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ON LANGUAGE AND MIND
OR WHAT CAN LINGUISTS LEARN FROM COGNITIVE PSYCHOLOGISTS ABOUT LANGUAGE AND ITS ACQUISITION[♣]

[♣] This essay was submitted as a final essay as partial fulfillment for the requirement for Darlene Howard's class in Cognitive Psychology at Georgetown University in the Fall of 2003. Many of the ideas advocated here have grown from my own observations and course readings in the fields of language acquisition, cognitive psychology, and neurolinguistics, as well as from extremely enthusiastic and influential chats of the GU/UMD Biolinguistic group meetings.

The field of cognitive psychology is a thriving area that deals with a bewildering diversity of phenomena, such as attention, memory, perception, language, emotion, concept formation, and thinking. Together with cognitive science, a unified program for studying the human mind, it represents one of the main research enterprises into the human nature in the 21st century. It is a field at the cutting edge of research into the functional architecture of the human brain, which is presumably the most complex, sophisticated, and powerful information-processing device known. In spite of its diversity, however, cognitive psychology studies the brain and mind as a *coherent* theme, working to understand cognition - its processes and its mechanisms - based on the analogy between the human mind and an information-processing device. Hence, from the computational point of view, visual processing will be taken to be similar to auditory language processing in being a computational procedure that manipulates a certain input, and produces certain output, though these two functions may have different neuroanatomical and neurobiological basis, of course.

Trained primarily as a generative linguist and psycholinguist, I have always been interested in the computational, psychological, and neurological basis of language. I believe that the machinery used to acquire, generate, and process human language is one of the most amazing and computationally most complex biological systems that exist in nature. It is amazingly fast and extremely efficient, performing its function in an effortless manner, using very few resources. Some of the main research questions in the field of generative linguistics and cognitive science in general is what is the *nature* of such a computational system (Chomsky 1995, 1998, 2000; Lasnik 1999), how the

computation of language may proceed *algorithmically* (Berwick & Weinberg 1984; Berwick et al. 1991; Stabler 1992; Wexler & Culicover 1980; Yang 2000), what properties of such an information-processing device subserving language and its acquisition may be *innately specified* (Jenkins 1997, 2000, 2003; Jackendoff 2002; Anderson & Lightfoot 2002), how these properties have *evolved* in a human species (Bickerton 2003; Briscoe 1999; Gazzaniga 1992; Komarova & Nowak 2003; Lieberman 1984, 1990, 1998; Pinker & Bloom 1990; Hauser et al. 2002; Pinker & Jackendoff 2003), and, especially recently, what kind of *physical* and *biological laws* such a biological system may or should obey (Jenkins 1997, 2002, 2003; Uriagereka & Piatelli-Palmarini in press; Friedin & Vergnaud 2001).

It seems that modern generative linguistic theory has been recognizing the importance of *interdisciplinary* work bridging linguistics and natural sciences more and more in the last decade or so. Though ever since the cognitive revolution (Miller 1956, 2003) there has always been awareness among generative linguists that their object of study is *human psychology*, and ultimately, *human biology* (Lenneberg 1967), little work has been done in *unifying* the two fields (Chomsky 2000). However, thanks to the state-of-the art brain imaging techniques that have developed in the field of cognitive neuroscience and to our better understanding of the functioning of the human brain (Gazzaniga 1995; Gazzaniga et al. 1998; Savoy 2001), linguists have started to *bridge* their observations and findings with those of evolutionary and cognitive psychologists, biologists, computer scientists, and cognitive neuroscientists.

What have (or at least, *should have*) linguists and language acquisitionists learned from cognitive psychologists since the cognitive revolution? First, we have learned that our brain - and consequently our mind - is probably *modular* (Fodor 1983, Barkow et al. 1992). Cognitive and evolutionary psychologists have been talking about *metarepresentations* (Sperber 1994), *'task-oriented' domains* of the human mind (Mithen 1996), and describing *multiple intelligences* (Gardner 1983). Barkow et al.'s humorous metaphor about the mind being like *a Swiss army knife* comes closest to the notion of modularity. Back in late 60s and early 70s already, Atkinson & Shiffrin (1968, 1971) showed that memory included several linked processing systems, where the processing of information was believed to function on a stage-by-stage basis. Hence, the process was thought to be *selective* and '*lossy*' at each particular stage. At each stage of the proposed model, the information was thought to be filtered, selected, and even altered. Kanwisher's 2000 study, for example, provides an extremely refined system of face recognition with several *domain-specific* subcomponents; Tulving's classic study from 1983 and his 2002 review show that there are at least two *distinct* systems of long-term memory, processing *distinct information* (e.g., semantic and episodic), besides the usual short-term (working) memory. Though cognitive scientists and philosophers of mind remind us there are several types of modules (Segal 1996, Schwartz 1999), language probably *is* modular, whether representational (Chomskyan) or computational (Fodorian). Much evidence about modularity in many cognitive domains comes from *dissociations studies* in cognitive psychology (e.g., the famous classic study by Shallice & Warrington 1970, outlining dissociation between two memory systems), as well as neurolinguistics (Damasio et al. 1996). On a par with this, even the language module/faculty would

presumably consist of several *sub-modules* or *subfaculties* (possibly phonological, semantic, and syntactic, or possibly even more specialized; see Damasio et al. 1996 on lexical retrieval).

Second, cognitive psychology has provided us with evidence that our mind is extremely *selective*, cognitive processes (be it memory, language, visual processing, or any other kind of information processing) being not only *unconscious* to a great extent (Reber 1989), but often also *partial*, *fragmented*, *personal*, and *biased* (e.g., Burton et al. 1999, Cabeza & Kato 2000, and Kanwisher 2000 for face recognition; Ferreira et al. 2002 for language processing), possibly dependent on age (Kramer et al. 1999 for process-based and knowledge-based activities; Mondloch et al. 1999), sex (Ullman 2003 for language retrieval), previous exposure and knowledge (Marian & Neisser 2000 for language retrieval), or the environment/atmosphere one finds himself in (e.g., Anderson et al. 1999, Marian & Neisser 2000).

Third, one of the most important lessons from a cognitive psychology class for a linguist should also center around the verbs *KNOW* and *COGNIZE*, which generative linguists and language acquisitionists usually translate to mean 'given', 'innate', 'fully specified', or even 'overspecified' (cf. Baker 2003), or something that emerges maturationally due to some specific biological program (Borer & Wexler 1987, Radford 1990). It is true that most of our linguistics knowledge is innate (or at least, for the skeptics, the *computational system* required for *linguistic symbol manipulation* is genetically given, leaving aside the issue whether a certain linguistic property is merely representational

(*descriptive*) rather than of an *explanatory nature*; for a discussion on this, see Haider 1993; Fanselow 1993), psychologists have always stressed that what we process and remember is influenced not only by the external world, but also by our *previous* knowledge. Hence, we are not just selective, but we construct pieces unknowingly. Generative linguists would all agree with this thesis. However, psychologists remind us that we do not see everything, hear everything, remember everything, linguistically process everything, or mentally represent everything. Though our mind is extremely complex, information processing seems to follow the *minimize effort* line. Cognitive psychology is an exciting field seeking answers to the questions of how the human cognitive processes work, what it really means to *know* something (consciously or subconsciously), and what enhances or inhibits such knowledge and I strongly believe that there's much in the field that linguists could learn from.

The 'hot' word in cognitive psychology (as well as in generative linguistics now) is *imperfection*. Biologists, anthropologists, and cognitive and evolutionary psychologists have claimed repeatedly that biological systems usually exhibit imperfections in their designs, generally assumed to be by-products of otherwise well-adaptive systems that have emerged in the course of evolution, either through *adaptation* (Pinker 1997) or *exaptation* (Gould & Lewontin 1979; Gould 1991). Schacter, one of the world's leading researchers in the field of human memory, offers an interesting proposal along the lines of the imperfections (calling them *sins*) that a human memory system exhibits (Schacter 1999). His claim has a direct correspondence for any serious (bio)linguist – human memory is fallible, we forget things, either temporarily or permanently, we misattribute

information, or struggle with words in the so-called tip-of-the-tongue state. Human memory is viewed as a defective system by lay people though it seems that its 'sins' are genuine adaptations to the structure of the environment (i.e., forgetting can be useful or even necessary for subsequent retrieval of information and blocking of information is beneficial in order to prevent 'mass confusion produced by an incessant coming to mind of numerous competing traces' (Schacter 1999: 196)). Analogous to these beliefs, language has recently been discussed in the literature as a biological system exhibiting certain imperfections (Chomsky 1995, 1998, 2000; Hauser et al. 2002; Jenkins 1997, 2002; in press), namely *displacement* (*movement*) of linguistic material, which has been claimed to have arisen from externally imposed legibility conditions, with speculations about facilitation of processing (on the sound side) and interpretative principles (on the meaning side). In other words, the computational nature of the language faculty is determined by the interface cognitive systems, namely the perceptual and articulatory system (sound) and the speaker's general knowledge (in relation to meaning in the intuitive sense). This direction in linguistics opens an exciting new field of biolinguistics, which seeks answers to questions concerning the human *language design* and *architecture*, *language evolution*, and *language acquisition*.

Language acquisition is probably the field where many linguists would immediately dismiss approaches that have developed among psychologists, though as Karmiloff-Smith 1999 reminds us, scholars have always assumed that the approach pursued by behaviorists is *totally incompatible* with Piagetan psychologists, Chomskyan nativists or 'new' connectionists (Karmiloff-Smith 1999). I have always argued that scholars need to

be aware that the 'Chomskyans-on-one-side-and-computationalists-on-the-other-and-nothing-in-between' perspective is not only false, but scientifically also very uninteresting. At the end of the day, scientists will realize that for a good theory of language learning, one needs to postulate *innate machinery* that effortlessly manipulates linguistic symbols and facilitates acquisition, as well as the role of statistics, consistency, and the nature and amount of primary linguistic data to which the child acquiring a human language is exposed to. In other words, *universal grammar* accounts (Borer & Wexler 1987, Crain & Thornton 1998, Crain & Lillo-Martin 1999, Guasti 2002, Lightfoot 1991, Radford 1990, inter alia), which best explain the representation of grammatical knowledge and how it arises in the individual, should probably shop around among their cognitive psychology and cognitive neuroscience neighbors, pursuing statistical (Newport & Aslin 2000, Saffran 2001, 2002), and other computational approaches (Yang 2003, Briscoe 2000, 2002), possibly to attain the level of not only descriptive but also explanatory power, as well as achieve the level of *psychological reality* (Fodor 2003).

So what is the take-home message for linguists from all this? First, we need to be aware more of the fact that the nature of language, as well as cognition in general, can only be understood with the nature of the brain itself (Eysenck & Keane 2002). Second, It seems to me that cognitive psychologists are not 'those sitting on the other side of the fence', as usually perceived by linguists. A lot of work in cognitive psychology is directly relevant for the study of language as a mental and biological system and we should all be aware of that. Though approaches and theories between a psychologist and a linguist may differ,

the charm of any scientific enterprise in the 21st century is the ability to recognize the *interdisciplinary* nature of research. If linguistics truly wants to be taken as part of cognitive science (which most of us ultimately believe), a serious (generative) linguist should make use of a variety of approaches to consider any given issue from different perspectives in order to maximize his own understanding of the architecture of language and the human mind.

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