Before the word

Language evolution: evolutionary vestiges may provide clues to the ultimate origins of human language.

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If, as François Jacob famously argued, evolution is like a tinkerer who builds something new by using whatever is close at hand, then from what is the human capacity for language made?

Most accounts of the evolution of language have focused on characterizing changes that are internal to the language system. Were the earliest forms of language spoken or (like sign language) gestured? Did language arise suddenly? Or did it emerge gradually, progressing step by step from a simple one-word 'protolanguage' (limited to brief comments about the 'here and now') into a more complex system that combined individual words into structured meaningful sentences encompassing the future, the past and the possible — as well as the concrete present? Regardless of how these questions are resolved, if we seek the ultimate origins of language, we also need to look further back, beyond the first protolinguistic systems, to whatever prelinguistic systems may have preceded any form of language.

Possible prelinguistic precursors might include systems for planning or sequencing complex events, categorization, automating repetitive actions and representing space and time. In each case, there are parallels between candidate prelinguistic cognitive (or motor) precursors and systems found in language. For example, many animals are able to construct mental maps for navigation, and all known languages draw heavily on spatial metaphors. Thus, it is tempting to conclude that machinery for the mental representation of space plays some role in — or is at the very least available to — the machinery for language.

But parallels alone are not enough to establish shared lineage between two systems — they could instead represent convergent (independent) evolution. For example, a language system could have evolved its own machinery for automating repeated tasks, independent of pre-existing machinery for automatizing other cognitive functions.

A more telling way of establishing prelinguistic ancestry could come from evolutionary contrivances — properties of language that existed not because of some selective advantage, but simply because they have descended from ancestral systems evolved for other purposes. Just as the panda's thumb is not a true digit, but a modified sesamoid bone pressed into service for gripping bamboo, some properties of our capacity for language may be better understood not as optimal

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solutions to a system for communication, but as cobbled-together remnants of ancestral cognitive systems.

In language, one good candidate comes from the study of memory. According to an optimal design, if the capacity for understanding language were evolved from scratch, it would be possible to reliably retrieve individual bits of syntactic structure on the basis of their location in a hierarchical structure, independently of their content — as in most digital computers.

Instead, human language systems seem to rely on 'content-addressable' memory, a form of memory — widespread in the vertebrate world and with an apparently ancient evolutionary source — that retrieves information directly on the basis of its content, rather than through location. Unlike a computer's binary-tree structure, content-dependent memory in mammalian brains is subject to degradation over time and to interference between similar or intervening items. Human speakers are thus less likely to resolve the relation between 'admired' and 'the newspaper' in a sentence such as: "It was the newspaper that was published by the undergraduates that the editor admired," than in the briefer sentence "It was the newspaper that the editor admired." In languages such as English that lack rich case-marking, in most cases listeners can correctly interpret only two levels of embedding, not because of a strict limit on the size of representable binary trees, but because similar items become confused in memory. Although content-dependence may have its advantages, with respect to language, it clearly has it costs. A memory substrate that is scrambled by similarity and devastated by distance thus suggests that some aspects of language have descended with modification from off-the-shelf components.

Irregular verbs (for example, go–went as opposed to walk–walked) might reflect another memory-related vestige. Although these would seem unnecessary in an ideal system, they might serve as precompiled entities to speed up sentence processing. But even then, one might expect each one to be treated as an independent entity in a table. Instead, most irregular verbs come in clusters that follow similar patterns (sing–sang, drink–drank, stink–stank, and so on). These clusters may derive from the possibility of confusion between similar items that pervades human associative memory, rather than any feature of optimal communicative design. Likewise, spoonerisms (such as referring to a loving shepherd as a shoving leopard) and other speech errors might derive from inherited limitations in human memory.

If irregular verbs, speech errors or infelicities in our abilities to parse sentences follow from ancient, inherited memory substrates, it is worth investigating whether other language properties might also follow from the properties of ancestral cognitive systems. To the extent that the neural or genetic substrates of language and cognition overlap, language should be understood not just as an adaptation selected for effective communication, but also as a darwinian descendant with modification from pre-existing cognitive systems. Studying how linguistic systems may have descended with modification from cognitive precursors could in turn elucidate the oft-noted (but never satisfactorily explained) co-morbidity between language disorders and other cognitive impairments, in terms of overlap in genetic and neural machinery. At the same time, by highlighting how new mechanisms can be built on top of old, we may be able to make better sense of the mystery of how, within a relatively short period of time, with just a relatively small amount of genetic change, humans evolved the amazing gift of speech. ■

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FURTHER READING

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