Gestural Linguistics

The Signs of Language. EDWARD S. KLIMA and URSULA BELLUGI with ten others. Harvard University Press, Cambridge, Mass., 1979. xiv, 418 pp., illus. $25.

The principal authors of this volume, Klima and Bellugi, have written it in collaboration with ten colleagues who have worked with them at the Salk Institute for Biological Studies. The volume results from seven years of investigation into American sign language, the primary means of communication within the deaf community.

The original objective of Klima and Bellugi's research was to throw light on the biological foundations of human language. During the past 20 years there has been a greal deal of research on spoken language and on the ways in which hearing children acquire language from the speakers around them. The considerable literature that has emerged has revealed remarkable regularities across languages in the way children learn and in the structure of their early utterances. This has led many psychologists and linguists to postulate both linguistic and cognitive universals, at least for users of spoken language. With this in mind, Klima and Bellugi originally set out to study the way young deaf children acquire sign language from their deaf parents, in order to compare language acquisition in this visual mode with the more common auditory variety of language acquisition. The comparative study could help elucidate which features of language are limited to one mode or another and which are the common product of an intact human intellect striving to communicate through language, whether visual-gestural or spoken. In the process, they, like a handful of other researchers, found that very little was known about the formal structure of what deaf children were learning. This led first to these studies on the nature of sign language itself, and the work on children's acquisition of sign will follow in another volume.

American sign language (ASL), unlike American English, is descended from French sign language, and, interestingly, is both unrelated to British sign and unintelligible to users of British sign. Writing in another volume, William Stokoe, who has done pioneering work on sign himself, reported that his knowledge of ASL enabled him to communicate easily with deaf signers in Paris even though he had no knowledge of spoken French and they had no knowledge of spoken English.

The historical accident that has led to this strange state of affairs can be attributed to the Abbé de l'Epée, a French teacher of the deaf who published his theories around the time of the American Revolution. L'Epée had noticed that his students communicated among themselves by using manual gestures. In order to teach them French, he invented a number of signs himself, including some for French grammatical markers like *le* and *la*. He added these "signes methodiques" to the deaf students' own "langue des signes naturels" and made this the language of instruction. It was this codified sign language that was brought to the United States in 1816 by Thomas Hopkins Gallaudet, a young minister from Hartford who had been sent abroad by a local committee to learn techniques for educating the deaf.

Gallaudet studied the French method in Paris and returned with Laurent Clerc, a teacher of the deaf, who was himself deaf. Together they established the American Asylum for the Deaf and Dumb (now called the American School for the Deaf) in Hartford. The school was supported first by private donations, then by an appropriation from the state of Connecticut and, in 1819, by funds from the federal government. It was probably the first school for other than normal individuals to receive public funds in this country. The success of the manual method of instruction was such that similar schools were soon established in New York, Philadelphia, and New Jersey. Within 60 years of the foundation of the first school, 31 states had schools for the deaf where ASL was the principal mode of instruction. (A competing oral tradition began in the 1860's, which led to an immense philosophical rift between promulgators of the different methods, but that fascinating tale must be told elsewhere.)

One major result of the establishment of schools for the deaf was that there were now communities of signers who used a common language. The artificial grammatical signs that had been added gradually dropped out, and ASL began to take on linguistic characteristics of its own. It became a living language, one that deaf babies could learn as a first language from their deaf parents.

Despite the fact that ASL has a 160-year history in the United States, very little has been known about its structure until recent times. Casual observers, and even some serious researchers, have been confused by the fact that there are a number of other kinds of manual communication that one sees: there is finger spelling, for instance, where each letter of a word can be represented by a different handshape; there is pantomime, where a series of impromptu mimetic gestures can stand for a word; and there is signed English, a combination of signs and finger spelling meant to correspond closely to English sentences. American sign language, as distinct from all these, is a language with its own structure and its own grammar.

The very readable studies presented in *The Signs of Language* reveal a great deal about sign language and about the nature of language itself. Perhaps what they underline most clearly is the fact that to be a medium capable of expressing the full range of human intentions language need not be spoken. It is the human brain, not the mouth or the larynx, that makes language possible. ASL is a complete language.

The individual studies reported deal with important topics. For instance, there is the question of iconicity, or the degree to which a sign actually resembles the object it represents. Spoken words like *cuckoo* might be said to be iconic, since the word sounds like the call of the bird in question. Many signs have an iconic element, but over time they have become so stylized and abbreviated that their meaning is not at all self-evident. In fact, nonsigning hearing people were largely unable to guess the meaning of all but a few of even the most "obvious" signs. After the fact, however, it is not so difficult to see the iconic connection. While subjects were unable to guess what the sign for *vote* meant, once they were told its meaning they generally agreed that the sign contained elements reminiscent of putting a ballot into a ballot box.

A number of studies were undertaken in order to reveal formal grammatical properties in sign. These have shown that ASL is not just a loose collection of mimetic gestures and that it is capable of expressing a full range of grammatical variation. In one study done in collaboration with Carlene Canady Pedersen the investigators attempted to discover what kinds of modulations of meaning can be expressed in ASL by asking a dozen deaf

signers to translate into ASL a story about an old fisherman "whose face became red in the wind." Most signers omitted the sign for "become" and signed something like "red, face" or "wind (against face) red." At first the investigators assumed that ASL simply dispensed with the finer distinctions. But analysis of videotapes ultimately revealed that many adjectival predicates can be rendered in a variety of ways that express what are typically called *aspects* in spoken language, that is, such things as the onset, duration, frequency, or permanence of events or states. Predicates containing words like "red" or "sick" or "angry" can be modulated by variations in the movement of the sign. The basic sign might be made with a circular reduplicated movement or with a single accelerating movement, for instance. In this way the signer can indicate the shades of meaning that differentiate "tended to get red" from "got red once," and so on. The circular motion conveys the meaning "tends to be." Deaf signers, by adding this motion to the basic sign, can say things like "My brother characteristically gets dirty," or "My sister was in a car accident, and as a result she tends to be sickly." Only careful observation has made it clear that ASL is capable of expressing such sophisticated meanings, and these findings directly contradict the claims of some other contemporary researchers who still believe that ASL greatly resembles the language of young children who have not yet learned adult grammar.

Other studies deal with such topics as the formal structure of the sign, wit, humor, poetry, and song in sign. The volume is a tribute to human creativity and a significant contribution to our knowledge about language, thanks to the careful work of Klima, Bellugi, and their fellow authors: Robin Battison, Penny Boyes-Braem, Susan Fischer, Nancy Frishberg, Harlan Lane, Ella Mae Lentz, Don Newkirk, Elissa Newport, Carlene Canady Pedersen, and Patricia Siple.

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Rapprochements in Population Biology

Ecological Genetics. The Interface. Papers from a symposium, Ithaca, N.Y., June 1977. PETER F. BRUSSARD, Ed. Springer-Verlag, New York, 1978. x, 248 pp., illus. $22.80. Proceedings in Life Sciences.

Although population biology has traditionally, if artificially, been divided into the subdisciplines of population genetics and population ecology, there has always been some integration of the two. Ecological concepts have always been part of population and evolutionary genetic theory, and in recent years the mathematical models upon which much of this theory is founded have become increasingly contaminated with the parameters and variables of ecology. Geneticists working with natural populations have generally considered at least some components of the ecology of their subjects. In fact, for more than 20 years outdoor population geneticists in Great Britain have used the phrase "ecological genetics" to describe their endeavors. Although many ecologists continue to work on problems or at levels that enable them to ignore the complication of genetic variability, this is not the case for the increasing number of people interested in the evolution of ecological systems or in the role of genetic polymorphisms in stabilizing ecological associations. Although I would not characterize the efforts directed at merging the ecological and genetic components of population biology as a unified movement, it is clear that the tradition of separate treatment is breaking down at an increasing rate. The symposium from which the present volume stems was intended to illustrate this more ecumenical approach to the biology of populations.

The 12 papers in the volume vary considerably in subject matter and in the manner and extent to which ecological and genetic components are integrated. There are a brief introduction by the editor and an index, but there is no commentary on the topics considered or on the individual papers. The discussion following the original talks has not been included.

The opening section, Theory, includes a broad, somewhat critical, and I believe valuable review by S. A. Levin of the various approaches that have been used to develop a mathematical theory that simultaneously considers the ecological and genetic components of population biology. In the other paper in this section, J. Roughgarden uses ecological genetic models to consider how pairs of populations in nonsynergistic associations might satisfy the goals, or perhaps values, imposed upon them by geneticists and ecologists, that is, the simultaneous maximization of their fitnesses and sizes.

The two papers in a section entitled Physiology, Biochemistry, and Adaptation consider the association between variation in enzymes and other proteins and the physical environment in which the populations reside. R. K. Koehn lucidly sets out the criteria that would have to be met if enzyme polymorphisms were adaptive and then summarizes the results of his intensive field and laboratory studies to ascertain whether these criteria are met for the leucine aminopeptidase system of the mussel *Mytilus edulis*. W. J. Schull, R. E. Ferrell, and F. Rothhammer present a progress report on their retrospective investigations to ascertain whether existence in high-altitude environments has led to adaptive changes in blood and serum enzymes and proteins for human populations in the Andes.

Three papers are grouped by the genus of the organisms under consideration, *Drosophila*. H. L. Carson reports the results of some of his ecological and genetic studies of the mechanisms leading to the extraordinary number of *Drosophila* on the Hawaiian Islands. W. B. Heed summarizes the results of his studies relating choice of food plants to differential selection at the alcohol dehydrogenase locus in *D. mojavensis*. Heed's study reinforces the point clearly made in Koehn's paper; the direct demonstration of selection at particular enzyme loci and the elucidation of the mechanisms of that selection are difficult tasks that will require an extensive effort and a relatively deep excursion into the biochemistry and physiology of the organisms in question. R. C. Richmond presents evidence that ecological patchiness is responsible for microgeographical variation in natural populations of *Drosophila*.

In a section containing two papers devoted to Other Animals, R. G. Harrison considers the role of various forms of temporal isolation in selection and speciation in field crickets. And, in a paper whimsically entitled "Some contributions of snails to the development of ecological genetics," B. Clarke reviews the evidence for the selective maintenance of polymorphisms and linkage disequilibria obtained from studies with land snails. Although his paper does little to refute the suggestion that snails were chosen as the objects of ecological genetic studies because of an upper-