The evolutionary history of grasping among archontan mammals is complex. The ancestral archontan or euarchontan likely lived in trees (15, 17) and probably evolved a primitive form of grasping foot like that of Ptilocercus (11, 15, 16), with claws on all digits and without an opposable big toe. A more powerful, euprimate-like grasping foot with an opposable big toe, a nail on the big toe, and claws on the other digits then evolved in plesiadapiforms such as Carpolesites. Finally, orbital convergence and leaping evolved in euprimates. As Cartmill explained, we “can only hope that new fossil finds will help us to tease apart the various strands of the primate story, giving us clearer insights into the evolutionary causes behind the origin of the primate order to which we belong” (12, p. 111). This is certainly true of the Carpolesites skeleton because we now have a much better idea of the sequence of acquisitions in the primate lineage. Fortunately, the milestones of Wyoming should continue to produce fossils that will enlighten us about primate and mammalian evolution for years to come.

References and Notes
18. I thank J. I. Bloch and D. M. Boyer for useful discussions and L. Swedell for helpful comments. I also thank D. M. Boyer for preparing the first figure and P. Morrighan for preparing the second figure.


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we hear and say. After 50 years of forming linguistic theories, Chomsky (5–7) now suggests that the essential mapping process can be reduced to two basic operations: *merge* and *displacement*. The first combines (lexical) units in a hierarchical structure, resulting in phrase structure trees that are relatively familiar; the second displaces a unit previously merged by merging it again at a different location in the structure and leaving a copy of it behind. This is illustrated by English sentences like “Mary, John likes [mary]” and “Who does John like [who].” Even though “Mary” and “Who” appear at the beginning of their respective sentences, they must be interpreted in their original merge positions (that is, after “likes” and “like,” respectively).

The idea that an unconscious level of representation could be mapped at a conscious level set the field of language study (at that time largely populated by behavioral biologists, operationalists, and nominalists) on its ear. Next, the field of psycholinguistics sought to establish the psychological basis for Chomsky’s postulates of innate language structure and transformational grammar. This was accompanied by developments in so-called “hybrid” disciplines such as neurolinguistics. (Neurolinguistics specifies the neurological mechanisms underlying different components of linguistic theory, and has moved from primary dependence on aphasic research to modern brain-imaging techniques). Thus, linguistics research now centers on the capacities developed during childhood that could account for the richness and diversity of adult language, especially given the impoverished linguistic environments in which children are often nurtured. The complexity of what is acquired functionally and represented neurologically underlies the sometimes controversial claim that language is “innate,” a claim that will be enriched by Hauser et al.’s evolutionary perspective.

Two developments since Chomsky’s initial formulations of syntactic theory provide the theoretical underpinnings for Hauser et al.’s programmatic study of language evolution. The focus has shifted from describing factors manifest in external language (E-language) to describing abstract internal language universals (I-language) (8). Hauser and colleagues argue that what is at issue is not how language evolved to communicate or represent ideas, but rather how the central core of I-language computations can be delineated. They access the recent idea that I-language is essentially a “minimal” mapping between form and meaning, and can ultimately be reduced to an optimal set of processes. Thus, the study of syntax becomes the study of the immediate perfect “engine” driving syntactic computations—what the authors term “faculty of language in a narrow sense” (FLN). Other contributing biological features of language are relegated to the “faculty of language in the broad sense” (FLB).

So, what is at the center of this perfect engine of syntax? Hauser et al. crystallize a long-held intuition—that the essential process of syntax is recursion, the ability to generate an infinite array of expressions from a limited set of elements. Recursion appears in a wide range of human behaviors. For example, a childhood pastime defines the concept of “it” in a game of tag, namely, “the kid who was tagged by the kid” (who was tagged by the kid… who was originally “it”). And of course, recursion is an object of study in mathematics and logic. Hauser et al. suggest that recursion is also the central feature of the computational component of I-language. Accordingly, in addition to considering biological antecedents for FLB, the new broad field of “bio-comparative linguistics” explores the parallels and potential antecedents for recursion in other animals and other human behaviors.

A further question remains. If the components of FLB are shared with nonhuman species and the sole central component of FLN is shared with other human cognitive domains (and possibly other species), is there something particularly unique to human language? Chomsky has suggested that recursion itself is instantiated in human language by the two mechanisms of narrow syntax: *merge* and *displacement*. It is displacement that seems to have no parallel manifestation either in nonhuman animals or in other human cognitive domains. Thus, displacement might seem to be both unique to humans and unique to human language. But it is not totally unique to human theories of the mind. Jakobson, the giant of mid-20th century linguistics, noted that these two main linguistic mechanisms also underlie cognitive behavior and emotion (9). Hauser, Chomsky and Fitch themselves tentatively point out that recursion may appear in other human activities, such as music, games, and social structures.

Chomsky’s theory is unparalleled among 20th century theories of behavior, with the single exception of Freud’s metapsychological investigations. These two models of the mind have striking parallels, if one considers the computational architecture that psychodynamic theory postulated for the emotional expression of internal emotional representations. Both Freud and Chomsky showed the utility of a stable and structured unconscious level of representation. They suggested two similar core mechanisms for mapping it onto more explicit representations: *association* (Freud’s “Verdichtung,” Chomsky’s “merge”) and *movement* (Freud’s “Verschiebung,” Chomsky’s “displacement”). For Freud (10), dream elements are symbols that are sometimes united with their underlying themes, and sometimes displaced from them. In fact, even what Hauser et al. claim is language’s innermost syntactic property (recursion) has a small manifest echo in Lacan’s metapsychological theory (11).

This brings us back to Rousseau and Herder: Perhaps we see now a glimmer of unification among the notions that human symbolic representations have both an emotional and a computational component. What we may be working toward is a theory of the evolution of *human expression* in general. Whether this turns out to be a fruitful line of thought or not, Hauser et al. have taken the next step in presenting how we can empirically study the evolutionary basis of human language.

References and Notes
8. ———, Knowledge of Language (Prager, New York, 1986).