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Communication with extraterrestrial intelligence

Harold Wooster, moderator
Paul L. Garvin
Lambros D. Callimahos
John C. Lilly
William O. Davis
Francis J. Heyden

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As originally set up, this session was planned as a debate between those who say there is extraterrestrial life and those who say there isn't. It struck me that it might be much more interesting to set up the assumption that there is extraterrestrial life, and then attempt to answer the question, "How do we go about recognizing it and, hopefully, communicating with it?"

It seems evident that no single professional discipline is able to answer this question by itself, and so I thought that I would see what sorts of skills might be involved and then ask people representing these skills to appear on the panel.

In a discussion of this nature, we quite obviously need a linguist—a very special kind of linguist who specializes in monolingual field work (which will be explained subsequently). I believe that Paul L. Garvin fills the bill perfectly.

Obviously, too, a cryptologist was needed. I chose Lambros D. Callimahos, a highly qualified expert from the Department of Defense.

Let us examine the word "extraterrestrial." *Terrestrial* means "earth or land" and *extra* means "outside of." An ideal choice would be someone who has actually lived with, worked with, and talked with an extraterrestrial species. Therefore we have with us Dr. John Lilly, who works with dolphins.

William O. Davis is a physicist, a rather free-thinking one, who was invited on the grounds that we should have somebody on the panel whose comments are seldom predictable.

"Extraterrestrial" has other connotations. Since there is an astronomical aspect to this whole question, a learned astronomer would be an excellent person to have on the panel. And so we have Father Heyden.

Panel members will each have an opportunity to state their positions. They will then be allowed to—using a nice sociological word—interact.

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tor, not reliance on ingenuity of the recipient. The "inverse cryptographer" must make his meaning clear to the recipient, even if the latter does not possess a cosmic equivalent of the Rosetta Stone.*

As an illustration of how much information could be conveyed with a minimum of material, and as an example of facile inverse cryptography, let us consider a message I have devised to be typical of what we might expect of an initial communication from outer space. In Fig. 3 is shown a series of transmissions that could have come from another inhabited planet, many light-years away. The 32 arbitrary symbols are representations of the 32 different signals (combinations of beeps, or distinctive pulse shapes) heard on a frequency of 1420.4 Mc/s. The punctuation marks are not part of the message, but here represent different time lapses: adjacent symbols are sent with a short pause (1 unit) between them; a space between symbols means a longer pause (2 units); commas, semicolons, and periods indicate pauses of 4, 8, and 16 units, respectively. Between transmissions (numbered here for reference purposes) there is a time lapse of 32 units.

The first transmission, (1), is obviously an enumeration of the 32 different symbols that will be used in the communications; in transmission (2) is the clear implication that A represents the integer 1, B the integer 2, . . ., J the integer 10. In the first 20 transmissions there are introduced symbols for the introductory expository treatment in teaching us their mathematics. Among the items treated are: addition, subtraction, multiplication, and division; decimal notation and the concept of zero; inequalities and approximation; powers and roots; and definitions of π and e. Transmission (21) adds nothing new to the 31 symbols recovered thus far, but it does quote one of the most beautiful concepts in pure mathematics: They are telling us that if they can teach us such a complex notion at this early stage, we will be staggered by what they will teach us by the 200th or the 2000th transmission. Beginning with transmission (22), words and word-cluster concepts are introduced, so that by the time we come to transmission (30), we now are understanding, in a manner of speaking, pure Venerean. We can now see how we could recover the code they are using on us, and which will obviously consist of thousands of code groups with different meanings; this is easily appreciated by anyone who takes the trouble to fathom the meaning of all the 30 foregoing transmissions. (The solution may be found in Fig. 4.)

Even right after this first message, if we are in direct communication with that planet, we shall have questions to put to "them": the proof of Fermat's last theorem, Goldbach's conjecture,† and many other unsolved problems in mathematics and the natural sciences. It will not be difficult for "them" to demonstrate their intellectual and technological superiority (first of all, don't forget it was *they* who were able to call *us*). If "they" but know the seventh digit of the "fine structure constant," they are ages ahead of us (we know only the first five for sure, suspect the sixth). This number, 137.039 . . ., is the ratio, among others, of the speed of light to the speed of the hydrogen electron; it may take a century to calculate this constant to nine digits. And after we resolve our pressing scientific questions, it might be appropriate to make discreet inquiries as to how we could live in harmony and peace with our fellow man — that is, if we aren't eaten or otherwise ingested by the superior civilization that had the good fortune to contact us. But as far as the cryptologist is concerned, he (and generations of his descendants who might experience the thrill of their lives when we hear from "them") must keep a level head and be prepared to cope with problems such as he has never seen — problems that are out of this world, so to speak.

John C. Lilly

Communication Research Institute

The title that I might choose for my discussion is "The Need for an Adequate Model of the Human End of the Interspecies Communication Program," a plea for self-conscious, open-ended, general-purpose, nonspecies-specific cognition research into models of theory for communication with nonhuman minds. I believe that this is the first time the word "mind" has been mentioned in this respect.

John C. Lilly, M.D., is director of the Communication Research Institute, an independent organization with laboratories in Florida and the Virgin Islands, which he founded in 1959 for studies on methods of communication between man and other species and on the structure and functions of the brain and psychology of man and of animals of the sea. He received the B.S. degree from the California Institute of Technology and the M.D. degree from the University of Pennsylvania. He was on the faculty of the E. R. Johnson Foundation for Medical Physics for 12 years and later became chief of the Section on Cortical Integration, Laboratory of Neurophysiology of the National Institute of Mental Health, Bethesda, Md. He is the author of *Man and Dolphin* and coauthor, with Dr. Ashley Montagu, of *The Dolphin in History*. He has also written some 90 published papers on his scientific research.

*The Rosetta Stone is a piece of basalt found in 1799 near the Rosetta mouth of the Nile, bearing a bilingual inscription (in Egyptian hieroglyphics, Egyptian demotic, and Greek) with which Jean François Champollion was able to solve the mystery of the Egyptian hieroglyphs.

†With what he has learned from this example of space communication, let the reader formulate these two questions directly for transmission to "them," in a clear and compact form; the solutions appear in Fig. 4. For the reader who is a little rusty on classic unsolved problems in mathematics, Fermat's last theorem states that no integral values of x, y, and z can be found to satisfy the equation $x^n + y^n = z^n$, if n is an integer greater than 2; Goldbach's "notorious" conjecture ("notorious" only because other mathematicians failed to make the conjecture themselves) states that every even number greater than 2 can be expressed as the sum of two primes.

For approximately the last nine years, I have struggled with the problem of devising working models of the interspecies communication problem at a relatively highly structured cognitive level. Despite overglamorization and excessive public exposure, the embryo has remained viable and hard working.

The major portion of the total problem has been found to be my own species rather than the delphinic ones. There is apparently no currently available adequate theory of the human portion of the communication network. The lack of such a theory has made it difficult for most scientists to see the reality of the problems posed in the interspecies program. As long as the conscious unconscious basic belief exists of the pre-eminence of the human brain and mind over all other earthside brains and minds, little credence can be obtained for the proposition that a problem of interspecies communication exists at all.

Despite arguments based on the complexity and size of certain nonhuman brains, little if any belief in the project has been instilled in the scientific community at large. Support has been obtained for further examination and demonstration of the large-sized, detailed excellence of structure and description of the large dolphin brain. There is no lack of interest in this area. The falling out comes in obtaining the operating interest of competent working scientists in the evaluation of the performance of these large brains. Interest and commitment of time and self are needed for progress.

The basic assumptions on which we operate are as follows. Each mammalian brain functions as a computer, with properties, programs, and metaprograms partly to be defined and partly to be determined by observation. The human computer contains at least 13 billion active elements and hence is functionally and structurally larger than any artificially built computer of the present era. This human computer has the properties of modern artificial computers of large size, plus additional ones not yet achieved in the nonbiological machines. This human computer has stored program properties, and stored metaprogram properties as well. Among other known properties are self-programming and self-metaprogramming. Programming and metaprogramming language is different for each human, depending upon the developmental, experiential, genetic, educational, accidental, and self-chosen variables, elements, and values. Basically, the verbal forms are those of the native language of the individual, modulated by nonverbal language elements acquired in the same epochs of his development.

Each such computer has scales of self-measuration and self-evaluation. Constant and continuous computations are being done, giving aim and goal distance estimates of external reality performances and internal reality achievements.

Comparison scales are set up between human computers for performance measures of each and of several in concert. Each computer models other computers of importance to itself, beginning immediately *post partum*, with greater or lesser degrees of error.

The phenomenon of computer interlock facilitates model construction and operation. One computer interlocks with one or more other computers above and below the level of awareness any time the communicational distance is sufficiently small to bring the interlock functions above threshold level.

In the complete physical absence of other external computers within the critical interlock distance, the self-directed and other-directed programs can be clearly detected, analyzed, recomputed, and reprogrammed, and new metaprograms initiated by the solitudinous computer itself. In this physical reality (which is an as completely attenuated as possible environment with solitude), maximum intensity, maximum complexity, and maximum speed of reprogramming are achievable by the self.

In the field of scientific research, such a computer can function in many different ways—from the pure, austere thought processes of theory and mathematics to the almost random data absorption of the naturalistic approach with newly found systems, or to the coordinated interlock with other human computers of an engineering effort.

At least two extreme major techniques of data-collection analysis exist for individual scientists: (1) artificially created, controlled-element, invented, devised-system methods; and (2) methods involving the participant-observer, who interacts intimately and experientially with naturally given elements, with nonhuman or human computers as parts of the system.

The former is the current basis of individual physical-chemical research; the latter is one basis for individual, explorative, first-discovery research of organisms having brains larger than those of humans.

Sets of human motivational procedural postulates for the interlock research method on nonhuman beings, with computers as large as and larger than the human computers, are sought. Some of these methods involve the establishment of long periods—perhaps months or years—of human to other organism computer interlock. It is hoped that this interlock will be of a quality and value sufficiently high to permit interspecies communication efforts on both sides on an intense, highly structured level.

In essence, then, this is the problem of communicating with any nonhuman species or being or mind or computer. We do not have, however, the full support in basic beliefs in the scientific community for these postulates. Obviously, we as a species do not believe, for example, that a whale, with a brain six times the size of ours, has a computer worth dealing with. Instead, we kill whales and use them as fertilizer. We also eat them. To be fair to the killer whale, I know of no instance in which a killer whale has eaten a human, but I know of many instances in which humans have eaten killer whales.

Therefore, on an historical basis, I do not feel that at present there is much chance that any species of greater attainments than ours will want to communicate with us. The dolphins want to communicate only with those people who are willing to live with them on the terms the dolphins set up and that certain kinds of human beings set up. Other types the dolphins drive away. Every year we lose people from the dolphin research program. Usually it is because of fear of the power of these animals and fear of damage, even though in the history of the laboratory no one has yet been injured by the dolphins. Sometimes we think that these people who are lost are projecting their own hostilities outward onto the animals in a very unrealistic fashion. The people who survive either realize that this mechanism is operating and conquer it, or else their nature is such that they do not have hostilities to project.