

What is language? Can we distinguish language from general cognition? Is language an isolable, biologically coherent system? Does the linguistic description of language as an autonomous system, formed from a combination of more or less autonomous subsystems, correspond to psychological and neurophysiological fact? These and related topics are the themes of the discussions that follow, and perhaps an initial word of justification is called for.

From a biological point of view we may raise the issue of the autonomy of language, simply because there can be no biology of language if language is not, in some sense, a separate system. Yet no behavioral system—indeed, no organ—can be entirely independent of other characteristics of an animal. The unit of natural selection is the individual, not the gene, or even the gene complex. Moreover, the unit is the individual in relation to other individuals—very obviously so in the case of interlocking patterns of social behavior, such as language.

As a simple instance of this lack of autonomy, consider the lexicon, constrained in content by individual and social cognitive demand, in form by perceptuomotor capacity. To categorize and differentiate among many thousands of objects, events, and attributes is not in itself linguistic, even if the capacity seems only to emerge through language. The impulse to name—in the child no less than in the adult, in

the primitive society with its often vast inventories of flora and fauna (Lévi-Strauss, 1966) no less than in industrial society with its diverse technologies and subcultures—is logically prior to the instrument of naming, phonology. And phonology, however arbitrary, abstract and “unnatural” its particulars may often seem, is nonetheless grounded in and constrained by anatomy and physiology. The segmental structure of the lexicon, that is, the few dozen phonetic segments (consonants and vowels) from which, by permutation and combination, every language constructs its lexicon, is a solution—perhaps a biologically unique solution—to the problem of matching a finite set of articulators to the cognitive demand for a more or less unlimited lexicon.

Whether this segmental structure requires specialized systems of perception and motor control is of great interest and a question to which several of the following discussions are directly, or indirectly, addressed. But we can hardly doubt that phonological form reflects not only anatomical and physiological constraints on movement but also the perceptual modality to which the movements are addressed. This truth has been borne in on us in recent years by the discovery of American Sign Language (ASL). (Klima and Bellugi, 1979; and see the chapter by Bellugi). Briefly, we now know that ASL (and, without a doubt, British, Chinese, Russian, Brazilian, and many other sign languages) has evolved entirely independently, and yet with a dual structure exactly analogous to that of spoken language. Every meaningful sign is formed by some distinctive combination drawn from a few dozen hand configurations, hand orientations, places of articulation, and movements, each in itself meaningless; the signs are then modulated and ordered syntactically to form an utterance. What is of interest here is, first, that the overall formational structures of spoken and signed morphemes seem to be largely determined by their modalities of expression: a sequential pattern in time addressed to the ear or a layered pattern in space addressed to the eye (Studdert-

Kennedy and Lane, 1980). A second point is that the predominantly sequential structure of speech and the predominantly layered, parallel structure of ASL extend even into the syntactic structures of the two modes of language (Bellugi, 1980a); the syntactic sanctum is not inviolate. But this is not the place to elaborate these matters (see the chapter by Bellugi). Enough has been said to make it obvious that there are no grounds for expecting language to be free of its moorings in the perceptuomotor systems from which it has emerged. We do not talk with our toes.

In fact, we may even hope to gain some insight into the nature of language by exploring its perceptuomotor origins. Consider, for example, the notion of Lenneberg (1967) that the hierarchical, interdigitated, interlocking pattern of activity in synergistic groups of muscles marshaled for speaking is not only formally analogous to, but functionally continuous with, the hierarchical patterns of organization at phonemic, morphemic, and syntactic levels of description. Lenneberg (1967, p. 106) wrote that "formal aspects of purely physiological processes seem to be similar to certain formal aspects of grammatical processes . . . as if the two, physiology and syntax, were intimately related, one grading into the other. . . ." In other words, linguistic structure may emerge from, and may even be viewed as, a special case of motoric structure, the structure of action. This is a view with which Herbert Spencer, the first great evolutionary psychologist, would not have been uncomfortable.

A similar argument was elaborated by A. M. Liberman (1970), from a perceptual point of view, when he drew attention to formal similarities between the processes of decoding phonetic and syntactic structures. He described the analogies between the overlapping actions of separate muscles as they merge to form a syllable and the interleaving of deep structure segments to form the complex utterance. And he emphasized the need for a specialized decoding device for

the comprehension of both phonological and syntactic structures.

An important point here is that despite the possible continuity between physiology and syntax, the true coherence of language may rest on a physiologically novel use of segmented structure, at two functionally distinct, yet hierarchically related, levels of organization: syntax and phonology. So far as we know such a dual structure—echoed, perhaps, in the structures of music and dance—is without biological parallel. Here, then, may be a sense in which language is indeed autonomous: not fully separable, but different, a subsystem (itself a nesting of subsystems) nested within the organism, and subject to idiosyncratic principles, just as are hearing and sight within the broad cross-modal structure of perception.