oped over the course of human evolution, however, unfortunately cannot be determined at our present level of knowledge.

Beyond the mirror neuron – the smoke neuron?

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Abstract: Mirror neurons form a poor basis for Arbib's account of language evolution, failing to explain the creativity that must precede imitation, and requiring capacities (improbable in hominids) for categorizing situations and unambiguously miming them. They also commit Arbib to an implausible holophrastic protolanguage. His model is further vitiated by failure to address the origins of symbolization and the real nature of syntax.

Mirror-neuron theory is the second-latest (*FOXP2* is the latest) in a series of magic-bullet solutions to the problems of language evolution. To his credit, Arbib realizes it could not account for all of language. Unfortunately, his attempts to go beyond it fall far short of adequacy.

Even as a significant component of language, mirror neurons are dubious. There cannot be imitation unless someone has first created something to imitate, and mirror neurons offer no clue as to how totally novel sequences – complex ones, at that – could have been created ab ovo. Moreover, when someone addresses you, you don't just imitate what they said (unless you want to be thought an idiot); you say something equally novel.

Arbib treats as wholly unproblematic both the category "frequently occurring situation" and the capacity of pantomime to represent such situations. Situations, frequent or otherwise, do not come with labels attached; indeed, it is questionable whether any species could isolate "a situation" from the unbroken, ongoing stream of experience unless it already had a language with which to do so. For this task requires abstracting away from a potentially infinite number of irrelevant features – place, weather, time of day, number and identity of participants, and on and on. How, short of mind-reading powers that would leave professional clairvoyants gasping, could our alingual ancestors have known which features seemed relevant to the sender of the message, and which did not?

If Arbib answers "through pantomime," one assumes he has never played charades. Those who have, know that even with the help of a large set of "disambiguating signs" – stereotypic gestures for "film title," "book title," and so on, elaborate routines of finger-counting to provide numbers of words and syllables – participants with all the resources of modern human language and cognition find it often difficult and sometimes impossible to guess what the pantomimer is trying to represent. When what is to be represented is not a monosyllabic word but something as complex as "The alpha male has killed a meat animal and now the tribe has a chance to feast together. Yum, yum!" or "Take your spear and go round the other side of that animal and we will have a better chance of being able to kill it" (Arbib's own examples, sect. 7, para. 2), the likelihood of successful guessing becomes infinitesimally small.

Arbib does see what I pointed out more than a decade ago (Bickerton 1990, pp. 97–98),[1] that any espousal of mirror neurons commits one to a holistic (Wray 1998; 2000) rather than a synthetic protolanguage – one that would have to represent "bird flying" with one symbol, rather than two ("bird" and "flying") as all contemporary languages do (see Bickerton [2003] and especially Tallerman [2004] for discussion). True language is then supposed to develop straightforwardly through the "fractionation" of this protolanguage. Arbib asks us to "imagine that a tribe has two unitary utterances concerning fire which, by chance, contain similar

substrings" (sect. 7, para. 3). But won't similar substrings also occur in unitary utterances that have nothing to do with fire? Here he is on the horns of a dilemma. If he thinks they will not, he has smuggled in a ready-made word, and if all "similar substrings" behave similarly, a holistic stage becomes superfluous – all the separate words of a synthetic language are already present, clumsily disguised. If he thinks they will – and given the limited number of possible syllables even in modern languages, they will probably occur more often in sequences that have nothing to do with fire – why should they be taken as meaning "fire" in the rarer cases, and what will similar strings in other contexts be assumed to mean? And even before this dilemma can be addressed, Arbib must specify what would count as "similar enough" and explain why phonetic or gestural similarities would not be eroded by natural change processes long before hominids could correlate them with similarities of meaning. Moreover, to extract a symbol meaning "fire" from a holistic utterance, our ancestors must first have had the semantic concept of fire, and it becomes wholly unclear why, instead of going the roundabout holistic route, they could not immediately have given that concept a (signed or spoken) label. Real-world objects can be ostensively defined; events and situations cannot.

Two substantive issues lie at the heart of language evolution: how symbolism emerged, and how syntax emerged. No treatment that fails to deal with both can be taken seriously. Indeed, symbolism (as distinct from iconic or indexical reference, distinctions that Arbib nowhere makes) has seemed to some (e.g., Deacon 1997) to be the Rubicon between our species and others. Arbib mentions it several times, hypothesizing it as a "support" for protolanguage and noting the necessity for its "increasing sophistication" as true language emerges. But at no point does he even acknowledge the problem of how such an evolutionary novelty could have developed.

Syntax makes an even better candidate for a human apomorphy, since even with explicit instruction our nearest relatives fail to acquire the rudiments of it (Givon 2004). Arbib's dismissal of syntax as a "historical phenomenon" makes such uniqueness hard to explain. According to him, "Words as we know them then coevolved culturally with syntax through fractionation" (sect. 2, para. 2). Even if syntax meant only the most frequent word-order in simple affirmative sentences, this claim might be tricky to defend. In fact, syntax depends on a wide variety of relationships within complex hierarchical structures. Where do these structures and relationships come from? Arbib, ignoring the half-century of linguistic research that has revealed (if not explained) them, remains silent on this.

Arbib's treatment claims to go "beyond the mirror." However, what he offers is only a smoke-and-mirrors version of language evolution, one in which all the real issues are obscured. His flowcharts and neurological references may look impressive, but they tell us nothing about the central problems of the field.

NOTE
1. It is surely worth reminding readers that all the features of mirror neurons (except for their catchy title) were described by David Perrett and his associates (Perrett et al. 1982; 1985) more than two decades ago – a fact seldom acknowledged in contemporary accounts, including Arbib's.