

Many problems of morphemic analysis also receive quite simple solutions if we adopt the general framework outlined above. In attempting to develop discovery procedures for grammars we are naturally led to consider morphemes as classes of sequences of phonemes, i.e., as having actual phonemic 'content' in an almost literal sense. This leads to trouble in such well-known cases as English "took" /tuk/, where it is difficult without artificiality to associate any part of this word with the past tense morpheme which appears as /t/ in "walked" /wɔkt/, as /d/ in "framed" /freymd/, etc. We can avoid all such problems by regarding morphology and phonology as two distinct but interdependent levels of representation, related in the grammar by morphophonemic rules such as (19). Thus "took" is represented on the morphological level as *take + past* just as "walked" is represented as *walk + past*. The morphophonemic rules (19 ii), (19 v), respectively, carry these strings of morphemes into /tuk/, /wɔkt/. The only difference between the two cases is that (19 v) is a much more general rule than (19 ii).<sup>8</sup> If we give up the idea that higher levels are literally constructed out of

that many sense in them by the use of recursive definitions. He does not pursue this suggestion in any detail, and my own feeling is that success along these lines is unlikely. Moreover, if we are satisfied with an evaluation procedure for grammars, we can construct interdependent levels with only direct definitions, as we have just seen.

The problem of interdependence of phonemic and morphemic levels must not be confused with the question of whether morphological information is required to read a phonemic transcription. Even if morphological considerations are considered relevant to determining the phonemes of a language, it may still be the case that the phonemic transcription provides complete 'reading' rules with no reference to other levels. Cf. N. Chomsky, M. Halle, F. Lukoff, "On accent and juncture in English," *For Roman Jakobson* ('s-Gravenhage, 1956), 65-80, for discussion and examples.

<sup>8</sup> Hockett gives a very clear presentation of this approach to levels in *A manual of phonology* (1955), p. 15. In "Two models of grammatical description," *Linguistics Today*, *Word* 10.210-33 (1954), Hockett rejected a solution very much like the one we have just proposed on the grounds that "took and take are partly similar in phonemic shape just as are *baked* and *bake*, and similar in meaning also in the same way; this fact should not be obscured" (p. 224). But the similarity in meaning is not obscured in our formulation, since the morpheme *past* appears in the morphemic representation of both "took" and "baked." And the similarity in phonemic shape can be brought out in the actual

lower level elements, as I think we must, then it becomes much more natural to consider even such abstract systems of representation as transformational structure (where each utterance is represented by the sequence of transformations by which it is derived from a terminal string of the phrase structure grammar) as constituting a linguistic level.

We are not actually forced to give up hope of finding a practical discovery procedure by adopting either the view that levels are interdependent, or the conception of linguistic levels as abstract systems of representation related only by general rules. Nevertheless, I think it is unquestionable that opposition to mixing levels, as well as the idea that each level is literally constructed out of lower level elements, has its origin in the attempt to develop a discovery procedure for grammars. If we renounce this goal and if we distinguish clearly between a manual of suggestive and helpful procedures and a theory of linguistic structure, then there is little reason for maintaining either of these rather dubious positions.

There are many other commonly held views that seem to lose much of their appeal if we formulate our goals in the manner suggested above. Thus it is sometimes argued that work on syntactic theory is premature at this time in view of the fact that many of the problems that arise on the lower levels of phonemics and morphology are unsolved. It is quite true that the higher levels of linguistic description depend on results obtained at the lower levels. But there is also a good sense in which the converse is true. For example, we have seen above that it would be absurd, or even hopeless, to state principles of sentence construction in terms of phonemes or morphemes, but only the development of such higher levels as phrase structure indicates that this futile task need not be

formulation of the morphophonemic rule that carries *take + past* into /tuk/. We will no doubt formulate this rule as

ey → u in the context t - k + *past*

in the actual morphophonemic statement. This will allow us to simplify the grammar by a generalization that will bring out the parallel between "take"- "took," "shake"- "shook," "forsake"- "forsook," and more generally, "stand"- "stood," etc.