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Guest Editorial

Exploring Neurobiology of Language

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Since the mid 1980's, there has been a growing interest in the cognition underlying Second Language Acquisition (SLA). The typical procedure for discovering cognitive processes is to study interlanguage behavior and, on the basis of the patterns observed, to infer causal cognitive mechanisms and processes. This mode of research has produced an interesting set of constructs that includes buffers, filters, analyzers, formulators, conceptualizers, articulators, interpreters, monitors, as well as pidginization, nativization, generalization, simplification, transfer, etc. But there may be another way to understand the mechanisms and processes that are responsible for SLA, and that is by relating SLA to the biological organ responsible for it, the brain. As Bechtel (1992) indicates, constructs such as those above may constitute mechanisms to explain phenomena observed at the behavioral level. But these mechanisms themselves become phenomena to be given mechanistic explanations at the neurobiological level. The reduction often leads to new understanding and perhaps reformulation at the higher level.

At UCLA, one of our doctoral students, Bob Jacobs, began studying neurobiology in 1985. Bob's interest in the relationship between applied linguistic issues and neurobiology led to a series of informal meetings during the fall of 1986 between Professor Arnold Scheibel (Director of the UCLA Brain Research Institute), Professor Wolfgang Klein (Director of the Max Planck Institute in Holland, a visiting professor at the time), Bob, and myself. Using Bob's work (i.e., Jacobs, 1988) as a basis for discussion, we explored a range of issues concerning neurobiology and second language acquisition. These discussions led to a plan to institute a neurobiology course in the Applied Linguistic Program in the

autumn of 1987. The course was taught by Dr. Scheibel and Bob that year and again by Dr. Scheibel in 1989 and 1991. This has resulted in about 30 students who now have a background in neurobiology to which they can refer in their studies of language acquisition, assessment, and use. Our plan is to continue to offer the course every other year as part of our department's program to develop a laboratory system for doctoral training (see Celce-Murcia, 1992). In this regard, we have established the Neurobiology of Language Research Group (NLRG).

With a knowledge of basic neuroanatomy and neurophysiology there are several approaches to the study of cognition in SLA. One can relate interlanguage behavior to parts of the brain that are known to generate similar behaviors. One can also take the mechanisms and processes that have been inferred from SLA studies and match them with neural structures and functions known to operate in similar ways. Finally, one can start with areas of the brain responsible for perception, stimulus appraisal, emotion, attention, and memory, study how they operate, and relate them to SLA. In this way, neurobiology can provide a new perspective on the discipline (see Jacobs and Schumann, 1992).

However, as the members of our department's NLRG have been quick to learn, there is some reluctance in the field to the view that cognitive processes are neural processes and that the study of the brain can inform the study of multilingualism. For example, my earlier work on SLA, the pidginization/acculturation model, was a social-psychological account of SLA that was often criticized for lacking a cognitive component. At a recent conference I presented a neurobiological perspective on cognition in SLA and afterwards I asked a colleague who had been urging me for years to add cognition to the model what she thought. My friend replied, "I said cognitive, not neuro!" I asked, "Well, where do you think cognition takes place?" Being astute in such matters, she replied, "If I don't say the brain, you'll call me a dualist." She was right. Long (1992) has raised the issue of whether it is the applied linguist's job to provide hypotheses about the neurophysiology of language acquisition. I would argue that it is certainly not necessary for applied linguists to undertake such tasks, but if they were to acquire the requisite knowledge, there is no reason why they should not theorize about the neurobiology of language. If the enterprise becomes a productive research paradigm that furthers our understanding of language acquisition and use, it may then be necessary for applied linguists routinely to

learn neurobiology in order to understand and evaluate the explanations that are generated.

Thinking about neurobiology and language has been constrained by the demand that neurobiological accounts address specific, current issues in linguistic theory, such as subadjacency or the empty category principle. When neurobiologists interested in language are unable to do this, linguists usually assert that the problem is that not enough is known about the brain. However, there is a great deal known about the brain, and the problem may be that current linguistic theory is so far off the mark or so abstractly formulated that it defies a neurobiological account. Before a neural explanation of linguistic theory is possible, we may need a much more sophisticated formulation of the theory.

In the articles in this special issue on the brain and language, we have deliberately ignored the constraints referred to above. Instead, we have approached the topic with a very broad view of language. We examine cognitive processes that affect SLA generally (e.g., attention), cognitive processes involved in language production (e.g., procedural knowledge), memory systems affecting language loss (e.g., intermediate memory), and areas of the brain involved in lexical knowledge (e.g., the fusiform cortex).

In these articles, we have not avoided using the relevant neurobiological terms. We feel that expressions such as "the attention areas of the brain" or "the memory centers of the brain," while sparing the reader technical vocabulary, actually are a disservice because they are imprecise and do not allow the reader to know whether the authors are referring to the same or different parts of the anatomy. The articles, therefore, may not be easy reading for someone who is totally naive to the nervous system, but a little study of the included definitions, sketches and diagrams, plus a careful re-reading, should be sufficient for anyone who really wants to grasp the material.

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