 17.

The number of responses made to the Visual Stimulus was as follows:

English 171 : French 22 : Welsh 10

In brief English had supplanted French for general purposes although both French and Welsh had been retained since the former was used largely for domestic matters and the latter for social intercourse with children and adults in the predominantly Welsh environment of the village where she now lived.

It is also of interest to note the effect of certain visual stimulus words for the responses appear to support our third hypothesis, namely, the response which will occur is in part determined by excitation from cell-assemblies already active, thus:-

the Auditory Stimulus Word "SWIL" was perceived as "SWLLT" (English shilling) evoked - Responses : "money, de l'argent" whilst the Visual Stimulus Word "DULL" perceived as "TWLL" (English hole) evoked - responses : "hole, un trou. He had a hole in his fore-head." In other words it is important to notice in the J.A.W.L. Experiment as far as the comparative philology of functional intelligence is concerned the thought process appears to search for those forms with which it is familiar and tends to react to a seemingly recognized pattern - in preference to a new pattern. Such a searching activity also supports Hebb's findings on the influence of early learning and appears to fit the facts more closely than trying to account for them by mere "conditioning".

In brief, we have established that there is evidence to support Hebb's general proposition that learning may be speeded up, hindered by or qualitatively changed by having learned something else before by proving the validity of our first hypothesis, based on Hebb's neuro-psychological theory, namely that performance in Welsh remains superior owing to early learning of Welsh, and of our second hypothesis, namely

that free associative responses to visual stimuli tend to show a greater proportion of initial immediate responses from the second language learned in part through reading and writing. We have also shown that there is good evidence for assuming, in accordance with our findings concerning the third hypothesis, that the influence of the pre-existent central activity on the next link of the phase-sequence chain would lead one to expect specific English and/or Welsh responses in accordance with the language or languages learned early or later. Furthermore, we have also shown that there are grounds for believing Hebb's reasoning to be correct when he states that ^{at} each point in a conceptual series the ensuing activity is determined by the total pattern of sensation at the moment and by the residue of facilitation or inhibition from the preceding central activity - in other words that there is interaction between sensory and central facilitations.

Our qualitative findings are corroborated by our quantitative results. Thus whereas it is clear from inspection that the responses of the Monoglot English Control Group are, as expected, all in English and likewise those of the Bilingual first language Welsh Group largely in Welsh - a statistical analysis of the Bilingual Group (First Language English/Early language Welsh) to the neutral auditory and visual stimuli in the James Associative Word List Experiment shows an interesting difference, thus:

Where X_1 = Number of Welsh responses to Auditory stimuli.
 Where X_2 = Number of Welsh responses to Visual stimuli.
 and Where \bar{D} = Difference in favour of the Auditory stimuli.

J.A.W.L. EXPERIMENT ELEVEN PLUS STUDY 1960

N = 100	X_1	X_2	D	\bar{D}^2
Sum	2463	85	2378	57978
Mean	24.63	.85	23.78	

$$t = \frac{\bar{D}}{s_{\bar{D}}} = \frac{\bar{D}}{\sqrt{s_D^2/N-1}}$$

$$s_D^2 = \frac{57978}{100} - (23.78)^2$$

$$= 579.78 - 565.4884$$

$$= 14.2916$$

$$t = \frac{23.78}{\sqrt{14.2916/99}} = \frac{23.78}{.14436} = \frac{23.78}{.38}$$

t = 62.58 Significant at all levels.
 (Degrees of Freedom (n-1) = 99).

We note that there is a highly significant difference in favour of the language learned first by auditory means. Thus early learned Welsh (which has subsequently been maintained) is retained in a well prepared state of action in response to a familiar auditory stimulus whilst there is on the other hand a distinct tendency to respond to the visual clue in English.

It would have been of added value had it been possible to reverse the order of presentation of the auditory and visual stimuli - but this would of necessity have introduced influences in favour of English set. It should be remembered that set is situationally determined and in its turn restricts and modifies the language behaviour. Indeed to say that the fact that the First Language English Bilinguals retain Welsh phonemic structures learned early and respond suitably to them in a traumatic test situation is alone sufficient to underline the influence of early auditory learning as opposed to the later acquired visual and motor skills associated with reading and writing

We note that there is a significant difference between the number of immediate Welsh responses to the Auditory stimuli and the number of Welsh responses to the Visual stimuli, where the responses tend to be couched in the language learned later, namely English. These findings tend to give statistical proof of H.O.Hebb's theory on the influence of early as opposed to late learning - and appear to confirm the three hypotheses put forward by the present writer in this thesis on the comparative philology of functional intelligence.

It is also suggested under the same terms of reference that the definition of intelligence should recognize the existence of two types of mutually exclusive, yet interdependent, laws - the one dealing with hierarchical structure and the other with inner independent factorial dimensions. Hebb's description of twin A and B intelligence can, therefore, be redefined in terms of James' functional level of intelligence where $B = f(A)$ and where the influence of both early and late learning leaves its inevitable linguistic traces.

But let us now consider a Thirteen Plus Follow-up Study (1962) concerning the influence of comparative philology on the functional intelligence of the same Eleven Plus Bilingual Groups (excluding children who were absent, had left the area or died). Thus 60 pupils (30 boys and 30 girls) in each experimental group were again matched for age, sex, socio-economic background and intelligence (as measured by a Non-Verbal Reasoning Test). First Language English Group (Mean I.Q. - 110.85); First Language Welsh Group (Mean I.Q. - 110.9).

A N.F.E.R. Verbal Test (Advanced I) standardised by D.A.Pidgeon on a year group between 12.0 and 14.0 years was then used. The Conversion Table based on the scores of 1564 children was constructed in accordance with the method described by Lawley in the British Journal of Psychology (Statistical Section) Vol.III, Part 2, June 1950. The standardised scores so obtained were similar to Intelligence Quotients in their numerical distribution but they differed in that they were not arrived at through consideration of mental age. Each child was assessed by comparing him with a representative sample of children of exactly the same age. The Test Proper (Time 50 minutes) was preceded by a Preliminary Practice Test (Time 10 minutes). Instructions for the administration did not differ from those usually given and the detailed scores are tabulated in the appendix.

The following is a statistical analysis of a follow-up Study of the Bilingual Experimental Groups:-

Where X_1 = English Verbal Quotients of First Language English Bilinguals.

Where X_2 = English Verbal Quotients of First Language Welsh Bilinguals.

and D = Difference in favour of the English Bilinguals.

J.A.W.L. EXPERIMENT THIRTEEN-PLUS FOLLOW-UP: 1962				
N = 60	Eng. Bil. X_1	Welsh Bil. X_2	D	D^2
Sum	6431	6020	411	10421
Mean	107.18	100.33	6.85	-

$$s_D^2 = \frac{10421}{60} - (6.85)^2$$

$$= 173.6833 - 46.9225$$

$$= 126.7608$$

$$t = \frac{6.85}{\sqrt{\frac{126.7608}{59}}} = \frac{6.85}{\sqrt{2.148488}} = \frac{6.85}{1.46577}$$

$$t = 4.673 \text{ (Significant at .001 level).}$$

It is of interest to note that although in fifteen (15) cases the First language Welsh children do better in the English Verbal Test than the corresponding First language English children, the overall group difference is significantly in favour of the First language English Bilinguals.

In brief this bears out our suggestion that the functional level of intelligence is directly affected by the degree of verbal fluency and vice versa. That is not to say that some pupils can be equally fluent in both languages although the tendency appears to be for a child to be more fluent in one preferred language than another. It must clearly be remembered, however, that many factors such as we have already discussed are operating in any given S-R situation

and that this multiplicity of factors affects the issue directly when the comparative philology of functional intelligence is considered.

Let us consider our results in greater detail for the findings are extremely interesting. Thus when we compare the Upper/Middle/and Lower "Terciles" comprising of some twenty cases each we note the following:-

FUNCTIONAL LEVEL OF INTELLIGENCE			
"Tercile"	I.Q.Range	t-Value	level of significance
Upper	115-134	3.376	@ 1%
Middle	105-118	2.87	@ 1%
Lower	83-108	1.835	@ 10%

Thus the better the performance of the pupils on the Non-Verbal Reasoning Test the more significant is the difference between X_1 (First Language English) and X_2 (First Language Welsh) in terms of standardised scores obtained from a Verbal Reasoning Test. Or again, the more competent they appear to be at Non-Verbal Reasoning the greater facility do they appear to develop in the preferred language as opposed to the other and the greater the discrepancy between First Language English and First language Welsh Experimental Groups.

There appears to be a tendency, therefore, for the more intelligent child to develop more particularly his preferred first language. In this manner he would tend to assimilate a large number of phonological, lexical, semantic, structural, stylistic and graphological forms in one language rather than another. In short there would tend to be an increase in the complexity of cell-assemblies and phase-sequences in the preferred language commensurate with the degree of reasoning facility with the result that the functional level would depend on, and in turn affect, the comparative philology.

It would, therefore, appear that during the early learning of language let us say English and/or Welsh, organisation occurs in non-specialised cortical areas and this organisation, as Drever Secundus suggests, acts as a basis for the perceptual skills and insight upon which later learning in part depends. Furthermore, it would appear from the above findings that the functional level of intelligence described in terms of the comparative philology of these skills is developed after the manner of the James-Hebb laws of combined hierarchical structure and inner-dimensions, where $B = f(A)$.

Thus as Karl Zenner and Mercedes Gaffron have indicated in their monograph on "Perceptual Experience" comprising an analysis of its relations to the external world through internal processings - the response to a given stimulus involves something more than a simple S-R reaction and that the term "perception" covers a "multiplicity of relationships, each representing different foci of interest in a total process such as (a) experiential relationships (b) cognitive relationships (c) perceptual discrimination and (d) perception as behaviour control.

Thus recent developments strongly indicate, as Zenner and Gaffron have pointed out, "the likelihood that the perceptual processes which are mediated by and through neuro-physiological mechanisms are more diverse qualitatively than the traditional cognitive theories of perception have pre-supposed. Further understanding of them can scarcely be irrelevant to the detailed understanding of psychological processes which over schematized theoretical conceptions at the psychological level have discouraged".

We have clearly arrived at a position in our research where the various aspects of our neuro-psychological theorizing become naturally inter-related; thus, as we have demonstrated, it is nowhere more evident than in our present study where we may for a moment consider some of the general findings which come from our Experimental Group data and apply directly to the run of our argument.

To deny the existence of a certain degree of innate potential intelligence A and of intelligence B which is subject to development or on the other hand to deny that this latter type of intelligence is not subject to modification by environmental influences is to fly in the face of all our experimental evidence; such proof can be amply demonstrated in the field of bilingualism where the functional level of intellectual performance may be greater or better in one language than in another. Hebb's propounding of intelligence A and B may, therefore, help us to clarify our ideas by making it possible to speak of the functional level of intelligence rather than of the I.Q. as such, whilst our study of bilingualism illustrates the need to implement the present writer's contention that we should speak of the functional level of I.Q. because in one and the same person:

- (1) the functional level of I.Q. may differ in two languages as well as in the different modalities.
- (2) the functional level of intelligence may be differently directed in terms of contextual clues or set determined responses, for example, (a) socially (b) educationally (c) scientifically.

KARL ZENNER: Perceptual Experience: An Analysis of its Relations
MERCEDES to the External World through Internal Processings".
GAFFRON: Psychology: A Study of Science Vol.4, pp 515-618.
Edit. S.Koch, Pub.Macgraw Hill, New York, 1962.

In other words the findings of the James Associative Word List Experiment support the theoretical contention of Professor William Mackay of the Department of Linguistics, Laval University, Canada that: "it is easy to see how the relation between skills and levels may vary from bilingual to bilingual. At the phonological-graphic level, for example, we have the case of the Croatian who understands spoken Serbian but is unable to read the Cyrillic script in which it is written. At the grammatical level it is common to find bilinguals whose skill in the use of grammatical structures in both languages cannot match their knowledge of the vocabularies. At the lexical level it is not unusual to find bilinguals whose reading vocabulary in language B is more extensive than it is in language A and far beyond their speaking capacity in either language. At the semantic level a bilingual may be able to express his meaning in some areas better in one language than he can in the other. A bilingual technician who normally speaks language A at home and speaks language B indifferently at work, may nevertheless be able to convey his meaning much better in language B whenever he is talking about his speciality. Finally a bilingual's familiarity with the stylistic range of each language is very likely to vary with the subject of discourse." That this is true has become clear from the supporting evidence drawn from our Experimental Bilingual Groups of English and Welsh children.

In the special case cited at the beginning of this chapter we have seen, for example, how a boy suffering from a physical disability (cataracts) can be functionally inhibited through blindness and concomitant complications. Again the Monoglot English girl (case No.1) would function differently in a Welsh milieu from the Welsh girl (case No.3); this situation will be reversed in an English context. Both the German girl (case No.8) and the French girl (case No.9) have also been shown to experience functional handicap in the English as well as the Welsh environment. On the other hand, the highly intelligent (I.Q. = 170+) bilingual English/Welsh girl is at home in both worlds as the experimental evidence makes clear. Of equal interest is the reaction of a Norwegian - English girl (of French/Arabic Egyptian education) to the Terman and Merrill question at Year XIII, Sub Test 5, Dissected Sentences: where the subject is asked to rearrange the words:

TO/ASKED/PAPER/MY/TEACHER/CORRECT/I/MY

The immediate initial response was made "I asked my 'papa' to correct....." Where the visual stimulus 'paper' was admittedly confused with Norwegian auditory stimulus 'papa'

MACKEY. W.F.: "The Description of Bilingualism (1962)
reprinted from Canadian Journal of
Linguistics.

(father). Upon reflection, however, the girl corrected her answer when the remaining English words were seen not to fit.

It will be realised, therefore, that another fundamental principle inherent in the actual structure of recorded language as opposed to spoken is that the style and content will vary with the level of usage. In other words, as we have discussed in Chapter one, a person may be fluent at one level, let us say popular as opposed to scientific, whereas in another language he may be more familiar with domestic slang rather than with literary expression - this is particularly true where colloquial Welsh bears no relation to literary Welsh or again with written English in a mixed linguistic milieu.

From our experimental findings the following major influences in order of priority are among those which play their part in fashioning this functional level of intelligence in accordance with a synchronic description of bilingualism.

- (1) early learning as opposed to late.
- (2) teaching media of the basic skills in the schools.
- (3) language of the playground.
- (4) linguistic background of the area.
- (5) attitude of parents, friends and of the child herself.

All things being equal the first language learned auditorily (orally) will be reproduced providing there is no later imbalance of extreme factors to change the linguistic set. This has been fully demonstrated by the Monoglot Welsh Experimental Group where almost all the responses to both auditory and visual stimuli are in Welsh. The assimilation of a particular phonemic structure lays the basis for future linguistic communication. The process of listening establishes the context of the sound recognized which is followed in due course by its expression as a semantic structure. The power which an auditory stimulus may exercise over a visual one may be illustrated from a script taken from Llanybyther School, where the colloquial form of auditory Welsh stimulus becomes stronger than the visual presentation - and indeed appears to over-ride the presented stimulus, thus - the visual stimulus "COD" auditory stimulus "COED" (i.e. a different word) and the full sentence response = "yr oedd y dyn yn torri cod". A similar interesting example occurred when the French girl (Case No.9) who was clinically examined on the Terman and Merrill graded vocabulary gave the response to the word "mosaic" as "musique".

It is suggested that this phenomenon of early learning can be regarded as an example of what Hebb means by "cell assembly" where he states "the key concept is that of the "cell assembly" a brain process which corresponds to a particular sensory event, or a common aspect of a number of sensory events. This assembly is a closed system in which activity can 'reverberate', and thus continue after the sensory event which started it ceased. Also, one assembly will form connections

with others, and it may therefore be made active by one of them in the total absence of the adequate stimulus. In short, the assembly activity is the simplest case of an image or an idea: a representative process. The formation of connections between assemblies is the mechanism of association."

In like manner if there is an imbalance of stimulation there may be a shift of influence from one language to another, for example a child learning Welsh up to the age of 5 years may tend to become English at the age of 7 if the background is heavily Anglicised and if the original Welsh phonemic structure is not supplemented in the different modalities through formal instruction in reading and writing. This has been shown in the mixed bilingual group where the response to the auditory stimulus is in Welsh and the response to the visual stimulus tends to be in English.

We can establish from the results of our experimental groups that where early learning is not systematically supplemented in all the modalities by later learning the potential of the initial stimulus is weakened particularly as far as the visual modality is concerned. The appearance of the original language is masked - although it still has the latent power to evoke a response providing the searching is continued. The process of learning is accelerated (accentuated) if the second language learned auditorily is also associated with and strengthened by the new basic visual and tactile-kinesthetic skills of reading and writing. Early learning of the first language is strengthened, however, if the child has also learned to read and write in the first language - it is further strengthened if reading and writing is continued until a quadrupled set of linguistic habits is established. That this is a fact can be demonstrated by referring to the results of the complete experimental group of Welsh Monoglots. The reverse happens when the early language is not supplemented as in the case of the French girl (Case No. 9) but even here although the language becomes less accessible to contextual clues, its use goes but the language does not disappear.

In Hebb's description what takes place is "that these representative activities each corresponding to some property of environmental stimulation, would form connecting links with each other and with concurrent motor activities, on the

basis of the synaptic resistance" postulate referred to by Hebb. Most assemblies would be established during the occurrence of particular motor activities (visual stimulation and eye movements, tactual stimulation and movement of the corresponding part of the body, auditory stimulation and vocalization)". In this manner contextual clues might account for such regional differences of response to visually neutral stimuli, thus:

- (1) NOD sheep's mark (Welsh) in the Caio rural district of Carmarthenshire.
- (2) MUD "flocks" and "slack" in the Amman Valley Mining Area.
- (3) BARN associated with
 - (a) chapel/Welsh: day of judgement.
 - (b) eisteddfod/Welsh: literary judgement.
 - (c) farm building/English connotation.

This brings us to Drever's point in support of which the evidence is strong namely that certain basic skills are built up over a period of years and underlie performances in ways not unlike those suggested for abilities by workers in the field of mental testing; that these skills seem to have been built up early and later learning has little effect. It can be shown from our experimental results that these basic skills exist and that they should be learned (and taught) independently for the response to a given stimulus appears to depend upon the language in which that particular skill is learned (or taught) - not necessarily according to the language first heard and learned auditorily (e.g. Welsh) but according to the one in which the pupil has learned to read (visually) and write (tactile-kinesthetically) for example in English. We have already pointed out how these skills can act as mutually dependent supplementary searching agents. If this supplement does not take place the newly acquired independent skill in one particular language may introduce a new regime of thought, namely -

Spoken Welsh - written English. (Case No.5).

Spoken French - written English and Welsh (Case No.9).

In other words a new "phase sequence" is established.

Hebb has described the phenomenon as follows:-

"The phase sequence is a temporally integrated series of assembly activities; it amounts to one current in the stream of thought. Each assembly activity in the series might be aroused (1) sensorily (2) by excitation from other assemblies

or (3) in both ways. It is assumed that the last (3) is what usually happens in an organised flow of behaviour. Each assembly must establish connections with a number of other assemblies, at different times; which of these it will arouse on any specific occasion will depend on what other activity, and especially what sensory activity is going on at that moment. Assembly A tends to excite assembly B, C and D; sensory activity tends to excite D only, so A is followed by D. At each point in time behaviour would thus be steered both sensorily and centrally, jointly controlled by the present sensory input and the immediately prior central activity." Our experimental findings in the comparative philology of functional intelligence tend to confirm this view.

The prime instrument of man's intelligence is language; the functional level of a man's intelligence depends on his ability to manipulate linguistic, verbal and mathematical symbols. Thus language functions as a system of systems; in a bilingual situation this systematization becomes extremely complex particularly when the infant becomes more mature and passes on to the junior stage of learning both at the perceptual and conceptual levels. Hebb has shown that "the larger the system the greater the probability of its establishing an effective inter-facilitation with another - provided that the two are well organised, so that arousing the part of one will arouse the whole". We have substantiated this by our findings in the monoglot and bilingual Experimental Groups - in other words we are also interested in the associations formed at maturity between much more complex processes - that is between these two languages English and Welsh as structured in the comparative philology of functional intelligence.

In other words in the more mature child learning does not of necessity mean the acquisition of a new set of data; it also means working out the effective relationships between facts already learned or as Hebb puts it "Learning at maturity concerns patterns and events whose parts at least are familiar and which already have a number of other associations. This changes the problem considerably. It means that the learning is not an association between totally unrelated processes. It must concern a complex of cell-assemblies and elaborate phase cycles (in the jargon of Hebb's scheme);

and amounts to a strengthening of facilitations, not a setting up of new connections between wholly unrelated activities". He suggests that the more adult type of learning is made up by recombining process of perceptions and patterns of movement with which we are already familiar, in other words previous learning (in our case the assimilation of linguistic structures in the various modalities, has already taken place earlier so that as Hebb says "For the theory being developed, a prompt learning is possible when the stimulation sets off well organised phase-sequences but not otherwise". Thus, for example, a stimulus presented in the J.A.W.L. Experiment may as we have seen not evoke any response at all because it is unfamiliar.

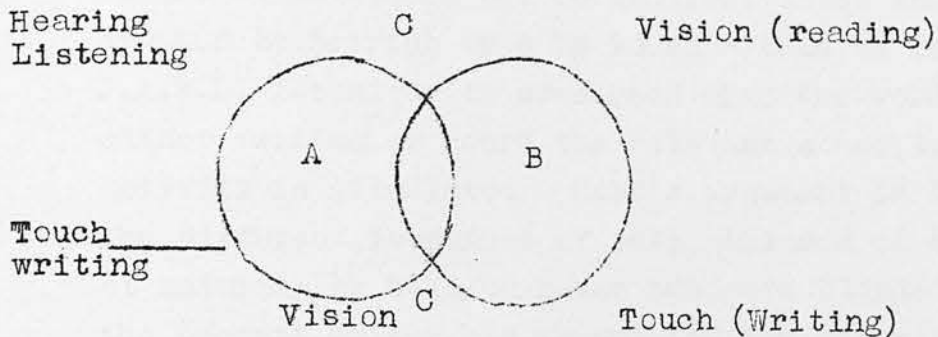
The validity of Hebb's theory, it is suggested, can be well demonstrated in the field of comparative philology by studying the functional level of individual members of our Experimental Group. The J.A.W.L. Experiment at one and the same time brings out both the regularity of the response and the variety of its treatment in a bilingual situation. Let us cite at random from the response to the auditory stimulus word "PEN", thus we have:-

- (1) "pencil, write, work paper tools, point nib holder"
"Boy/Monoglot Control Group.
- (2) "My fountain pen is black" (girl, ditto).
- (3) "Ar ben y goeden yr oedd y wiwer yn neidio".
"Welsh Girl/Bilingual Experimental Group.
- (4) "Y mae gennyf ben".
Welsh boy/Bilingual Experimental Group.
- (5) "Pen, head, trwyn, eyes, gwallt, llaw, arm, bys, troed".
Welsh/English Girl/Mixed Bilingual Experimental Group.
- (6) "The sheep went into the pen. Ble mae pen y ceffyl".
English boy-Welsh Boy/Mixed Bilingual Experimental Group.

In this context we note how the stimulus sets off well organised "phase cycles": we have either an open circuit in the form of a sentence in English or Welsh or an open end response where a series of bilingual words are sparked off - all related to the previous semantic structure - always within the learned experience of the child. We also notice, as Hebb has said, that the organised activity of the association areas is subject to environmental control. A good example of the latter is found in the response of Welsh children - to the stimulus word NOD, the rural area reference is made to "nod" as sheep mark thus, "Y mae pob ffermwr a nod ar ei ddefaid".

Whilst in the urban areas the frequent response is the "teacher's mark" - "Cafodd y bachgen nod gan yr athro". In English the stimulus is more straight forward and we have, for example, the response "answer yes sleep bed" or simply "I nodded my head".

Such learning, says Hebb, may be diagrammed as below, where each circle represents a conceptual activity thus:



"The concept of an object or place is an irregular cycle, each phase of which is activity of a cerebral cell-assembly. If a large enough part of this phase cycle is aroused, the whole becomes active. Thus in the above figure the concept A was originally organised by an interaction of hearing, touch and vision. Once organised it may be aroused by hearing alone, or perhaps by hearing and touch but the essential association between A and B resulting from simultaneous activity would be the same whether each was aroused by vision or whether one was aroused by hearing and the other by touch". That the conception is feasible can be shown from the results of the J.A.W.L. Experiment, just cited, where the stimulus word "PEN" whether presented auditorily or visually produces similar or related responses; in other words whether the stimulus is seen or heard the same kind of conceptual activity - let us say in the form of phase-cycles-results.

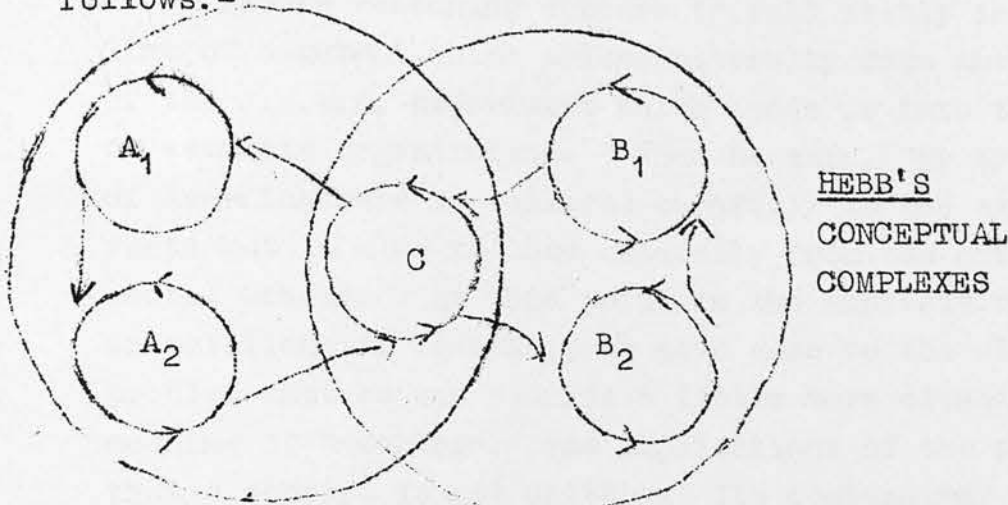
Thus Hebb's following explanation of his diagram fits in with our experimental findings. A and B represent two conceptual activities, C, C, possible connections between A and B. These are not simple closed neural circuits nor even the more complex "assemblies" but "phase cycles ; systems of assemblies whose several activities are temporally integrated and tend to recur in an irregular cycle. A was originally organised by auditory, tactual and visual stimulation.

(that is, it involves assemblies in each of these modes): B by tactual and visual stimulations when these cycles are well organised, their activity may be indicated by part of the original stimulation - A for example by hearing, touch or vision. When A. and B. are simultaneously active, they may acquire an inter facilitation which is diagrammatically represented by C and C. The learning independent of any particular stimulation: the association might be set up by two visual stimulations but be manifest later when A is aroused by hearing or B by touch - thus as far as the J.A.W.L. Technique is concerned when the word PEN is either written or heard the relevant conceptual activity is stimulated. Hebb's argument is based on the different responses of rats blinded at birth and/or at maturity as well ^{as} on human subjects blinded by cataracts; the present writer has translated the experiment into the field of human symbolic activity.

Hebb develops his argument in a manner which is of singular interest to our experiment: "The perception of an actual object (that can be seen from more than one aspect, and touched, heard, smelled and tasted) involves more than one-phase cycle. It must be a hierarchy, of phases, phase cycles, and a cycle or series of cycles. ("Cycle" is of course temporal: referring not to a closed anatomical pathway but to the tendency of a series of activities to recur irregularly). The two ideas or concepts to be associated might have, not only phases, but one or more sub-systems in common. It should provide an even more effective link. Such a mode of association is possible only between complex systems and it may be recalled again that a complexity of meaning is more readily remembered than a simple perception without meaning." Again Hebb's reasoning has direct reference to our present experiment in comparative philology. Thus the two ideas or concepts to be associated might be regarded as operating in a bilingual context where the common link is the stimulus word, let us say "PEN" and the dependent sub-systems could operate in different languages. The different modalities as demonstrated in the J.A.W.L. Experiment would operate through the stimulus - response technique to produce different and yet related effects in all or some of the various modalities in just the way that Hebb envisaged the manner in which early or late learning

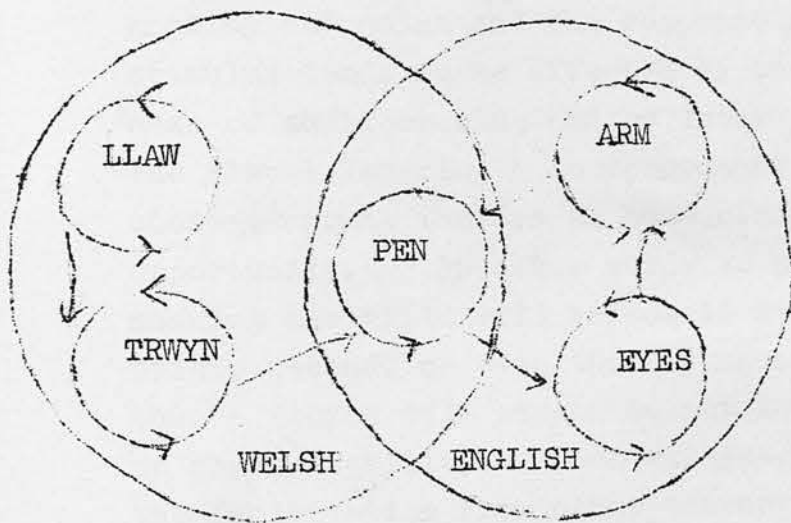
would modify the resulting data in accordance with environmental (for example socio-economic and educational influences of a pre-determined kind.

Hebb pictures the kind of activity which will take place as follows:-



HEBB'S
CONCEPTUAL
COMPLEXES

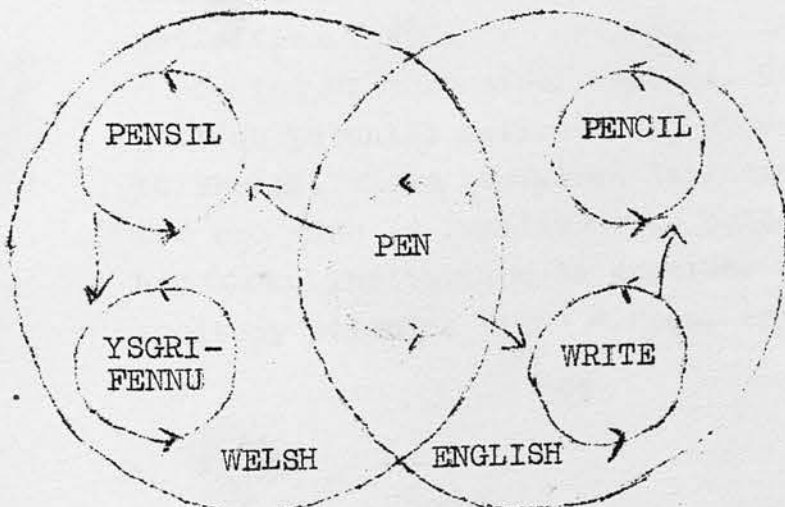
This diagram is meant to illustrate the possibility that a sub-system C, may act as a link between two systems (conceptual complexes). The concept is represented by A₁, A₂, and C; the second by B₁, B₂ and C. The two systems have a sub-system C, in common, to provide a basis of prompt association. This is very much like what takes place in the J.A.W.L. Experiment in the effect of comparative philology on functional intelligence, thus the sub-system C must be equated with the stimulus "PEN" and resulting responses A₁, and A₂ together with B₁ and B₂ might form the different conceptual complexes in the neuro-psychologically related language structures of English and Welsh, thus:-



JAMES ASSOCIATIVE
WORD LIST EXPERIMENT

(i) Welsh Meaning where

PEN = Head



J.A.W.L. EXPERIMENT

(ii) English Meaning where

PEN = Writing Instrument.

Hebb's reasoning appears to fall neatly into the line of argument which arises naturally from the findings of the J.A.W.L. Experiment which leads us into the field of semantic organisation. Thus he says, "My treatment of learning here is tailored carefully to the experimental facts but it also follows naturally from the original neural schema. At this point in the emphasis on pre-existent associations in learning, we have come to the classical problem that we can examine a little more closely: the meaning of "meaning". The implications of the preceding is that a concept is not unitary. Its context may vary from one time to another except for a central core whose activity may dominate in arousing the system as a whole. To this dominant core, in man, a verbal tag can be attached; but the tag is not essential. The concept can function without it, and where there is a tag it may be only part of the "fringe": sometimes aroused with the dominant subsystem, sometimes not. The conceptual activity that can be aroused with a limited stimulation must have its organised core but it may also have a fringe content or meaning, that varies with the circumstances of arousal." This I submit is what we have shown to happen in the thought process of bilingual children. There is, as we have seen, a relatively stable core of meaning in both English and Welsh and the response which is aroused by the stimulus tends to be affected by the early learning in the case of auditory clue and by later learning in the use of the visual learning - in accordance with the effect of such socio-economic factors as home circumstances and educational opportunity. In other words we have a fair idea of which meaning the child will select if we are aware of his choice of first, second, or even third language. Hebb has put it, thus - "which will happen is not indeterminate, but depends on the excitability of each subsystem at the moment, and on the facilitation from other concurrent sensory and central activities."

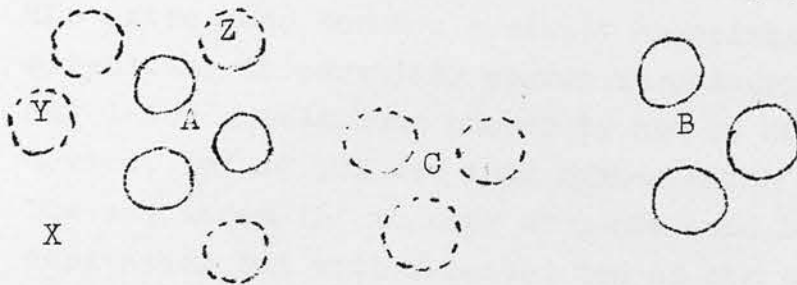
Let us reconsider case no. 9 that of the girl (of British parental nationality) whose first language (spoken) is French, whose preferred language (written) is now English but who also is familiar with colloquial Welsh and has also had formal instruction in Spanish. Her reaction to:-
Auditory stimulus "PEN" = "pen, crayen"

We notice the introduction of the two dominant languages.
In the case of -

Visual Stimulus "PIG" - "pig, cochon, mochyn: the pig was in the pig sty. Thus we have the natural order of appearance which gives a clue to the strength of the stimulus: and in addition we have the sentence in English which clinches the girl's preferment of English as the chosen instrument of written communication or again consider:-

Visual Stimulus "SAIL" - "sail, maire (mer), afon: the sail of the ship flew with the wind".

We note the same order of appearance of the languages English, French and Welsh but in the whole script there is no trace of Spanish which had been subject of formal learning during the previous twelve months. Hebb's diagramming in another form of the same principle as the previous figures serves well to illustrate our own findings, thus:-



(A) PIG = English (C) MOCHYN = Welsh (B) COCHON = French.

Hypothetical comparison of Hebb with James' A.W.L. Experiment. Hebb's description is as follows: "the complexes A and B are sensorily aroused at the same time, solid circles represent systems that are reliably aroused; broken circles, ones that are facilitated by the activity of adjacent systems, but not reliably aroused by them. That is, the "fringe" systems X, Y, Z, C, and so on, receive a facilitation from A which is often not sufficient to arouse them; which ones are active will depend on preceding activity in the tissue and accidents of concomitant stimulation. The complex C might or might not be aroused as a sequel to A or to B but when both are active simultaneously C is more likely to be aroused. Thus the subject associates an object B with the object A because both are associated with something else C. (Compare pig - cochon - mochyn in the J.A.W.L. Experiment) but the processes A, B and C all occur within what is grossly the same tissue, not spaced as in the diagram: and

when by virtue of C's activity A and B are persistently active together, they may slowly build up a direct inter-facilitation so that C can drop out eventually leaving A linked to B directly by a short circuiting. This appears to be very much like Woodworth's Reasoning when he deals with the learning of meanings, thus, "a pair of related words which suggest a meaning, however fanciful, is quickly learned and well-retained, though occasionally the extra idea alone, without the response word is recalled. It is important to notice that these extra ideas tend to drop out of mind as the learning advances. They have done their work and are discarded. Short-circuiting occurs, the transition from item to item, instead of taking the circuitous route by way of the extra idea becomes a direct association. Such short circuiting is certainly common in ordinary learning. You may learn a telephone number by aid of some little device, but if you use this number often you know it directly. You may learn the meaning of a new word by looking up its derivation but with repeated use of the word you no longer think of the derivation. What these extra ideas accomplish is to hold certain items together until a direct association has been established between them." We have seen that this sort of interfacilitation is also true of languages where the syntactical structure of one language will include a morphological element from another which is sometimes retained indefinitely or disappears along the course of the new learning, we have already cited such an example:-

Auditory stimulus COAL(English) and COL (Welsh)

(a) English response - "The coal was very hard"

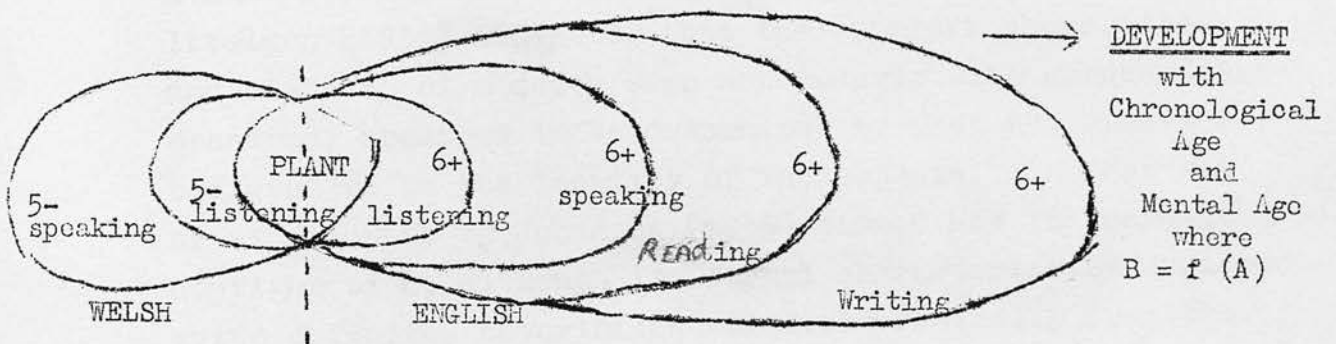
(b) Welsh response - "Y mae glo yn hard"

Likewise when a second language is learned there is constant reference to the first language but in due course the conscious linkage is dropped and the second language functions independently.

But to return to Hebb who states the prompt learning of maturity is not an establishing of new connections but a selective reinforcement of connections already capable of functioning. Observe, however, that this account differs from traditional association theory in at least one respect, which is of the greatest importance for applying the theory to the results of experiment.

Two concepts may acquire a latent "association" without ever having occurred together in the subjects past experience. Although the "association by similarity" of older theory recognized this fact, the explanation seemed to depend on the idea of identical sensory elements. The present theory suggests that the elements may be conceptual rather than sensory; that is two things may seem similar without exciting the same receptors". The findings of the J.A.W.L. experiment has produced an abundance of data in support of this reasoning where the same apparently neutral stimulus produces a different semantic response in the various modalities.

The development of the semantic organisation can proceed in various ways : thus where the introduction of the second language (e.g. English) supersedes the unreinforced first language (e.g. Welsh) - and vice versa - the language first used tends to become less accessible to the evoking stimulus although it does not entirely disappear. We note that concept formations (cf. Hebb's conceptual complexes") develop more fully with many more ramifications through the medium of the four skills than they do through the medium of only two - this is particularly true where the socio-economic influences tend to favour the searching process for the correct responses.



Where, however, their learning proceeds undisturbed from an early age and is supplemented (for both English and Welsh) in all the modalities we notice, particularly, in respect of the highly intelligent Equi-bilingual child (cf. Case No. 7 I.Q. = 170) that her whole vocabulary is enriched by a complex system of phonological, lexical, semantic, structural, stylistic, graphological relationships between language A and language B, much in the way we have indicated in the U.N.E.S.C.O. synchronic description of individual bilingualism as well as in our accompanying diagram. On the other hand one should also mention that the mentally slow child will display corresponding limitations of vocabulary and accomplishment in the various skills.

Not the least among the interesting features of the J.A.W.L. Experiment is the light it throws on a new version of the old problem of Binocular Rivalry. According to the early technique the accent was on the stimulus and how the binocular field was made up from the monocular fields: Panum (1858) for example noted (a) Rivalry of contours (b) Prevalence of Contours (c) binocular mixture of colors and (d) mosaic composition of the binocular field. Breese (1899, 1909) in an effort to establish the effectiveness of various factors on the perceptual sense of the eyes studied (a) light intensity (b) presence of figures (c) movement and (d) attention. A related problem concerned binocular fusion which consisted in making a single cortical response to the combination of the two retinal fields Hecht - (1928) experimented with mixtures of colours in an attempt to clarify the findings of the Young - Helmholtz three-component theory of retinal response whilst Bills (1931) studied the oscillations in the perceptions of ambiguous figures; the shifts of binocular rivalry or in viewing ambiguous figures were shown to be not mere shifts of attention. More recent experiments on ambiguous identifications with reduced sensory data have thrown more light on the complicated nature of perception. A number of experiments by Hastorff (1950) Ames (1951) and Ittelson (1951) indicated that the apparent shape, size, and distance of objects seen monocularly with surroundings obscured, appeared to be determined by what the observer believed to be the identity of the objects. Another set of experiments by Johansen (1955) showed how the perceived configuration, although its formal characteristics appeared quite definite, nevertheless differed radically from the stimulus data. Piaget and Stettler von Albertini (1954) threw some light upon the development of inferential thinking in young children by studying their reactions to simple forms (Circle, Square, etc.) The various aspects of the problem have been given succinctly thus by M.D.Vernon "Whenever the sensory data are scanty or ambiguous, or incongruities occur in the perceptual situation, observers tend to employ processes of inferential thinking to arrive at satisfactory identifications. Such inferential thinking also appears when the observer is called upon to make accurate judgements about events which ordinarily might not be closely observed. In making inferences, observers utilize schematical

M.D. Vernon: "Cognitive Influence on Perceptual Activity"
(p.35) B.J. of Psychology Vol. 48, Part I,
Feb. 1957.

organised knowledge and tendencies to react which they have acquired, either through experiences which are common to everyone as they grow up, or as the result of particular individual experiences and training. Thus some inferences and judgements are closely similar in different individuals whilst others show marked individual differences. Evidence supporting this thesis is given in examples drawn from everyday life and from experimental investigations. "This statement agrees remarkably with the findings of our present experiment where although the neutral stimulus evokes a similar range of responses in children who have undergone a series of comparable experiences it brings forth a completely different response in others where learning has followed an alternative path. We have seen the auditory and visual stimuli chosen from the James Associative Word List produce responses which are to a large extent predictable in accordance with the previous linguistic and socio-economic background of the subject.

Hebb has this to say about the phenomena of set, " when one considers the problem in the light of implicit assumption of sensory dominance of behaviour it becomes clear at once that the notions of set, attention, attitude expectancy, hypothesis, intention, vector, need, perseveration and preoccupation (Gibson 1941, pp. 781-782) have a common element and one element only. That element is the recognition that responses are determined by something else besides the immediately preceding sensory stimulation. It does not deny the importance of the immediate stimulus; it does deny that the sensory stimulation is everything in behaviour. All such terms then are a reference to the central process which seems relatively independent of afferent stimuli, defined by Hilgard and Marquis (1940) which I shall here call the autonomous central process. To Gibson's list can be added Pavlov's (1928) and Hull's (1943) stimulus trace, a lasting cerebral state, set up it is true by a specific stimulus but not transmitted and dissipated at once; Beach's (1942) central excitatory mechanism; Morgan's (1943) central motive state; and Kleitman's (1939) 'interest' a factor in wakefulness. All these things have the same property of an activity that has a selective effect on behaviour without being part of the present afferent excitation". This recognition that responses are determined by something else besides the immediately preceding sensory stimulation - Hebb's autonomous central process - is clearly demonstrated in the J.A.W.L. experiment where, for example, the stimulus

"PEN" can evoke a range of responses in either (or both) English and Welsh in accordance with early or later learning.

The following list of words illustrate the point:-

AUDITORY STIMULUS "PEN" evoked in various children -

<u>English</u>		<u>Welsh</u>	
Pad	point	clwyf	llaw
ruler	nib	rhiw	grisiau
fountain-pen	holder	torri	chwarae
wood	word	wiwer	plentyn
letter	work	tafod	het
hand	broken	danedd	person
inkwell	school	clystiau	gwynegu
sheep	leak	trwyn	dysgu
ink	board	llygaid	mawr
write	chalk	gwallt	bach
fill	line	ysgrifennu	da
pencil	desk	dolur	inc
paper	teacher	ysgol	athro
books	pupil, etc	coeden	mynydd, etc.

In other words a study of the response S on the one hand or of the stimulus R on the other is not enough - one has to take account not only of the input and output but also of the "backput" (analogy with feedback) as indicated by Drever in his discussion on "Perception and Action". We note, therefore, in our experiment that the stimulus can evoke a response which is not only conditioned by earlier learning but also by the fact that learning in the different modalities can produce a correspondingly different response in accordance with whether a particular linguistic system was learned early or late.

The importance of set, therefore, is well illustrated in the J.A.W.L. Experiment where the response in part depends on a cognitive inference in respect of the perceived stimulus. M.D. Vernon, as we have seen, has brought this new approach clearly into focus whilst Allport has this to say about the problem: "Some, for example, would rather explain set as a part of the learning process than regard it as something that determines the course and efficiency of learning. Some desire to interpret the perseveration of reactions as due to learning rather than the persistence of set. Sets are regarded by some as habits endowed with a dynamic quality (mechanism with "drives"). Intention may be something that is learned, so how can learning be due to intention?. In many instances also set competes for recognition with theories of motivation. As usual, the already established departments of psychology act as barriers to a new and broader interpretation that would require a new and drastic shake up of concepts.

The obstacle to a satisfactory theory of set that presents itself at the start is thus one of definition; though inability to define it may be, in turn, a symptom of the lack of an adequate theory. Let us say, that Hebb has tried to supply such a theory and let us say that the present J.A.W.L. Experiment has sought to prove the validity of some of the hypotheses arising from that theory. Allport then is in good company when he calls for a "drastic shake-up of concepts", for a similar plea has been made by Skinner (1959), Miller, Galanter and Pribram (1960), Luria (1961) and Drever (1961), or again Bruner (1957) has put it - "A theory of perception we assert, needs a mechanism capable of inference, and categorizing as much as one is needed in the theory of cognition."

We have shown how the onset, at an early age, of a physical disability such as congenital cataracts can inhibit normal language development: we have seen how normal development depends in part upon both the early and later disposition of the symbolic processes in terms of comparative philology. We have shown that many idiopathic and traumatic factors affect the functional level of intelligence, as well as the person's set. In addition when we attempt to measure the functional level account must also be taken of the artefacts of test construction.

We have shown that the responses of the Monoglot English Control Group to neutral verbal auditory and visual stimuli are entirely in English; the responses of a first language Welsh Bilingual Experimental Group tend to be largely in Welsh whereas the children of a first language English Bilingual Group who learned Welsh before the age of five and who continued to receive instruction in both languages tended to respond to auditory stimuli in Welsh and to the visual stimuli in English. The response of this latter group, however, depended upon the linguistic set of the individual and this set involved a "code switching" process that could be induced or modified at the will of the person concerned in accordance with the context of need for verbal expression.

We have suggested as far as test construction is concerned that it is not enough to know the facility value of test items, since the corresponding responses will incorporate a qualitative appraisal of the incoming stimulus before an answer to the question is given. In the case of the Healy Pictorial Completion Test No.1., referred to above, although the stimulus question may appear simple the response may demand an answer at several levels of cognition - that is, illogically, at the sensori-motor level but in terms of association of ideas or relational thinking at the perceptual and conceptual level.

When we look at the overall picture at a higher intellectual level in terms of the symbolic processes the scene becomes more complicated: when we introduce two languages the factors influencing individual differences of response are multiplied. Nevertheless it is by studying this very multiplicity of responses that our perspective of the problem becomes clearer. In brief, a study of the comparative philology helps to throw light on the related problems of perception and learning. We can demonstrate by means of a simple experiment that the interpretation of a test question and the eventual answer, like love, lies in the eye and ear of the beholders.

Whilst bearing in mind the previously discussed results and findings of the J.A.W.L. Experiment let us consider the way that a sample of children from our experimental groups reacted to the administration of the "James Semantic Blank Mark III where a series of questions are arranged from words which may be either English or Welsh in meaning but where the solution of the problem depends upon the ability of the subject to recognize the set of the stimulus and the subsequent reasoning process lying behind the juxta position of the words.

The instructions for the administration of the James Semantic Blank: Mark III are in both languages as follows in English and Welsh - "Some of the following questions are in English and some are in Welsh. In each of the rows below there are five words. Find one word in each row which is unlike the other four and draw a line under it: then give the reasons for your answers".

"Y mae rhai o'r cwestiyniau sydd yn canlyn yng Nghymraeg neu yn Saesneg. Ym mhob rhes isod fe welwch bum gair. Ym mhob rhes chwiliwch am yr un gair, yr un mwyaf annhebyg i'r pedwar arall a thynnwch linell o dano: ac yna rhowch y rheswm am eich atebion".

The following questions were posed:-
Neutral Stimulus

<u>Neutral Stimulus</u>	<u>Expected Reponse</u>
1. Sir/Man/Person/Moron/ <u>Parch</u>	(English)
2. <u>Dawn</u> /Bore/Cut/Dig/Draw	(English)
3. Pen/Crib/Blew/ <u>Nod</u> /Cap	(Welsh)
4. Pig/Hen/Barn/Corn/ <u>Gaws</u>	(English)
5. <u>Men</u> /March/Cwt/Trot/Tail	(Welsh)
6. Sail/Brig/Helm/Punt/ <u>Bad</u>	(English)
7. Call/Hurt/ <u>Dull</u> /Mud/Pert	(Welsh)
8. Plant/Hoe/Dig/Pump/ <u>Had</u>	(English)
9. Robin/Brain/ <u>Gaws</u> /Cog/Pig	(Welsh)
10. Clog/Cot/ <u>Crib</u> /Brat/Cap	(Welsh).

Clearly all the above words can be interpreted either in English or in Welsh but the questions themselves can only

be answered successfully if the right set of associations are formed in a particular language, since five of the questions (viz. Nos. 1, 2, 4, 6 and 8) are designed for an English solution and the other five (viz. Nos. 3, 5, 7, 9 and 10) call for a Welsh solution.

In each question, however, an item has been built into the test to confuse the issue by impeding the train of thought if the subject vacillates from interpreting the stimuli in one language rather than another, thus, if a subject attacks the problem posed in question No. 1 wholly in English he eventually succeeds in finding the right response "parch": if he does not concentrate his train of thought in one language or another he may be confused by "Parch" = Reverend or confusion may be worse confounded by associating "Sir" (Shire) with "Man" (Place) or again "Man" with "Person".

The following present some of the basic built-in difficulties:

- (a) In question No. 1. "Parch" = English "Dry" but also Welsh "Reverend".
- (b) In question No. 2. "Dawn" = Welsh "Bore" (morning) but also Welsh "Skill".
- (c) In question No. 3. "Nod" = Welsh "aim" but also English "pertaining to head".
- (d) In question No. 4. "Caws" = Welsh "cheese" pertaining to farmyard.
- (e) In question No. 5. "Men" = English "Mane" pertaining to horse (Welsh "March").
- (f) In question No. 6. "Bad" = English generic term pertaining to "boat".
- (g) In question No. 7. "Dull" = Welsh "Manner" confused with Welsh "Hurt" (i.e. Dull).
- (h) In question No. 8. "Had" = Welsh "Seed" pertaining to garden.
- (i) In question No. 9. "Caws" = Welsh "cheese" but English sound.
- (j) In question No. 10. "Grib" = Welsh "comb" but in English pertains to "cot", etc.

The complexities of the James Semantic Blank Mark III are infinite. Here lies the proof, par excellence, of Hebb's dictum that "responses are determined by something else besides the immediately preceding stimulation".

The following is a boy's own description of the manner in which he solved the problems including that presented by question 8. This boy's reasons were given in Welsh - the following is a free translation:-

"I tried to see if any one (word) was different from the others in any language. Sometimes some of the examples are in English and in Welsh and I write down on paper the most appropriate.

e.g. Plant/Hoe/Dig/Pump/Had.

It is possible that "Pump" could be different from the others for two reasons.

- (1) Take the English meaning = "to cause something to move from one place to another".
- (2) Take the Welsh meaning = "Pump" = 5. This (number) has nothing to do with "Gardening" at all.

- (1) "Pump" in English might be taken to imply "pumping" water on the garden".
- (2) "Pump" in Welsh taken to mean the figure "5" has nothing at all to do with the garden therefore I take the word "Pump" in Welsh -

or again

If I were to take the question to be completely in English the word most unlike the other would be "HAD" ("to have").

The word "PUMP" would not enter into it at all since all the other words would be associated with gardening whereas "HAD" would not.

Therefore the word most unlike the others would be "HAD".

The following is the original Welsh Version: (verbatim)

'Rwyn treio i gael gweled os oes rhyw un yn anhebyg i'r lleill mewn unrhyw iaith. Ambell waith y mae rhai o'r engraiffiai yn Saesneg a Chymraeg, a'r un mwyaf golygus yr wyf yn ei rhoi i lawr ar y papur.

PLANT/HOE/DIG/PUMP/HAD

gallai Pump fod yn un gwahanol am ddau rheswm.

- (1) Ei gymeryd yn Saesneg Pump = I orfodi rhywbeth i fynd o un lle i'r nall.
- (2) Ei gymeryd yn Gymraeg = Pump = 5. Nid oes gan hwn ddim i wneud gyda garddio o gwbl.
- (1) Gallai Pump yn Saesneg feddwl i "bypio" dwr ar yr ardd.
- (2) Y mae Pump = 5 dim o gwbl i wneud a'r ardd felly yr ydwyf yn cymeryd Pump yn Gymraeg.

Petai mi cymeryd yr engraiffft yn hollol yn Saesneg, yr un anhebyg byddai 'HAD' = (cael).

Ni fyddai pump yn dod i mewn iddi o gwbl.

Byddai'r lleill yn cyfeirio at arddio eto ond ni fyddai"HAD!"

Felli yr un annhebyg fyddai"HAD."

The attached three scripts, with verbatim answers, are included in order to illustrate the type of thinking that occurs when a monoglot or bilingual child tackles a problem calling for verbal reasoning. The stimuli may initiate trains of thought which are mutually antagonistic and the pre-conceived set of semantic relationships can confuse the child's thinking unless, to use the concepts of Miller et alia, the linguistic "Plan" is held constantly before him.

In the case of the James Semantic Blank Mark III a Welsh meaning will intrude into an English train of thought (or vice versa) so that when the direct relationship of the four words is sought in contra distinction to the fifth - there is a tendency for two words to be paired (two pairs) whilst the fifth word is then considered different from the other pairs because it "does not fit." This phenomenon of pairing is accentuated when the English and Welsh meanings are confused.

The result is that the children find difficulty in carrying their reasoning process to its ultimate **conclusion** i.e., there is a failure to relate the four words together because another set of meaningful concepts appears to upset the train of thought. Furthermore, this pairing can take place in two different languages so that the meaning of one pair in English is related to another pair in Welsh leaving the fifth odd word as the possible answer.

A preconceived relationship is seen to upset the whole train of reasoning, e.g.

- (1) "DAWN" (English) is so closely associated to "BORE" (Welsh = morning) that many fail to shake off this association and are thus unable to solve the problem.
- (2) The "CALL" (English = Wise) "HURT" (English = Dull) and "DULL" (English = Manner) relationship appears to inhibit the right Welsh solution of this problem which calls for the elucidation of abstract ideas.

JAMES SEMANTIC BLANK. MARK III

TIME UNLIMITED

Example No.1.

SIR/MAN/PERSON/MORON/PARCH

"Moron" is Welsh for maid and the others are men.
Sir - man.

Person could be a man and parch is a preacher.
(Note: "MORON" (= English-carrot) confused with
'morwyn' (= English - maid)).

DAWN/BORE/CUT/DIG/DRAW.

To bore, to cut, to dig and to draw are all verbs
whereas the other is a noun.

PEN/CRIB/BLEW/NOD/CAP

The other four are associated with one's head and 'nod'
is an action made with one's head.

pen - head, blew - hair, crib - comb, cap - hat.

PIG/HEN/BARN/CORN/CAWS

A barn is a building and the other 4 are either made
grown or reared on the farm.

caws - cheese.

(Note: Vacillation between English and Welsh meanings).

MEN/MARCH/CWT/TROT/TAIL

March and trot are verb and cwt which means tail is the
same as tail.

: men is not common.

(Note: the right answer is reached for the wrong reasons).

SAIL/BRIG/HELM/PUNT/BAD

Sail, brig, helm are all parts of ship and are nouns.

Punt - pound is also a noun.

Bad is uncommon because it is an adjective.

CALL/HURT/DULL/MUD/PERT

Call - wise, hurt, dull and pert - pretty are all
adjectives whereas mud is a noun.

Mud is uncommon.

PLANT/HOE/DIG/PUMP/HAD

The 1st four are all verbs whereas "had" is Welsh
for seeds.

ROBIN/BRAIN/CAWS/COG/PIG

Caws - cheese. Cheese is a farm produce whereas the
others are all birds or associated with birds.

Robin, brain is plural of bran - blackbird.

cog - cuckoo, pig - beak

CLOG/COT/CRIB/BRAT/CAP

Crib is Welsh for comb which is an instrument which
is used.

The rest are articles of clothing i.e.

clog - cloak, cot - coat, brat - pinafore,

cap - hat.

Example No.2.

SIR/MAN/PERSON/MORON/PARCH

Moron because it is carrot and the others are people.

DAWN/BORE/CUT/DIG/DRAW

Dawn because it is morning and the others are something that you can do.

PEN/CRIB/BLEW/NOD/CAP

Crib is something in which babies sleep and the others are to do with the head.

Blew is hair in Welsh.

PIG/HEN/BARN/CORN/CAWS

Caws is cheese and the others are animals and have something to do with a farm.

MEN/MARCH/CWT/TROT/TAIL

Men because they are people and the others have something to do with animals.

SAIL/BRIG/HELM/PUNT/BAD

Punt because it is a pound and the others are boats and parts of boats.

Bad is boat in Welsh.

CALL/HURT/DULL/MUD/PERT

Because pert is pretty and the others are dull and things you do.

PLANT/HOE/DIG/PUMP/HAD

Pump because it is five and the others are to do with the garden.

Had is seed in Welsh.

ROBIN/BRAIN/CAWS/COG/PIG

Because caws is cheese and the others are birds and animals.

CLOG/COT/CRIB/BRAT/CAP

Crib because babies sleep in it and the others are clothes so crib is different from the others because you don't wear it.

Clog is cloak.

Cot is coat.

Brat is apron.

Cap is cap.

JAMES SEMANTIC BLANK MARK III

Example No.3

SIR/MAN/PERSON/MORON/PARCH

Y mae moron yn ffrwyth (strawberry), ar lleill yn cyfwyros at rhyw person.

DAWN/BORE/GUT/DIG/DRAW

Enw or amser o'r dydd yw bore. Y mae'r lleill yn bethau sydd yn digwydd - yn Berfau mewn rhyw ffordd neu gilydd.

PEN/CRIB/BLEW/NOD/CAP

Nod yw talcen (rwy'n credu) a'r lleill rhywbeth i wneud a top y pen.

Y mae Pen yn cyfeirio at rhywbeth i ysgryffenu a'r lleill rhywbeth i wneud a phen.

PIG/HEN/BARN/CORN/CAWS

Y mae Barn yn adeilad, a'r lleill yn fwyd a dyfwyd ar fferm neu a'i bod yn byw ar fferm ac yna yn cael ei llad i wneud bwyd.

MEN/MARCH/CWT/TROT/TAIL

Men yw dynion. Y mae'r lleill igyd yn cyfwyros at rhyw bethau i wneud a cheffyl.

SAIL/BRIG/HELM/PUNT/BAD

Y mae Brig yn ddarn o goeden, a'r lleill igyd yn rhyw ddarn neu yn gwch neu long.

CALL/HURT/DULL/MUD/PERT

Y mae Pert yn rhywbeth a gallid gweld o'r tu allan, ond mae'r lleill yn rhywbeth mewnol - rhywbeth ni allid newid yn rhwydd. Gellir gwneud rhywyn yn bert wrth wneud.

PLANT/HOE/DIG/PUMP/HAD

Nid yw Pump yn llawer i wneud a garddio ond mae y lleill yn cyfeirio at rhywbeth i wneud a hwn.

Y mae pump yn meddwl = i erfodi rhywbeth.

Neu y mae pump yn meddwl = y figur pump = 5.

Yn pob un o rhain y mae garddio ddim yn dod i mewn.

ROBIN/BRAIN/CAWS/COG/PIG

A oes mis-print ar y gair Cog.

Y mae pob un ond Caws yn cyfeirio at aderyn neu rhan o aderyn. Petai Cog yn Gog fe byddai gog yn aderyn hefyd. Yn awr y rwy'n gweled Treigliad yw gog o cog.

GLOG/COT/CRIB/BRAT/CAP

Lleill i wisgo.

(3) of equal interest is the failure of many children to solve these problems.

PLANT/HOE/DIG/PUMP/HAD.

As previously indicated the solution of this problem calls for only limited thinking on the part of the English monoglot but it exercises the mind of the bilingual to a far greater extent. The bilingual child although he is familiar with the English meanings of all the words which are well within his compass associates the three words PLANT/HOE/DIG with garden and also includes the Welsh connotation of "HAD" (= English Seed) to complete his erroneous yet correct reasoning and therefore excluding "PUMP" for a variety of linguistic reasons not the least being the potent influence that the visual presentation of "PUMP" induces the bilingual child to associate the word with the number "5" (Welsh meaning) - a fact which as we have seen bears no relationship to words concerning gardening.

The problem therefore which faces the bilingual child as far as semantic organisation is concerned, is that of differentiating between similar and related words in either language. The following example suffices to illustrate the difficulty which faces a person of another language when attempting to express himself in English. The auditory and visual presentation of the words "insured" and "injured" are so similar as to cause hesitation in the minds of those linguistically inexperienced. In a bilingual situation as demonstrated above such similarities can be multiplied particularly when the juxta position of words from two distinctly different languages call for a constant reappraisal of incoming auditory and visual stimuli where the influence of set plays a predisposing part in solving the problem.

Thus the answer to a test question may be said to depend not only upon the statistically evaluated stimulus but also on the qualitative set of the subjects symbolic processes. In addition, the searching of the bilingual child will be more complicated in the James - Hebb sense that he has a broader field to cover (more cell assemblies, more phase sequences) than the monoglot - on the other hand the person who has learned to categorize efficiently symbolically on the conceptual and abstract level will enjoy certain advantages, as has been shown to be the case with the highly intelligent bilingual children in the J.A.W.L. Experiment - whereas the slower child who still functions on the perceptual level will find difficulty in sorting out linguistic concepts and hence be, to a certain degree,

more handicapped. It would therefore appear that the theoretical explanation of perception and learning on the human level calls for something more than mere conditioning to a stimulus.

Our findings would appear to support the view of the present writer that we should endeavour to assess the functional level of a child's intelligence rather than only estimate his I.Q. per se. The appraisal of a person's functional level would call for both a quantitative cum qualitative assessment which would in turn take account of ideopathic and traumatic factors affecting the cognitive and orrectic development of personality in terms of comparative philology: it would call for the analysis of the inter relationship between the stimulus and response data and would pre-suppose a multi-dimensional hypothetico-structural approach to the rationale of the assessment of individual differences in both learning theory and perception.

In brief we have shown that there is some ground for believing that Hebb's neuro-psychological theory merits serious consideration particularly with a view to modifying or changing our present outlook on S-R psychology. Our study of the comparative philology of functional intelligence has shown that the stimulus-response reaction is no simple phenomenon but involves both central and peripheral activity of such a kind as to have a direct bearing on the level of an individual's performance in the various modalities. These functional levels will be determined not only by the total pattern of sensation at the moment but by the extent in which early learning has assimilated the basic skills of listening speaking, reading and writing in one or a number of languages in accordance with age, aptitude and ability and socio-economic circumstances of the pupil. Such a statement appears to be well supported by the findings of the present James Associative Word List Experiment which tends to have substantiated the validity of our three hypotheses based on Hebb's underlying hypothetical constructs - or as Benjamin Whorf has also put it, "the forms of a person's thoughts are controlled by inexorable laws of pattern of which he is unconscious; these patterns are the unperceived systematizations of his own language shown readily enough by a candid comparison and contrast with other languages, specially those of a different linguistic family" - in the case of the J.A.W.L. Experiment, English and Welsh.

Let us return to the beginning - what we have said shows how impossible it is to infer from our present state of knowledge the physiological organizations mediating between the stimulus and the response. It also shows the inadequacy of purely psychological constructs which attempt to explain the relationship between what De Saussure has chosen to call between the method of obtaining "the association between a sound-image with a concept". We have seen that the physiological organizations upon which language depends are of great complexity, extend over considerable areas of the brain and are organised in time as well as space. These serve neuro-psychological functions possibly of such a kind of hypothetical construct as the "cell-assembly" and "phase-sequence" described by Hebb. Moreover the anatomical organization of the behaviour will have to account for the perceptual phenomena associated with the influence of early and late learning. We have seen from the findings of Senden, Riesen and the present James Associative Word List Experiment that there are reasonable grounds for supposing Hebb's suggestions to be valid: but for the present, however, the findings are still tentative and although we have shown that hypotheses based on Hebb's neuro-psychological theorizing tend to prove the validity of his reasoning there is still ample room, and means left open, for experimentation at the response end of the S-R theory. The task of the future is to use all the available modern methods of psychological diagnosis, linguistics, phonetics, communication theory, factor-analysis as well as the neurological study of the aphasias to correlate psychology with physiological functions. Already we can see the directions in which progress is likely to be made, Jerome Bruner has proposed four kinds of mechanisms for dealing with known phenomena of perceptual categorizing and differential perceptual readiness; grouping and integration, access ordering, match-mismatch signal utilization, and gating. Stanton (1958) has shown that for speech "delayed auditory feedback" may throw light on the disorder function of aphasia at the sensori-motor level. Aljouanine and

B.L.WHORF: "Language, Thought and Reality" (p.253)
J.B.Carroll ed.pub.Wiley and Technology Press,
New York, 1956.

KARL PEARSON: "The Grammar of Science" - Summary of the
material of science, p.312 Everyman Library
1892.

Mozziconacci (1948) Aljouanine (1956) and Bay (1957 and 1960) have studied phonetic disintegration. Furthermore Piaget's (1956) theory of operations where "motor activity is the fountain head of operations" and Drever's (1961) suggestion that "in particular the ability to discriminate backput from input seems to require that output - action, intention, innervation conation or whatever - must be cognitively present in its own right: it need not be conscious but it must be there". Schuell and Jenkins (1961) in their work on the reduction of vocabulary in aphasia, have shown as we have seen, that nineteenth century theories of isolated disturbances of single language modalities resulting from circumscribed lesions of topographical cortical areas are no longer tenable, but neither are theories of cortical equipotentiality. Probability theory has been applied to normal speech (Miller 1961, Licklider and Miller 1951, Fletcher 1953) and Herdon (1958) has applied it to aphasia in a statistical study of the vocabulary of aphasics. Penfield and Roberts (1959) have dealt with the biological time-table of language learning whilst Luria (1961) and Miller et Al (1960) at opposite ends of the S-R spectrum have discussed respectively the role of speech in the regulation of normal and abnormal behaviour, on the one hand, and the Plan and Structure of Behaviour on the other. This summary of investigations and postulates is by no means exhaustive but it suffices to show that the way has been opened for a New Look in perception research - much of which has been accomplished is demonstrational but it shows promise of a near future in which hypotheses such as those proposed and tested in the present J.A.W.L. Experiment - will be rigorously formulated and conceivably neural mechanisms postulated.

It would appear, therefore, that a study of semantic systems in the thought processes of bilingual children has helped to clarify some of the issues which arise in the comparative philology of functional intelligence. The use of language seems to distinguish human thinking from that of the animal and is almost always assessed by means of words and other symbols. An operational definition of intelligence in a context of comparative linguistics, such as we have suggested, would appear desirable since not all have access to the same language structures and the structures may in part determine performance; above all else we have demonstrated that this performance appears to be so affected by the degree of early

and late learning that the psychologist must perforce take account of the socio economic factors, much after the manner of Hebb's postulated Alpha/Beta Intelligence, before making any qualitative or quantitative assessment of a child's directed or non-directed reasoning levels in the manner suggested by the present writer where $B = f(A)$. In like measure educationists in the field of languages and technology might make a reappraisal of their curriculum and methodology in the light of recent scientific psychological principles with a view to taking a fuller part in the renaissance of Western Europe.

THE COMPARATIVE PHILOLOGY OF FUNCTIONAL INTELLIGENCE

A P P E N D I C E S

1. Applied Psychology: Carmarthenshire Policy.
- the basis of educational science in the
Local Authority.
2. Organisation of the School Psychological Service.
(a) 1960 Report (b) Diagram (c) Plans.
3. Distribution of Intelligence and Classification
of Symptoms.
4. Special Case History of Early Blindness (cataracts).
5. J.A.W.L. Experimental Groups:
- data regarding distribution of intelligence, etc.
6. Non-Verbal Reasoning Test:
- Carmarthenshire Norms with bilingual instructions.
7. Synchronic Description of Individual Bilingualism
(U.N.E.S.C.O.) - Mackey, Smith, Kehrli, James and
Nesheim.
8. (a) Previous Works by present author.
(b) Bibliography.
9. Examples of Tests and Schedules used in the
J.A.W.L. Experiment.

The aim of the Local Authority throughout the school life of the pupil has been to keep the door of educational opportunity wide open for any pupil who showed the desire and the will to develop his personality and abilities to the full. It was envisaged that such a scheme of educational guidance would lead to a form of vocational guidance, when advice would be available from the staffs of the schools concerning the range of subjects required to take up certain careers. Likewise liaison would be maintained between the schools and the Youth Employment Officer who would by means of close consultation with the schools, be able to advise pupils and parents as to the best manner of furthering their careers, having regard to their aptitude and ability for certain occupations.

In this manner, therefore, the Authority hoped to establish a system of Educational Guidance merging gradually into a form of Vocational Guidance which would enable pupils at any stage in their school career to make the most of the opportunities afforded them. It is clear that such a system was based on a bilingual policy of education and that one of the important points to ascertain was the best age for the introduction of the first and second language.

This scheme has sought to contribute in the words of the 1944 Education Act, "towards the spiritual, moral, mental and physical development of the community to meet the needs of the population of the area". In the Ministry of Education Pamphlet "The Road to the Sixth-Form" it has been clearly stated that "the curriculum must follow the child" and since language is the main vehicle for the development due regard must be paid to the linguistic aspects of the child's personality, "this implies neither licence nor vagueness of purpose, but only that every curriculum should be judged in terms of its effect upon the pupils for whom it exists". Such a criterion includes the acquisition of knowledge and techniques in various subjects but the ultimate question must still be whether the pupils are making the best possible progress and whether any alterations in their curriculum would help to make their progress better still. The application in detail of such a criterion to the curriculum of Primary and Secondary Schools alike is a comparatively new and most welcome development though this

implies no disrespect for the work of teachers in the earlier generations. Many of these knew and loved their children and they certainly knew how to teach, but too often their efforts were hampered by rigidities of the curriculum which followed from the arbitrary standards of subject knowledge then in vogue; if the children did not measure up to the common yard-stick, it was unfortunate but subject teaching could not be modified to meet the needs of the individual child. The school of today cannot afford to be complacent about such matters; its teachers will not be satisfied if they cannot feel that their work represents a sincere and considered effort to give each single pupil what he needs most". From this statement we see that the Ministry of Education is very much alive to both the basic and the ever-changing problems of learning - not the least of these problems is that in which we are carrying out our experiment, namely, the possible need for alterations in our attitude with regard to language teaching, for example, should both languages, in certain circumstances, be introduced to the child in the infant department so that the auditory phonemic structures can be more easily assimilated? This is but one of the many linguistic questions which faces a country which is seeking to play a larger part in European affairs.

REPORT OF EDUCATIONAL PSYCHOLOGIST, YEAR 1960

SCHOOL PSYCHOLOGICAL SERVICE

In Carmarthenshire arrangements for Child Guidance and Special Educational Treatment have been functioning in accordance with Circulars 347 and 348 of the Ministry of Education dated 10th March, 1959, where a School Psychological Service is working smoothly with the School Health Service.

A valuable development is taking place in the Llanelly Divisional Executive Area where the local Education Authority is in the first stage of preparing a building (to be opened in 1961), in close proximity to the School Health Clinic and to Old Road School Remedial Education Unit (see account below) in order to house a Central Diagnostic Unit which will combine a comprehensive Child Guidance Service with a Remedial Education Service where the Authority's School Medical Officer, Psychologist, teacher and social worker as well as the consultant psychiatrist of the Regional Hospital Board can meet and discuss the assessment, placement and treatment of the various categories of children who attend for reasons ranging from educational guidance to "school phobia". The aim is to have an integrated service to help the ordinary and "problem" child.

A further example of the value of such an integrated approach has been amply demonstrated by the success of the Remedial Education Unit for Educationally Sub-normal and Maladjusted children which has been established within the context of an ordinary school where stress has been laid, not in regarding children as "cases" but as ordinary beings in need of social and educational rehabilitation.

During 1959/60 the psychologist has devoted much of his time to putting this unit on a firm basis as a preliminary measure to integrating it with the projected central Diagnostic Unit nearby.

This Remedial Education Unit at Old Road School, Llanelly, through the good offices of the headteacher has been established within the curtilage of the ordinary school and the work is proceeding generally in such a manner that the educationally sub-normal and maladjusted children who attend the three classes in the Unit are not regarded as other than ordinary children who also take

part in the corporate life of the school; an outstanding example of the value of this approach has been shown by the improvement of a boy referred for "school phobia" who has passed through the class for maladjusted pupils and voluntarily now attends the "composite class" for retarded children within the ordinary school every day after travelling a single journey of fifteen miles.

The remedial unit is divided into three classes each with a qualified teacher as follows:

(i) Class for educationally subnormal (dull and backward) children,

I.Q.: range 50-80 : Age range: 8-12

Those children are ascertained by the School Medical Officer and the Educational Psychologist.

Some of them suffer from multiple defect and are often emotionally disturbed. There has been a demonstrable improvement in their social relations and in their general condition.

(ii) Class for Maladjusted children.

I.Q.: range 90-160 : Age range 7-15

Those children after an initial diagnosis by the medical officer, psychologist and consultant psychiatrist are arranged in structured groups by the teacher or may be given individual sessions. The 35 children who attended for special educational treatment in 1960-61 were drawn from primary and secondary schools. Their rate of educational progress ranged from 1 year 4 months in 100 attendances to 3 years 2 months in 24 attendances.

As the children improve their case is considered by the psychologist and arrangements are made for them to be either discharged or attend for a further period in the composite class. The interesting feature of this class is that it is supplied with an abundance of creative material which in turn allows the children to carry out a variety of activities in carefully structured groups but yet in a permissive atmosphere of benevolent discipline. The result is that the children are able to give free play to their emotions and express their difficulties in an environment specially designed to improve their mental health and educational development.

(iii) Composite Class for Educationally Subnormal (Backward and Retarded) Children.

I.Q. range 80 plus : Age range 9-11

This class forms the connecting link between the Remedial Unit per se and the ordinary school : it consists of twelve pupils of Old Road Primary School and a varying number of part-time pupils passed on from the "maladjusted class".

It performs the dual task of providing Remedial Education for under-functioning children of the parent-school and rehabilitation within a normal class for visiting children - as an extension of their treatment from the Maladjusted Class. Over a period of six months the children in this class have shown an educational gain ranging from 6 months to 24 months.

The full-time pupils are drawn from the third and fourth year 'B' Stream classes of Old Road School and are selected on the basis of low educational attainment during their first two years in the primary school. The object of Remedial treatment at this stage is to assist the child to function at an optimum level before leaving the primary for the secondary stage of education where new emotional and other difficulties may increase his difficulties and inhibit his development.

The part-time pupils transferred from the Maladjusted Class attend for more formal remedial work in reading, for the extension of individual relationships and generally for the treatment of educational problems within a normal class. In the case of "School Phobia" this class provides a road of return and an opportunity for the establishment of therapeutic relationships with other children as well as with the teacher. In the main, part-time pupils attend in the afternoons on the days when they visit the maladjusted class : friendships are soon formed and there their presence is not only accepted but eagerly anticipated by the class, as a whole.

This class is fully integrated with the remainder of the school as all corporate activities and friendships with children in the classes are fully maintained both in play and out of school pursuits. No distinction is made against members of the class by other pupils and misgivings which may have been felt by children re parents on entry have been banished by the increased confidence and satisfaction which result from a taste of success.

In addition to the three classrooms there is an activity room where the children can perform many crafts as well as a reception room where parents can be interviewed or where the children can receive personal tuition from the teacher or have an individual examination by the psychologist.

Remedial Units for backward children within the age of eleven have also been established in the secondary schools of the county for example in Llandebie, Ammanford, Lower Gwendraeth High and Carmarthen.

The policy of the Carmarthenshire authority to treat handicapped children as far as possible within the context of the ordinary school is also followed in the case of the Unit for Partially Deaf Children where one boy and six girls are receiving special educational treatment from a qualified teacher of the deaf and also take part successfully in the corporate life of Tumble Primary School.

The following provision was made for children in Residential Special Schools and Hospital Special Schools.
Highmead Residential Special School for E.S.N. Pupils

	<u>Boys</u>	<u>Girls</u>	<u>Total</u>
No. on roll last day of Christmas Term 1959	26	18	44
Discharges 1960	14	6	20
Admissions 1960	12	6	18
No. on roll on first day of Spring Term 1961	24	18	42

The children at Highmead made relatively satisfactory progress having regard to the limits of their specific disabilities. Many oblique methods of teaching including animal husbandry have been developed to further the interest and education of these children, many of whom have been maladjusted and sociologically deprived.

Through the joint consultation of the Principal School Medical Officers of the three authorities the services of a trained audiometrician (Health Visitor) and a speech therapist have been continued.

Likewise through the co-operation of the three authorities the respective Youth Employment Officers have arranged for the children to receive Vocational Guidance.

In addition the following numbers of physically handicapped pupils attending Residential Special Schools and Hospital Special Schools on first day of Spring Term 1961:

	<u>Boys</u>	<u>Girls</u>	<u>Total</u>
(i) Blind	1	2	3
(ii) Partially Blind	1	2	3
(iii) Deaf	4	6	10
(iv) Partially Deaf	1	2	3
(v) Delicate	6	5	11
(vi) Physically handicapped	7	6	13
(vii) Maladjusted	-	1	1
(viii) Epileptic	2	0	2
	<u>22</u>	<u>24</u>	<u>46</u>

Likewise 14 children who were unable to attend school received Home Tuition i.e. 6 boys, 8 girls.

A further 10 children were receiving special educational treatment in Glangwili Hospital and Tumble Isolation Hospital on the first day of Spring Term 1961.

	<u>Boys</u>	<u>Girls</u>	<u>Total</u>
Tumble Isolation Hospital	2	1	3
Glangwili Hospital	2	5	7
	<u>4</u>	<u>6</u>	<u>10</u>

During 1960 a total number of 138 children received special educational treatment at Glangwili Hospital and Tumble Isolation Hospital. The number being made up as follows:-

	<u>Boys</u>	<u>Girls</u>	<u>Total</u>
Tumble Isolation Hospital	15	11	26
Glangwili Hospital	47	65	112
	<u>62</u>	<u>76</u>	<u>138</u>

Details of the children clinically examined by the educational psychologist during 1960 and recommended for various forms of special educational treatment are appended below

	<u>Boys</u>	<u>Girls</u>	<u>Total</u>
(i) Educationally Subnormal (a) Retarded	5	2	7
(b) Backward	17	-	17
(c) Dull	11	3	14
Total	<u>33</u>	<u>5</u>	<u>38</u>
(ii) Ineducable	1	0	1
(iii) Maladjusted (wholly)	3	6	9
(iv) Educational guidance	5	4	9
	<u>42</u>	<u>15</u>	<u>57</u>

Of the 57 children examined in 1960 another group of 16 boys and 3 girls suffered from various degrees of maladjustment and were referred for psychiatric opinion. (This figure does not include wholly maladjusted children).

A most valuable feature of the School Psychological Service has been the assistance given by headteachers and staff of the schools in making a detailed return of handicapped pupils who require or are receiving special educational treatment. Although it has only been found possible to examine the most urgent of these referrals, since it can be assumed that most backward children are receiving individual attention in their own schools, this Return has facilitated the clinical assessment and ascertainment of the more gravely handicapped pupils. It has also

enabled the authority to draw up a development plan for a comprehensive child guidance service.

The Education Welfare Officers have provided valuable sociological reports on the home circumstances of E.S.N. and maladjusted children and have facilitated the transport arrangements for transferring children to and from Special Schools. They have also maintained close co-operation between schools, parents and the School Psychological Service.

Much of the spade work done by the Psychologist in previous years has borne fruit in 1960 particularly in the shape of remedial education units where excellent work has been done by the teachers in rehabilitating handicapped pupils. In 1961 the new Diagnostic Unit will be opened and further consideration will be given to the establishment of a hostel for maladjusted children. The success of Carmarthenshire's progressive policy is confirmed by the many requests received from outside bodies including University agencies to allow people to visit our new units.

It is also of interest to note that a number of teachers are being seconded by this authority on a university course in order that they may obtain extra qualifications for teaching E.S.N. and maladjusted pupils.

Furthermore the psychologist is also taking part in a part-time course and in 1961/62 a full-time course for serving teachers. The work done in this direction by the staff of the Swansea University College, Department of Education will prove invaluable in increasing the number of teachers trained in the field of special educational treatment.

Thus it has been possible by dovetailing school records, including the results of the eleven-plus assessment, with the clinical records of handicapped pupils, to facilitate through the School Psychological Service, the provision of a variety of types of education for different categories of pupils according to their age, aptitude and ability - in such a way that the quick, the slow and the handicapped have a chance to profit in accordance with the Carmarthenshire Authority's policy statement "Keeping Open the Door of Educational Opportunity".

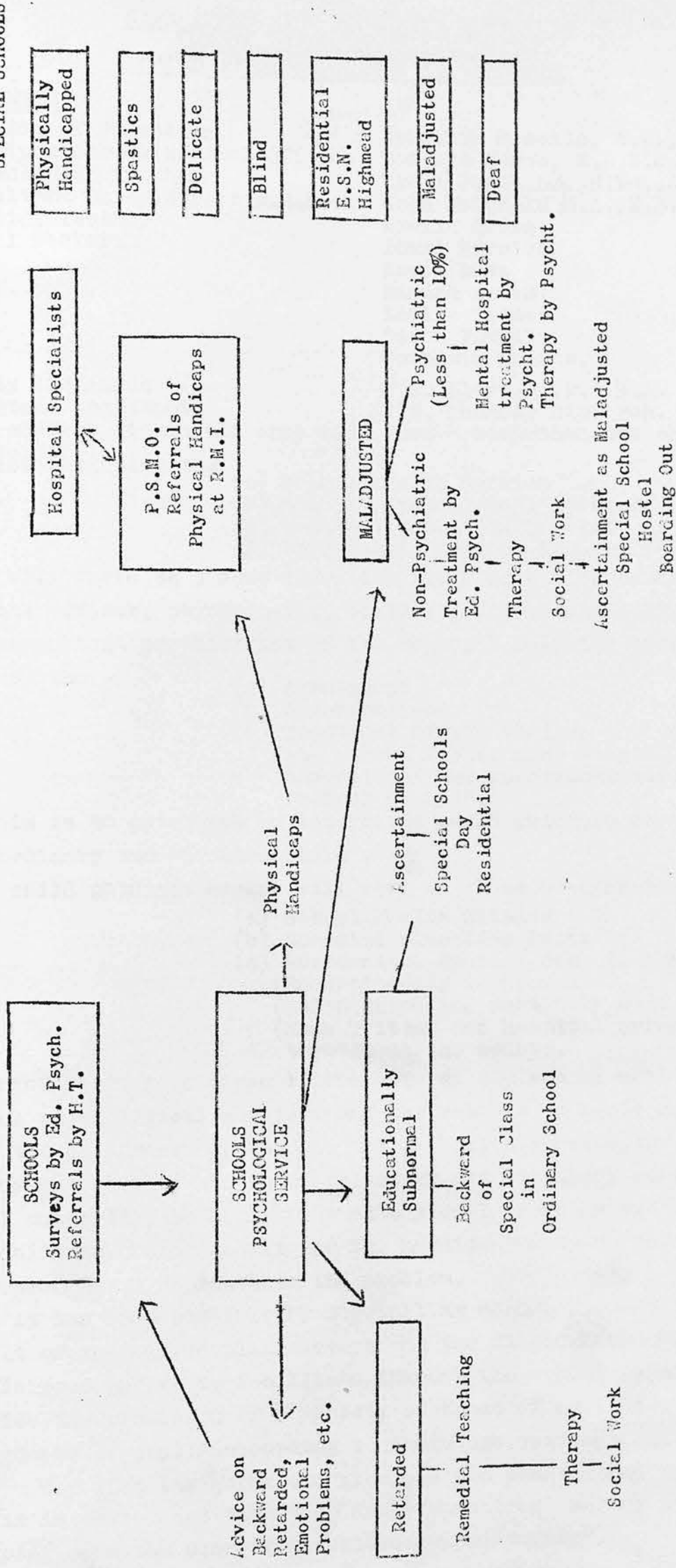
In brief, there has been a close liason between the School Psychological Service and the School Health Service and the schools themselves as well as with the other statutory services of the Local Authority to enable the educational progress and mental health of the children -

both the fit and the handicapped to be safeguarded through a comprehensive approach to their personal problems.

CYRIL JAMES

Education Department,
County Hall,
Carmarthen.
February, 1961.

SPECIAL SCHOOLS



ORGANISATION OF SCHOOL PSYCHOLOGICAL SERVICE

CARMARTHENSHIRE EDUCATION COMMITTEE
SCHOOL PSYCHOLOGICAL SERVICE
CHILD GUIDANCE CENTRE AT LLANELLY

PERSONNEL

Director of Education	Iorwerth Howells, B.A., Ll.B.
Principal School Medical Officer	Gerallt Jones, M.B.B.S., D.P.H.
Psychologist in Charge	Cyril James, B.A., B.Ed., A.B.F.S.
Consultant Psychiatrist R.H.B.	John McDonald M.A., M.B., Ch.B., D.P.M.
Remedial Teacher	Sheila Evans
Social Workers	Idwal Harries
	David Lake
	Eirian Lewis
	Leslie Thomas
	Susan Powell
	Patricia Thomas.

County Architect W.T. Lloyd, A.R.I.B.A.
Assistant Architect I.G. Thomas, Dip.arch. A.R.I.B.A.
This central diagnostic unit will form a comprehensive child guidance service including the

- (a) School Health Service
- (b) School Psychological Service
- (c) Remedial Education Service
- (d) Psychiatric Service R.H.B.

This will serve as a base where the local education authority's school medical officer, psychologist, teachers, and social workers as well as the consultant psychiatrist of the regional hospital board, can meet and discuss the

- (a) Assessment
- (b) Placement and
- (c) Treatment of the various categories of children who attend for reasons varying from educational and vocational guidance to "school phobia".

The aim is to establish an integrated child guidance service to help the ordinary and "problem child".

This child guidance centre will work in close co-operation with the

- (a) School Health Clinics
- (b) Remedial Education Units
- (c) Residential Special Schools for
(Educationally subnormal
Maladjusted and partially deaf children
Home Tuition and hospital arrangements
throughout the county.

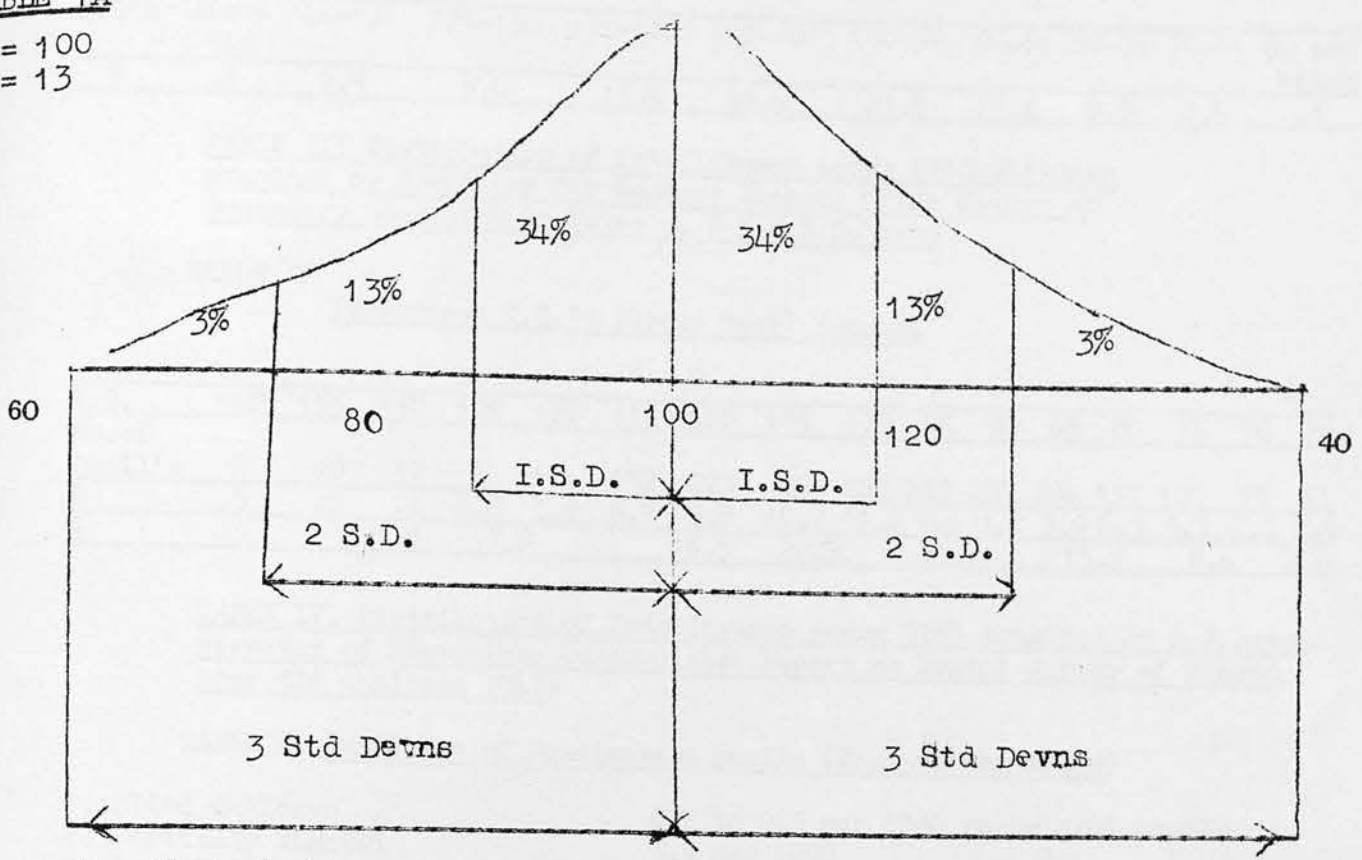
In brief there is a close liason between the school health service, school psychological service, and the schools themselves, as well as with the childrens department, the probation service, the youth employment service and other voluntary and statutory services of the local authority, to enable the educational progress and mental health of the children, both the fit and the handicapped to be safeguarded through a comprehensive approach to the problem.

Thus it has been possible by dovetailing SCHOOL RECORDS including the result of the eleven plus surveys and the CLINICAL RECORDS of the handicapped pupils to facilitate through the school psychological service the provision of a variety of types of education for different categories of pupils according to their age, aptitude and ability in such a way that the quick, the slow and the handicapped have a chance to profit in accordance with the Carmarthenshires' policy statement of "Keeping Open the Door of Educational Opportunity".

NORMAL DISTRIBUTION OF I.Q. (THEORETICAL)

TABLE 1A

X = 100
S = 13



The distribution according to the normal curve with a mean value of I.Q. 100 whose standard deviation is I.Q. 13 units.

TABLE 1 B. Theoretical "Normal" Distribution with Standard Deviation of 15.

I.Q.	50	50/59	60/69	70/79	80/89	90/99	100/109	110/119	120/129	130/139	140/149	150+
N. Cases	.05	.33	1.92	7.3	15.3	25.1	25.1	15.3	7.3	1.92	.33	.05
I.Q.	150	140/149	130/139	120/129	111/119	100/109	90/99	80/89	70/79	60/69	50/59	50

TABLE II Percentages of I.Q.'s (Scotland)

SD	140	135	at and over			115	110	Btwn 110 & 90	90	85	Below		70	65	60
			130	125	120						80	75			
13	.11	.36	1.1	2.7	6.1	13	22	56	22	13	6.1	2.7	1.1	.36	.11
16	.62	1.5	3	6	11	17	27	46	27	15	11	6	3	1.5	.62
17	.91	2	3.8	7.1	12	19	28	44	28	19	12	7.1	3.8	2	.91

Distribution of Percentages of I.Q. for different Standard Deviations (Vide "The Testing of Intelligence" by Hamley - Mental Survey of Scottish Children p.69 Pub. Evans).

(Refer to thesis page 117)

TABLE III. (3) Percentage I.Q.'s (Group Test) Northumberland

I.Q's	Above 140	140-131	121-130	111-120	110-101	100-91	90-81	80-71	70-61	60 and below
%	.3	2.9	8.6	15.2	22.4	23.9	15.2	8.8	2.4	.3

TABLE III Distribution of Intelligence among 2710 children examined by Professor Sir Godfrey Thomson (Vide Future of Secondary Education in Wales p. 9 H.M.S.O. 1949)

TABLE IV

Percentage I.Q.'s (Group Test) Swansea

I.Q.	140	135	130	125	120	115	110	105	100	95	90	85	80	75	70	70-
No. of Pupil's	8	20	37	64	114	152	222	24	269	283	254	204	157	120	70	51
%	.3	.9	.6	2.8	5.0	6.7	9.8	10.7	11.8	12.5	11.2	9.0	6.9	5.3	3.1	2.4
%	.3		1.5	7.8			16.5	22.5		23.7		15.9		8.4		2.4

TABLE IV. Distribution of Intelligence among 2269 examined by L.J.Drew, Director of Education. (unpublished Report on Mental Survey of Eleven year old children 1947)

TABLE V. Incidence of Handicapped pupils (England and Wales)

1. Blind Children	0.2 to 0.3 per 1000 registered pupils.
2. Partially Sighted	1.0 per 1000 " "
3. Deaf Children	0.7 to 1.0 " " "
4. Partially Deaf Children	1.0 upwards per " " "
5. Delicate Children	1 to 2 per cent " " "
6. Diabetic Children	No estimate available " " "
7. Epileptic Children	0.2 per 1000 " " "
8. Physically Handicapped Children	5 to 8 per 1000 " " "
9. Children with Special Defects	1.5 to 3 per cent of " " "
10. Maladjusted Children	About 1 per cent of " " "
11. Educationally Sub-Normal Children	10 per cent of " " "

TABLE V. Distribution of Handicapped Pupils published Pamphlet No.5 Special Educational Treatment H.M.S.O. 1946

TABLE VI. Incidence of Educationally Sub-normal Children (England and Wales 1946)

Number of children requiring Special Educational Treatment estimated at 10 per cent.

Special Educational Treatment at Ordinary School 8-9 per cent.

Special Educational Treatment at Special School 1.2 per cent (Day Special School (1.0 per cent. (Boarding Special School (2.0 per 1000.

(Compare Scottish Education Department Recommendations H.M.S.O. 1951).

(Refer to thesis page 117).

NOTES ON MALADJUSTMENT
CLASSIFICATION OF SYMPTOMS

1. NERVOUS DISORDERS:

- (i) Fears - anxiety, phobias, timidity, over-sensitivity.
- (ii) Withdrawal - unsociability, solitariness.
- (iii) Depression - brooding, melancholy periods.
- (iv) Excitability - over-activity.
- (v) Apathy-lethargy-unresponsiveness, no interests.
- (vi) Obsessions - rituals and compulsions.
- (viii) Hysterical fits, loss of memory.

2. HABIT DISORDERS.

- (viii) Speech, stammering, speech defects.
- (ix) Sleep - night terrors, sleep-walking or talking.
- (x) Movement - twitching, rocking, head-banging, nail-biting
- (xi) Feeding - food fads, nervous vomiting, indiscriminate eating.
- (xii) Excretion - incontinence of urine and faeces.
- (xiii) Nervous pains and paralysis - headaches, deafness etc.
- (xiv) Physical symptoms - asthma and other allergic conditions.

3. BEHAVIOUR DISORDERS.

- (xv) Unmanageableness - defiance, disobedience; refusal to go to School or work.
- (xvi) Temper.
- (xvii) Aggressiveness - bullying, destructiveness, cruelty.
- (xviii) Jealous behaviour.
- (xix) Demands for attention.
- (xx) Stealing and begging.
- (xxi) Lying and romancing.
- (xxii) Truance - wandering, staying out late.
- (xxiii) Sex difficulties - masturbation, sex play, homosexuality.

4. ORGANIC DISORDERS.

- (xiv) Conditions following head injuries, encephalitis or cerebral tumours; epilepsy, chorea.

5. PSYCHOTIC BEHAVIOUR.

- (xv) Hallucinations, delusions, extreme withdrawal, bizarre, symptoms, violence.

6. EDUCATIONAL AND VOCATIONAL DIFFICULTIES.

- (xvi) Backwardness not accounted for by dullness.
- (xvii) Dislikes connected with subjects or people.
- (xviii) Unusual response to school discipline.
- (xix) Inability to concentrate.
- (xx) Inability to keep jobs.

7. UNCLASSIFIED.

(Refer to thesis page 117)

SPECIAL CASE HISTORY: R.L.T. (date of birth - 22.6.50)

Early history of virtual blindness resulting from cataracts on both eyes. Walking at age 3 years/talking 4 years/control of bladder and bowels 4 years/nocturnal enuresis until 5 years.

29.4.55. Hospital Report Senior House Officer

Diagnosis Galactosaemia with principal complication, cataract. Admitted for needling of his cataract to left eye. This was carried out on the 16.4.55., it being noted that the capsule was very tough and attached to the iris. Further needling will be undertaken in one month.

The child's general condition is good though there appears to be a very considerable degree of mental defect.

10.6.55. Medical Report: almost blind in both eyes.

30.6.55. Readmitted to hospital for further needling of his cataracts. The operation was not entirely successful, a further attempt had to be postponed because of upper respiratory infection.

2.7.55. Medical examination partially sighted and indistinct speech. Special Educational Treatment not recommended. Parents state he has improved physically and mentally. Prognosis: Very uncertain.

30.5.56. School Nurse reports that this boy is attending school and is making definite educational progress.

6.2.58. Speech improving: Consider for Residential Special School for Blind.

13.9.58. Recommendation re: supply of telescopic eye lenses.

27.5.59. School Medical Inspection: improving: a bright boy but slow developing.

18.9.59. Headteacher's Report: making good progress in Reading and satisfactory progress in English though his output is naturally less and much more laboured than that of other children. His Arithmetic, however, is not up to the same standard. He knows his tables well and understands the working of the four rules but he does not have much success in his unaided written work which makes one wonder whether he can see a sum as a whole. His speech is deliberate clear and precise. At play he joins with other children and enjoys himself. On the whole for a child with so grave a disability it would probably be true to say that he is making quite remarkable progress.

- 12.3.60. Recommendation for retention in Primary School for extra year.
- 22.6.60. Psychologist's Assessment (Regional Hospital Board).
Stanford/Binet Scale: CA = 9-10/12: MA = 9-10/12
IQ = 92.
(Could see well enough to complete test on Binet Card Material for Partially Sighted).
Reads well and records what he reads. Attention and concentration good. Auditory memory good but responses slow and it takes him a long time to grasp what is said.
Very poor at seeing absurdities whether verbal or in pictures and abstract reasoning ability is only fair.
Arithmetical reasoning is poor and has little concept of numbers.
Recommendation: Remedial Teaching.
- 18.8.60. New type of lenses supplied: sight improved.
Distant vision R 2/60 and 6/36 (distant lenses).
- 2.4.62. Psychologist's Report (L.E.A.(present writer)).
This boy is at least average plus intelligence (TM/FL: CA = 11-9/12: MA = 12-4/12: IQ = 105+), but his functional level which has been adversely affected at an early stage has improved steadily over the years until he has now come to terms with his disability and is seeking to reach the Eleven Plus Standard for entry to a Grammar School or Residential Special School with similar facilities.

PSYCHOLOGIST'S REPORT ON PROBLEM CASES

Name of Child R.L.T.

Address _____ Date of Birth 22.6.50

_____ Date Referred 29.3.62

School _____ Date of Interview 2.4.62.

Problem as Referred Educ. Guidance (NID/105+/Eye Defect/Speech Defect).

Source of Referral Director of Education and County Medical Officer

Intellectual characteristics Average plus.

Test Results TM/FL CA = 11⁹/12 MA = 12⁴/12 Est. IQ. = 105+

Functional level inhibited by physical disabilities

- of. (1) Report 29.4.55 : "Very considerable degree of mental defect (D.W. Evans, S.M.O.)
 - (2) Report 22.6.60 : CA = 9¹⁰/12 / MA = 9⁰/12 / IQ. 92 (Psychologist Whitchurch).
- Note gradual improvement in his general condition.

Scholastic attainments _____

Relatively satisfactory in basic subjects. ERA = 12+

Social and emotional characteristics Socially immature and withdrawn but tries

hard to come to terms with his gross physical disability. There are certain overt symptoms of emotional difficulty (habit disorders) associated with his generalised visual problems.

Physical Appearance and Health Vide medical records.

Galactosaemia/Cataract/Gross Eye Defect (telescopic lenses).

Home Background Excellent. Father school teacher/mother housewife.

Extremely interested in the boy's welfare but naturally over-anxious and overprotective.

Summary This boy appears to be of at least average intelligence. His

functional level which has been adversely affected by gross eye defect has improved steadily over the years. He appears to have come to terms with his disability and is trying hard to overcome it.

Recommendations (1) Reconsider the recommendation in the light of the results

of the eleven plus allocation procedure.

N.B. In the case of this boy being considered as a borderline grammar candidate it is recommended he be given the benefit of the doubt.

- (2) Speech Therapy.
- (3) Possible R.S.S. : Exhall Grange.

CYRIL JAMES.

Educational Psychologist.

Date 2.4.62.

CASE HISTORY

Surname R.L.T. Christian Names -----

(Father's occupation (1) Teacher (2) -----

(3) ----- (4) -----

(Mother's occupation (1) Housewife (2) -----

(3) ----- (4) -----

(Child's place in family at transfer from Infant to Junior 1/2

at transfer from Junior to Secondary 1/2

Physical defects (where appropriate).

Glasses for reading - Telescopic Lenses. Glasses at all time - Yes

Slight deafness -----

Left handed -----

Recommendations for special education:

E.S.N. Retarded NID/105 + /Eye Defect and Speech Defect.
(Multiple Defect).

Backward -----

Dull -----

Occupational Training Centre -----

Child Guidance -----

Remedial Teaching -----

Speech Therapy Speech Defect

Partially sighted -----

Partially deaf -----

Remedial Orthopaedics

Residential -----

Home Tuition -----

Other (1) Review

(2) SET at Exhall Grange Special School

(3) Consider for ".G.C.E." and Commercial Course.

General:

J.A.W.L. EXPERIMENTAL GROUPS

DISTRIBUTION OF NON-VERBAL REASONING TEST RESULTS AT 11+

I.Q.	f	x	fx
130-134	3	5	15
125-129	6	4	24
120-124	10	3	30
115-119	15	2	30
110-114	17	1	17
105-109	12	0	0
100-104	10	-1	10
95-99	8	-2	16
90-94	9	-3	27
85-89	8	-4	32
80-84	2	-5	10
	100		+21

Bilingual:
First Language Welsh

I.Q.Mean = 108.05

I.Q.	f	x	fx
130-134	3	5	15
125-129	6	4	24
120-124	11	3	33
115-119	17	2	34
110-114	16	1	16
105-109	9	0	0
100-104	12	-1	-12
95-99	9	-2	-18
90-94	7	-3	-21
85-89	8	-4	-32
80-84	2	-5	-10
	100		+29

Bilingual:
First Language English

I.Q.Mean = 108.45

DISTRIBUTION OF RESPONSES TO AUDITORY AND VISUAL STIMULI

Subject	X ₁	X ₂	D	D ²	Subject	X ₁	X ₂	D	D ²
1	25	1	24	576	51	25	0	25	625
2	25	1	24	576	52	25	0	25	625
3	25	0	25	625	53	25	0	25	625
4	25	0	25	625	54	25	7	18	324
5	25	1	24	576	55	25	0	25	625
6	25	0	25	625	56	25	0	25	625
7	21	0	21	441	57	25	2	23	529
8	25	0	25	625	58	25	0	25	625
9	25	0	25	625	59	25	1	24	576
10	25	19	6	36	60	25	0	25	625
11	25	0	25	625	61	25	1	24	576
12	25	0	25	625	62	25	6	19	361
13	25	1	24	576	63	25	0	25	625
14	25	13	12	144	64	25	0	25	625
15	25	0	25	625	65	25	0	25	625
16	25	0	25	625	66	25	0	25	625
17	25	0	25	625	67	25	0	25	625
18	25	1	24	576	68	25	0	25	625
19	25	0	25	625	69	25	1	24	576
20	25	2	23	529	70	25	0	25	625
21	25	0	25	625	71	25	0	25	625
22	25	0	25	625	72	25	0	25	625
23	25	0	25	625	73	25	0	25	625
24	25	0	25	625	74	25	0	25	625
25	25	0	25	625	75	24	0	24	576
26	25	0	25	625	76	25	0	25	625
27	25	0	25	625	77	25	0	25	625
28	25	2	23	529	78	25	2	23	529
29	25	0	25	625	79	25	0	25	625
30	25	0	25	625	80	25	0	25	625
31	25	0	25	625	81	25	0	25	625
32	25	0	25	625	82	25	0	25	625
33	25	0	25	625	83	25	0	25	625
34	25	0	25	625	84	25	0	25	625
35	25	1	24	576	85	25	0	25	625
36	25	1	24	576	86	5	4	1	1
37	25	0	25	625	87	25	12	13	169
38	25	0	25	625	88	25	0	25	625
39	13	2	11	121	89	25	0	25	625
40	25	0	25	625	90	25	0	25	625
41	25	1	24	576	91	25	1	24	576
42	25	0	25	625	92	25	0	25	625
43	25	1	24	576	93	25	0	25	625
44	25	0	25	625	94	25	0	25	625
45	25	0	25	625	95	25	0	25	625
46	25	0	25	625	96	25	0	25	625
47	25	0	25	625	97	25	0	25	625
48	25	0	25	625	98	25	0	25	625
49	25	1	24	576	99	25	0	25	625
50	25	0	25	625	100	25	0	25	625
						<u>2463</u>	<u>85</u>	<u>2378</u>	<u>57,978</u>

13+ FOLLOW-UP

DISTRIBUTION OF NON-VERBAL AND VERBAL REASONING TESTS RESULTS 13+

	<u>Ew</u> Boys		<u>We</u>		<u>Ew</u> Girls		<u>We</u>			
	<u>NV</u>	<u>VR</u>	<u>NV</u>	<u>VR</u>	<u>NV</u>	<u>VR</u>	<u>NV</u>	<u>VR</u>		
1	134	137	131	122	31	132	140	132	131	<u>Bilingual means</u> First Language English Boys = 111.6 Girls = 110.1
2	126	116	126	94	32	126	112	126	125	
3	125	122	125	112	33	126	111	125	92	
4	124	122	123	119	34	123	104	124	93	
5	123	120	123	95	35	122	117	122	104	
6	122	115	122	94	36	121	123	122	96	
7	120	96	121	120	37	120	114	119	117	
8	120	101	121	100	38	120	111	119	100	
9	119	113	119	102	39	117	124	117	103	
10	118	120	118	122	40	115	120	117	99	
		123.1	122.9				122.2	122.3		
11	118	106	118	109	41	115	111	116	95	
12	117	113	117	92	42	114	115	114	108	
13	116	107	116	109	43	113	128	113	106	
14	116	103	116	100	44	112	112	113	104	
15	115	115	115	105	45	112	116	112	112	
16	114	103	114	113	46	111	107	110	104	
17	112	112	112	118	47	111	107	110	94	
18	111	102	111	112	48	110	103	109	98	
19	111	96	111	97	49	105	114	106	102	
20	110	116	110	99	50	105	107	106	93	
		114.0	114.0				110.8	110.9		
21	107	121	108	92	51	103	102	105	97	
22	107	109	107	95	52	103	89	104	88	
23	106	106	106	108	53	100	84	101	97	
24	103	100	104	107	54	99	99	101	78	
25	102	83	102	93	55	98	93	99	86	
26	96	93	97	91	56	97	91	99	85	
27	95	94	94	84	57	96	97	95	93	
28	91	92	90	107	58	95	88	94	85	
29	87	86	86	74	59	93	95	93	79	
30	85	86	85	82	60	89	92	83	89	
		97.9	97.9				97.3	97.4		

13+ FOLLOW UP (60 cases)

S	Boys				Girls				
	Ew X1	We X2	D	D2	S	Ew X1	We X2	D	D2
1	137	122	15	225	31	140	131	9	81
2	116	94	22	484	32	112	125	-13	169
3	122	112	10	100	33	111	92	19	361
4	122	119	.3	9	34	104	93	11	121
5	120	95	25	625	35	117	104	13	169
6	115	94	21	441	36	123	96	27	729
7	96	120	-24	576	37	114	117	-3	9
8	101	100	.1	1	38	111	100	11	121
9	113	102	11	121	39	124	103	21	441
10	120	122	-.2	4	40	120	99	21	441
11	106	109	-.3	9	41	111	95	16	256
12	113	92	21	441	42	115	108	7	49
13	107	109	-2	4	43	128	106	22	484
14	103	100	3	9	44	112	104	8	64
15	115	105	10	100	45	116	112	4	16
16	103	113	-10	100	46	107	104	3	9
17	112	118	-6	36	47	107	94	13	169
18	102	112	-10	100	48	103	98	5	25
19	96	97	-1	1	49	114	102	12	144
20	116	99	17	289	50	107	93	14	196
21	121	92	29	841	51	102	97	5	25
22	109	95	14	196	52	89	88	1	1
23	106	108	-2	4	53	84	97	-13	169
24	100	107	-7	49	54	99	78	21	441
25	83	93	-10	100	55	93	86	7	49
26	93	91	2	4	56	91	85	6	36
27	94	84	10	100	57	97	93	4	16
28	92	107	-15	225	58	88	85	3	9
29	86	74	12	144	59	95	79	16	256
30	86	82	4	16	60	92	89	3	9
	3205	3067	138	5354		3226	2953	273	5067

NON-VERBAL TEST 2: ENGLISH/WELSH VERSION

Conversion Table

Standardised Scores

Raw Scores 1-50

Ages 10:6 - 12:0

Raw Score	106	107	108	109	110	10:11	110	111	112	113	114	115	116	117	118	119	11:10	11:11	12:0	
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11	70	70																		
12	71	71	71	70	70	70	70													
13	73	72	72	72	72	71	71	71	70	70	70	70								
14	74	74	73	73	73	73	72	72	72	71	71	71	71	70	70	70				
15	75	75	75	74	74	74	74	73	73	73	72	72	72	72	71	71	71	70	70	70
16	76	76	76	76	75	75	75	74	74	74	74	73	73	73	72	72	72	72	71	71
17	78	77	77	77	76	76	76	76	75	75	75	74	74	74	74	73	73	73	72	72
18	79	78	78	78	78	77	77	77	76	76	76	76	75	75	75	74	74	74	74	74
19	80	80	79	79	79	78	78	78	78	77	77	77	76	76	76	76	75	75	75	75
20	81	81	80	80	80	80	79	79	79	78	78	78	78	77	77	77	76	76	76	76
21	82	82	81	81	81	81	80	80	80	79	79	79	79	78	78	78	77	77	77	77
22	83	83	82	82	82	82	81	81	81	80	80	80	80	79	79	79	78	78	78	78
23	84	84	83	83	83	83	82	82	82	81	81	81	81	80	80	80	79	79	79	79
24	85	85	84	84	84	84	83	83	83	82	82	82	82	81	81	81	80	80	80	80
25	86	86	85	85	85	85	84	84	84	83	83	83	83	82	82	82	81	81	81	81
26	87	87	86	86	86	85	85	85	85	84	84	84	83	83	83	83	82	82	82	82
27	88	87	87	87	87	86	86	86	85	85	85	85	84	84	84	83	83	83	83	83
28	89	88	88	88	87	87	87	87	86	86	86	85	85	85	85	84	84	84	84	83
29	89	89	89	89	88	88	88	87	87	87	87	86	86	86	85	85	85	85	84	84
30	90	90	90	90	89	89	89	88	88	88	87	87	87	87	86	86	86	85	85	85
31	91	91	91	90	90	90	89	89	89	89	88	88	88	87	87	87	87	86	86	86
32	92	92	91	91	91	91	90	90	90	89	89	89	89	88	88	88	87	87	87	87
33	93	93	92	92	92	91	91	91	91	90	90	90	89	89	89	89	88	88	88	88
34	94	93	93	93	93	92	92	92	91	91	91	91	90	90	90	89	89	89	89	89
35	95	94	94	94	93	93	93	93	92	92	92	91	91	91	91	90	90	90	89	89
36	95	95	95	95	94	94	94	93	93	93	92	92	92	92	91	91	91	90	90	90
37	96	96	96	95	95	95	94	94	94	94	93	93	93	92	92	92	92	91	91	91
38	97	97	96	96	96	96	95	95	95	94	94	94	94	93	93	93	92	92	92	92
39	98	97	97	97	97	96	96	96	95	95	95	95	94	94	94	93	93	93	93	93
40	99	98	98	98	97	97	97	97	96	96	96	95	95	95	95	94	94	94	93	93
41	99	99	99	99	98	98	98	97	97	97	97	96	96	96	95	95	95	95	94	94
42	100	100	100	100	99	99	99	98	98	98	98	97	97	97	96	96	96	96	95	95
43	101	101	101	101	100	100	100	99	99	99	98	98	98	98	97	97	97	96	96	96
44	102	102	102	102	101	101	101	100	100	100	99	99	99	99	98	98	98	97	97	97
45	103	103	103	102	102	102	102	101	101	101	100	100	100	100	99	99	99	98	98	98
46	104	104	104	103	103	103	103	102	102	102	101	101	101	101	100	100	100	99	99	99
47	105	105	105	104	104	104	104	103	103	103	102	102	102	102	101	101	101	100	100	100
48	106	106	106	106	105	105	105	104	104	104	103	103	103	103	102	102	102	101	101	101
49	107	107	107	107	106	106	106	105	105	105	104	104	104	104	103	103	103	102	102	102
50	108	108	108	108	107	107	107	106	106	106	105	105	105	105	104	104	104	103	103	103

Raw Score	106	107	108	109	1010	1011	110	111	112	113	114	115	116	117	118	119	1110	1111	120
51	109	109	109	109	108	108	108	107	107	107	107	106	106	106	105	105	105	105	104
52	111	110	110	110	110	109	109	109	108	108	108	108	107	107	107	106	106	106	105
53	112	111	111	111	111	110	110	110	109	109	109	109	108	108	108	107	107	107	107
54	113	113	112	112	112	112	111	111	111	110	110	110	110	109	109	109	108	108	108
55	114	114	113	113	113	113	112	112	112	111	111	111	111	110	110	110	109	109	109
56	115	115	115	115	114	114	114	113	113	113	112	112	112	112	111	111	111	110	110
57	117	116	116	116	116	115	115	115	114	114	114	114	113	113	113	112	112	112	111
58	118	118	117	117	117	117	116	116	116	115	115	115	115	114	114	114	113	113	113
59	119	119	119	118	118	118	118	117	117	117	116	116	116	116	115	115	115	114	114
60	121	120	120	120	119	119	119	119	118	118	118	117	117	117	117	116	116	116	115
61	122	122	121	121	121	121	120	120	120	119	119	119	119	118	118	118	117	117	117
62	123	123	123	123	122	122	122	121	121	121	121	120	120	120	119	119	119	119	118
63	125	125	124	124	124	123	123	123	123	122	122	122	121	121	121	121	120	120	120
64	126	126	126	126	125	125	125	124	124	124	123	123	123	123	122	122	122	121	121
65	128	127	127	127	127	126	126	126	125	125	125	125	124	124	124	123	123	123	123
66	129	129	129	129	128	128	128	127	127	127	126	126	126	126	125	125	125	124	124
67	131	131	130	130	130	130	129	129	129	128	128	128	128	127	127	127	126	126	126
68	133	132	132	132	132	131	131	131	130	130	130	130	129	129	129	128	128	128	127
69	134	134	134	133	133	133	133	132	132	132	131	131	131	131	130	130	130	129	129
70	136	136	135	135	135	134	134	134	134	133	133	133	132	132	132	132	131	131	131
71	138	137	137	137	137	136	136	136	135	135	135	135	134	134	134	133	133	133	132
72	140	139	139	139	139	138	138	138	137	137	137	137	136	136	136	135	135	135	134
73						140	140	140	139	139	139	139	138	138	138	137	137	137	137
74													140	140	140	140	139	139	139
75																			140
76																			
77																			
78																			
79																			
80																			
81																			
82																			
83																			
84																			
85																			

SYNCHRONIC DESCRIPTION OF INDIVIDUAL BILINGUALISM.

SCHEDULE.

- I. NUMBER - i.e. the number of languages used by the individual (e.g. language A and language B)
- II. TYPE - i.e. the linguistic relationship between language A and language B.
- III. FUNCTION - i.e. the conditions of learning and use of the two languages.
- IV. DEGREE - i.e. proficiency in each language.
- V. ALTERNATION - i.e. 'switching' from one language to another.
- VI. INTERACTION - i.e. the way in which the languages affect each other linguistically, namely by importation and substitution.
-

II TYPE

	A	B	Differential
PHONOLOGICAL	allophones		
	phonemes		
	clusters		
	prosodemes		
	etc.		
LEXICAL			
SEMANTIC			
STRUCTURAL			
STYLISTIC			
GRAPHOLOGICAL			

III FUNCTION

A. CONDITIONS OF LEARNING

(i) INTRINSIC CONDITIONS.

- (a) Age
- (b) Intelligence
- (c) Emotional associations
- (d) Orectic factor (Drive +)

(ii) EXTRINSIC CONDITIONS:

	INFORMAL LEARNING.									
	HOME		COMMUNITY							
	A	B	N		E		R		O	
		A	B	A	B	A	B	A	B	
1. Number of persons involved (Relative population)										
2. Frequency of contact										
3. Language used										
4. Language skills used										
5. Status										
6. Linguistic aptitude ¹										
7. Linguistic attitude ¹										
8. Age of introduction										
9. Amount of each language used.										
10. Relative standards										
11. Duration										
12. Subjects taught in each language										
13. Teaching methods and techniques										

Note. 1. Of persons involved (Home), or of groups (Community)

2. N = Neighbourhood E = Ethnic R = Religion
 O = Occupational.

III FUNCTION

A.CONDITIONS OF LEARNING (Contd)

	FORMAL LEARNING				OTHER AGENCIES				
	CLASSROOM		PRIVATE TUITION	GROUP LEARNING		RADIO T.V.		SELF- LEARNING	
	DUAL-MEDIUM	SINGLE-MEDIUM		A	B	A	B	A	B
1. Number of persons involved (Relative population)									
2. Frequency of contact									
3. Language used									
4. Language skills used									
5. Status									
6. Linguistic aptitude ¹									
7. Linguistic attitude ¹									
8. Age of introduction									
9. Amount of each language used.									
10. Relative standards.									
11. Duration									
12. Subjects taught in each language									
13. Teaching methods and techniques									

1 Of person involved (Teacher)

III. FUNCTION (contd)

B. CONTEXT OF USE AND GROUP PRESSURE

CONTEXT OF USE	GROUP PRESSURE										ADMINISTRATIVE		
	HISTORICAL		POLITICAL		ECONOMIC		CULTURAL		MILITARY			RELIGIOUS	
	A	B	A	B	A	B	A	B	A	B		A	B
HOME													
SCHOOL													
NEIGHBOURHOOD													
ETHNIC GROUP													
CHURCH GROUP													
OCCUPATIONAL GROUP													

B. CONTEXT OF USE AND GROUP PRESSURE (contd)

CONTEXT OF USE	GROUP PRESSURE DEMOGRAPHIC	
	A	B
HOME		
SCHOOL		
NEIGHBOURHOOD		
ETHNIC GROUP		
CHURCH GROUP		
OCCUPATIONAL GROUP		

IV DEGREE

SKILLS:	PHONOLOGICAL		LEXICAL		SEMANTIC		STRUCTURAL		STYLISTIC		GRAPHOLOGICAL	
	A	B	A	B	A	B	A	B	A	B	A	B
LISTENING												
READING												
SPEAKING												
WRITING												

V. ALTERNATION

	CONTEXT			
	PERSON A - B B - A	PLACE A - B B - A	TOPIC A - B B-A	ETC
SWITCHING				
RATE				
FREQUENCY ORAL WRITTEN				

VI. INTERACTION

INTERACTION	IMPORTATION A - B B - A	SUBSTITUTION A - B B - A
PHONOLOGICAL		
LEXICAL		
SEMANTIC		
STRUCTURAL		
STYLISTIC		
GRAPHOLOGICAL		

EXPLANATORY NOTES

I. The Uses and Application of the Schedule

- (a) This Schedule has been devised primarily to provide a framework for the description of bilingualism in an individual at a single point of time. It is based on a relativist and dynamic concept of bilingualism. The completion of the Schedule should give a profile of bilingualism in the individual in respect of each language used by him.
- (b) The separate tables in the Schedule can be used to provide a factorial analysis of the bilingualism in the individual. By correlating elements in one table with elements in the other tables it should be possible to obtain highly significant information about his bilingualism.
- (c) The Schedule can also be used for the synchronic study of group bilingualism, by applying it individually to a group of individuals and making a synthesis of the results.
- (d) The diachronic study of bilingualism in individuals or groups is also possible through the application of this Schedule. Various aspects of bilingualism can be studied by comparing the separate results obtained on a number of occasions when this Schedule is applied to the individuals or groups over a period of time (e.g. dominance).
- (e) It should be clearly understood that the tables shown in the Schedule are meant to be regarded only as patterns of description. These tables require to be expanded in detail by the specialists of the various disciplines concerned and it is hoped that programmes of research will now be initiated for the creation of suitable measuring devices on these lines.

II. The Main Divisions of the Schedule

- (a) NUMBER. Although only two languages are mentioned in this copy of Schedule, it would be possible to include in the analysis three, four, or more languages as used by the individual.
- (b) TYPE. This part of the description really implies a differential description of the dialect of each language (idiolect) used by the individual. It demands very detailed technical knowledge, and would require the services of linguists especially trained in the technique of linguistic description.

- (c) FUNCTION. A number of tests have already been devised for measuring certain items in this table, for example, tests of verbal behaviour and tests for involving factorial analysis of meaning. It should be possible to increase the number of these measuring devices.
- (d) DEGREE. What is required here is to use, adapt and create tests in linguistic behaviour for each language used, and to modify these tests to fit the idiolect of the individual.
- (e) ALTERNATION. The purpose of this table is to measure the individual's facility and practice in switching from one language to the other. A number of tests have already been devised by psychologists for this purpose.
- (f) INTERACTION. There exist different practices for the classification of the various types of importation and substitution in bilingual situations (e.g. Haugen, Weinreich, Leroy),

III. REFERENCES. The following references to recent publications will be found useful in considering the practical application of this Schedule.

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