Brain and Language

While it is happily the case that one of the main objectives of neuroscience is to understand how the brain manages such complex behaviors as language and speech, it is sadly apparent that the field is nowhere near setting limiting conditions for a theory of language as a result of possessing specific knowledge about neural networks. The literature to date mostly reflects correlations in the grossest terms. Lateralized damage or disconnections yield patients with a general loss of this or that kind, and in the main, these observations have not produced enough information for a theory of brain and language. Indeed, the *a priori* issue of whether a system that is handling such a complex phenomenon can be studied after it is placed in such total disarray, as is the case following brain damage, is largely ignored.

From a purely neurophysiological and neuroanatomical point of view, there is at present no knowledge of what it is that makes the nervous system capable of language and speech. With respect to language, which here means the capacity to assign symbols to objects, events, concepts, and the like and to represent them in a way that carries the agent’s intent to another organism, the essential biological capacity is particularly mystifying. As we shall see, this deep-core cognitive capacity seems resistant to massive brain damage in man and indeed is newly discovered to be present in chimpanzees and perhaps even lower animals. As a result, the old tactic of analyzing the gross anatomical discontinuities between man’s brain as compared to the brain of the chimp and other animals no longer seems to be a fruitful enterprise, since the essential difference between these two groups on the language dimen-
sion is no longer clear. The uniqueness of man appears to be in the areas of speech production and reception.

In clinical studies, there have been a variety of phenomena noted following brain damage. Here, a series of well-known and striking abnormalities appear with a high degree of regularity as a consequence of discrete lesions. The problem has been, however, what to do with them. It is not unlike the problem of a radio engineer listening to the squeaks and squawks of a broken radio. No matter how reliable and accurate his measures might be of the radio's behavior, they would tell him precious little about how a radio works and how it can be fixed unless he possessed prior knowledge of how it works. With language behavior, it is the same, with the present problem being that there is no agreed-upon theory of what language is, let alone how it works in the brain. Thus, the magnificent summary of aphasic disorders by Lhermitte and Gautier1—which lists disorders of comprehension as well as disorders of expression, including phonemic disintegration, dysprosody, stereotyped agrammatisms, paraphasia, and the like, each with its own dramatic reality—finds one feeling that some lovely answers are available to a variety of unknown questions. Add to this the fact that disorders of language resulting from brain lesions invariably have, as an integral part of the disease, numerous associated cognitive problems, and the task of identifying the relevance of the observations to a biological understanding of language becomes staggering.

Still, certain facts concerning brain and language have emerged, and in what follows, we will attempt to organize them into a meaningful framework. We will consider our new observations on case P.S., as well as a variety of other clinical and normal data that bear on what we feel are some of the key issues concerning the neural correlates of linguistic processes.

LANGUAGE DEVELOPMENT AND LATERALIZATION

In the vast majority of humans, the left hemisphere is dominant for language. In the remaining small percentage, language de-