

READING CHOMSKY

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Un estomac malade pousse
au scepticisme

Maupassant

The impact of Chomsky's works on modern linguistics has been tremendous. As Lyons (1970) correctly points out generative transformational grammar is not just one linguistic school among many. Though numerous of Chomsky's cavillers and just as many of his followers have taken positions in specific linguistic or philosophical questions that go contrary to claims made by Chomsky, the publication of *Syntactic Structures* twenty years ago must be looked upon as revolutionary in a much more radical, much more profound way than is representative of other new linguistic ideas, including Saussure's *Cours* or the Prague theses. One has to go back to the New Grammarians of the 19th century to find something similar in the history of linguistics. This is a fact which must not be forgotten today when generative grammar has lost its reputation to a considerable degree.

It would be premature to try to explain the sudden rise and sudden decline of the intellectual empire of Massachusetts. We do not have the perspective. But it is not out of place for the contemporary scholar to speculate about the vices of his own time. It could possibly help him to get grip of himself so as to avoid mistakes so typical of the last two decades. That is why I think it is not out of place to read *Syntactic Structures*, the very motor of generative grammar, once more, and read it critically. As a matter of fact, Chomsky's ability in formulating platitudes as if they were precious gems, and his love for polemics seem to have concealed the intrinsic weakness of his theoretical writings. This is true of *Syntactic Structures* as well as subsequent writings. Thus Chomsky's critics, even the most skilful of them all - Coseriu (1975), have restricted themselves to discussing the theory in one or more of its revelations, but they have neglected to examine Chomsky's argumentation for proposing this theory at all. I will hereby try to show that such an examination ought to have been done long ago.

For the sake of discussion I am bound to accept Chomsky's modest demands concerning the formal properties of a linguistic theory. Otherwise the very idea is simply naive, the idea that a natural language could be exhaustively described by way of a device spelling out the possible strings of morphemes, which, in turn, are thought to explain the structural pro-

perties of the language in question. But even within this restricted frame-work Chomsky's evaluation of alternative grammars (devices of producing sequences of morphemes) does not hold.

The three alternatives of such grammars that Chomsky is able to propose, are a finite state grammar, a phrase structure grammar, and a transformational grammar, the last of which partly includes a phrase structure grammar. Chomsky's evaluation procedure is obviously chosen in such a way that it will select a priori among the three mentioned grammars in precisely the order bad, better, best. As a matter of fact, the evaluation procedure Chomsky claims to have been following is no real evaluation procedure in the sense defined by Chomsky himself. It is rather a decision procedure (see Chomsky, 1957, 51f.). This is a consequence of a very peculiar feature of the thinking of contemporary linguists: love for formalism and exactness combined with horror for consistency.

Chomsky's finite state grammar is a rather scanty copy of the so called Turing machine. But whatever the properties of the Turing machine, they must necessarily also be properties of a finite state grammar, even those Chomsky has chosen to omit. Thus a Turing machine is able to move both to the left and the right, and, consequently, the machine can erase what it has written at an earlier state. This is exactly what so-called deletion transformations are supposed to do. Accordingly, the finite state grammar is quite more efficient than Chomsky seems to believe.

Chomsky obviously underestimates his machine. But this detail should not bother us here. There is another oddity in Chomsky's reasoning which is far more disturbing. Chomsky extends his machine with closed loops, thus making it recursive. With this fact in mind it is hard to understand on what grounds he can disqualify the machine as a suitable device for generating strings of morphemes.

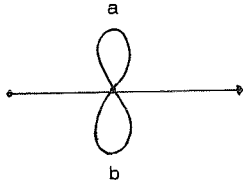
His argumentation runs as follows: given the general remark about English:

(1) English is not a finite state language

he states that "it is impossible, not just difficult, to construct a device of the type described above [. . .] which will produce all and only the grammatical sentences of English" (Chomsky 1957, 21).¹ The reason for this curious postulation is that there actually are sentences in English - sentences with embeddings - which, according to Chomsky, could not be adequately handled by a finite state grammar. Given languages containing just the two elements a and b, it would quite generally be impossible to

generate mirror image sentences of the type aa, bb, abba, baab, and so on, using this type of machine. And since embeddings in natural languages actually result in mirror image sentences, the same would be true of English. As a matter of fact, this "rough indication of the lines along which a rigorous proof of (1) can be given"² is utter nonsense. Sentences of the type mentioned can easily be produced by adding closed loops:

(2)



The device (2) will produce not only mirror image sentences but also sentences of the types ab, aabb, aaabbb and aa, bb, abab, aaaa, all of which are claimed by Chomsky not to be sentences of finite state languages. Chomsky's decision to reject finite state grammars as inefficient for describing at least one natural language is simply unfounded. Consequently, there are no reasons at all to prefer phrase structure grammars to the finite state grammar. In fact, Chomsky's phrase structure grammar is - to use a term that he later on became so fond of - nothing but a notational variant of a finite state grammar.

Observe that I will not claim that Chomsky's fragile finite state grammar or even a more elaborated machine would be superior to any other sort of sentence-generating device. My aim is only to demonstrate what kind of deficient argumentation is allowed to pass for genuine scientific work. What I say here does not imply that I find Chomsky deceitful in this specific case. I think he simply was ignorant. Rather to be blamed are we who once accepted this type of preposterous argumentation, we who became so impressed by Chomsky's stylistic abilities that we did not even suspect it to be fallacious.

The remarks made are serious. But they would not have been worth mentioning, if the positive argument for adopting a phrase structure grammar in favour of a finite state machine had not been quite as invalid and, furthermore, if the arguments for adding transformations to this kind of grammar in order to generate such structures, which are supposed to be impossible to form directly by the aid of phrase structure rules, had not been just as fallacious. Those facts are much more alarming, because Chom-

sky as far as concerns the formal properties of finite state machines is an amateur - just as the present author. But with regard to constituent analysis of syntactic chains Chomsky had already when formulating his theory a thorough linguistic education. Nevertheless his argumentation is just as amateurish.

Chomsky's starting point is traditional constituent analysis. There is of course no harm in that. But it is questionable to assert that this kind of analysis presupposes a certain kind of grammar³ and, furthermore, that this sort of grammar would be essentially (italics in Chomsky's text - see Chomsky, 1957, 26) more powerful than the finite state model. Obviously Chomsky means that the proposed model has more descriptive power, which is true only to the extent that we accept arbitrary and technically unmotivated restrictions on the finite state model. Otherwise both models are equally powerful, as far as concerns the type of structures Chomsky discusses. But per se the finite state grammar - even without closed loops - is more powerful, since it does not presuppose an analysis brought about by way of binary partitions. This deficit of traditional IC analysis has crept into generative grammar and made it tremendously laborious. Actually, bipartition is a prerequisite for Chomsky's phrase structure grammar as well as for IC analysis. It cannot be removed. This is a deficit so embarrassing that any grammar with a phrase structure grammar of the type concerned as a base cannot gain explanatory power. It is bound to remain a clumsy descriptive device.

Now consider Chomsky's motivations for incorporating transformational rules. The main argument is that there are - at least in English - certain syntactic constructions that only clumsily or ad hoc can be formulated in a phrase structure grammar, i.e. be generated by rewriting rules of the form $X \longrightarrow Y$. Chomsky is somewhat vague on the point concerning the capacity of phrase structure grammars. On the one hand he seems to admit that this type of grammar could be made efficient enough by a more complex account of the notion of phrase structure than he proposes himself. On the other hand he explicitly tells us that certain types of linguistic constructions and elements cannot be handled within a grammar of phrase structure. And the reason for this vagueness is the same as in the case of his rejecting his finite state grammar: ignorance of the capacities of the model he has proposed himself.⁴ It is quite possible to reformulate the model without significantly increasing its complexity in such a way that it could handle conjunctions - it is enough to add closed

loops. The difficulties with regard to auxiliaries are merely pretended: the elements ought to be ordered, there is no urgent need to have them fused into one rule. This solution is even intuitively to be preferred: a grammar of English has more of descriptive power if it can generate "am" in

- (3) (a) I am hungry.
 (b) I am starving.

in one single rule. What regards the third argument - the relation between active and passive sentences - the reasoning is not only formally deficient, it is deceitful. Firstly, the phrase structure rules for passives are deliberately complicated in order to become exceedingly cumbersome for the given model. Secondly, the proposed grammatical relation between actives and passives has never been established but simply taken for granted. The fact that

- (4) (a) John drinks wine.
 (b) Wine is drunk by John.

approximately render the same propositional content is rather a lexical fact and need not be stated in terms of a grammatical relation. The rule

- (5) If S_1 is a grammatical sentence of the form
 $NP_1 - Aux - V - NP_2$,
 then the corresponding string of the form
 $NP_2 - Aux + be + en - V - by + NP_1$
 is also a grammatical sentence.

has just as much bearing as the following rule:

- (6) If the proposition
 The pope is elected by the Roman curia.
 expresses a fact about the present world, then the corresponding proposition
 The king of Sweden inherits his dignity.
 also expresses a fact about the present world.

The very fact that an innovation - such as is the case with transformations - has not been properly motivated does, however, not imply that it would be useless in scientific work. True creative innovations are most often genuine hypotheses and cannot be motivated exclusively with regard to their postulated or factual advantage over competing theories. Further-

more, the truth or the efficiency of a certain theory does not per se depend upon standards of any kind. Standards such as simplicity or descriptive power are merely devices we use to assure that it be possible to examine the consistency of our theory. And our theory might very well turn out to be consistent, even if it has been stated by way of a fallacious argumentation. Thus, both the finite state grammar and the phrase structure grammar could possibly turn out to be consistent theories as such, even if they, in the form presented in Syntactic Structures, are not completely in accord with the object they are said to represent - natural language. Let us now suppose that the notion of constituent structure based upon constituent analysis really is consistent within the framework of phrase structure grammar. We shall then ask: is the notion of transformation consistent with the notion of constituent structure? If we find it is, we ought to abandon one or both of the notions with respect to Occam's razor. However, if it is not consistent in this sense, we should reject it as scientifically unsound and metaphysical.

Consider now Chomsky's informal definition of the notion of grammatical transformation:

- (7) A grammatical transformation T operates (on a given string (or [. . .] on a set of strings) with a given constituent structure and converts it into a new string with a new derived constituent structure.⁵

The notion of derived constituent structure is not properly defined in Syntactic Structures, but we find this general condition - there may be more - formulated on page 73:

- (8) If \underline{X} is a \underline{Z} in the phrase structure grammar, and a string \underline{Y} formed by a transformation is of the same structural form as \underline{X} , the \underline{Y} is also a \underline{Z} .

This means that everything that can be recognized as, say, a PP in a transformed string, also is a PP in terms of a non-transformed string. This in turn must mean that a derived constituent structure is identical to an ordinary constituent structure except for the fact that it is generated through the application of a transformational rule. A transformed string thus corresponds to the same type of constituent tree as the non-transformed tree, and any constituent tree is by definition a graphic representation of what is essential for the determination of the phrase structure (constituent analysis) of the analyzed sentence. Consequently, also the transformed string must presuppose a set of ordered phrase struc-

ture rules, given definition (7), condition (8), and the general but false assumption made by Chomsky concerning the possibility of deriving grammars from constituent structure. That is: either a transformed string corresponds to a set of phrase structure rules or the notion of derived constituent structure is incompatible with the notion of constituent structure.

If the first alternative is true, then transformations ought to be abandoned with regard to the standards of descriptive power and simplicity. Transformations can under those circumstances do nothing that cannot be done directly by phrase structure rules derivable from the transformed string. This in turn means that transformations are totally redundant and, consequently, unnecessarily add to the complexity of the grammar. Customarily, generative grammarians seem to accept the first alternative; at least they claim that it principally should be possible to construct the constituent tree corresponding to the derived form (cf. discussions in Bach, 1964, and Ruwet, 1967). The phrase structure rules generating this type of derivation are, on the other hand, considered as non-existent. In fact, nobody has ever asked what they would be like. And no believer would ever ask, because he is not used to asking questions that could risk destroying his idea of the universe and force him to put his *raison d'être* in question. Unfortunately, I am not able to tell whether the notion of transformation is consistent to other critical notions of generative transformational grammar, notably the notion of constituent structure. I must leave the reader to judge for himself. But I can certainly state: the definition (7) of the notion of transformational rule is qua definition invalid, and it leads to unsurmountable difficulties with regard to the general frame-work of the grammatical theory in question.

Notes

1. A finite state language is by Chomsky defined as "any language that can be produced by a machine of this sort" [i.e. a Turing machine - T.P.]. See Chomsky (1957, 19).
2. See Chomsky (1957, 23).
3. The claim is nothing but a presumeably unconscious inductive syllogism, the inconsistency of which the Stoics already were aware. Moreover, the deductive way of reasoning Chomsky obviously believes himself to follow leads to a vicious circle. The truth is of course that there cannot be any restrictions put on the number of string generating devices. Any technique for analysis is just a technique. And as

such, a technique cannot tell us anything about the form of grammar underlying the analyzed sentences. It is the hypothetical grammar that presupposes the form of analysis, not the other way round.

4. Chomsky specifically claims that conjunctions and discontinuous morphemes could not be adequately handled within this model, which is said to be due to the fact that his machine cannot "look back" to earlier strings in the derivation. In reality his machine has the capacity of "looking forward" to the end result of the derivation, which makes any back-looking mechanism unnecessary. That is why it has been possible in the later development of transformational grammar to undo the results of transformations by way of filters and global constraints. Such devices are implicitly incorporated into the model already in Syntactic Structures.
5. See Chomsky (1957, 44).

References

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