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INTERSPECIES COMMUNICATION

by
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Interspecies communication

Up to the present time man, *Homo sapiens*, is the only species of the animals on earth or in the sea known to communicate by means of spoken and written languages. Even though there is a Babel of human tongues, it is possible for an individual human to learn to communicate with other humans in a language different from his native one. In recent years serious scientific investigations have been made on the intraspecies communication of species of animals other than man. Man has not yet spoken with another species. The first extensive scientific attempt to teach a human language to another species is apparently that of Cathy and Keith Hayes with their chimpanzee, Viki. Within 2 years Viki was induced to say "mama, papa, cup, and up" in a highly explosive fashion. Insofar as the author knows there have been no systematic and serious attempts to date on the part of the human to learn to speak with another species in its own tongue.

Criteria for candidate selection. Certain criteria have been developed for the selection of other species as candidates for exploring interspecies verbal communication with man. Some of the necessary but probably not sufficient factors involved are a mammalian brain, a brain size above a certain critical weight, a brain of a certain degree of complexity, adequate vocalization apparatus, naturally cooperative attitude toward man, sufficient control over emotional impulses (such as aggression, sexual activities, and so on), ability to learn quickly to select the appropriate sonic and other patterns from the environment. Also included is the ability to receive and transmit nonverbal gestures associated with the meaning of the vocal exchanges. Theoretically, there does not seem to be a necessarily fixed relation between the actual development of a natural nonhuman language and the unrealized ability to learn one of the human languages.

Dolphin experiments. At the Communication Research Institute, the first animal to be tried in verbal interspecies communication is a species of small whale, the bottle-nosed dolphin (*Tursiops truncatus*). This species seems to fulfill the selection criteria. Certain formal sonic exchanges between individuals of the species have been recorded and analyzed, and there are various formal resemblances to human conversation. "Exchanges" in which each animal transmits and then waits for the transmission from the other animal have been found (Figs. 1 and 2). Alternations between two individuals seem to be the rule for the whistles and clicks emitted by these animals.

In addition to these native "dolphinese" sounds, *Tursiops* emits high-pitched sounds which have been variously described as quacks, squawks, wails, bleats, barks, and buzzings. The striking similarity of some of these sounds to those of the human voice has been observed. The tendency of some bottle-nosed dolphins to produce many of these "humanoid" sounds while hearing human speech has been interpreted as mimicking.

Neurophysiological studies. The brains of bottle-nosed dolphins have been explored in a fashion analogous to that in which the human brain has been explored but by means of neurosurgical techniques specially adapted to the situation of these animals. The dolphin's cerebral cortex resembles the human cortex in its vast size, its complicated fissuration patterns, its six layers of cortical cells, and its high cellular (neuronal) densities. Prof. E. Grünthal has called attention to the striking similarity of these brains to those of the highest primates, including man.

The neurophysiological exploration of the dolphin's brain reveals some similarity to the human one (as opposed to smaller-brained animals) with respect to vast "silent" areas, a restricted "motor strip" which causes muscle movements when stimulated, and large and well-differentiated areas for eye movements (both uniocular and binocular). As has been shown by W. Schevill, B. Lawrence, W. N. Kellogg, and K. Norris, dolphins can recognize objects and navigate among obstacles in murky water or darkness by use of the echoes of short recurrent pulses of sound produced in their heads. Their pos-

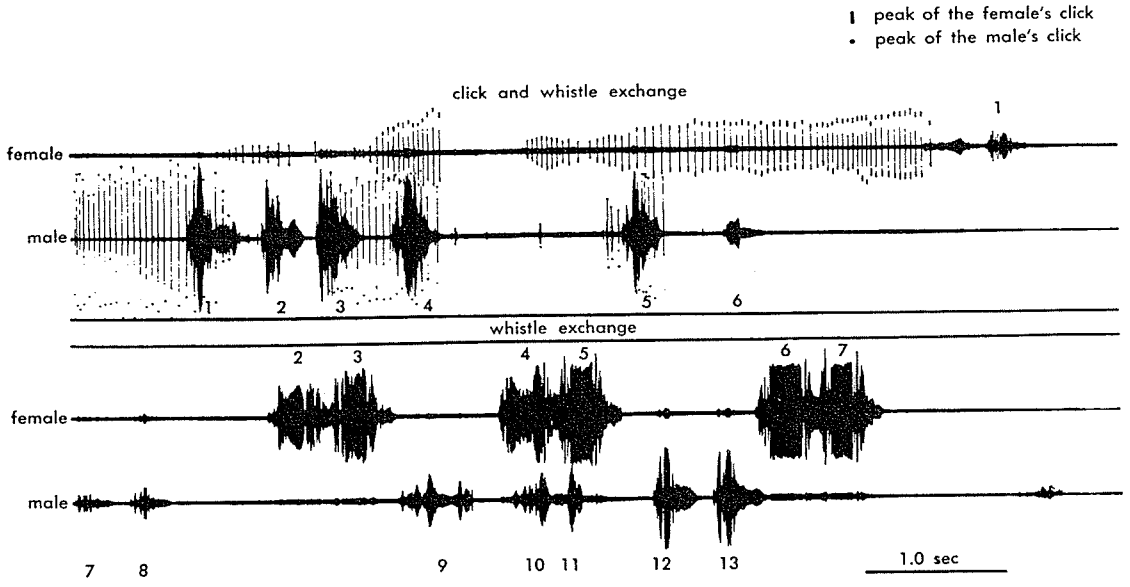

Fig. 1. A graphic record (amplitude vs time) of a vocal exchange between a male and female dolphin. The record lasts 15 sec. Each whistle of each animal is numbered in sequence. Other disturbances in the baseline are usually water noises. (*From J. C. Lilly and A. M. Miller, Vocal exchange between dolphins, Science, 134(3493):1873–1876, 1961*)

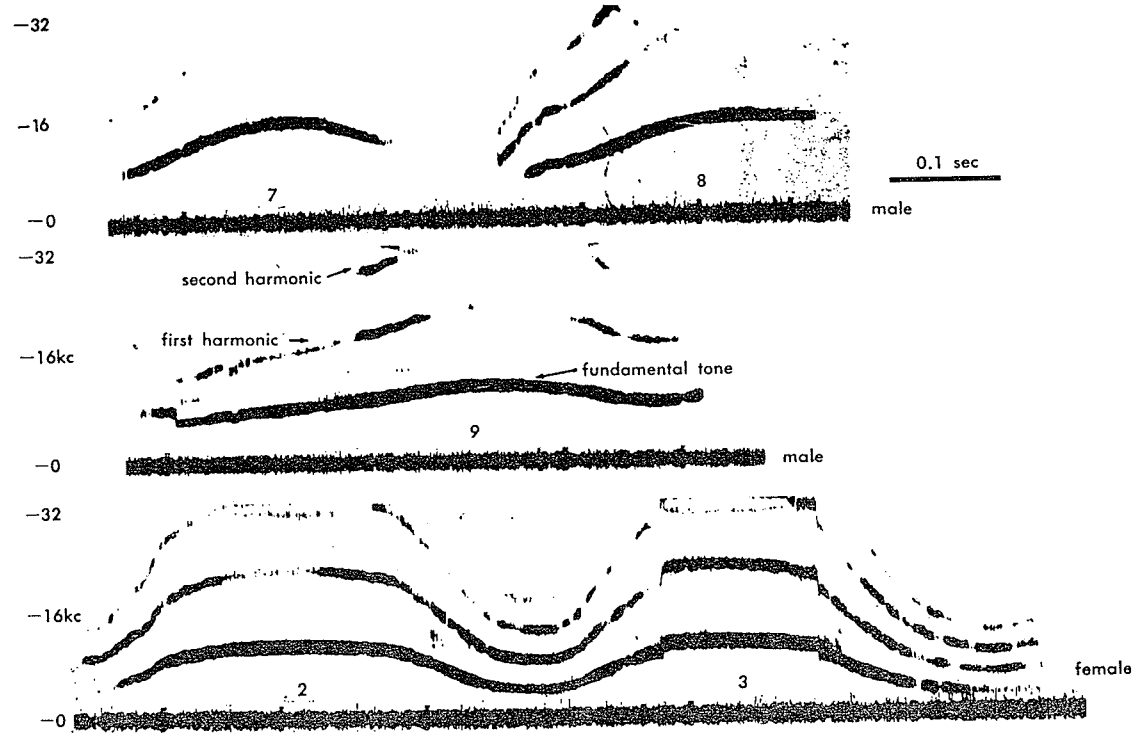

Fig. 2. Sonograms (recordings of frequency vs time) of a portion of an exchange between a male and female dolphin. The number of each emission in this figure corresponds to that of the amplitude trace in Fig. 1. The fundamental tone and the first two harmonics are visible on these sonograms. Some enhancement of the higher frequencies was used in recording the sonograms. These emissions are similar to those of a human whistle language (silbo) of the Canary Islands. Each seems to use frequency modulation as the information carrier. (*From J. C. Lilly and A. M. Miller, Vocal exchange between dolphins, Science, 134(3493):1873–1876, 1961*)

session of such an ability and the human's lack of it may be a handicap to development of interspecies communication. [JOHN C. LILLY]

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