anything is pretty certain about the acquisition of grammar at this point, it is that its central principles are not "learned" in any sense, because the experience necessary to induce them is simply not available to the child in any systematic fashion. On the other hand, however, I can play only Pac-Man on that machine down at the arcade; there is no way I'll get to play Asteroids or Space Invaders for my quarter, short of altering its circuitry. People, though, speak literally thousands of tongues but presumably do not substantially differ in those aspects of brain structure and function relevant to language. Reality, then, seems to fall somewhere between these extremes; grammars are more like what Stabler calls "hybrid" systems. Insofar as a linguistic theory attributes grammatical universals ultimately to the genetic endowment of the organism, it is committed to at least certain aspects of the grammar being hardwired, not programmed, for how could a child come to know these principles, given the "poverty of the stimulus," unless they were intrinsic properties of the system? All that would remain open, on this view, would be how those properties which individuate grammars, the "software applications" permitted by the nature of the hardware, are instantiated. So it seems that the relation of higher-order cognitive theories such as grammars to their physical realizations is most like an Atari home video system; I can't word-process on it, but I can play Pac-Man, Asteroids, Space Invaders, and a host of other games just by putting in the proper cartridges.

But perhaps this is enough of this computer mishmash. Today's computers may prove no more helpful as metaphors for mind than did yesterday's hydraulics.

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On levels

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Stabler has drawn attention, in some detail, to the advantages of keeping separate the different levels at which it is possible to give an account of a set of phenomena. In particular, he has pointed out that a true linguistic theory will not specify the human language-processing algorithm. In general, the message is that higher-level specifications never entail particular lower-level specifications. As Stabler points out, Marr and Poggio (1976) have already made this claim and suggested that the first-level hypothesis should be stated fully before second-level hypotheses can be developed. Stabler thinks "this itinerary is overly rigid," but he does not pursue this demur. Of course, in practice, the majority of psychologists operate at the second level. This can be because their understanding of the phenomenon they are trying to account for is incomplete or does not exist in a suitable form. Thus, psychologists who attempted to rely on the current "true" grammar, viewing it as their function for suggesting the processing algorithm for that grammar, would spend more time trying to follow the linguistic debates than getting on with their own thing. The escape clause, in practice, is based on the modularity hypothesis. If we believe that the human language-processing algorithm can be split into component modules, then the properties of some of these modules can be explored in the absence of a complete description at the first level.

This description of current practice seems to violate one of Stabler's other claims, that "a second-level theory . . . is necessarily a first-level theory." In fact, there is no violation, since it seems clear that, in the quotation, Stabler is referring to a *complete* second-level theory. A second-level theory that refers to only a subset of the domain covered by a putative first-level theory, such as grammar, would say nothing about the grammar, of course. If a second-level theory were complete with respect to grammar then the mode of operation of the former would be described in terms of the latter. There would, however, seem to be no requirement that the terms in the grammar bear any direct relation to the nature of the modules in the second-level theory.

The same arguments apply to the relationship between second- and third-level theories and to that between third-level theories and physiology. Stabler takes an intermediate position on the latter, claiming that "the computational account of cognitive processes would need to be very well developed before neurophysiological data could be brought to bear" on third-level issues. Mehler, Morton, and Jusczyk (submitted for publication) have argued a little more strongly along the same lines – in effect, on the assumption that the neurophysiological level can be regarded as a fourth level. The extent to which the assumption is valid remains to be discovered.

The relevance of the machine metaphor

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Stabler's work seems to me to be not a criticism of, but rather a fairly lucid exposition of the cautious assumptions that linguists make (Chomsky, in particular) about the mind/body relation. Linguists are sure that some relation – but who knows what – must exist between grammars and processing, acquisition, or neurological systems. Stabler points out that if one follows a strictly constructed computer model, then it may not be correct to say that the grammar is "represented" or "encoded" or that "rule-governed" behavior is involved. Nor, one might add, does he show that grammars cannot be neurologically represented.

What Stabler is doing has been done before. It belongs to a school of criticism with a formula. Take a science that uses a mathematical notation, observe that it has a few open definitions, and then show that its realization in another domain (usually physical) has infinitely many logical instantiations, due to a few vague definitions.

The problem with this approach flows from an excessive affection for the computer metaphor. The crucial initial assumption is that linguistic theory is a deductive, axiomatic theory that works like a machine. In reality, the deductive model is a goal and not a current reality. Therefore current concepts simply fail to have the rigor needed to be subjected to computerlike logical extrapolations.

This is as it should be, because linguistics is evolving in just the manner in which every other science evolves. Generative grammar is comprised of partially systematic and partially intuitive notions, many of which are deliberately left open (like *subject*) and others which are genuinely mysterious (like *referential*, or *thematic*). I think the true goal of linguistic theory is to achieve a *natural* fit between mathematically conceived grammars and neurological models. Although every linguist remains in principle open to the possibility of radical differences between an atemporal, aphysical representation and a temporal, physical representation, the underlying belief is that there will be a natural and perspicuous alliance. No one knows what "natural" means, but no one is upset by baroque logical possibilities, since they are merely reflections of (we hope) small conceptual defects.

The spirit of the enterprise in reality is quite alien to the computer metaphor. Chomsky has occasionally remarked that eventually linguistic theory will simply be regarded as neurological theory, just as mathematical versions of physics came