

A FUNCTIONAL CENTRES MODEL
FOR
LANGUAGE ACQUISITION PROCESSES

Copy

by

MAJOR F. A. PERRY



DRAE MEMORANDUM NO. M51

DRAE

DEFENCE RESEARCH ANALYSIS ESTABLISHMENT
DEPARTMENT OF NATIONAL DEFENCE

A FUNCTIONAL CENTRES MODEL

FOR

LANGUAGE ACQUISITION PROCESSES

MAJOR F.A. PERRY
STAFF OFFICER ANALYSIS (DRAE)
TRAINING COMMAND HEADQUARTERS

C.F.B. WINNIPEG
WESTWIN, MANITOBA
FEBRUARY, 1973

Memoranda are issued for information purposes, and do not necessarily represent the views of any departmental agency.

TABLE OF CONTENTS

	<u>Page</u>
<u>FOREWORD</u>	iii
<u>INTRODUCTION</u>	1
<u>ACKNOWLEDGEMENTS</u>	4
<u>PART ONE</u> - The Functional Centres Model: Its Component Parts and What They Do	5
<u>FUNCTIONS OF EACH HYPOTHETICAL CENTRE</u>	9
A. The Input - Output Device Centres.....	9
Initial Audio and Visual Receptors (IAR and IVR).....	10
B. Processing Service Centres	11
Scanner	11
Comparator	11
Transformer.....	11
Affective Catalytic Energizer (ACE)	12
Imagination And Intuition Centre (I & I)	12
C. Storage Device Centres	12
Long-Term Storage	12
Preconscious	13
Subconscious	13
<u>RATIONALE AND JUSTIFICATION</u>	14
For the Auditory and Visual Perceptory Matrices (APM and VPM)	14
For the Initial Auditory and Visual Receptors (IAR and IVR)	15
For the Scanner	16
For the Comparator	16
For the Transformer	17
For Long-Term Storage	19
For the Affective Catalytic Energizer (ACE) ..	20
For the Imagination and Intuition Centre (I & I)	22
For the Preconscious	24
For the Subconscious	24

TABLE OF CONTENTS (Cont)

	<u>Page</u>
<u>PART TWO</u> - The Model and First-Language Acquisition....	26
Phase One: Precognition.....	27
Phase Two: First Words.....	28
Phase Three: Combinations and Elementary Structural Experiments.....	34
Phase Four: Free Expression and Refinement of CUS.....	37
Phase Five: Reading Skills.....	41
Phase Six: Higher Use Schemata.....	41
Phase Seven: The Adult.....	47
<u>MEMORY AND FORGETTING</u>	
<u>AN OVERALL PICTURE OF FIRST-LANGUAGE ACQUISITION.....</u>	50
<u>THE MODEL IN COMPARISON TO OTHER THEORIES.....</u>	53
<u>SUMMARY OF FIRST-LANGUAGE ACQUISITION PROCESSES.....</u>	55
<u>PART THREE</u> - The Model, and Second-Language Acquisition	56
<u>BACKGROUND.....</u>	57
<u>BILINGUALISM.....</u>	58
<u>TEACHING AND LEARNING.....</u>	62
From Partial Towards Complete Bilingualism..	64
<u>IMPLICATIONS FOR L2 TEACHING DERIVED FROM THE MODEL....</u>	67
Regarding Degrees of Bilingualism Sought....	67
Regarding the APM and the Scanner.....	68
Regarding the Affective Catalytic Energizer.	68
Regarding the Transformer.....	69
Regarding Long Term Storage.....	69
Regarding Methodology in General.....	70
<u>CONCLUSION.....</u>	72
<u>REFERENCES.....</u>	73

FOREWORD

This paper was written by Major Perry as a private venture while he was employed as a research officer in the DRAE section at Training Command. While it is not a sponsored project it does provide an excellent illustration of the operational research approach to a complex problem; we therefore have no reservations against issuing it as a formal DRAE memorandum.

The object of the paper is not to present a theory of language learning but rather to analyse the processes by which learning takes place and to confirm them where possible by direct observation. The paper throws considerable light on the difficulties of achieving bilingualism, and I can commend it both to those who are trying to acquire a second language and those who are trying to teach it.

A FUNCTIONAL CENTRES MODEL FOR
LANGUAGE ACQUISITION PROCESSES

INTRODUCTION

Teachers of second languages have long asked themselves the question: "What does it mean to know a language?" The question is crucial because its answer determines the sorts of teaching-learning situations which will be used by the profession.

The *traditional method*, encompassing reading, translation, and grammar lessons, was for a long time the most popular way of teaching. Its ultimate aim was the ability to read and appreciate literature. This was probably a realistic approach in an era of limited mobility and limited contact with people who spoke other languages. During World War II, however, the US Army took a different tack. It set out to teach its personnel to understand and speak foreign languages, so that they would be able to use them to converse with the natives for military purposes. The Army's "Mim-Mem" approach consisted of having the students mimic and memorize the speech of native speakers, so as to be able to say the appropriate things in specific circumstances. Language teachers became quite interested in this approach after the War, and under a new name, the audio-lingual (aural-oral) method began to be accepted as the method of teaching second languages, in America at least. Although more thoughtful members of the profession pointed out that grammar still could play a useful role in a language course, others held that the old method was completely passé. Yesterday's orthodoxy becomes today's heresy; yesterday's innovation, today's dogma. Then the new orthodoxy in turn begins to be questioned.

American psychology has long been under the influence of the behaviorist tradition. Thus it was probably inevitable that the audio-lingual method would come to be seen eventually as the only logical application of the accepted notion that learning comes from training. The final rationale for the audio-lingual method was supplied by Skinner, whose *Verbal Behavior* set out the doctrine that all language learning is a form of operant conditioning, with shaping, trial-and-error learning, and generalization. If one's first language is acquired in this way, the use of a similar approach, i.e. the audio-lingual method, must be the appropriate way to teach a second language.

The behaviorist viewpoint has been rejected by later theorists, most notably by Lenneberg and Carol Chomsky. Lenneberg pointed to the fact that all children learn their native language at roughly the same age, regardless of the complexity of that language, as an indication that language acquisition is a form of self-actualization depending on the maturation of innate human potential. Chomsky became convinced that the human nervous system possesses a sort of innate logical structure which is waiting to be actualized within the parameters of the language spoken in the environment. The innate logical structure forms the basis of a semantic meta-grammar of possibilities, which is given form by transformational rules appropriate to each individual language. These rules interface between the *surface* level of language and *deep* level of meaning, for both incoming and outgoing communications, and are referred to as transformational-generative grammar. For Chomsky, the child develops the ability to use this T-G grammar by identifying the basic syntactic system of his native language, and then using his latent potential in terms of the rules which he has identified rather than by just imitation, repetition, and reinforcement.

If Chomsky's theories are accepted, it appears that mere repetition and practice of a second language will not be sufficient for a person to acquire the ability to innovate in that language. In other words, audio-lingual methodology is no more likely than any other to develop in a person the ability to use a language with unconscious accuracy when expressing other than memorized phrases. Further, if Lenneberg's theory about maturation is accepted, the chances are very slim of one becoming fluently bilingual after the final maturation event has been reached at about puberty.

It appears that the behaviorist and Chomsky-Lenneberg schools hold irrevocably opposing points of view. Who is right? Is anyone right? Are all theories right up to a point? One really must begin to wonder when some studies appear to indicate that students can learn just as well by one method as by another (see for example, Scherer and Wertheimer, 1964). At this point it seems prudent to consider the words of Whitehead; "Never swallow anything whole. We live perforce by half-truths and get along fairly well as long as we do not mistake them for whole-truths." (Price, 1964, p. 243). This brings us to the purpose of this paper.

The author does not believe that the viewpoints mentioned above are irreconcilable, and presents the Functional Centres Model as one means of incorporating and reconciling opposing theories. This paper contends that language learning involves a sequence of phases which may be characterized in turn as being reactive, intuitive, and rational. Language is at first context-bound, then later becomes innovative, and its acquisition depends on a master program of biological maturation. In the belief that all theories can shed light on the question of what it is to *know* a language, the model incorporates information from many sources. It is primarily a theory about first-language learning, but its application to subsequent languages will also be shown.

A competent language teacher today does not swallow any theory in its entirety. He knows that if he uses the audio-lingual method his students will react appropriately within situations for which they have been trained, but may be at a loss to express original ideas. On the other hand, if he teaches them grammatical theory, they may become adept readers, but hesitant and stilted communicators in everyday situations. Clearly both approaches are needed, but how much of which and when? Answers to these questions are important if we are to take real steps toward promoting understanding among people by learning other languages, and if we are to make the most effective use of the funds available for second-language teaching.

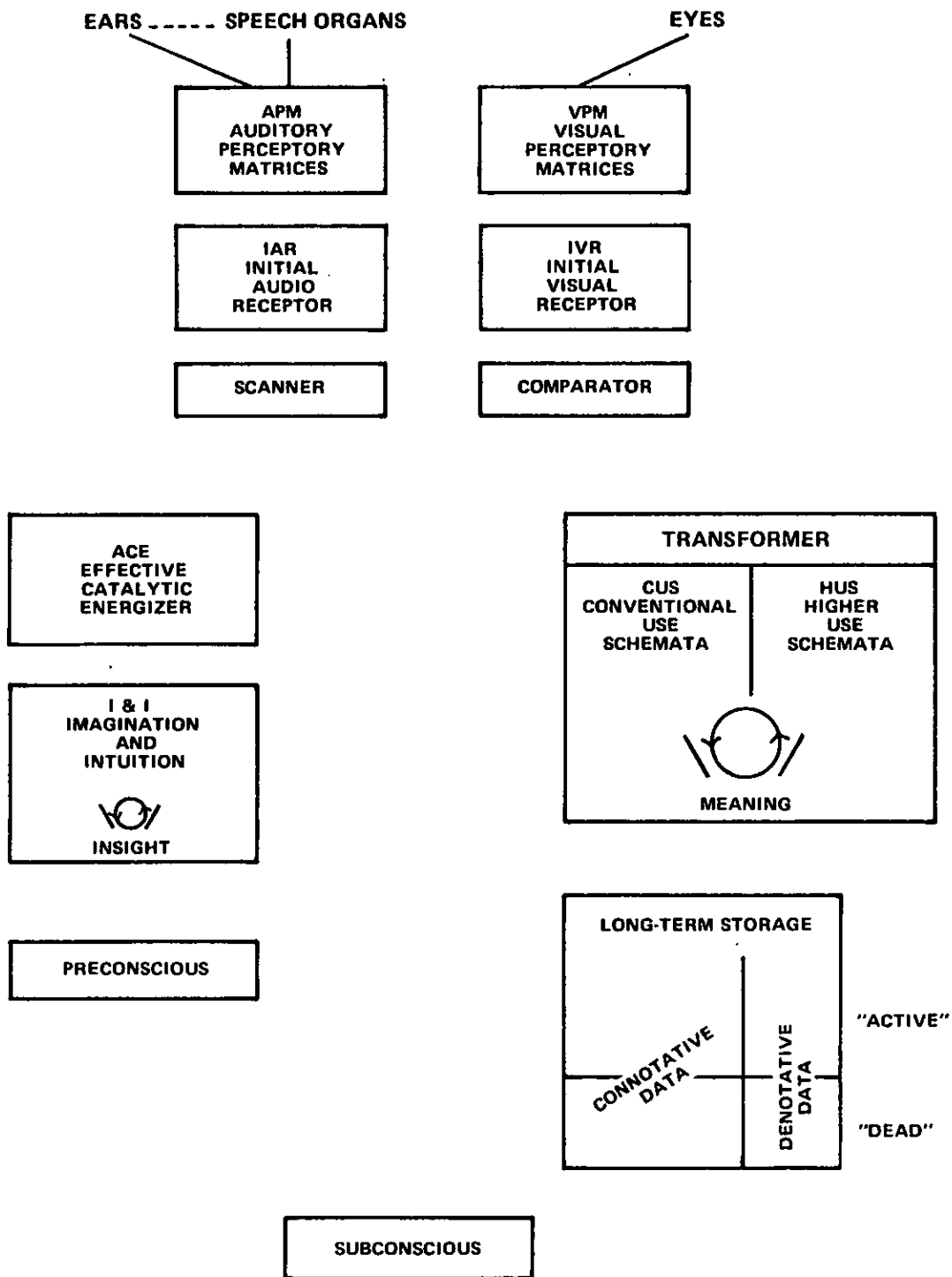
It is hoped that this model may stimulate interest among language teachers and may help them to find their own answers to these perplexing questions. It must, however, be stressed that it is not intended as a great theory. It is simply a teacher's own construction in cybernetic terms, the usefulness of which needs to be tested by the language teaching profession.

ACKNOWLEDGEMENTS

The author wishes to express his sincere thanks to Dr. H.H. Stern, a most enthusiastic and inspiring teacher, who took the time to read the first draft of this paper, and whose many valuable suggestions have been incorporated into this present version. Thanks are also given to Dr. James Arthurs (University of Victoria), whose constructive comments were helpful and to Lt. Alex Weatherstone whose experience in flow-charting was of great help. This work is dedicated to Dr. Ron Oldham, Dean of Arts at Royal Roads Military College, without whose encouragement it would not have been undertaken.

Major F.A. Perry, CF
Training Command Headquarters,
Westwin, Manitoba.
February, 1973.

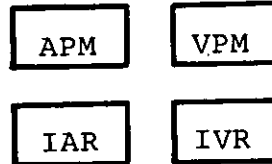
THE FUNCTIONAL CENTRES MODEL



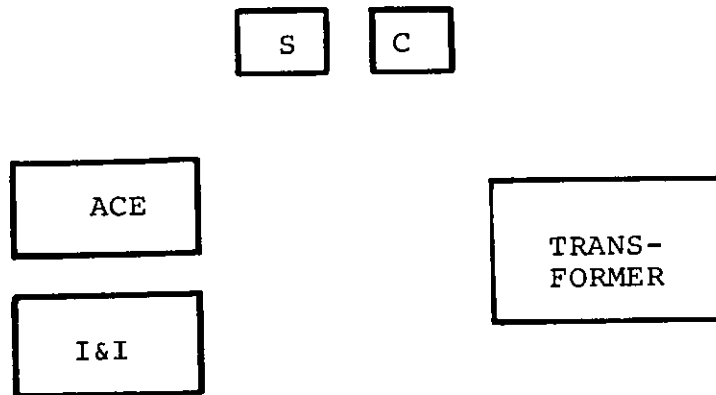
For ease of initial comprehension, the model may be thought of as containing Centres which perform three general types of functions:

Input-Output Devices
Processing Devices
Storage Devices

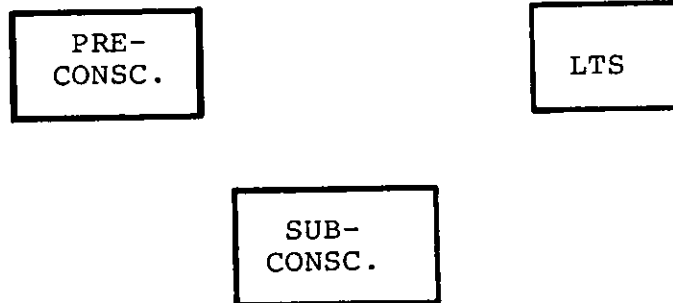
INPUT-OUTPUT DEVICES:



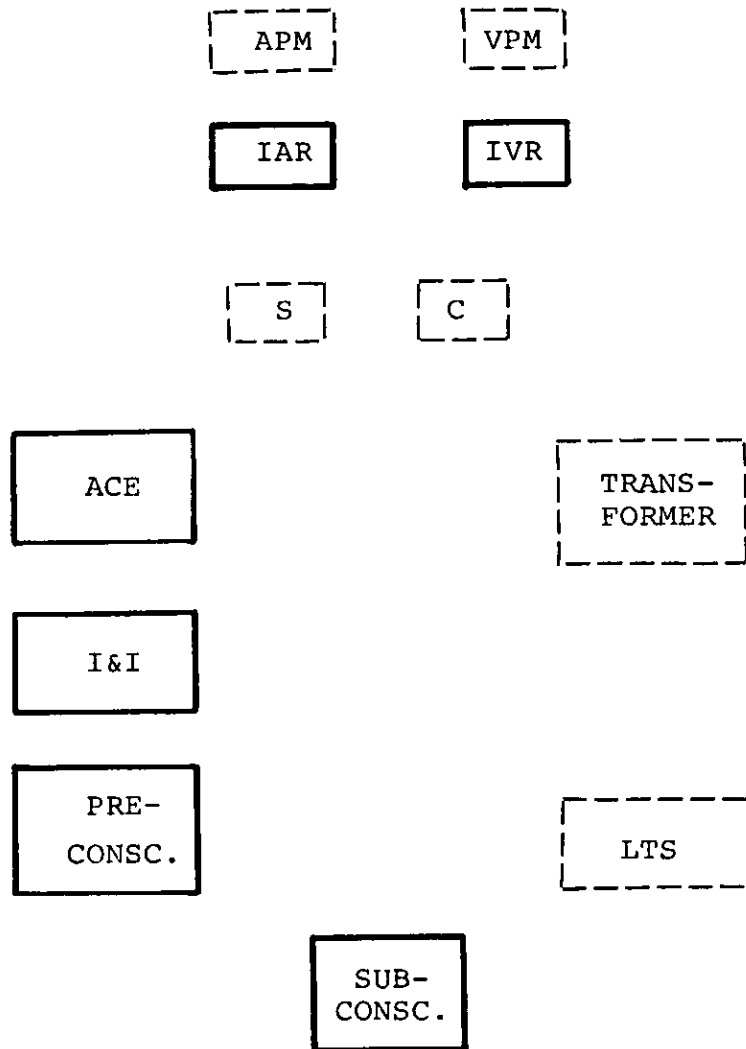
PROCESSING DEVICES:



STORAGE DEVICES:



The various Centres may also be thought of as being either innate or developed, as the following diagram shows. Innate Centres, which are present in the newborn infant, are shown in solid lines. Developed Centres, whose capabilities and content must be acquired, are shown in dotted lines.



The following pages will outline the functions of each hypothetical Centre.

FUNCTIONS OF EACH HYPOTHETICAL CENTRE

A. THE INPUT - OUTPUT DEVICE CENTRES

AUDITORY AND VISUAL PERCEPTORY MATRICES (APM and VPM)

Existing only in potential in the newborn infant, and developed progressively, these Centres can perform the following perceptory functions at full development:

1. Auditory functions:

- a. Check acoustic makeup of incoming phonemes, and attribute identity to them.
- b. Check acoustic accuracy of a person's own speech, by means of a feedback mechanism to his speech-producing organs.
- c. Compensate for acoustic differences between speakers - male or female, young or old, etc.
- d. Compensate for slightly-distorted incoming speech, such as that of speakers with accents.
- e. Identify and reject speech which is completely garbled.
- f. Select communications to attend to, out of many sounds impinging on the ear.
- g. Activate acoustic switching devices for different languages if a person knows more than one.
- h. Identify intonational characteristics of incoming speech, and provide for appropriate intonations for outgoing speech.

2. Visual functions:

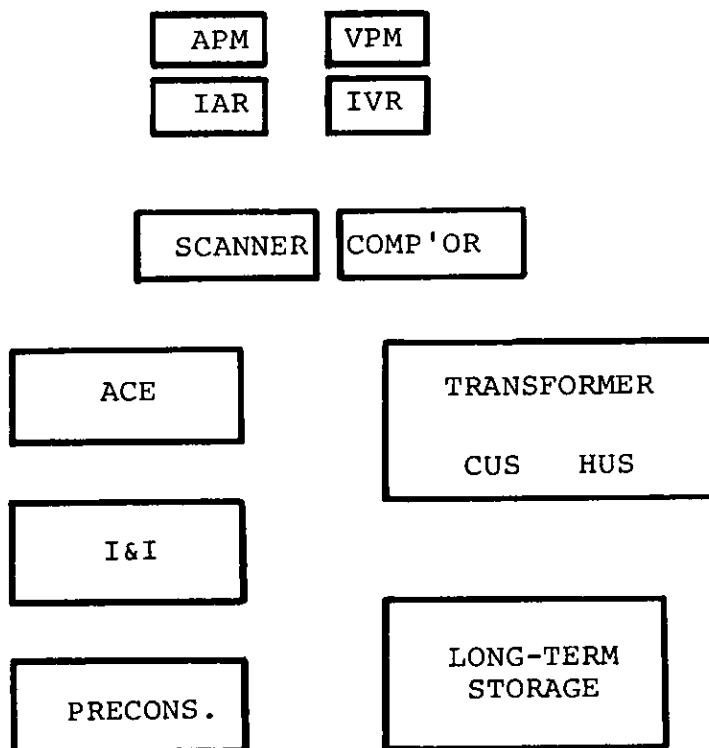
- a. Organize visual fields.
- b. Identify correctly-formed written symbols.
- c. Compensate for distorted written symbols, and for idiosyncratic writing styles.
- d. Activate written-language switching devices for different languages if the person knows more than one.

3. Affective functions:
 - a. Alert Affective Catalytic Energizer of emotion-charged oral communications.
 - b. Alert A.C.E. of emotion-charged visual contextual clues, i.e. paralinguistic signals.
 - c. Provide suitable emotional loading to speech produced by the person, under direction of the A.C.E.

INITIAL AUDIO AND VISUAL RECEPTORS (IAR and IVR)

These are where information which the person takes in through his ears and his eyes is stored temporarily while he decides whether to act on it, or to disregard it. As such, they are a form of short-term memory.

REFERENCE DIAGRAM



B. PROCESSING DEVICE CENTRES

SCANNER

If the Affective Catalytic Energizer decides to act upon incoming stimuli received in the IAR and IVR, the scanner is the first Centre to become involved. It picks out pertinent surface features of both contextual and structural nature. It then searches Long-Term Storage for available information on the topics under consideration, and retrieves the pertinent data. It also informs the Transformer, of the structures involved, and transfers the data to the Transformer, which will then use the appropriate rules for the decoding of incoming messages.

COMPARATOR

While an utterance is being formulated the Comparator checks its form and content against the speaker's intention, thus improving the accuracy of the encoding of original utterances.

TRANSFORMER

This centre is the repository of the person's linguistic competence and acts as an interface between the surface level of form and the deep level of meaning (Chomsky, 1968). The transformational rules which carry out this interfacing are referred to in this model as schemata: - Conventional Use Schemata (CUS) and Higher Use Schemata (HUS). In accordance with the theories of Chomsky (in Allen and Van Buren, 1971, p. 132) there are no other subdivisions into encoding and decoding function. Chomsky believes that there is only one transformational-generative grammar required for both these functions. In this model, the provision of the Comparator for use in encoding makes it possible to have only one T-G grammar.

AFFECTIVE CATALYTIC ENERGIZER (ACE)

This Centre is affective because it is emotion-oriented, responding to experiences which have a satisfying outcome. It is catalytic because it provides the extra something which renders satisfying learning experiences permanent. It is an energizer because it provides the driving force which causes the other Centres to operate and continue operating.

It is proposed that this Centre, fully-operational from infancy, provides the impetus for all the others to initiate and continue the acquisition of language because of the positive benefits which the command of language confers upon its possessor. The ACE reinforces experiences which have had a satisfying outcome and disregards those which have not. Besides causing an infant to explore his environment, it makes him try to master speech because of the feeling of satisfaction which he experiences as he comes to exert some verbal influence over the people who surround him.

IMAGINATION AND INTUITION CENTRE (I & I)

This Centre provides the elementary intuitive means by which the child comes to discover the relationship between words and their meanings. It usually tends to fall into disuse in adulthood.

C. STORAGE DEVICE CENTRES

LONG TERM STORAGE

This is the prepository of learned information, such as names, definitions, concepts, principles, formulae, etc., both with and without connotative shadings. It is divided in

this model into active storage for readily-available data and dead storage for unused data which is no longer readily accessible. The LTS is built up throughout the lifetime of the language-learner and user.

PRECONSCIOUS

This Centre serves in the model as an elementary early visual memory in which the infant stores visual percepts before he acquires language.

SUBCONSCIOUS

The Subconscious, which in this model serves as a repository for repressed fears, is shown in order to differentiate it from the Preconscious. It may exercise a negative influence in many activities, including a possible inhibiting influence on the learning of second languages by adults. Aside from this possibility it is given no specific role in language acquisition.

Having stated the functions of the various hypothetical Centres, a more detailed rationale and justification for their inclusion in the model is now presented.

RATIONALE AND JUSTIFICATION

FOR THE AUDITORY AND VISUAL PERCEPTORY MATRICES (APM AND VPM)

Human speech contains a myriad of phonological features which must be meaningless and perplexing to the newborn infant. Yet that same infant eventually develops the ability to understand words and progressively longer utterances from many sources male and female, young and old, familiar and unfamiliar. Therefore we must infer that he gradually develops auditory matrices (patterns) which enable him to choose from verbal utterances those features to which he will attend, and from which he will extract and organize pertinent details. In other words, sounds enter the APM but phonemes come out. This idea was presented by Broadbent (1958) in the form of a system of filters. The idea has recently been expanded considerably by Pimsleur (1971), who proposes a seven-stage model for sentence perception, the first stages of which correspond to the proposed functions of the APM. Regardless of the actual details of how these hypothetical perceptory organizing devices work, it is clear that the language-learner must gradually develop some form of matrices which prepare the way for him to make sense of the sounds which he hears. These form the APM in this model.

In a similar fashion, visual organizing devices are postulated. In support of this we may note that Guilford (1967, p. 257) gives credence to the idea formulated by Crossman that children develop some sort of visual filtering devices. These do not appear to be present at birth, although Guilford (p. 261) does mention findings which appear to indicate that infants have an innate disposition toward recognizing human faces. How much more complex must be the ability to recognize written symbols and translate them into corresponding sounds! Yet with

a lot of adult help, the child does gradually develop the ability to recognize written symbols, and finally can read both handwritten and printed communications with varying degrees of proficiency. In short, he does develop a VPM which is capable of carrying out the functions attributed to it in this model.

Slight variations in the form of production of verbal utterances (timbre, etc.) may add an affective connotation, which may or may not coincide with their apparent surface content. Since these are phonological features, the need for an alerting mechanism at the auditory input stage is seen. Similarly, visual kinesic clues from the context which accompanies oral communications may give affective significance of a supportive or a contradictory nature, provided that one has developed the ability to recognize these clues (Fast, 1970). Finally, as Harris points out (1967), for those interested in Transactional Analysis, visual clues may give an indication about the identity of the person making an utterance.

Thus the APM and VPM perform auditory, visual, and affective functions as described.

FOR THE INITIAL AUDITORY AND VISUAL RECEPTORS (IAR AND IVR)

We may hear without listening, and may see without observing, in other words we may be subjected to auditory and visual stimuli without perceiving them. There must therefore be some locations where incoming stimuli are received and held temporarily while awaiting further action by conscious mental processes. That function of initial short-term storage is performed by the I.A.R. and the I.V.R. in this model.

FOR THE SCANNER

Some device is needed to pick out the pertinent details of topical and structural nature from what we hear and read. We can infer its existence from observations of persons learning a new language. At first they strain to catch every word that is said, but gradually they develop the ability to pick out the key words and ideas without straining. A similar process occurs as one learns to read in a new language. So we must infer that people gradually develop the ability to scan incoming messages, using what I have called the Scanner. In this model, the Scanner also performs a search-and-match function, matching topical content to data held in Long Term Storage, and structural content to schemata held in the Transformer.

FOR THE COMPARATOR

Linguists frequently point out that speech in which personal ideas are expressed (i.e. in which there is a very low probability factor) tends to be hesitant and rather circumlocutory. The speaker begins, stops, hesitates, starts again, changes his form of expression, etc., until the entire idea has finally come out in a form which he considers appropriate. Sometimes he will then repeat his statement in a concise manner for the benefit of his listeners. This indicates that the speaker is mentally listening to himself, and comparing what he is saying to the internal idea which he is trying to express. This function of holding, comparing and revising is carried out in this model by the Comparator. It performs a quality-control check on the encoding process. It can also perform the same function when a person is writing, since the writer is mentally talking and listening to himself while he is writing.

When the Transformer is considered, it will be shown how the use of a Comparator in this model provides for the acquisition of Higher Use Schemata in addition to the function explained above.

FOR THE TRANSFORMER

The theory of a transformational-generative (TG) grammar (Chomsky, 1968) has been accepted for this model as a reasonable explanation of the way in which form is converted into meaning and vice-versa. This arbitrary decision requires the use of what is called the Transformer. Its bipartite nature will now be explained.

Conventional Use Schemata. These are transformational-generative rules used mainly for context-bound communications. They consist mainly of the cliches of everyday life and the routine and recurring exchanges which are used over and over again in the workaday world, in short the reaction-utterances which we can make without having to think about them.

Linguists frequently point to the novel and creative nature of speech. It is no doubt true that well-educated and professional people (such as linguists and the students with whom they associate) are constantly using their language in new and creative ways. However, consideration of the speech-events of people who function within less stimulating linguistic environments can lead one to the conclusion that much of what these people say is quite predictable. It is spoken by force of habit within recurring contexts, rather than by a need to communicate novel ideas. While such people undoubtedly possess linguistic competence superior to their performance, they are not often called upon to use it when engaged in ordinary conversation. Instead, they make use of a few immediately-available schemata, and speak in short utterances. It is because of the immediate availability of the context-bound schemata used in informal communication that they are given a separate location within the Transformer, and are henceforth referred to as Conventional Use Schemata (CUS).

It is suggested that CUS are the first structures acquired by a language-learner. Later on, it will be shown that they may form the major part of the second-language competence of students who have been taught by an unimaginative teacher.

Higher Use Schemata. Everyone who has at least an elementary-school education has been exposed to and has acquired Higher Use Schemata (HUS) in his native language. By listening to new ideas being expressed, by trying to communicate his own ideas in discussions, by reading, and by struggling to put down his own ideas on paper, the student comes to recognize and then to use schemata which are more complex than those which he uses for informal communication. Whether or not he makes full use of his HUS after the completion of his formal education depends upon his own initiative and the circumstances of his employment.

There are obviously degrees of complexity within the HUS. This becomes apparent when a person wishes not simply to narrate something, but rather to give it a form which will convey the complete semantic flavour which he experiences within himself. For this purpose, the most subtle and complex of his HUS will be required. Some people can communicate complex nuances, while others can't.

The acquisition of HUS must involve a process similar to problem solving (Gagne, 1970), and a great amount of effort must be expended. The extent to which HUS are acquired must depend on the complexity of ideas to be communicated and the willingness of the individual to make the necessary effort. In short, HUS are not acquired by simple exposure to language, but rather are the end result of conscientious effort undertaken under the impetus of the Affective Catalytic Energizer. A person doesn't exert much effort unless he experiences a need to do so. The implications of this belief will be seen when we consider second-language learning.

At this point it appears that the Comparator plays an important role in the acquisition of Higher Use Schemata. As will be explained later, the Conventional Use Schemata may be acquired through experimentation and confirmatory feedback from the environment, but the internalization of Higher Use Schemata must come about at least partially through internal feedback.

Suppose for example that a person wants to communicate an idea whose subtleties are beyond the scope of the CUS. He checks his Long Term Storage to determine if he can recall having seen or heard any examples of schemata which might be appropriate. If so, he makes a halting attempt to incorporate them, along with variations upon his already-acquired CUS, until he has found just the right way of expressing himself. This halting, groping, hesitant internal experimentation takes place in the Comparator. When the new schemata thus devised are found to display compatibility between product and intention they are permanently stored for future use in the HUS section of the Transformer. Thus, HUS are internalized and made available within a need-to-communicate context. This observation has important implications for both first and second-language learning.

FOR LONG-TERM STORAGE

This is where everything which has been learned is stored. The model shows two different sorts of bits of data, denotative and connotative, with the latter variety of data being allocated more storage space. Storage space is also arbitrarily divided in this model into data which can be readily retrieved, active storage, and that which through lack of use is difficult to retrieve, dead storage.

Although there are many different theories about the ways in which information is arranged in Long Term Storage, as Guilford (1967) points out in Chapter 13 of his book, we do not know yet for certain precisely how it is done. Penfield's findings (1952) appear to indicate that experiences are recorded in great detail, so that greater space should indeed be allotted to connotative data storage. In addition, it is likely that data is stored according to some hierarchical system of complexity by areas of similarity. As every teacher knows, learning is facilitated by relating new data to what the student has already acquired. Finally, what is most important are the degrees of speed and thoroughness with which data may be retrieved.

For the purposes of this model, data will be considered to be stored vertically, although the same data may be stored in several vertical columns as it appears to be related to various topics. Such multiple storage then makes for ease of retrievability by the Scanner.

Data which has been stored in only one location, and has then remained unused, may be transferred to dead storage. In this regard, see Penfield's findings, as mentioned by Guilford (1967, pp. 211, 375). This process of transferring unused data to dead storage may offer an explanation for the way in which a language may be lost if it is not used, only to be rediscovered (brought back to active storage) in a short period of time when one re-enters the linguistic milieu.

FOR THE AFFECTIVE CATALYTIC ENERGIZER (ACE)

It is a generally-accepted principle of both psychology and pedagogy that events which are accompanied by satisfaction promote learning, while those which are not satisfying do not. I see no reason why this principle should not apply to language learning, and have postulated the ACE as the means of incorporating

it in the model. In fact, the ACE may well be the most important single Centre in this model.

Children learn to speak their first language at a time when they display an affective attitude toward life in general, and while they require a lot of affective support from their parents. Guilford cites many studies which show that emotional deprivation can hinder general intellectual development, of which language learning is an important part. Relating this to the model, it would appear that emotional deprivation interferes with the ACE's role of reinforcing gratifying feedback from the environment. Without gratifying feedback and the help of the ACE language acquisition is slowed down. In the case of second-language students who are studying the language rather than learning how to use it in meaningful and satisfying situations, learning may never take place at all!

We do not know how or why satisfying experiences tend to make learning stick. Guilford (Ch. 15) relates many findings of research into what may be called the chemistry of the brain, notable among them is the importance of the hypothalamus in connection with motivation, feedback, reward and punishment. Since this model is a figurative construct only, we must not make the assumption that the proposed ACE corresponds to the hypothalamus, or to any other known brain centre for that matter. However, we must conclude from the findings of research that there is some process, which may be of chemical or electro-chemical nature, which strengthens mental impressions which are acquired under circumstances of satisfaction. The way it is done in this model is that the ACE orders the permanent storage of lexical items and of schemata whose trial use is rewarded while language is being acquired. To put it another way, the ACE provides the extra element which ensures the acquisition of data which has been found to be pertinent, and of rules which have been found to be valid.

FOR THE IMAGINATION AND INTUITION CENTRE (I & I)

Fundamental to this model is the belief that the acquisition of language is a long-term creative process. This means that the child particularly at the early stages, creates language for himself out of what he hears others say, by means of a process of discovery which is akin to the inductive leaps made by those rare adults whom one may call creative. It thus behooves us to look briefly at the process of creativity in adults, to see how it is related.

Many authors, among them Anderson (1959) and Gagne (1970), have considered the creative phenomenon in adults. It is generally acknowledged that the creative act requires the prior acquisition of knowledge, and that it frequently occurs unexpectedly amid circumstances of sensory inactivity. Some unfelt and involuntary process appears to have been at work, which has brought about sudden insight where rational thought has failed. Apparently some processes of imagination and intuition have been at work below the level of conscious thought. Maslow and Fromm have pointed out (in Anderson, 1959) that the ability to use imagination and intuition is present in children, but tends to fall into disuse in adults, perhaps because an adult is expected to act like an adult, i.e. to stick to the facts and to be rational and logical, rather than fanciful and imaginative. In any case, children seem to have an innate capacity to imagine and to intuit which decreases in significance as they grow older.

But, one may point out, the amount of first-language learning which takes place also decreases as one grows older. Can there be some relationship between the fact that imagination and intuition are used less and less as a child matures, and the other fact that his native language is acquired before he reaches adulthood?

It has been observed that second languages are learned more easily by children than by adults. Lenneberg (in Lenneberg, 1967) has stated that first-language learning also is easier for children. He has gone so far as to suggest that there is a critical period for all language learning, which is apparently related to the physiological maturation of the brain (cerebral lateralization). These observations do not answer the question posed above, but they appear to show that parallel increase in linguistic competence and decrease in the use of imagination and intuition are not a matter of pure coincidence. As will be shown in Part Two of this paper, the role given to the I & I Centre can provide one tentative explanation.

How does our hypothetical I & I Centre work? I propose that it uses a form of association, which will be called comparative analogy. Let us for a moment reconsider normal conscious thought processes as carried out by the Scanner, Comparator, Transformer, and Long Term Storage. Since data are stored by classification within the LTS, only information which is stored within a particular category will be retrieved by the Scanner for conscious consideration. However, the I & I Centre is, as explained above, a rather capricious free agent whose action is not bounded by the rational categories within which an adult has been trained to operate. It is proposed, in short, that the I & I Centre can retrieve information both vertically and horizontally from storage. It can cut across classification boundaries, drawing from both active and dead storage and even from the Preconscious.

When a person wants to move beyond the category in which information is stored to find out if there is a relation between one bit of information and other apparently-unrelated bits, the I & I Centre comes into operation, always provided that the person's interest is sufficiently compelling to cause his ACE to order the I & I Centre into action. The I & I then retrieves the first bit of information, and compares it by analogy to all

others to see if there are similarities and possible points of interrelation. This association procedure takes a long time, and obviously it can't go on if data is also being retrieved by the Scanner for use in normal conscious thought processes. This may explain why flashes of insight often occur after sleep or periods of sensory inactivity, and why they may involve combinations of data which would not normally be considered together. Furthermore, the involvement of the ACE in this process explains why flashes of insight come with irresistible force; the *eureka* event. Finally, the use of the rather primitive procedure of comparative analogy explains why insight may sometimes be valid, sometimes invalid. The fact that two bits of data are similar and interrelatable by analogy does not necessarily prove that they really belong together.

In Part Two of this paper, it will be shown how the I & I Centre enables children to make inductive leaps in language-learning, using data from both the LTS and the Preconscious.

FOR THE PRECONSCIOUS

Early visual impressions are stored in the Preconscious in this model. Once the Auditory Perceptory Matrices are developed sufficiently to allow the infant to reach the stage of verbal recognition, data begin to be stored instead in Long-Term Storage. This will be made clear in Part Two of this paper.

FOR THE SUBCONSCIOUS

As a repository of repressed fears, this Centre is not normally involved in language-learning. It could, however, exercise an inhibiting influence over the learning of a second language if it harbours tendencies toward xenophobia, or strong feelings of the cultural superiority of the native-language group.

We are now ready to consider the model in action during the long period of first-language acquisition. We will proceed through a series of phases, each of which begins as a result of the biological maturation or readiness of a particular Centre. It is postulated that at each stage the child makes use of what is available to him. When he has learned to use that intellectual equipment, he finds that a new Centre is ready, so that he can experiment with it until he can use it effectively, and so on. Thus we will be observing the long-term interaction of three factors; physiological maturation, stimulus-response learning, and trial-and-error learning.

The usual representation of the model is used to illustrate the first Phase, which is a relatively simple process. For subsequent Phases, which involve more complex sequences of actions, a type of flow-charting is used instead.

(As shown, if the child has had impressed upon him the need to take note of the "tags" in his Comparator, he will do so. This may be shown by his stopping in mid-utterance and starting again. If, on the other hand, his ACE is satisfied with a haphazard linguistic performance, he will not make the effort to improve.)

PART TWO

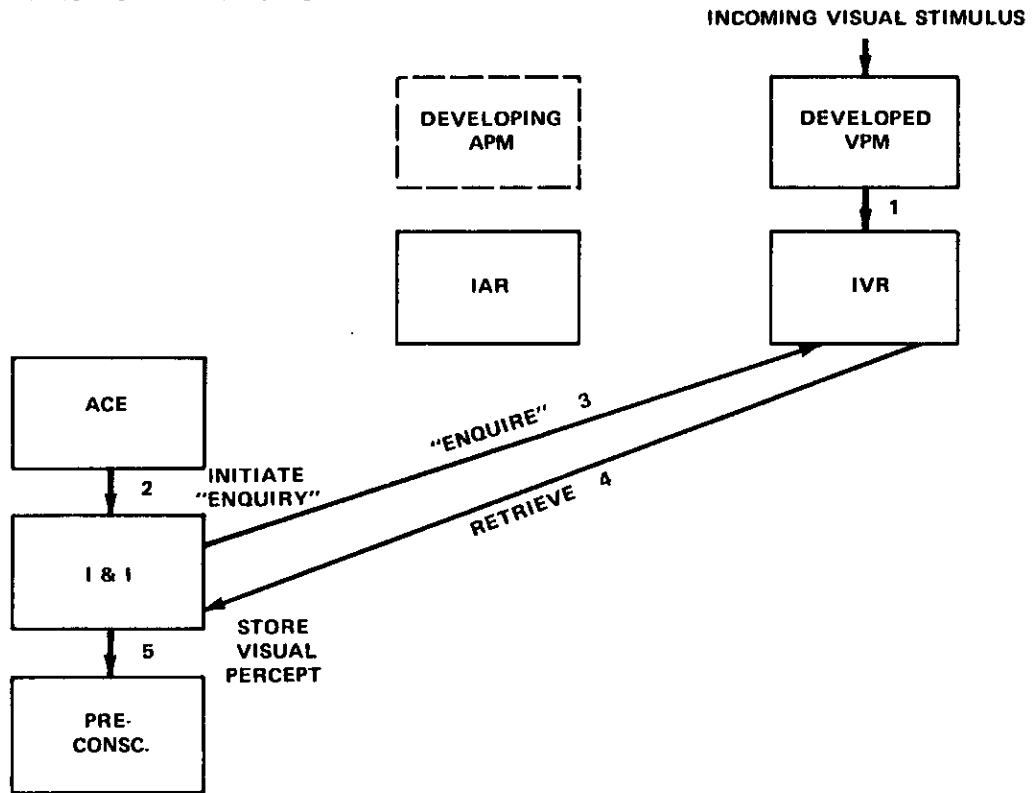
THE MODEL

AND

FIRST-LANGUAGE ACQUISITION

PHASE IN FIRST-LANGUAGE ACQUISITION

PHASE ONE: PRE COGNITION



This is the phase of early infancy, during which the child first learns to focus his eyes, then to distinguish objects from their backgrounds. Having accomplished this he is able to retrieve visual data from his IVR and to store it as visual percepts in his Preconscious.

During this period, which occupies the first eight months or so of his life (Mackey, 1965, p. 106), he makes general cooing sounds to himself as a form of early experimentation with his speech organs. By doing this he is taking the first steps toward developing his Auditory Perceptory Matrices. When this is also accomplished he will be able to make out phonemes from the sounds he hears, so that he will be ready for Phase Two.

PHASE TWO: FIRST WORDS

This phase takes place gradually over a period of several months. Jakobovits (1970, p. 55) cites Lenneberg to place this phase between 4 and 20 months on the average, while Mackey's chronology locates it roughly between 6 and 18 months. This phase of language acquisition may be considered to have three sub-phases:

visual recognition

verbal recognition

verbal imitation.

The first sub-phase begins once the child has stored elementary visual percepts in his Preconscious. He is now able to recognize persons and things which appear before his eyes. Although he cannot yet give a name to them, his stored visual percepts are now being constantly reinforced and clarified and are acquiring permanency.

The second sub-phase, verbal recognition, comes when the child makes the intuitive discovery that there is a relationship between verbal names and the persons and things which he can recognize. He tentatively stores the verbal names in his Long Term Storage, waiting for the time when he can verify their accuracy through verbal experimentation of his own.

The final sub-phase is that of imitation or experimentation with single words. For example, the infant sees his mother, and hears her or someone else say "mama". His own APM which have been the subject of considerable effort on his part are by now developed. He practises until he can say something which sounds close enough to mama to be recognized as such. Confirmatory feedback from his mother (smiles, hugs, etc.) provides a reward for the child's ACE, which in turn causes the combined auditory and visual percept of mama to be permanently stored in the LTS.

In this final sub-phase we see the action of a chain of stimuli and responses. The adult's word stimulates the infant to try to respond by imitation. The child's response then becomes a stimulus to the adult, whose response is confirmation. This confirmation in turn stimulates the child's ACE, whose response is to order long-term storage of the newly acquired word. It is suggested that this procedure continues with the acquisition of more names of concrete persons and things in the child's environment and later of elementary action words such as go, etc.

That is, I believe, the way in which the first words are discovered and generated by most infants. It is known, however, that both congenitally blind and congenitally mute children also acquire language (Lenneberg, 1962, 1966). In the case of the blind the process probably takes longer and other contextual factors (touch, smell, etc.) may be combined with the auditory input to replace sight. In the case of the mute, again a longer

period of time may be required since mute children likely receive less confirmatory feedback than infants who are able to utter words, although their gestures are no doubt rewarded.

Throughout the entire Phase Two the child is engaged in active behaviour, some of which happens to be verbal. He is entirely dominated by his ACE, which causes him to explore and experiment constantly. One might say that for him there is no division between activity and thought. He is totally engaged, physically, emotionally and mentally, in everything he does. At this stage he cannot help but want to learn to speak, since words give him more control over his environment. Once he has acquired a vocabulary of names and action-words the stage is set for the beginning of tentative word-combinations, which is the next phase.

At this point the following resume of the processes described so far may be of help to the reader.

Phase One:

1. Develop elementary Visual Perceptory Matrices
2. Store elementary visual percepts in Preconscious.
3. Begin development of Auditory Perceptory Matrices.

Phase Two:

1. Sub-phase 1:
 - a. recognize incoming visual stimuli as already having been noted and stored in Preconscious.
 - b. continue development of APM.

2. Sub-phase 2:

a. intuit relationship between:

- (1) incoming visual stimulus
- (2) incoming auditory stimulus
- (3) stored visual percept from Preconscious.

b. store audio-visual percept tentatively in Long Term Storage.

c. complete development of APM to short-word level.

3. Sub-phase 3:

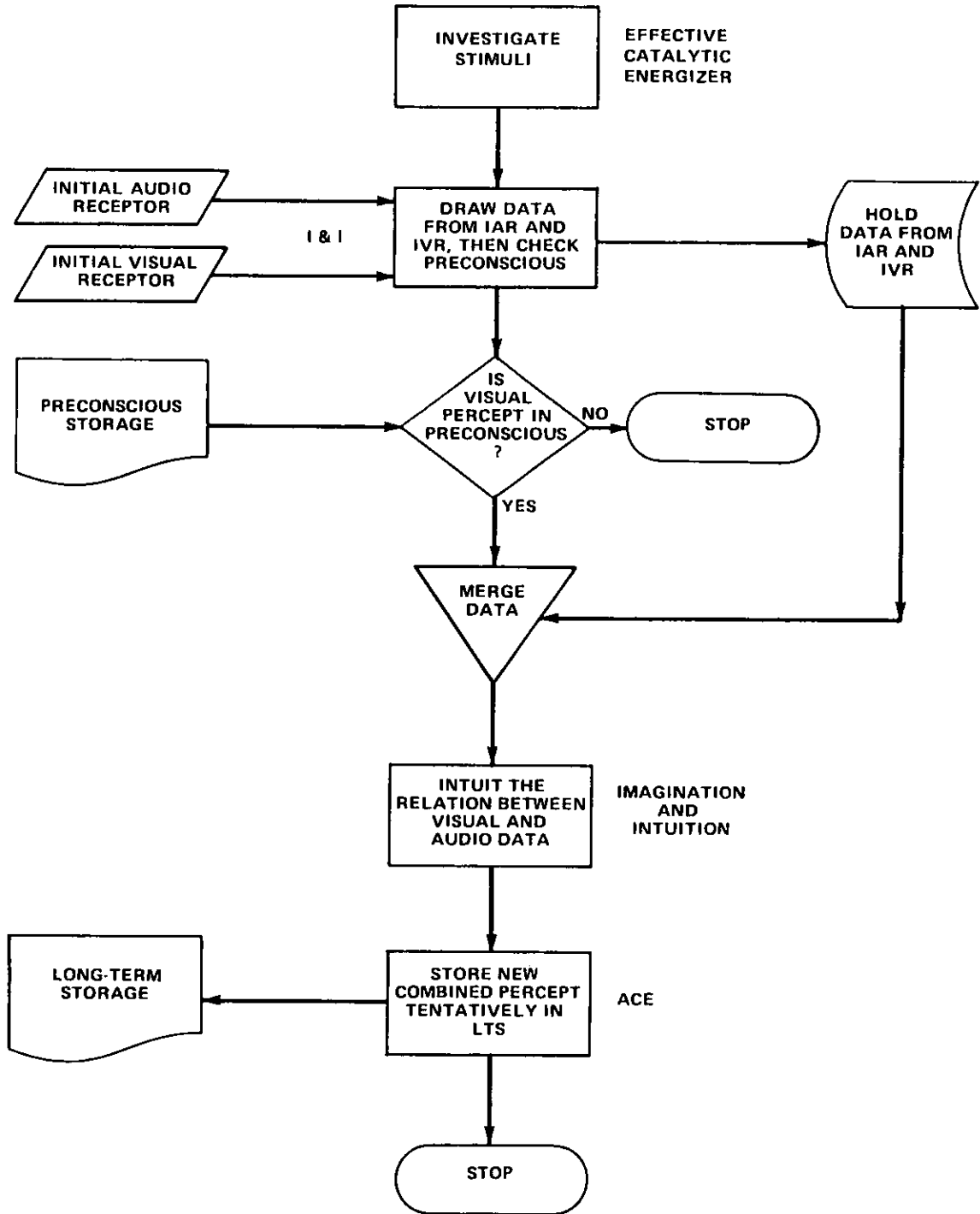
a. experiment to reproduce stored audio portion of percept in LTS under presence of:

- (1) visual stimulus
- (2) auditory stimulus

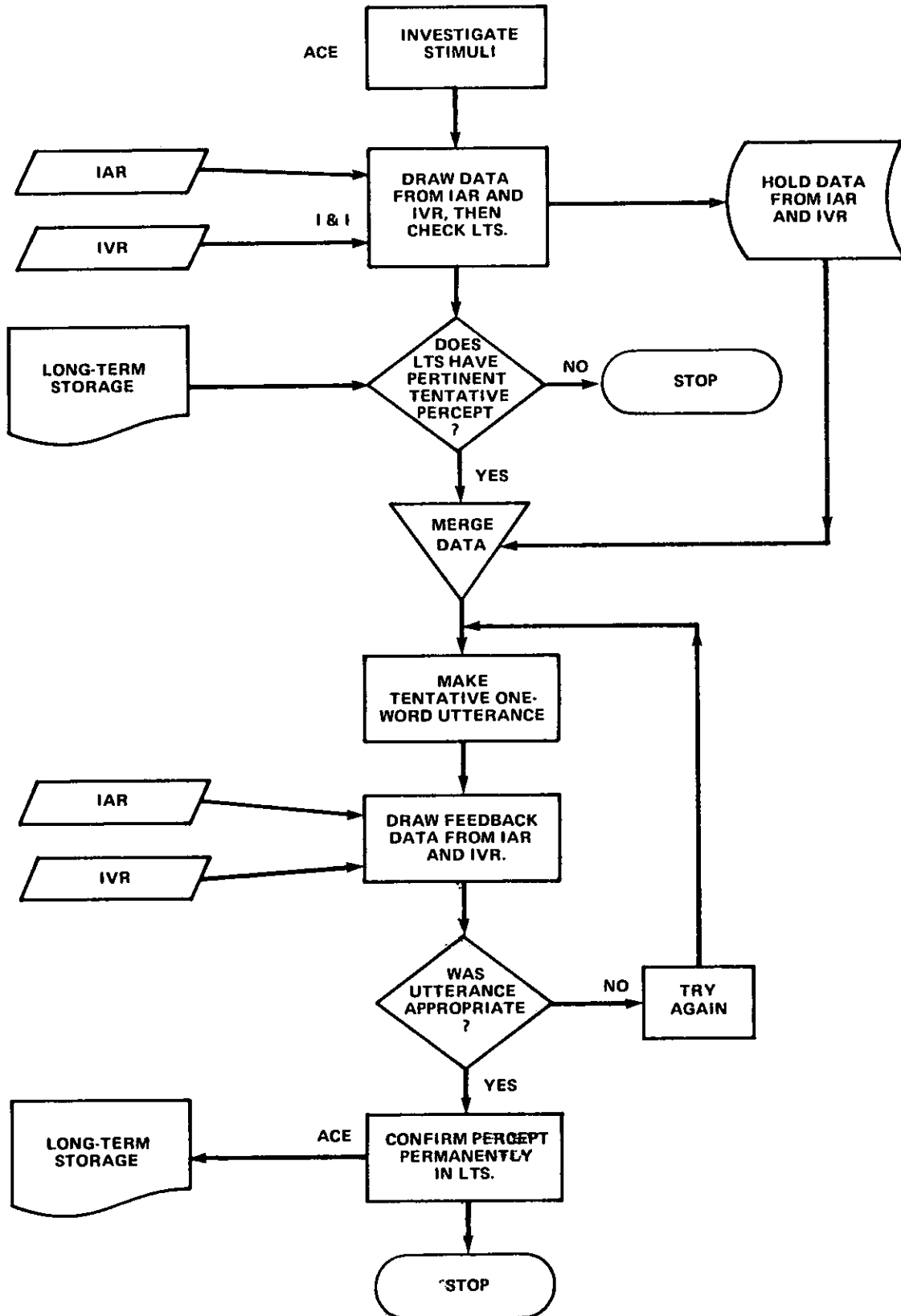
b. store confirmed audio-visual percept permanently in LTS.

c. begin use of single words without presence of an accompanying visual stimulus.

(representation of sequence in Sub-Phase 2)



(representation of sequence in Sub-Phase 3)



PHASE THREE: COMBINATIONS AND ELEMENTARY STRUCTURAL EXPERIMENTS

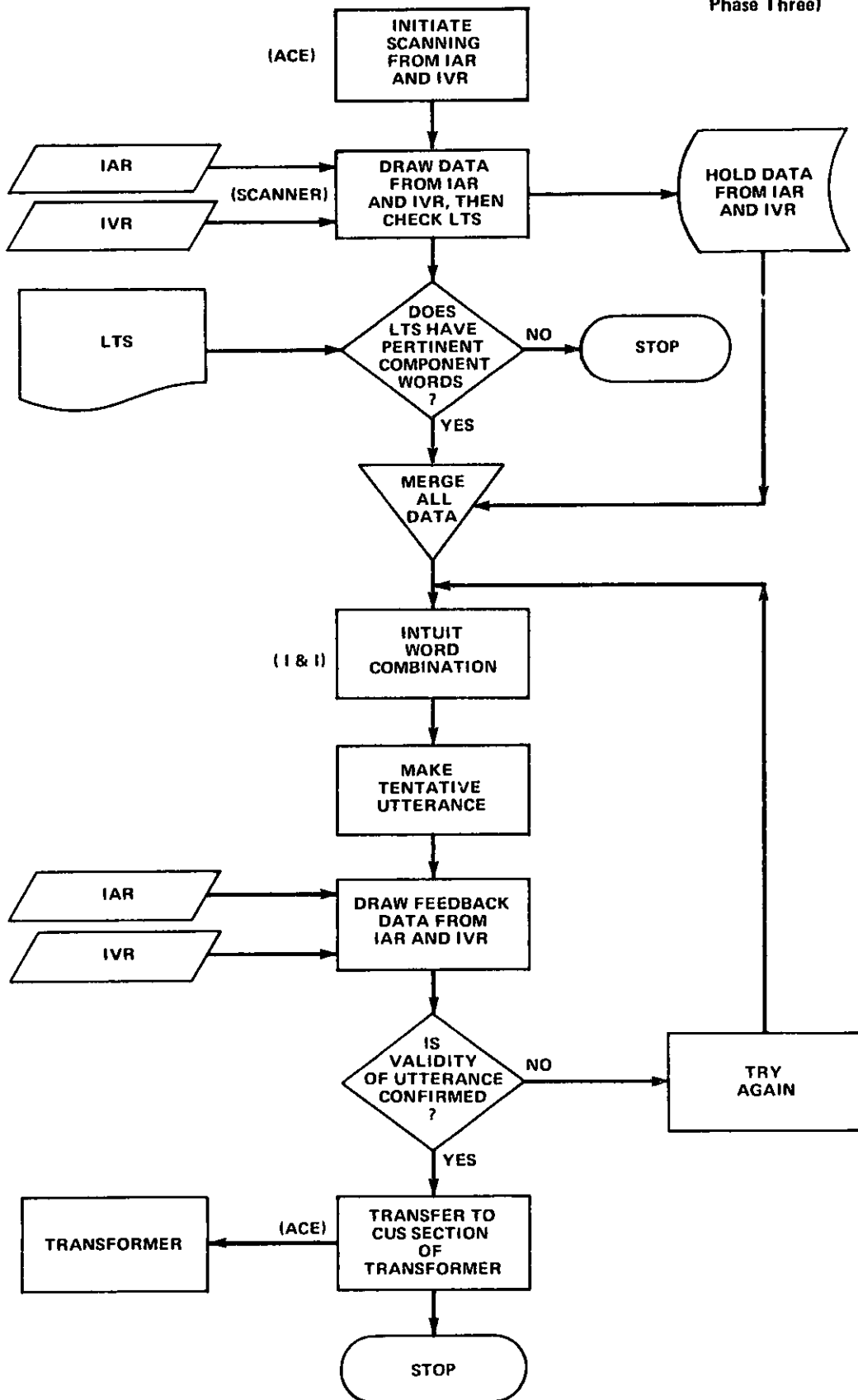
This phase begins with simple word combinations and continues on to the acquisition of more complex, but still relatively elementary structures, the kind which make up the Conventional Use Schemata. The child who has already acquired a certain number of individual words in Long Term Storage begins to put them together, two at a time at first, in an effort to speak as his older associates and his parents do. His efforts to speak meet with varying degrees of success and he gradually builds up a form of elementary language rules, which he begins to store in the CUS area of his Transformer for later re-use. Mackey (1965, p. 106) places evidence of this phase of development at roughly age three, but the child has of course been working toward it throughout the preceding year.

There is considerable approving and disapproving feedback from older persons, and much trial and error learning throughout this phase. It is interesting here to note the comments of Brown and Bellugi (1966). They observed a cyclic interaction between child and parent (imitation with reduction and imitation with expansion) followed by the child's renewed efforts to generate noun phrases and to gradually intuit the rules for the combinatory privileges of modifiers. They conclude that the work done by the child in this phase seems more like the development of an embryo (albeit with outside help) than the acquisition of a mere set of conditioned reflexes. One might say that response generalization is evident at the beginning where the child tends to hang on to the first basic variations which he discovers, even when they are not quite correct in all situations. Later it appears that he is actually taking the first steps in building up the transformational-generative grammar appropriate to his native tongue.

We may also consider in this phase the findings of Ervin (1966), namely that classes and rules are built up by analogy with gradual changes in complexity as a result of the influence of listening to adults. To this I would add a third influence, that of older playmates. The child's ACE causes him to make extra efforts to speak correctly because he does not want to be told by older children that he talks like a baby. (This is merely a personal opinion on my part, based on observations of my own children, but I believe that it is an important factor that appears to have been overlooked in research).

The flow chart representation on the next page shows the beginning of this phase, with the first tentative word combinations being tried out. It will be noted that the Scanner has now come into operation to pick out from various incoming stimuli those which may be matched to data already held in the LTS. In addition, we should note that the child's efforts at this stage are context bound. That is, the processes are initiated by sensory input from the environment to which the child reacts by putting words together to make an utterance. He is not yet thinking outside of immediate contexts but will acquire this ability with the development of his Comparator later in Phase Four.

(elementary word combinations -- beginning of Phase Three)



PHASE FOUR: FREE EXPRESSION AND REFINEMENT OF CUS

This is perhaps the most interesting of all the phases. The child has not yet learned to read and is in the pre-school and kindergarten period of his life. He has learned to put words together under contextual stimuli (Phase Three), and has built up rules in the CUS section of his Transformer. Now he begins to use his CUS for free expression, but he finds as he does so that he must modify some of them because they do not cover all situations.

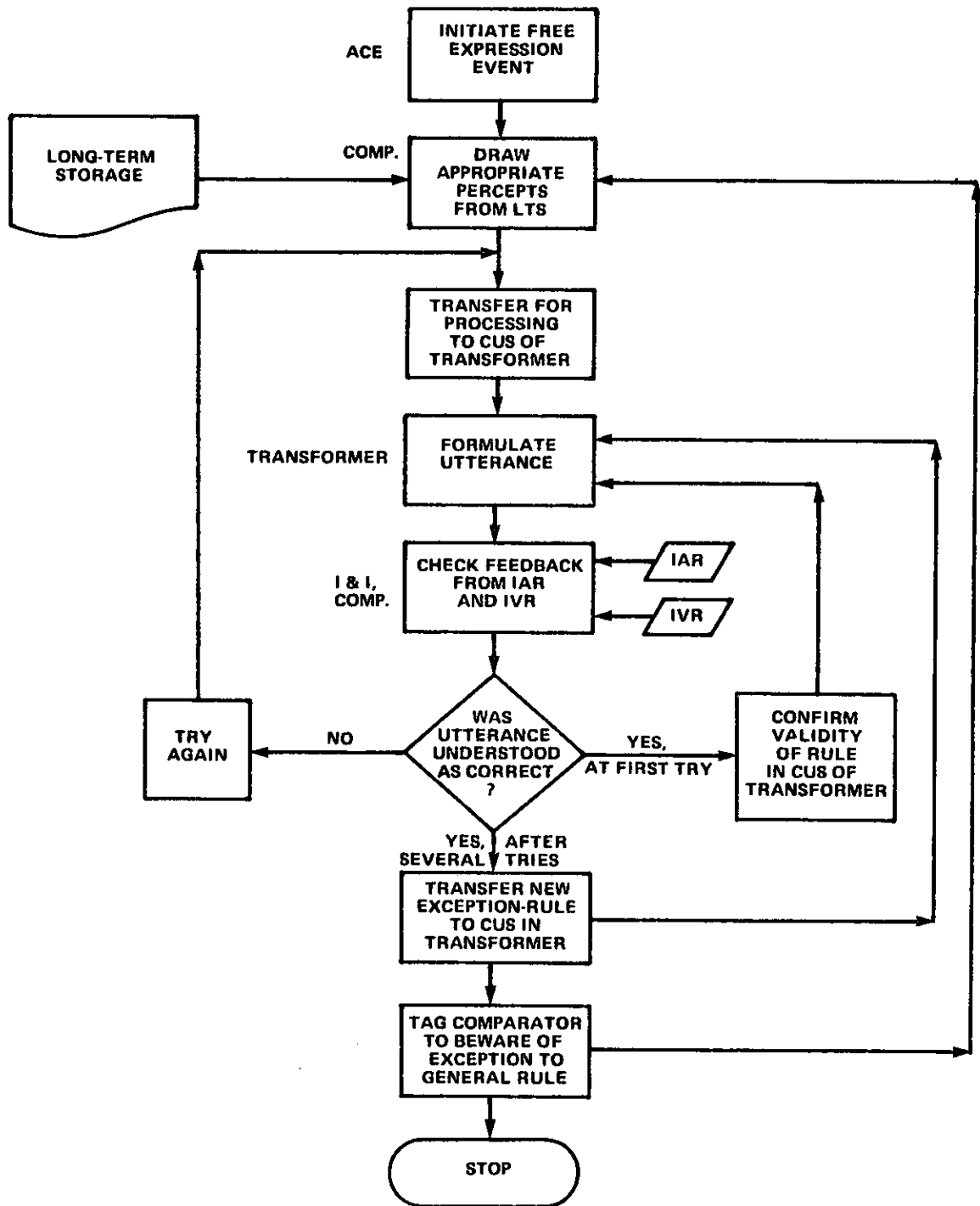
The extent to which his rules will be modified depends upon the affective significance of the forces which promote modification. For example, a child whose parents are recent immigrants from a different linguistic background and whose playmates are in a similar situation, will probably not be called upon to modify his CUS since the members of his linguistic environment will not be aware of exceptions to the basic rules. Similarly, children whose parents simply don't care about niceties in speech, or who think their child's speech sounds cute, won't make the effort to cause the child to correct himself. Such a child may go on for some time using generalized rules for all circumstances, e.g. "That works good," "I thought about it," etc. On the other hand, a child whose parents are particularly aware of language proprieties may be encouraged to develop exceptions to general rules from the moment deficiencies become evident. If the child of such parents also has older brothers and sisters in school he is even more likely to adopt the appropriate exceptions as soon as possible to avoid their criticisms.

The key factor in this phase is the development of the Comparator. It is postulated that when the child is informed that his general rule does not work in an exceptional situation, a note to that effect is tagged into his Comparator, which is

at first simply a place for noting such supplementary data. If the child is given sufficient affective reasons (in one way or another) to concentrate on the new rule, it will be stored in his CUS. The Comparator will then alert him whenever he begins to use the incorrect rule. With practice and appropriate confirmation, the new rule will become permanently stored in the CUS, and will become automatic. Thus the Comparator comes to be developed at this relatively early stage in life. Its main functions will come a bit later in Phase Six.

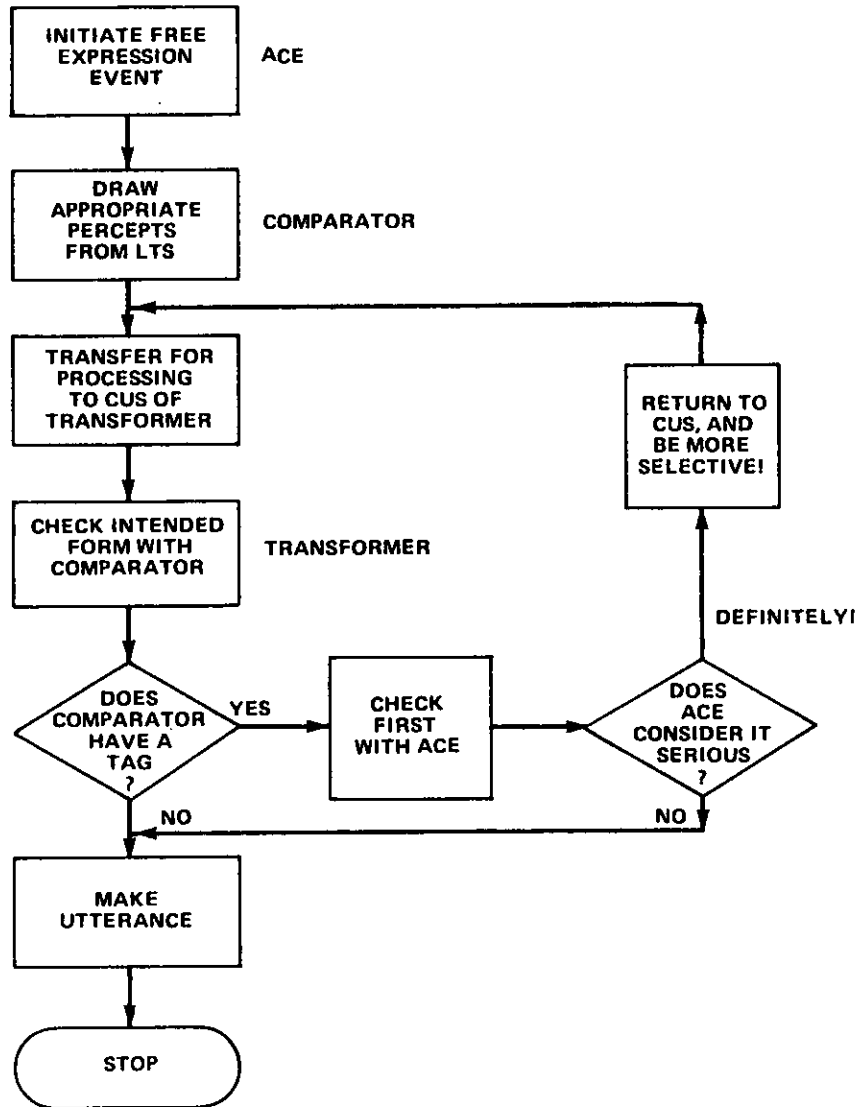
On the next two pages we see representations of the processes involved in Phase Four. First is the early attempt at free expression, with exceptions tagged into the Comparator. Then we see the results of the tagging and the requirement for the child's ACE to have been impressed with a real desire to avoid error.

(representation of initial refinement during free expression)



(As shown, if the child has had impressed upon him the need to take note of the "tags" in his Comparator, he will do so. This may be shown by his stopping in mid-utterance and starting again. If, on the other hand, his ACE is satisfied with a haphazard linguistic performance, he will not make the effort to improve.)

(representation of possibilities for permanent refinement)



PHASE FIVE: READING SKILLS

The child has now reached school age and is beginning to read. He has previously developed his Visual Perceptory Matrices to the extent that they were required to discern people, things, and events. Now he adds the specific VPM which are used in reading.

During this phase, in addition to enlarging the vocabulary in Long Term Storage, he begins to store more complex language constructions as recognizable entities in the LTS. In our culture, complex constructions are more frequently encountered in reading than in typical conversations, thus the main significance of the child's new reading skills is that they give him the means of becoming acquainted with such constructions even though he does not use them when speaking. It will be shown in the next phase that the acquisition of complex constructions as recognizable entities stored within the LTS is a prerequisite for the development of usable Higher Use Schemata.

The acquisition of reading skills is given recognition here as a separate phase, although this could also be considered as the first stage of Phase Six into which it naturally and quickly leads.

PHASE SIX: HIGHER USE SCHEMATA

It is postulated that this phase, which begins once the child has learned to read, continues throughout the rest of his formal schooling and in some cases during adult life.

As mentioned above, the development of Higher Use Schemata presupposes their acquisition within the LTS at the level of recognition and comprehension. This proceeds from two sources. The first is by listening to, and coming to comprehend

what the teachers and other articulate adults say and the ways in which they say it. The second is by reading, including what we call literature, which provides examples of HUS in the visual medium. The acquired data must then be used in order to transfer them from LTS to the HUS section of the Transformer.

One medium for the development of HUS is oral self-expression, both inside and outside of the classroom. The other is written self-expression, the mustering and organizing of thoughts without temporal urgency so as to try to convey meaning to the reader. I believe that written self-expression is of particular importance because it lets the child experiment without self-consciousness with *tournure de phrase* which he has heard adults use or has encountered in reading.

The Comparator becomes very significant in this phase. The student now wants to generate ideas of his own by putting together data held in LTS, but he must find some way to express the ideas so that they bring the same meaning to his listeners and readers. By using his Comparator he gradually develops the HUS which he needs to express himself effectively. That is, of course, always subject to the proviso that he must be given appropriate conditions for experimentation. His teachers in particular must provide him with the feedback necessary to let him know whether or not his efforts are succeeding. (This may be quite difficult to do in schools where the classes are inordinately large, or where there is too much stress on rote learning at the expense of self-expression. One does, however, get the impression that teachers are becoming more and more aware of this need.) Speaking personally, I am absolutely convinced that Higher Use Schemata can only be developed (transferred from the level of recognition within the LTS to that of usability within the Transformer) when the student is encouraged to express his own original ideas, and is then guided and helped in expressing them clearly. This belief will be shown later to have particular significance for the learning of a second language.

I do not intend to speculate upon the order of acquisition of HUS, that would be beyond my capabilities and the scope of this paper. However, I do not agree with those who maintain that children have acquired almost the entirety of their transformational-generative grammar by the time they enter elementary school. A nodding acquaintance with complex structures does not indicate that they have been assimilated and are usable. There may be some support from research for this contention that the HUS are developed in later childhood or even in adolescence. For example, Chomsky (1969) recently studied the acquisition of certain rules which in two instances would fall into what I consider HUS. She showed that the rules for the verbs *ask* and *promise* are acquired at varying times during elementary schooling, and indeed that some children have not acquired the rules for *ask* by the time they are ten years old. Her study does give some reason to believe that certain advanced rules may be developed in the HUS during adolescence, or may never be acquired at all.

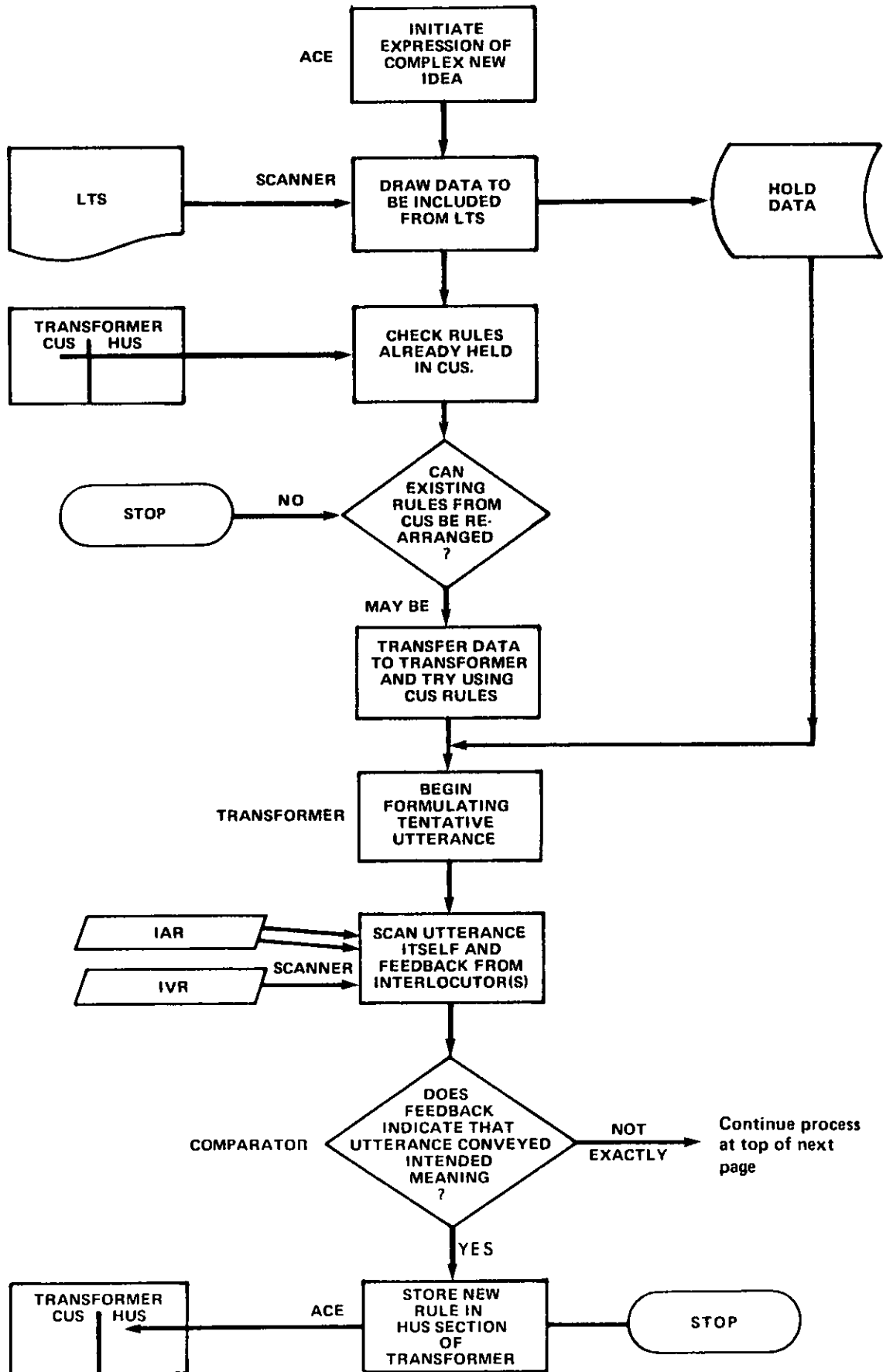
The representation which follows on the next two pages show the steps taken by the various centres in this model. As shown, provision is made for three possible sources of raw material, for HUS:

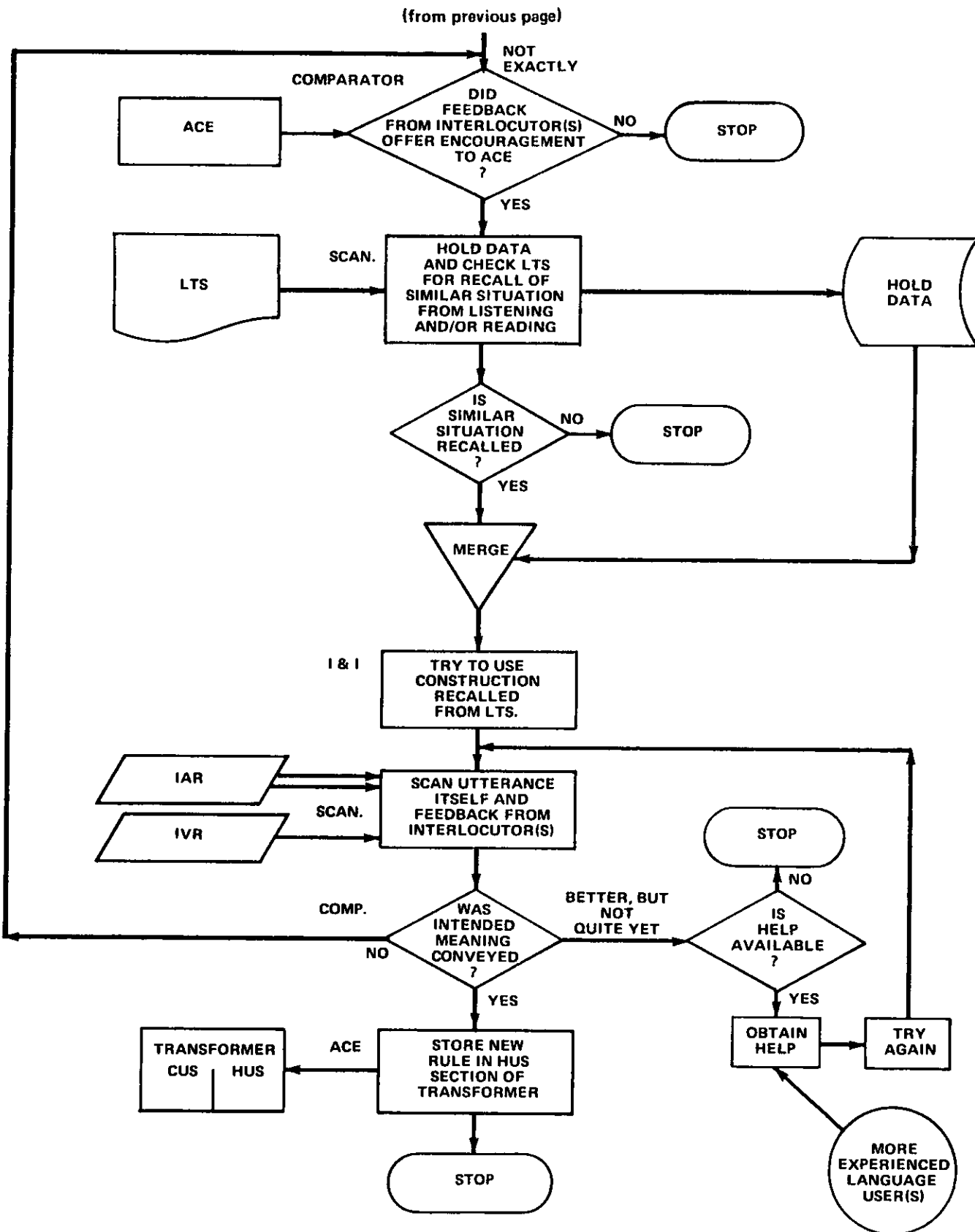
1. Rearrangement of available CUS,
2. Recall of remembered constructions stored in LTS, but not previously tried out,
3. Suggestions and help from more experienced language users.

In all cases, it is the actual successful use of the intended HUS which finally confirms their appropriateness and causes the ACE to have them stored for future ready use in the Transformer. It will also be noted that the availability of feedback from interlocutors combines with the Comparator's own assessment of the suitability of the experimental schema in order to achieve

confirmation. The process is in most cases a form of shaping, by which successive modifications to an utterance finally bring it to the point where its form can accomplish its intended purpose, whereupon the HUS incorporated in it are confirmed as valid for future use.

(representation of the development of usable HUS)





PHASE SEVEN: THE ADULT

This is a phase during which the extent of activity manifested in language acquisition will vary considerably from one person to another. Most will continue to acquire vocabulary but there will probably be little effort to develop new Higher Use Schemata, except on the part of creative writers, teachers, and others actively involved in the communication of ideas.

The general mental processes used by typical adults are of interest. The adult has already accumulated a large amount of data in LTS, so does not find it difficult to relate new data to what he already possesses. As Fromm points out (in Anderson, 1959), the adult tends to rely on classification of new data in relation to what he already knows, and seems to have lost the sense of intellectual wonder and excitement which animates the child. It may also be that once he becomes involved in an occupation he becomes relatively field dependent (Witkin, 1954), thus losing interest in many things outside his regular sphere of social and working activity. Or perhaps as Lenneberg suggests (1967, pp 178, 179), the acquisition of language becomes less likely after physiological maturation of the brain. In any case, in terms of this model, the adult probably has a sufficient collection of schemata in his Transformer to handle almost any communication situation which he may encounter. He thus feels little need to continue the involvement of his ACE or his I & I Centre to develop additional HUS. He believes himself to be sophisticated and capable of understanding just about anything in terms of what he already knows, and what he can't understand he simply ignores.

The apparent fact that most adults are no longer in the habit of acquiring increased competence in their first language will have implications for those who try to teach a second language to such adults.

MEMORY AND FORGETTING

Although memory has not been specifically mentioned in this model, neither remembering nor forgetting has been overlooked.

The role of short-term memory has been assigned to the Initial Audio and Visual Receptors (IAR and IVR). As mentioned earlier, information received in these Centres may be acted upon under the direction of the Affective Catalytic Energizer (ACE), or may be ignored and allowed to fade out. Language learning also involves the acquisition of data in what is referred to as Long-Term Storage (LTS). In this model, the fact that data has been acquired in LTS does not mean that it will always be there in accessible form as shown by the provision for dead storage in the LTS. The difference between the active and dead areas of the LTS is one of retrievability, which in turn depends on use.

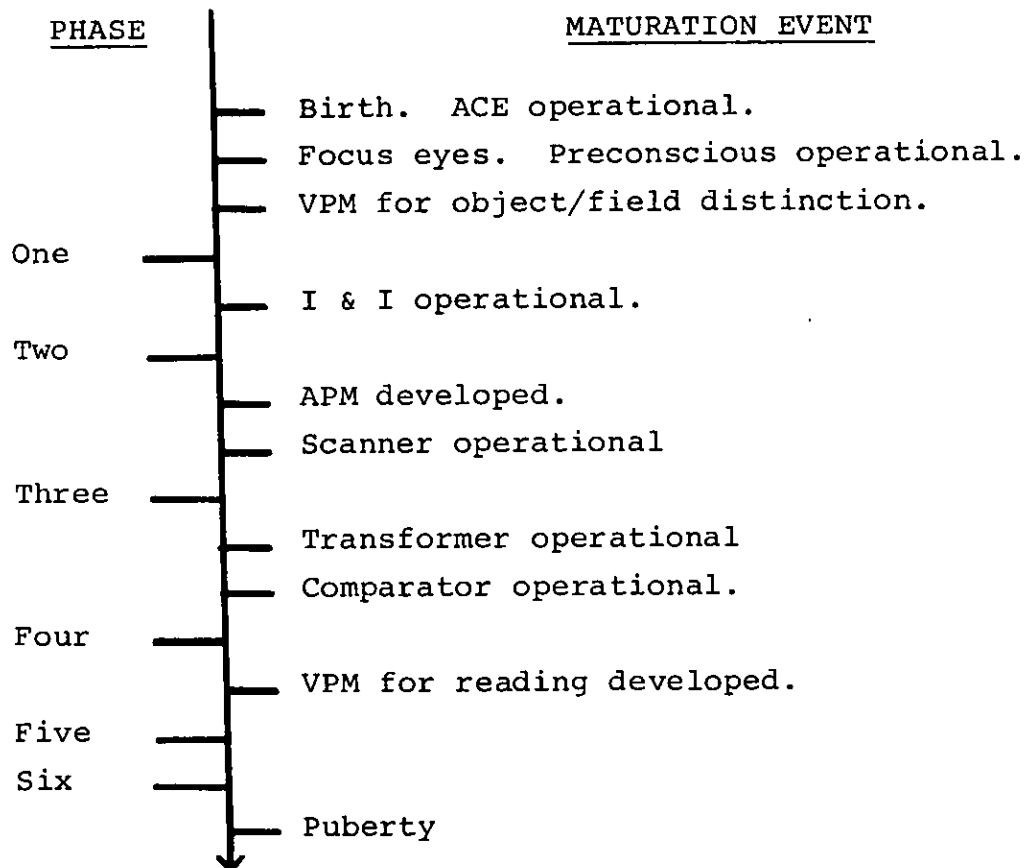
It has been explained that the Scanner detects topics in incoming communications, and calls up stored data from the LTS for processing by the Transformer. During the interfacing of acquired and incoming data, new relationships are formed among the various bits of information and they come to acquire more points of accessibility. It is this acquiring of greater accessibility which in this model characterizes long-term memory, in that data which are accessible through various reference-points within LTS acquire greater permanency. On the other hand, information which a person may have encountered only once and which he has not used subsequently, has not been interlinked with other information so as to improve its accessibility. As storage space is more and more used up, this unused information may be sloughed off to the dead section to leave more available space in the

active section. Thus, true forgetting does not occur with this model, and data which appear to have been forgotten may be retrieved under certain circumstances by the I & I Centre.

It can be seen that this theory has implications for second-language learners, particularly when the language being learned is left unused for a period of time. More will be said about this later.

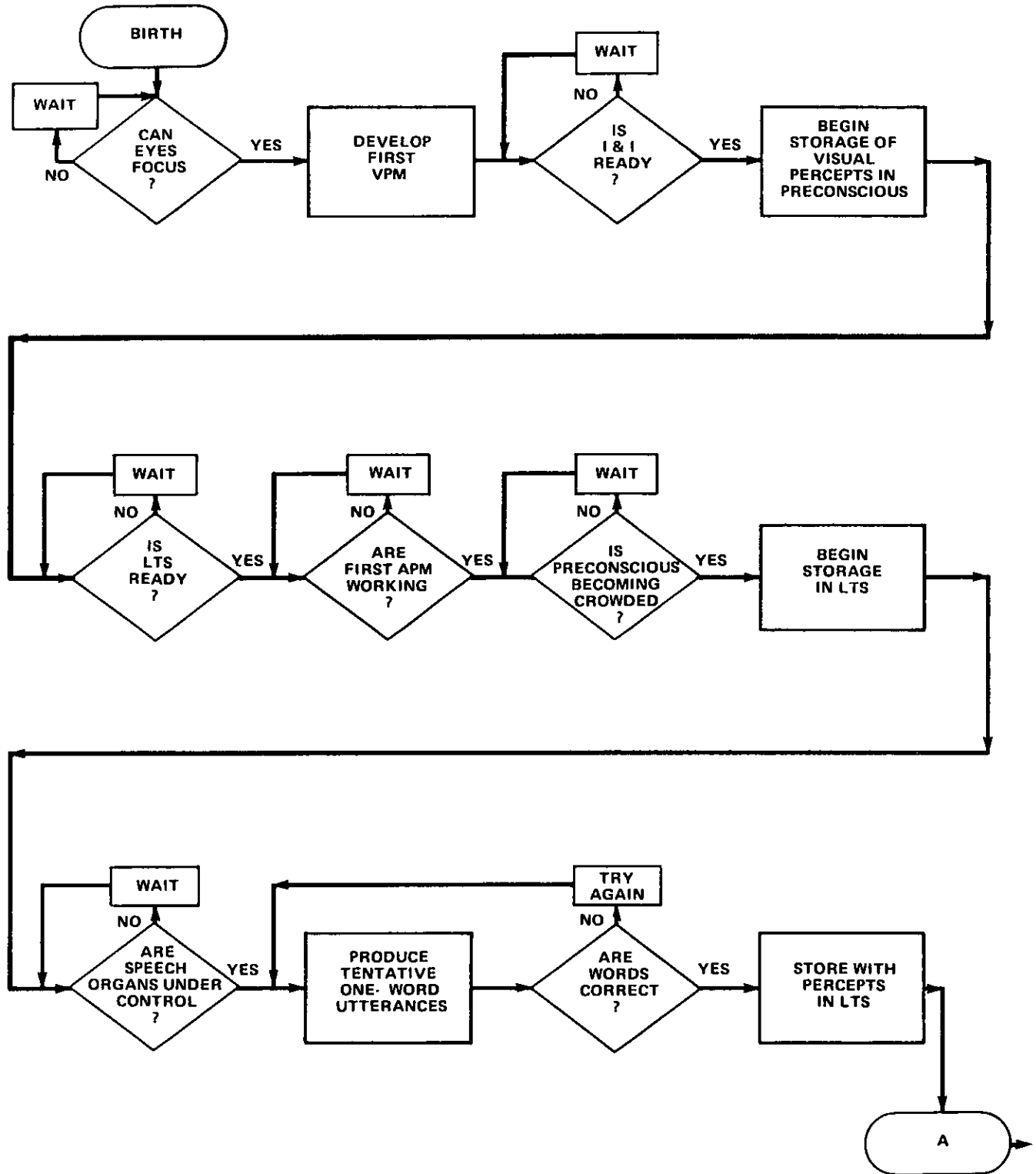
AN OVERALL PICTURE OF FIRST-LANGUAGE ACQUISITION

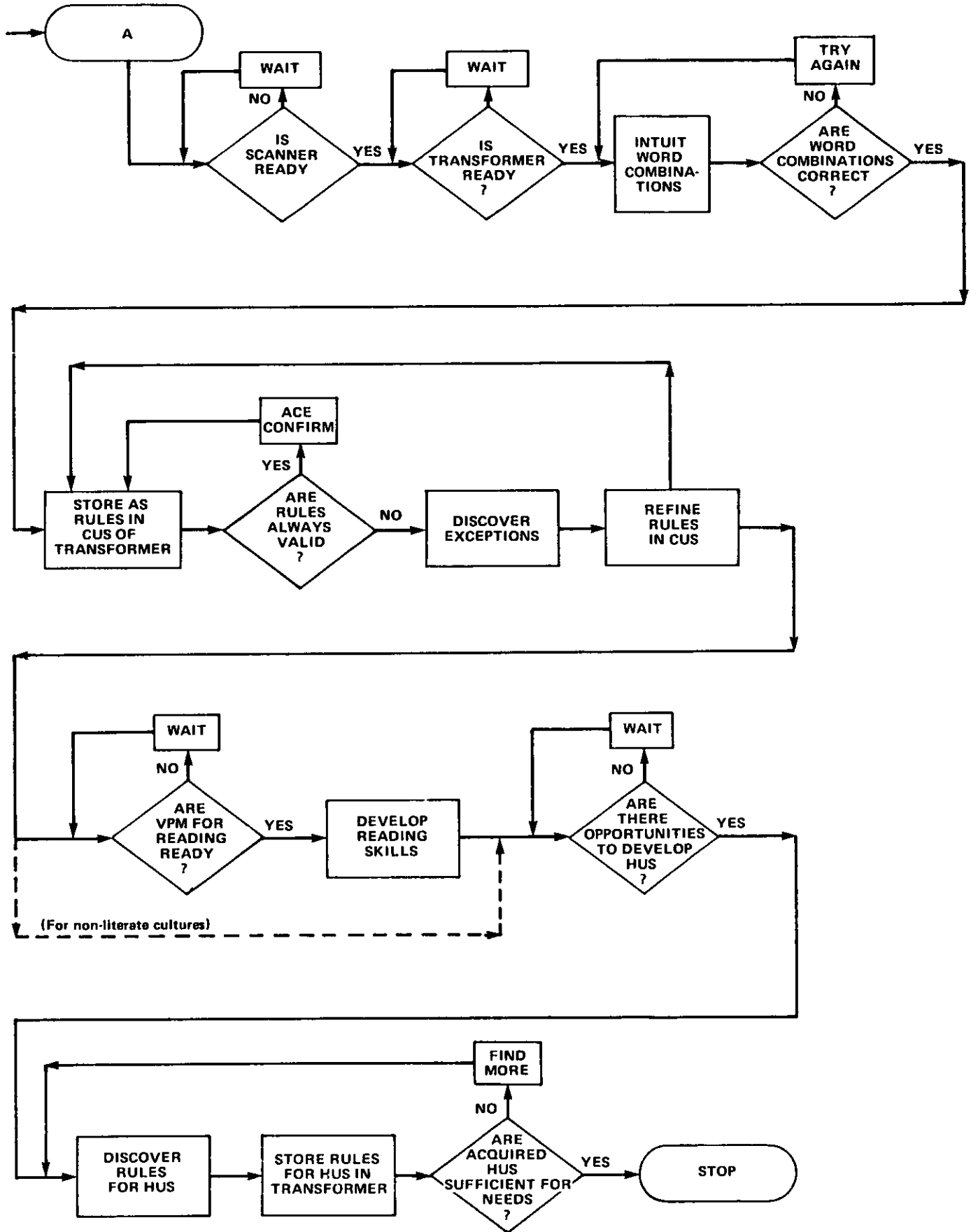
At the beginning of this paper, it was mentioned that certain Centres might be considered to be innate, while others required development. There appears to be an implied relationship between physiological maturation and language-learning activities, which is shown in the illustration below.



Consideration of the maturational events must make us wonder why they take place in this sequence in the model, and also how the brain knows that it is time to proceed to a new phase in language learning. In answer to these questions, we must remember that this model is not intended in any way to be an explanation of all the activities carried out by the human brain. It is, however, possible to trace out a rough master program for the sequence of events. This program, once again in terms of this theoretical model, appears on the next two pages.

(the Master Program based on maturation)





THE MODEL IN COMPARISON TO OTHER THEORIES

In the Introduction to this paper mention was made of the contrasting theoretical viewpoints of the behaviourist and the transformational-generative grammar schools. This model was presented partly as an effort to bridge the gap between them. It may also be of interest to relate it to other theories of the intellect and mental development.

The model may be compared to the writings of Piaget, who (1960) explained his view of the progressive buildup of intellectual schemata within the minds of children. He stressed that a maturational process is involved, and that various levels of complexity of thought are attained in an apparently fixed sequence by children at roughly the same stages in their development. The following illustration shows the model in comparison.

FUNCTIONAL CENTRES MODEL PHASE	PIAGET'S STAGES
One	Sensori-motor intelligence
Two	
Three	Symbolic and preconceptual thought
Four	Intuitive thought
Five	Concrete operations and
Six	Formal thought

↓

As shown, the model while not tied exactly to Piaget's progression does display an analogous development.

Another comparison may be made to Guilford's "Model of the Intelligence" (1966). The table which follows shows the approximate correspondence between the Phases and the three dimensions of Guilford's model.

<u>F-C MODEL</u>	<u>GUILFORD MODEL</u>		
PHASE	OPERATIONS	PRODUCTS	CONTENTS
ONE	?	units	figural
TWO	cognition memory	units classes	figural
THREE	memory convergent prod.	systems relations	semantic
FOUR	convergent prod. divergent prod.	systems transformations	semantic
FIVE	all to date, but by visual medium	all to date, visual medium	all to date, + symbolic, visual medium
SIX	convergent prod. divergent prod. evaluation	transformations and implications	semantic and behavioural

Finally, the F-C model, while only intended as a theoretical construct in cybernetic terms, does provide one means of bridging the apparent gap between the behaviourists and the T-G grammarians. The roles of habit-formation, trial-and-error learning, shaping and reinforcement are included. At the same time, it attempts to make clear that regardless of the means by which the child and his environment interact, it is the child's own inborn capacities which enable him to acquire and use language. Thus opposing points of view are brought together.

SUMMARY OF FIRST-LANGUAGE ACQUISITION PROCESSES

Beginning with the vaguest notion of an elementary hunch that there may be some relation between the people around him, the actions they perform, and the sounds they utter the infant sets out along the path which leads eventually to mastery of a language. Perhaps he is driven by a suspicion that his survival depends upon learning to communicate with those around him, perhaps by an internal maturation-schedule which has a concomitant necessity to develop first intuitive, then concrete, then formal modes of speech and thought.

He passes through various phases of language acquisition characterized by various processes carried out at first below the conscious level, then increasingly at the level of conscious endeavour. His mind is suited to the learning of language, all the tools are there, all that is needed is a linguistic environment to provide the words he needs and people to reward his efforts and guide him until he is able to guide himself.

During the process his sensory input equipment becomes more finely attuned to the significant details of what he hears and sees, and enables him to become selective in what he attends to. He comes to rely less and less on imagination and intuitive processes, and more and more on relating what is new to what is already acquired. Finally he thinks for himself and finds ways to express his original thoughts.

By the time he reaches adulthood or completes his formal education he uses his language with varying degrees of precision, reflecting the extent of correlation between his acquired linguistic competence and the linguistic performance required by his occupational and social environment. If we try, we can all understand more than we can explain.

PART THREE

THE MODEL,

AND

SECOND-LANGUAGE ACQUISITION

BACKGROUND

Before we can consider the relation of the model to second-language learning we must first look at two fundamental issues:

1. the way in which the second language is acquired,
and
2. the learner's motivation.

There are many reasons for learning a second language, among which the following are the most common:

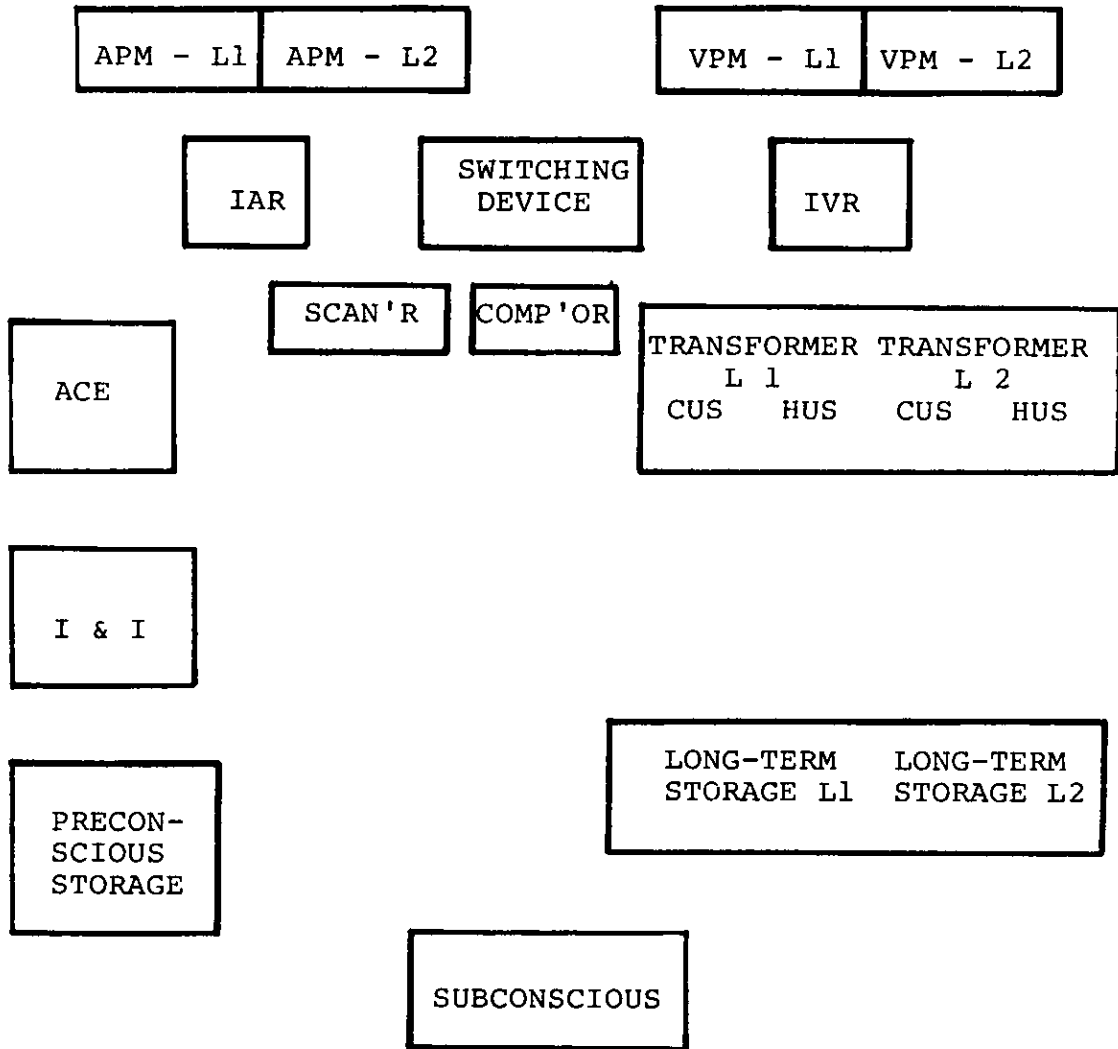
1. to live and work permanently or for a long period of time in the new language milieu.
2. to communicate orally during short-term visits to the new language milieu.
3. for general recreational reading.
4. for specialized professional reading.
5. to communicate orally or in writing periodically with people in the new language milieu who share the same general or professional interests.

Behind all these surface reasons lies a deep and overriding question of motivation. Does one wish to acquire a complete new set of linguistic abilities on a permanent basis, or does one want to use the new language only as a means toward an end? This question of deep-seated motivation has been considered by Lambert (1963), and the implications of his integrative and instrumental motivations have been analyzed by Jakobovits (1970). In general, a person with integrative motivation wants to be like the other language group, while one with instrumental motivation wants to use the other language as a means toward a particular private end. Of the five reasons listed at the beginning of this paragraph, only reason number one goes logically with integrative motivation.

Type of motivation is probably closely linked to the type of bilingualism which a person will achieve. One set of terms which is sometimes used here is coordinate and compound bilingualism. As a brief explanation, coordinate bilinguals are thought to possess two complete and separate language systems, while compound bilinguals are believed to possess their second language in the form of equivalents to their native language. Neither sort can be considered arbitrarily to be better than the other. This distinction was brought into sharp focus by Macnamara (1967), and was considered in detail by Jakobovits (1970). There may be grounds for believing that these two different sorts of bilingualism may be found although, as Fishman suggests (in Valdman, 1966), the distinction may merely refer to stages in language learning. Something similar to the latter point of view is suggested by this model as will now be explained.

BILINGUALISM

In terms of the model, bilingualism refers to the extent of completeness of the L2 system in comparison to the L1 system. The diagram which follows shows how the model would look for a person with two complete language systems, which will be referred to henceforth as complete bilingualism. This model contains new Auditory and Visual Perceptory Matrices, a new Transformer (with both CUS and HUS), and new Long-Term Storage for L2. In addition, a Switching Device has been added among the input-output devices.



At the opposite extreme from the idealized complete bilingual is the partial bilingual who has learned L2 by reading, translation, and grammar study. For him, L2 is just a variant of L1, with content and form which happen to be different. In between these two extremes are many other forms of partial bilingualism.

Is complete (coordinate) bilingualism possible to attain? It has been suggested by Macnamara (1967) that coordinate bilinguals are people who have learned their two languages in different contexts. Experiments along this line have been conducted with kindergarten and early elementary-school children (Lambert and Tucker, 1972; Barik and Swain, 1972), and seem to indicate that it is possible for young children to acquire two languages with relative efficiency when the new one is introduced within a different context (school versus home).

If children can do it, what about adults? It has been noted by many writers that young children seem to learn a second language much more effortlessly than do adolescents or adults. This may be because a new language is for children just another form of natural behaviour, in which they can engage without self-consciousness. In a way this tallies with findings mentioned by Titone (1964), that successful second-language learners in general tend to be outgoing persons without self-conscious inhibitions. From the model, we have seen how the contents of Long-Term Storage and the Transformer are built up by a person learning his first language. We have also seen that, for an idealized complete bilingual, these Centres are duplicated for L2. This leads us to a hypothesis:

Complete bilingualism requires the same sequencing of Phases for L2 as for L1.

Thus, complete bilingualism will likely be achieved only by persons who are ready and able to use the other Centres needed for the development of LTS and the Transformer. Yet we have seen that, as various new Centres become available through maturation, they then tend to have a greater responsibility in language learning than the other previously-used Centres. This brings us to another hypothesis:

The extent to which complete bilingualism will be attained depends upon the availability of an L2 environment at the time that appropriate Centres become ready for use.

We have noted that the I and I Centre in particular tends to fall into disuse among adults. Adults will thus find it hard to use the intuitive processes appropriate to learning L2 at the levels of Phases Two, Three, and Four. Similarly, an adult has a large data bank for L1 in LTS, and has Higher Use Schemata for L1 in his Transformer, so will find it difficult to bring himself to use the more laborious (and for him rather childish) process required to build these Centres anew for L2. In other words, if an L2 environment is available and meaningful at a level of physiological development appropriate to Phase Four or earlier, two separate and complete language systems may be acquired. Thus, the possibility of developing complete bilingualism will likely exist only for young children for whom the use of L2 can become a natural way of life, rather than something to be learned. In terms of this model, the adolescent or adult learner does not normally develop complete bilingualism.

To what extent, then, does the adolescent or adult become partially bilingual? Will he develop separate Long-Term Storage for L2, or just store L2 with L1? Will he develop a separate Transformer for L2, and will that Transformer have both CUS and HUS, or be limited just to CUS? These questions lead us to consider briefly second-language teaching-learning situations.

TEACHING AND LEARNING

The extent to which partial bilingualism will tend toward complete bilingualism will depend on several factors:

1. The significance of L2 for the learner. Will it engage his ACE over a long period of time, or not?
2. The method of teaching. Does it promote intuitive learning at the beginning, or not?
3. The sematic distinctiveness of L2 vocabulary. Are the items made sufficiently different from those of L1 to give a different connotation, thus inviting their storage as a new percept in a new LTS, or do they appear to be mere linguistic variants of L1 acquisitions?
4. The appropriateness of structures taught - Are usable Conventional Use Schemata imparted first?
5. The possibilities for self-expression - Are there reasons and sufficient time for developing Higher Use Schemata?

The following table gives an indication of what may result, in terms of the model, from various teaching-learning situations.

T-L SITUATION	RESULTS
Reading-translation -grammar	VPM for L2, (for reading). LTS for L1. Transformer for L1.
Audio-lingual	APM for L2. Some VPM for L2. Some LTS for L2. Transformer CUS for L2.
Audio-visual	APM for L2. VPM for L2. LTS for L2. Transformer CUS for L2.

As shown, when a person learns L2 by reading, translation and grammar explanation, he is not really learning the language but rather is learning about it. This learner comes to recognize what L2 means in terms of L1, so does not develop new Centres for L2 except VPM's for reading. He can, however, acquire vocabulary quickly, relating new terms to what he already knows in L1. It has been suggested (Ausubel, 1964) that a more advanced form of such methodology, including speaking practice, may be the most painless and appropriate way for an adult to learn a new language.

A person learning by the audio-lingual method will acquire new Auditory Perceptory Matrices, and the Visual Perceptory Matrices needed for reading (eventually) in L2. Without actual immersion within the new language milieu, however, he will not likely acquire additional VPM's for paralinguistic features of the language. On

the other hand, since he is acquiring vocabulary and structures within situational contexts, he will store some vocabulary separately from that of L1 and will develop Conventional Use Schemata for L2.

It is suggested that a person who learns by the audio-visual method (recorded dialogue and accompanying pictures) will have some advantage over other learners, because he learns to make a direct connection between what he hears and what he sees. The audio-visual situations are more realistic than simple dialogues to memorize; and given a skillful teacher, the student will begin to develop VPM for paralinguistic features of L2. He will also store content items in a new LTS, because the visual element of such a program is normally quite different from that which accompanies his usual L1 communications. Like a student who learns by audio-lingual means, the audio-visual student will also require Conventional Use Schemata in a new Transformer.

This brings us to the crucial point, the development of Higher Use Schemata. This is where the partial bilingual takes the steps necessary to work toward becoming a complete bilingual. It is also where most second-language learners stop.

FROM PARTIAL TOWARDS COMPLETE BILINGUALISM

I do not believe that it is impossible for a partial bilingual to become a complete bilingual; it is simply unlikely. The partial bilingual has made considerable efforts to acquire L2 items in Long-Term Storage and Conventional Use Schemata. In most cases, he can probably get by adequately with these acquisitions. If he has a real need to be able to express more complex ideas in L2, and has a supportive L2 environment, he may go on to develop readily-usable Higher Use Schemata. For example a high school language teacher who goes abroad for a year or so may well succeed in becoming a more complete bilingual. The person who rarely

has to express original ideas in L2 within his own living and working circumstances may be quite content to use only his CUS, and to have contamination from the Higher Use Schemata of L1 on those occasions where he must be more articulate in L2.

There are also other reasons why an adult in particular may find it too difficult to progress from partial to complete bilingualism. Here we must consider the findings of Lambert (1963) concerning the possibility of anomie (cultural-psychological dis-orientation) on the part of the advanced learner, which may make him stop trying to improve his command of L2 in order to avoid discomfiture. Finally, there is always the possibility of an inhibiting influence from the Subconscious, if it happens to harbour cultural-linguistic prejudices.

In summary, what really distinguishes the complete from the partial bilingual in terms of this model is the former's access to immediately-usable Higher Use Schemata in both languages. Everyone has HUS for his native language and uses them often enough for them to remain available. The second-language learner who grows up in a bilingual environment has acquired HUS for both languages, so will qualify as a complete bilingual, even though his command of the two languages may not be exactly equal. However, the second-language learner who learns by means of a language course alone will not likely progress to this level of proficiency. He will likely remain a partial bilingual, and this may well be quite satisfactory for his purposes.

This ends the discussion of the Functional Centres Model for learning both first and second languages. On the following pages are implications for L2 teaching which may be derived from the model. They are not presented as novel findings, indeed there

is nothing new and startling there at all. On the other hand, they will be found to contain nothing which contradicts the present state of the art of second-language teaching. They may thus be considered as an after-the-fact verification of the reasonableness of the model. It is hoped that others will find further implications and applications for it.

IMPLICATIONS FOR L2 TEACHING DERIVED FROM THE MODEL

REGARDING DEGREES OF BILINGUALISM SOUGHT:

The teacher must be aware of the individual motivations of his students, since this will determine whether a particular individual should realistically aim for complete bilingualism or some degree of partial bilingualism.

The development of complete bilingualism requires a complete second-language environment, so that the learner will be able to proceed through the various Phases in a meaningful setting.

The development of complete bilingualism requires a child-like ability to begin with elementary thought processes and continue over a long period of time to develop more complex ones in sequence. It is most likely to be attained if L2 learning begins in childhood, and continues throughout life.

Simulation of the L2 linguistic milieu within a classroom may be obtained to some extent by using audio-visual methodology, rather than just the audio-lingual approach. The teacher must be very careful to ensure that the learners are active participants, and not just spectators.

Audio-lingual and audio-visual methods are context-bound, so will not by themselves take the learners beyond the acquisition of CUS. Audio-visual methods may make initial learning more realistic and hence more effective up to the CUS level.

Complete bilingualism is probably an unrealistic aim for all but the most determined adult beginners, although it is reasonable for children. Adults may feel quite ill at ease using intuitive processes with which they are no longer familiar, and may also become quite impatient with their slow progress.

With adult students for whom it is not intended to aim for complete bilingualism, vocabulary can be acquired fairly quickly, since it is simply attached to their existing semantic store for L1. The use of vocabulary equivalents should be quite acceptable for this aim of limited bilingualism.

For adults who have achieved partial bilingualism outside the L2 environment, total immersion will likely only bring obvious improvements if they have an integrative motivation, i.e. a thoroughly-engaged ACE.

REGARDING THE APM AND THE SCANNER:

Except in cases where the student's only aim is to learn to read the new language, he must be given ample time to acquire Auditory Perceptory Matrices for L2. Until the new APM can discern phonemes among sounds, the Scanner will have little or nothing to work with, and neither Long-Term Storage entries nor the CUS can be acquired.

The Scanner must learn to seek and identify a new set of features for L2. For a long time, it will not be as efficient in L2 as in L1 (except where both languages are learned simultaneously). Thus, utterances presented at the beginning of an L2 course should be short, and should feature high predictability. Predictability can be gradually diminished and the communications lengthened as the learner develops facility in scanning.

REGARDING THE AFFECTIVE CATALYTIC ENERGIZER:

Situations which arouse a positive affective reaction by the student will facilitate his permanent acquisition of the language.

When practising with Conventional Use Schemata, a wide variety of meaningful contexts should be used, to avoid a negative reaction from the ACE. Such practice will also make these Schemata more readily available to the student, which will in turn have a positive effect on the ACE.

REGARDING THE TRANSFORMER

When aiming for complete bilingualism in children, the role of maturation must be borne in mind. One should not attempt to have them master usages in L2 which they have not shown the ability to master in L1.

The development of Higher Use Schemata is critical in the attainment of complete bilingualism. The teacher must be very imaginative, and must create circumstances wherein the student can express himself creatively, using his Comparator. The teacher should allow him to hesitate, stop, start again, etc., when speaking and should avoid all tendencies to interrupt every time he makes an error. Instead, the student should be allowed to complete his statement, then should be asked to repeat it concisely and errors pointed out.

If the aim of the course is complete bilingualism, translation of Schemata should never be used. If the aid is limited partial bilingualism, appropriate current equivalents from L1 may be useful, but under no circumstances should literal translation be used because this would make the development of CUS unlikely.

REGARDING LONG-TERM STORAGE:

Lexical items should be presented and practised in a variety of contexts, so as to ensure that they will be stored in more than one location in LTS, thus making retrieval easier.

Lexical items should be reviewed frequently, so that they will remain in active storage.

REGARDING METHODOLOGY IN GENERAL

The following comments are aimed toward teaching a second language within a school setting, so as to achieve the maximum possible degree of completeness of bilingualism.

An audio-visual methodology would appear to be more appropriate in the early stages than an audio-lingual one. This is because it would train the learner in listening (developing new APM), in intuiting the relationship between what he hears and what he sees, and also because it is more realistic and probably more interesting than simple dialogue-memorization. It also would avoid the need for either English-language equivalents or a lot of acting on the part of the teacher.

In an elementary course, simple CUS should be used in the recorded dialogue toward the beginning, and efforts should be made to feature high predictability. Idiomatic expressions of high frequency which can be intuited within the situation, should also be introduced gradually. Exceptions to CUS should be avoided possibly until the reading skill has been introduced. Exceptions to CUS should be preceded by theory explanations (but not translation) to aid in tagging the Comparator. These exceptions should then be reincorporated on a regular basis to ensure practice and permanency of the tags.

CUS should be practised in analogous situations as soon as they have been learned in the dialogue. Students should also be encouraged to try free expression early in the program, but must be cautioned to use only the structures and vocabulary which have been taught up to that time.

Theory explanations should precede the introduction of HUS, and most such schemata should be considered for introduction through the visual medium, i.e. in reading. Students should then be encouraged to use HUS to express their own ideas in free conversation, but again using only what has been taught up to that time.

Reading will make possible the introduction of more HUS than by the oral medium alone. When HUS have been stored as recognizable entities in the LTS, students should prepare and present dialogues and short talks based upon their own imaginations. This will help to make the recognized HUS usable, i.e. to transfer them to the Transformer from LTS.

Writing should take the form of original imaginative productions, short stories, etc., to help develop usable HUS. Accuracy and appropriateness of constructions should be evaluated and encouraged by the teacher, but such points as spelling and punctuation should not be graded so severely as to discourage the learners from continuing to try.

CONCLUSION

It is no doubt pointless to expect that we will ever fully understand the way in which languages are learned. One studies available research, gets a hunch, then waits for new research to determine whether or not the supposed insight was valid. Slowly we add the tiny certainties which go toward making the process clearer.

Yet the working language teacher must have some overall frame of reference on which to base decisions, and to which he can relate research findings. This frame of reference should be as complete and accurate as study can make it. Nevertheless, it will be altered time and again as new evidence comes to prove or disprove assumptions.

It is from this viewpoint that the Functional Centres Model has been presented. It is hoped that, as a theoretical construct, it may arouse interest and reaction from other language teachers.

REFERENCES

- Allen, J.P., and P. Van Buren (Eds.), Chomsky: Selected readings. New York: Oxford University Press, 1971.
- Anderson, H. (Ed.), Creativity and its cultivation. New York: Harper and Row, 1959.
- Ausubel, D.P., Adults versus children in second-language learning: Psychological considerations. Modern Language Journal, 1964, 48(7), 420-424.
- Barik, H.C., and M. Swain. Bilingual education project, Interim report on the Spring 1972 testing program, Modern Language Centre, Ontario Institute for Studies in Education, mimeo, 1972.
- Broadbent, D.A. Perception and communication. London: Pergamon, 1958.
- Brown, R., and U. Bellugi. Three processes in the child's acquisition of syntax. In E.H. Lenneberg (Ed.), New directions in the study of language. Cambridge, Mass.: M.I.T. Press, 1966.
- Chomsky, C. The acquisition of syntax in children from 5 to 10. Cambridge, Mass.: M.I.T. Press, 1969.
- Chomsky, N. Language and mind. New York: Harcourt, Brace and World, 1968.
- Ervin, S. Imitation and structural change in children's language. In E.H. Lenneberg (Ed.), New directions in the study of language. Cambridge, Mass.: M.I.T. Press, 1966.
- Fast, J. Body language. New York: M. Evans, 1970.
- Fishman, J.A. The implications of bilingualism for language teaching and language learning. In A. Valdman (Ed), Trends in language teaching. New York: McGraw-Hill, 1966.
- Gagne, R. The conditions of learning. (2nd. ed.) New York: Holt, Reinhart and Winston, 1970.
- Guilford, J.P. The nature of human intelligence. New York: McGraw-Hill, 1967
- Guilford, J.P. Intelligence: 1965 model. American Psychologist, 1966, 21, 20-26.
- Harris, T.A. I'm OK - You're OK. New York: Harper and Row, 1967.
- Jakobovits, L.A. Foreign language learning. Rowley, Mass.: Newbury House, 1970.

Lambert, W.E., and G.R. Tucker. Bilingual education of children: The St. Lambert experiment. Rowley, Mass.: Newbury House, 1972.

Lambert, W.E.; and others. Attitudinal and cognitive aspects of intensive study of a second language. Journal of Abnormal and Social Psychology, 1963, 66, 358-368.

Lenneberg, E.H. Biological foundations of language. New York: Wiley, 1967.

Lenneberg, E.H. A biological perspective of language. In E.H. Lenneberg (Ed.), New directions in the study of language. Cambridge, Mass.: M.I.T. Press, 1966.

Lenneberg, E.H. The capacity for language acquisition. In J.A. Fodor and J.J. Katz (Eds.), The structure of language. Englewood Cliffs, N.J.: Prentice-Hall, 1964.

Lenneberg, E.H. Understanding language without ability to speak: A case report. Journal of Abnormal and Social Psychology, 1962, 65, 419-425.

Mackey, W.F. Language teaching analysis. London: Longmans Green and Company, 1965.

Macnamara, J. The bilingual's linguistic performance - A psychological overview, Journal of Social Issues, 1967, 23 (2), 58-97.

Penfield, W. Memory mechanisms. A.M.A. Archives of Neurology and Psychiatry, 1952, 67, 178-198.

Pimsleur, P. Some aspects of listening comprehension. In L.J. Chatagnier and G. Taggard (Eds.), Language laboratory learning: New directions. Montreal: Editions Aquila, 1971.

Price, L. Dialogues of Alfred North Whitehead. New York: New American Library of World Literature, 1964.

Scherer, G.A., and M. Wertheimer. A psycholinguistic experiment in foreign-language teaching. New York: McGraw-Hill, 1964.

Skinner, B.F. Verbal behavior. New York: Appleton-Century: Crofts, 1957.

Titone, R. Studies in the psychology of second language learning. Zurich: Pas-Verlag, 1964.

Witkin, H., and others. Personality through perception. New York: Harper and Row, 1954.