Is human language just another neurobiological specialization?

Stephen F. Walker
Centre for Life Sciences
Birkbeck College
Malet Street
London WC1E 7HX
UK.
s.walker@psychology.bbk.ac.uk

Abstract:
I disagree with Müeller that it is neurobiologically questionable to suppose that human language is innate, specialized and species-specific, while agreeing that the precise brain mechanisms controlling language in any individual will be influenced by epigenesis and genetic variability, and that the interplay between inherited and acquired aspects of linguistic capacity deserves to be investigated.

Suppose one starts with the assumption that human language can be given a neurobiological explanation. What would be the next steps which follow from this? I propose to give an answer by imagining that biological questions which can be asked about human language have something in common with similar questions about the specialized capacities of other species, such as bird-song or the building capacities of beavers.

The first step would be the hypothesis that language evolved as an innate adaptation – that is to say it was selected for its usefulness. Pinker and Bloom (1992) and Pinker (1994) have emphasised that this would be the default position for a typical neurobiological specialization: it would be expected that beavers build lodges because this has some advantage (such as keeping them warm: Dyck and Macarthur, 1993) and that birds sing because of its utility in warning off rivals or attracting mates (Slasvold *et al,* 1994; Walker 1994). It would not be expected that beavers build dams because this is a lucky accident that happens if a rodent develops teeth beyond a certain size, but Müeller appears to follow other linguists (Chomsky, 1980; Piatelli-Palmarini, 1989) in assuming that language emerged not via selection for its functions but as a consequence of some general trend. (Section 3.1.2; page 11)

Next, would one expect a canonical biological specialization to be autonomous? The answer is yes, almost by definition. It is not unusual to suppose for instance that birds might have perceptual capacities for distinguishing between eggs but not between nestlings (Lotem, 1993) or for rodents to have separate motor skills for biting through saplings as opposed to chewing (Druzinsky, 1995).

For universality, it is certainly the case that a biological adaptation would be expected to be species-specific, that is, typically found in all individuals. But as Müeller himself points out (page 34), inter-individual variation is indispensable for standard Darwinian theory (and there are plenty of examples of distinct physical and behavioural polymorphisms). If language is just another biological adaptation, we should not be surprised if it is species-specific, but includes a significant amount of inter-individual variability.

The central concept Müeller criticises is innateness, where this is characterised as ‘genetic hardwiring’. He correctly emphasises that the brain mechanisms for language must depend on epigenesis and development during growth. But again, these factors must always be involved

in the specialized innate behaviour of any species. Müeller is surely right however that the question of how genetic information is translated into brain organization is worth considering (Keverne, 1994). It is clearly not the case that genetic information directly programs the position and strength of every synapse in the human brain, but this is probably also true in most vertebrates (e.g. Alvarez- Buylla *et al*, 1994). The 'poverty of the gene code' may be an alternative to the 'Tower of Babel' explanation for why the human species has multiple languages with open vocabularies which show historical changes in grammar, by comparison with the fixed and invariant signals involved in the communicative systems of other species. Even Pinker and Bloom (1992; page 716) from an innatist viewpoint, have to admit that 'the genome can store the vocabulary in the environment.'

It is here that I begin to agree with Müeller that the extreme end of the nativist position on human language is biologically unrealistic. I am thinking of the Chomskean position that having human language is like growing an arm or having a liver (Chomsky, 1980). Another popular analogy is that between human language and the immune system, which is innate yet enormously variable (Piatelli-Palmarini, 1989) and Pinker has recently suggested that we should regard the human ability to tell stories as biologically equivalent to the aptitude of spiders for spinning webs (Pinker, 1994; p.18)

With respect to these analogies, it is an inconvenient aspect of language that it is relatively recent. The basic plans for the vertebrate liver, limbs and immune system have been evolving for roughly 500 million years (Du Pasquier, 1993; Ottaviani et al, 1995) and the human versions can be sensibly compared to those of other species. Human language has however been around for 2 million years at most, and possibly in its current form for only 100,000 years or so, and those who compare it to bodily organs are most likely to say that comparisons with other species are futile. (Spiders have been spinning webs for 200M years, and spinning silk for twice as long: Seldon, 1989)

Finally, I believe Müeller is right to emphasise the environmental influences on language organization and use (section 6.1). It is not that it is biologically unusual for there to be environmental input into adaptations that are primarily instinctive. A well-studied example is social 'imprinting' in young fowl, where the interaction between innate predispositions and acquired information is not now considered to be exceptional (Bateson, 1990; Shettleworth, 1993) and where something is known about the neurophysiology underlying the behaviours (Honey *et al,* 1995). Even more fixed examples of instinctive behaviours, such as spatial orientation in insects, and the migration of salmon, require for their operation some memory for environmental stimuli. (Dittman and Quinn, 1996; Wehner et al, 1996).

But there is at least a quantitative difference between a young chick or salmon internalising one stimulus early in life, and the human individual who acquires a vocabulary of 60,000 words, each one a function of its geographical and historical environment. Psycholinguists are apparently comfortable with the idea of extremely fixed innate blue-prints being responsible for the creativity expressed in language, but analogies with flexibly expressed instinctive behaviours in other species would be very forced. There is a case to be made that the inter- and intra-generational transmission of information made possible by language is biologically unique, and that in this sense human language is *not* just another neurobiological specialization (Tomasello *et al* 1993). It can be argued that cultural transmission of information is made possible by an enhanced tool-kit of specialized instincts of the same kind as those used by spiders, but this sort of assertion needs to be tested. The evidence assembled by Müeller seems to me consistent with traditional possibility that human uniqueness was

made possible by evolving towards *less* reliance on the instinctive programming of semantic content and the detailed structure of communicative signals than our primate cousins, as well as by the development of neurobiological specializations for speech production and comprehension.

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