

Word Recognition and Organization of the Lexicon

Majeed Al-Mashta , Professor
Department of English, Chairman

Since the Chomskyan revolution in the late fifties, most of the linguists throughout the world have been busy with the historic question which Chomsky put forth: what exactly happens in the human mind when we use the language? That is, what mental operations take place before we produce a sentence and what mental operations take place as we perceive what we listen to?

Such a question may logically be answered by physicians and technologists. But since science has not yet developed such a sophisticated camera, theoretical linguists gave themselves the justification to guess the details of these mental operations. And so long as we are waiting for such a camera or a machine, we may accept these guessings as the only available answers. A good number of different, sometimes contradictory, answers have been offered so far. These answers constitute what is called transformational generative grammar. Each answer is taken as a version of the transformational theory.

The first answer came from Chomsky himself. It was through his book 'Syntactic structures' in 1957. The second important answer, that is, the second version of T.G. came from Chomsky as well. He put it in his 'Aspects of the Theory of Syntax,' in 1965. It has been termed the Standard Theory, In 1967, an important conference was held in America. It marked the first split among transformationalists. Some scholars, most notably Fillmore and McCawley, established what is called generative semantics, that is, version number 3 of T.G. . In 1971, Chomsky made some partial concessions in front of these semantists through what is called the Extended Standard Theory, or , version number 4 of T.G. . Since then, T.G. has been dividing into so many branches and subbranches that observers have lost count . Nowadays, as we

are already within the twenty-first century, Chomsky is no longer the sole leader: he is simply one of the leaders of this heterogeneous group. It is heterogeneous in the sense that some of its branches chose special names for themselves: relational grammar and minimalist syntax are only two examples.

Because of the major disagreements among themselves, transformationalists were in need of mediators to stand among themselves, to test their hypotheses and to verify their claims. These mediators stepped forward from a neighbouring field of knowledge, from Psychology. We call them Psycholinguists. Through experimentation, psycholinguists continually check the psychological realities of the transformational claims. Consequently, both theoretical linguists and psycholinguists have become interested in the same area, that is, in what happens in one's mind as one listens or speaks.

However, most of this psycholinguistic work has been carried out at the syntactic level. This is because one of Chomsky's innovations was that he moved the study of language from being word-centered to being sentence-centered. Nevertheless, the present paper will rather deal with a morphological area: with word recognition, i.e., with how a word uttered by itself or within a context is recognized or comprehended. The classical answer that was offered by the structural school is: by association. A word has two aspects: form and meaning (distribution, being a third aspect, is irrelevant to the present discussion). A listener receives the form, which is usually a series of sounds, and associates it with a certain meaning that is stored in his mind. Suppose I said 'chair'. After you receive this word acoustically, you will associate it with a certain concept that you have in your mind. This is how one recognizes the meaning of a word.

Such an answer is in fact quite logical and acceptable by all parties. But the nature of science demands that man should never be satisfied with any specific discovery and that man should always look for new adventures. As physics succeeded in breaking the atom into smaller parts, so does psycholinguistics try to picture what happens in the human mind as if it occurred over a far longer duration. So, in contrast with the structural view which considers this association as a single step, psycholinguists find in it a series of steps that may be described in detail.

Experiments were first made to measure the duration . It was found out that words in a typical context are usually delivered at a rate of two and a half per second. This means that a single word delivery typically takes 400 milliseconds. Other experiments showed that subjects can repeat back the input at delays as short as 250 milliseconds, which is well before the end of most words . If we allow roughly 50 msec. for execution of the response, this will leave us with an average W.R. time of 200 msec.

These findings have in fact been an important clue to the mental process, as they have shown that recognition usually takes place before the mind receives the last parts of the input signal.

Later experiments were run to describe these mental operations. I am going to expose three of these attempts briefly. Meanwhile, I would like to make it quite clear that no matter how precisely such experiments are run, they remain very indirect measures of a greatly complex faculty. All we can say is that they represent the most reliable evidence that is available at the present time. These three attempts are:

1. The Search Model by Forster, 1976.
2. The Logogen Model by Kempley and Morton, 1982.
3. The Cohort Model by Marslen-Wilson, 1987.

The Search Model : Forster proposes a system in the human mind in which a central processor monitors the input , matching it with access codes . These access codes are listed in three access files: one for recognizing the spoken word, one for reading and one semantically organized for production purposes, that is, for producing both the oral and the written forms of the word. It is called the Search Model because the processor searches for the correct access code in the relevant access file. In searching for the right access code, only the first part of the input signal is used. Once the access code is isolated, the full word is used as a post-access check.

The Logogen Model : The term logogen is coined from the Greek terms 'logos' (word) and 'genus' (birth). Every word has a logogen in the input signal corresponding to it. In describing this model, Christopher Hall says, "Each logogen responds to contextual and sensory information and as it accumulates matching input, its excitation level nears a threshold. Once it crosses threshold value, it is available in the output system for a response, i.e.,

it is recognized." (4-38) In order to account for frequency, this model assumes that higher frequency logogens have lower thresholds. It postulates two files to a single lexicon: one for production and one for recognition.

The Cohort Model : According to this model , W.R. depends on the acoustic properties of the beginning of a word. On hearing this, a 'pool' of competing candidates, that is, a word-initial cohort, becomes activated. The cohort may be thought of as a list of all the words in the lexicon which match the acoustic onset properties of the input signal. C. Hall says, " The activation of a cohort results from the collective responses of input monitors associated with lexical entries, which enter the word into the cohort if there is initially a positive match. The lexical entries gradually drop out of the cohort as soon as there is a mismatch. It is when a unique item is isolated in the cohort that W.R. takes place." (4-123)

The Cohort Model has been criticized for its overemphasis on the role of the word-initial in the process of W.R. The word's final fragment, it has been held, can play an approximate role. However, its advantage over the other models is that it seems to be the nearest one to the psychological reality.

One may stand at this point among these three models, evaluating them and arriving perhaps at a comprehensive synthesis which may serve as a fourth model. Well, this is not what is going to be done here. Instead, an attempt will be made to extract from these three models as much information as possible about the organization of the lexicon in the human mind, something marginal to the organizers of the three models.

Since the requirements for W.R. and word production are quite different, one may expect that there are perhaps two lexicons in the human mind. Such a hypothesis has not been adopted so far, as it is highly uneconomical. The general agreement is that there is one lexicon only. Forster's postulation, on the other hand, that the lexicon exposes itself along three files, one for spoken recognition, one for reading and one for production is again not economical, as it is unnecessarily tripartite in its organization. Listening and reading are simply two sides of the same coin, the coin of recognition. If we allot one file for reading only, we may rather allot a fourth file as well for writing, which shares the channel of production with speaking. The compromise then is what the Logogen Model offers. It is that there is one

lexicon with two files, one for production and one for recognition. The items in each file are neatly related to those in the other.

A basic question now is how the linguistic items are organized in the lexicon. Are these items grouped on semantic bases or on phonological ones? If the human mind gives priority to production, they should be arranged on semantic bases. If priority goes to recognition, they will be phonologically organized. The three models have implied that they are phonologically arranged. This claim is supported by the fact that in speech errors we usually pull out a phonologically neighbouring word. So, available evidence suggests that the items in the lexicon are organized on phonological bases. Does this mean that the human mind favours comprehension over production? Certainly No! From the logical point of view, both these faculties are of exactly equal importance to actual communication. Fay and Cutler do state it quite confidently that the lexicon is phonologically arranged. They justify this on the grounds that the activity of comprehension involves an additional complication over production: the problem of the external noise which the hearer should match against stored items, which necessitates choices between phonologically similar items whereas the activity of production is entirely internal.

A second justification is put forward by Hall. It is that "the speaker has greater control over the time course of an utterance than the hearer: the speaker may slow down the rate of production" throughout his struggle for the right word.

But how about semantics? Shall we say that it plays no role in word organization in the lexicon? Fay and Cutler suggest that in addition to the phonological organization, the lexicon contains a complex system of cross-wiring which is meant for production and which is hierarchical in nature. This cross-wiring accounts for semantic selection errors.

There is a negative aspect within the picture which I am drawing now: it leaves a lot of questions unanswered. If we agree with Fay and Cutler's claim that this cross-wiring is meant for production only, then how shall we recognize a multi-entry word, i.e., a word with more than one meaning? Morphologically complex words pose a further problem: how does a hearer recognize a word like 'unhappily'? Is he going to process it in the same way as he processes a non-derived word as 'school'?

As there is nothing final in the major theory itself, i.e., in transformational grammar, there is nothing final on such matters as well. With respect to the second question, however, Hall says, "What most psycholinguists are confident of is that at some point in lexical processing, hearers can recognize the difference between stems and affixes-i.e., they can, in some way, decompose morphologically complex words."

The problem with this answer is that it suggests new questions. Suppose we agreed with Hall's argument that the human mind does decompose complex words throughout the process of W.R., then how does this morphological decomposition take place? At what stage of W.R. does it occur? Shall we match the input signal with its counterpart access item taking it as a whole? If not, that is, if we were to break this signal up, at which level will the matching take place? The prefix first, the stem or the suffix? One feels here that one is going around a vicious circle, as there is no end to such speculations. I may remind you, dear reader, we are still conversing about what may take place in the human mind in these 200 milliseconds!

Fortunately, Christopher Hall steps forward again to offer some challenging answers. He holds that morphological structure is present in the mental lexicon and that affixes are somehow separately represented there. Moreover, he says that a regular suffix is more closely connected to the stem than an irregular one. Accordingly, a regular suffix as that in 'books', for example, is more closely connected to the stem, and is consequently faster to grasp, than an irregular suffix as that in 'oxen'. Hall goes on to say that the order of access for complex words is: main stem entry followed by sub-entries for affixes. In other words, access to the lexical entry begins with access to the stem. With suffixes, says Hall, the stem is located in initial position, therefore allowing normal processing until the suffix is encountered. Hall argues that the prefix is processed only after the stem is encountered. In other words, the human mind processes an input item like 'disagree' as if it were 'agree+dis'. The transfer of prefix necessitates then that it take a longer duration to process than a suffix does.

This finding is of great relevance, I think, to a subject beyond what we are discussing now. Let us leave aside for a moment our main topic, that is, W.R. and go back in our memory to 1966, when Greenberg exerted painful efforts discovering significant linguistic universals without being able to

explain some of them then. Greenberg's sample, which consisted of 30 languages, showed real preference for suffixing over prefixing : 17 of these 30 languages allow both prefixing and suffixing. Only one language is exclusively prefixing, compared to 12 languages which are exclusively suffixing. In 1988, Hawkins and Gilligan arrived at similar results from a sample consisting of 200 languages. Their sample showed that 111 languages allow both prefixing and suffixing, 79 languages are exclusively suffixing and only 10 languages exclusively prefixing. It is quite significant to realize here that the preference of the human mind for suffixing over prefixing can only be explained through understanding how prefixes, stems and suffixes are ordered within the process W.R. One may easily guess here that infixes, which are frequent in Arabic but not in English, are as problematic as prefixes for perhaps the same reason.

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In conclusion, let us revisit the main points:

- 1- Depending on the available linguistic literature, the present discussion has shown how complex the process of W.R. is.
- 2- The present discussion has made use of the information one gets from the three models concerned with explaining the process of W.R. It has drawn a tentative picture of the lexicon in the human mind. Moreover, it has made use of the details of this picture in explaining the universal phenomenon of preferring suffixes over prefixes.
- 3- In contrast to what has been taken for granted for ages that recognition is a passive skill compared to production, the present study has stood with Hall's word that production is neither more active nor more complicated in its mental processes than recognition. It has clearly shown in fact that the lexicon pays somehow more attention in its organization to recognition than to production.

The present essay has tackled W.R., in addition, of course, to the organization of the lexicon. Another challenging topic is sentence recognition. If we happen to observe in detail the mental processes of sentence recognition, we will certainly realize that what happens in the human mind in a couple of seconds is far more sophisticated than what most developed computers can do in hours. I do earnestly suggest sentence recognition for another paper!

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