

Language, Logic, and the Brain

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Abstract

Language is primarily a physical, more particularly a biological phenomenon. To say that it is primarily so is to say that that is how, in the first instance, it presents itself to observation. It is curious then that theoreticians of language treat it as though it were primarily semantic or syntactic or a fusion of the two, and as though our implicit understanding of semantics and the syntax regulates both our language production and our language comprehension. The brain is both a repository of semantic and syntactic constraints, and is the instrument by which we draw upon these accounts for the hard currency of linguistic exchange. With this view comes a division of the vocables of language into those that carry semantic content (lexical vocabulary) and those that mark syntactic form (functional and logical vocabulary). Logical theory of the past 150 years has been understood by many as a purified abstraction of linguistic forms. So it is not surprising that the “logical” vocabulary of natural language has been understood in the reflected light of that formal science. Those internal transactions in which “logical” vocables essentially figure, the transactions that we think of as reasonings, are seen by many as constrained by those laws of thought that logic was thought to codify. Of course no vocabulary can be entirely independent of semantic understanding, but whereas the meaning of lexical vocabulary varies from context to context (run on the treadmill, run on the market, run-on sentence, etc.) logical vocabulary has fixed minimal semantic content independent of context.

A biological view of language presents a sharply contrasting picture. On an evolutionary time-scale the human brain and human language have co-evolved. So we have pre-linguistic ancestors, some of whose cunning we have inherited, as we have quasi-linguistic ancestors and

early linguistic ancestors whose inherited skills were enhanced and made more effective by the slow acquisition of linguistic instruments of control and coordination. Where in this long development does logic enter? On the shorter time-scale of linguistic evolution, we know that all connective vocabulary descends from lexical vocabulary, much of it from the language of spatial relationship. And we can now say, more or less, how it happens. We can even find many cases of mutations in logicalized vocabulary, semantic changes come about in much the way that biological mutations occur in molecular biological processes. These changes proliferate to yield a wide diversity in the evolved uses of natural language connectives. In fact, we discover, we don't in general understand connective vocabulary, nor do we need to for the purpose of using it correctly in speech. And by no means do our automatic uses of it coincide with those that would be predicted by the syntax/semantics view. Far from having fixed minimal semantic content, logical vocabulary is semantically rich, context-dependent, and, partly because we do not in general understand it, semantically extremely fragile.

Whence then our cognitive skills? Perhaps from the same early sources of language itself: from the recognition of natural monotonicity properties in the structure of physical relationships. What is the natural logic of the brain? Perhaps we must look to a much earlier conception of what logic should be: that of the nineteenth-century mathematician, Augustus DeMorgan.

The talk will be copiously illustrated with examples, some of them interactive.

Keywords: The brain, language, logic, language development, semantics, cognitive skills, experiments