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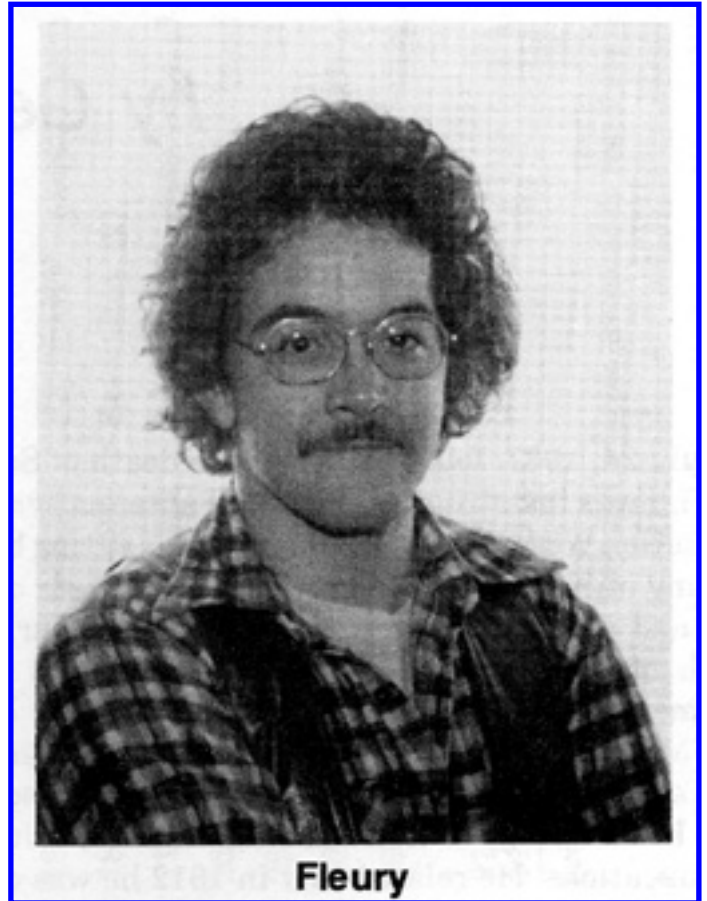
The Aliens In Our Oceans: Dolphins As Analogs

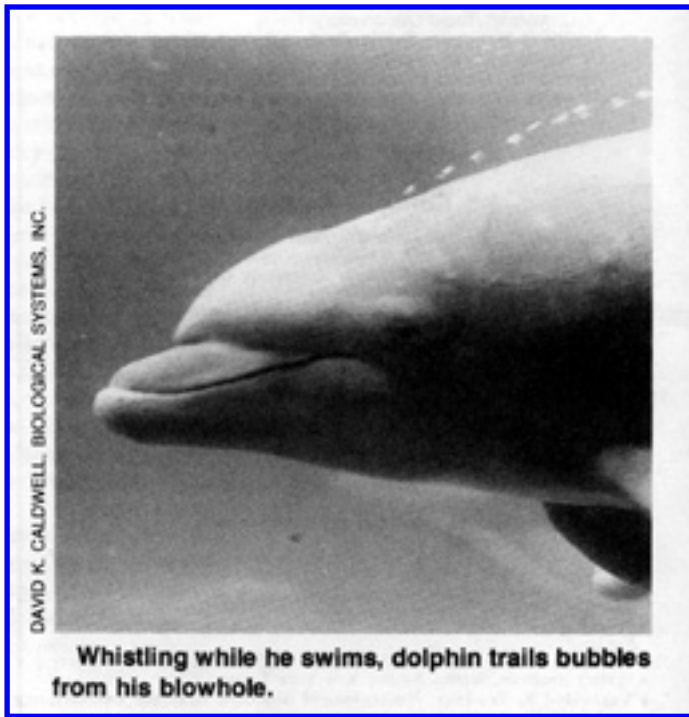
By: Bruce E. Fleury

The accompanying article by Bruce E. Fleury is a **COSMIC SEARCH AWARD** winner — the second to be judged worthy of this honor. The first award winner was Don Lago's "Circles of Stone and Circles of Steel" published in **COSMIC SEARCH** for March 1979 (vol. 1, no. 2).

While we spin elaborate theories about the nature and distribution of alien intelligence, we generally ignore the presence of intelligent aliens on our own planet, beings which preceded us in evolving a complex brain by over thirty million years.

These terrestrial aliens are the Cetaceans, a large group of marine mammals which includes the whales, dolphins, and porpoises. In several respects, these graceful and curious animals can serve as a useful model for our attempts to communicate with extraterrestrial beings. We are likely to encounter many of the same types of problems in breaking the communication barrier between human and dolphin that we will discover in attempting to communicate with an extraterrestrial intelligence.





The intelligence of the dolphin (*Tursiops truncatus*) still remains a matter of some controversy among researchers, but there can be little doubt that the Cetacean brain has reached a level of evolution matched only by the primates. In every area in which gross neuroanatomy has been correlated with intelligence, the dolphin's brain is highly developed. Both their brain and ours, for example, have an extremely intricate cerebral cortex. Although the dolphin's cortex is somewhat thinner, with neurons packed much less densely

than our own, its surface is folded and fissured to a much greater extent than the human brain, providing a vast cortical surface area. The associational cortex, or "silent brain", which is responsible for the most basic human qualities, is large in the dolphin in the very same areas in which ours is larger than the apes.

Despite the dolphin's fundamental biological similarity to ourselves, they have evolved into creatures with whom, at least superficially, we seem to have little in common. The dolphin's biochemistry and physiology, however, is much like our own. They are air breathers, warm blooded, and bear live young like any other mammal.



The Cetaceans were once land animals who, in some yet unknown geologic past, returned to the sea and adapted to a new set of biological demands. The oceanic environment demanded a streamlining of form for more rapid movement in a denser medium. The bones on the upper and lower limbs gradually fused, evolving into flukes and flippers better suited to the Cetacean's new mode of existence.

Since the murky ocean depths preclude the heavy reliance many mammals place on the visual cortex in obtaining food, Cetaceans evolved a complex echolocation system, analogous to radar but using sound waves in the water. Sound travels four

and one half times faster in water than in air and can travel over much larger distances.

It is entirely possible that this great dependence on sonic echolocation or sonar was the factor that triggered the development of the Cetacean brain. Dolphins are able to make fine sonic discriminations between objects underwater which far exceed the visual acuity of humans. While the dolphin's sonar evolved primarily as an efficient means of hunting prey, the constant presence in the dark waters of the dolphin's mortal enemy, the shark, may also have provided an evolutionary incentive for the development of this highly accurate sonar system.

There is a great deal of evidence that these signals have been adapted from food gathering and navigation to communication. Dr. John C. Lilly, the noted delphinologist, has demonstrated the ability of dolphins, isolated from one another in every respect but sonically, to teach simple tasks to one another. The level of vocal exchanges between dolphins in captivity and in the open sea suggests a highly social relationship between individuals, based on their ability to exchange information in the form of trains of sonic impulses.

We usually refer to the coordination of hand and eye, vital for living in trees, in our attempts to explain the explosive evolution of the human brain. In a similar fashion the neural structures required to transmit, receive, and translate the extraordinarily complex acoustical signals generated by the dolphins may have been the spur to their evolution as a non-manipulative intelligence.

This aspect of dolphin evolution leads us to the first problem in the dolphin/alien example. We tend to associate the use of the hand, especially the opposable thumb, with the evolution of an intelligent civilization. This very provincial prejudice pervades our imaginative literature and much of our research efforts. Man, it is repeatedly said, is the measure of all things.

If the dolphin does have, as Dr. Lilly suspects, a sophisticated culture with an oral tradition, we will have to revise our ideas of what constitutes an intelligent civilization. Dolphins erect no permanent structures, use no tools, possess no science (as we understand it), and are so streamlined as to lack the ability to use the facial expressions and body language we rely on in our own society.

Although we are not accustomed to accepting intelligence in a non-human form, who is to say that the dolphin's water based, acoustically oriented "culture" is not at least as widespread in the universe as our own "manipulatory/visual" one?

Such non-technical extraterrestrial civilizations are presently beyond our reach, since they are probably not able to transmit signals over great distances. Direct communication with them, however, if the opportunity does occur in the distant future, may be not only possible but highly desirable for both species. The dolphin can provide a valuable model for communicating with any non-technical aliens we may encounter.

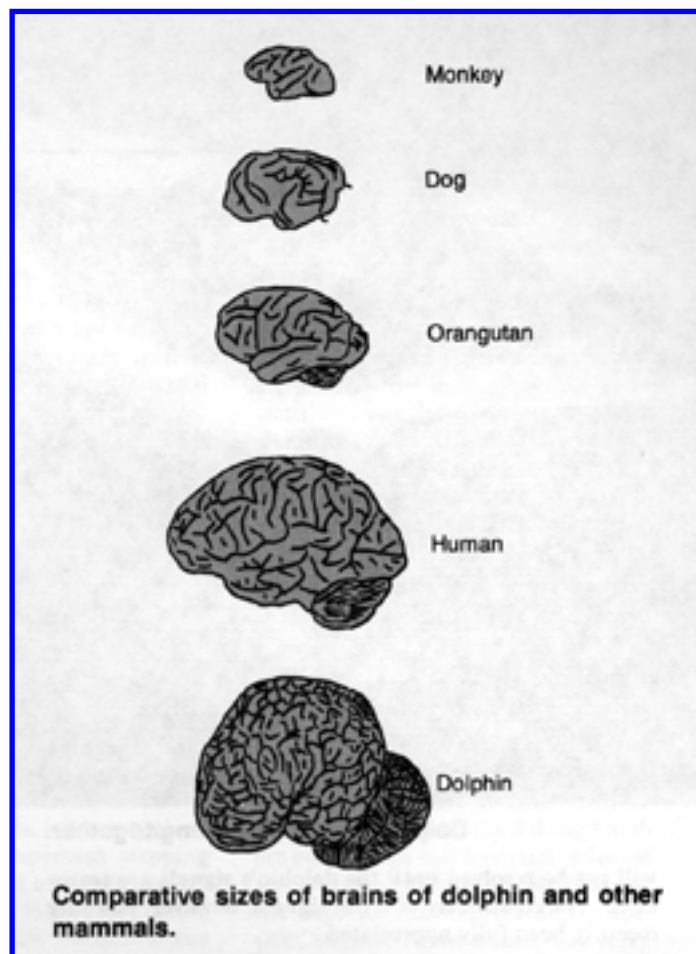
Although the level of the dolphin's intelligence has yet to be finally demonstrated, the available evidence indicates that it is high, perhaps the equal of our own. The problem will not be resolved until the dolphin's signals are translated. The complexity of these signals, however, has only recently been fully appreciated.

Dr. Lilly has established that the dolphin employs three distinct transmission sources, which can be used separately or simultaneously. The amount of information that can be processed using these simultaneous and independently variable acoustical signals is astounding.

Dr. Lilly's new JANUS project is an attempt to use the microprocessor to construct a device interfacing human and dolphin, and ending at long last the isolation of humanity from a comparable intelligence. He theorizes that their acoustical world may be every bit as rich and as varied as our own visual world. He has demonstrated that there is a definite stereo component to the dolphin's "language" derived from the relative position of two of its sound generating sources around the blowhole. He suspects that they may even be capable of communicating by means of what he calls "holographic sonic pictures".

If this is true, communication between man and dolphin may involve a transformation between their auditory world and our visual one, a transformation likely to test the limits of even our very best computer technology. This type of transformation may also be required to communicate with an extraterrestrial intelligence. We cannot predict what sensory modalities may dominate the evolution of a completely alien brain.

Computer software suitable for contact with dolphins could probably be easily modified to attempt contact with the great whales themselves. The brains of the whales are even larger than those of the dolphins, but they are contained within some of the largest bodies ever to have evolved on Earth.



If Dr. Lilly's theories concerning the relationship between brain size and body size are correct, large brains can only exist in large bodies. Dr. Lilly has studied the effects of angular momentum on the head and brain, examining the relationship between the moment of inertia of the brain and of the head and body which surrounds it. The brain has a delicate gel-like structure, and is far more fragile than most people generally realize. This fact limits the brain size that can safely exist in a given body size. Too much rotational acceleration, such as a glancing blow, will literally tear the brain from its blood supply and may even damage its internal structure. The elephant, for example, in spite of its

abundant padding, can suffer brain damage or even death from a simple fall.

The higher density of seawater over air has allowed the great whales to transcend this terrestrial limit, and their brains are, consequently, the largest that have ever appeared on the planet. Their vast bulk, buoyed and cushioned by the dense fluid medium they inhabit, helps protect their large brains from serious injury.

If this theory is indeed valid, a large proportion of intelligent aliens might be massive creatures, who have evolved in a supportive medium denser than air which helps buffer the various shocks and movements of day to day existence. The whale could be an excellent model for the logistical problems of communicating with such beings.

Finally, differences in the physical properties of the medium of communication that might be used by aliens will also present some technical problems. This can be illustrated by the difficulties of communicating with the dolphin across the air/water interface. It is not easy for dolphins to vocalize in air, and even mimic human speech, but they make the attempt with a minimum of encouragement. A major advantage of the dolphin as a model for extraterrestrial intelligence research is its apparent desire to communicate with us. They seem almost eager to interact, and are by nature as playful as they are agile and curious.



Fortunately, they do not use their great strength against us when we enter their environment. A dolphin is fully capable of killing a shark by ramming it at high speed. Despite our wholesale slaughter of the great whales and the indiscriminate massacre of the dolphin by the commercial fisheries, dolphins have made no attempt to revenge their species.

This fact may indicate an advanced ethical system which is shared on a planet-wide basis. It is by no means likely that another intelligent race would be as quick to forgive such outrageous treatment, or allow itself to be subjected to performing the circus acts we teach "trained" dolphins to perform.

Captive dolphins may be valuable as a reminder to land bound humans of the dolphin's presence on the planet, and of the need to protect Cetaceans from ultimate extinction, but will we inadvertently cage an intelligent alien race simply because it does not display intelligence in a form we readily recognize? Will we injure or exploit such creatures because of their inability to communicate in a human fashion?

In our search for extraterrestrial intelligence we must be prepared for, and even expect, great dissimilarities both in alien biologies and in the very nature of intelligence itself.

The dolphins and whales can serve as useful analogs for our hoped for

communication with an extraterrestrial intelligence. They live in a medium with physical properties different from our own. They navigate, communicate, and may even think in terms of a different sensory modality, and some Cetaceans are so large as to present a unique communications problem in their own right. In addition their language, if such it turns out to be, is far beyond our ability to decipher without the aid of highly sophisticated computer technology.

Our success or failure in communicating with these unique and fascinating creatures can help us to an increased awareness of our ability to communicate with any "off world" aliens we may encounter. Learning to communicate with the dolphin could teach us many of the technical skills we will need, and present many of the same problems we may have to face in communicating with an alien intelligence.

Ultimately, communicating with the aliens in our oceans may teach us much about our ability to accommodate our philosophy and our ethics to the presence of a non-human intelligence.



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Fleury

Bruce E. Fleury has just received his master's degree in Library, Media and Information Studies from the University of South Florida (USF) in Tampa. Born in Malone, New York, in June 1950, he did his undergraduate work in General Science and Psychology at the University of Rochester receiving a bachelor's degree in 1971. While at USF he served as student representative on the board of the University's Library Associates, a group of friends of the library.

Fleury is an amateur astronomer and skin diver. As an expression of his great interest in the sea, he has worked with the librarian at the Newfound Harbor

Marine Institute on the Florida keys. An article written by Fleury with Dr. Fred Pfister of USF on "Student Book Collection Contests in American Colleges and Universities" is appearing concurrently in the May 1980 issue of *College and Research Libraries*. Fleury has a special interest in academic libraries and scientific reference work.

I think all animals think. But that again becomes a matter of definition. Some people who would want to put animals into a separate category feel they think, but not on the level of humans. But man is pretty egocentric about these things. He doesn't think anything corresponds to or thinks like him, and that's probably true. But that doesn't make them a lower form necessarily. Maybe they haven't been able to conquer the earth and overcome environmental difficulties and fly airplanes and all that sort of thing, but in another sort of way they seem to do very well. They are free.

Peter Morgane, in "Mind in the Waters".

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