# The case for the Loch Ness Monster

When the first brief article presenting new evidence for the existence of the Loch Ness "monster" was published in NATURE last December (SN: 12/20/75, p. 391), both scientists and journalists treated the story with pointed skepticism. After all, a special symposium called to assess the evidence had been abruptly canceled, key photographs were withheld amidst rumors of high bidding for first rights, the research team had consisted of zoological "amateurs," while a group of "experts" from the Natural History Museum of London released a unanimous statement saying nothing had been proven. Now a more detailed summary of the work, with additional background and comments, in MIT's March/April TECHNOLOGY REVIEW, should clear up some of the misunderstandings.

Besides presenting more technical detail, the new report also gives more of a sense of personal involvement and adventure, previously missing from accounts of what should be one of the most exciting scientific expeditions of our time. As they made initial sonar contact with a large, submerged object moving under their boat at 1 a.m., Aug. 8, 1972, the authors recall: "If primitive instincts are any sign, there was something ominous in the loch that night; the hair went up on the backs of [our] necks." About 40 minutes later salmon began breaking the water's surface, apparently trying to escape two objects, clearly discerned by sonar, swimming about 12 feet apart.

At the same time, a submerged camera with synchronized strobe light was recording the first close-up, underwater photographs of what the authors contend is "Nessie"—the large aquatic creature that has been the subject of some 1,400 years of recorded sightings at the loch. Slow film and suspended particles of peat—which limit any visual observation to 30 to 40 feet—resulted in dark, blurred photos requiring computer enhancement to smooth out lighting artifacts and increase the contrast between subject and background. Once accomplished, however, the results were remarkable: two close-up shots of what appeared to be a diamond-shaped flipper, and a distant shot—at the limits of resolution—of two indistinct objects. When the exposure densities of the two objects were analyzed to determine their distance from the camera, they were found to be about 12 feet apart, as predicted by the sonar tracks.

In 1975 the researchers returned with more sophisticated equipment and faster film to try to photograph the rest of a creature's body. Divers carefully placed one camera-strobe unit on a ledge at about 80 feet depth, making sure it was clear of the loose silt that covers the barren loch floor. Another unit was suspended from a boat, at about 40 feet. What happened during the 24-hour period surrounding the night of June 19-20 can only be guessed, but it appears that a passing animal stirred up bottom silt enough to cover the main camera (the loch has no strong currents) and that the floating camera was buffeted repeatedly, twice knocked enough to shoot a straight-up picture of the boat bottom.

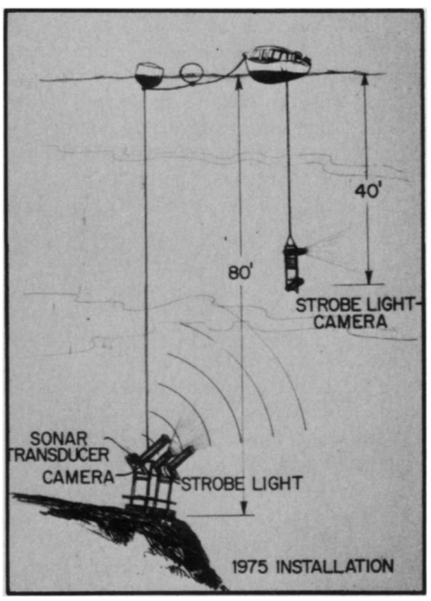
The floating camera did, however, manage to record during that time the pictures now interpreted as showing a whole-body shot of a Ness creature and a close-up of the head. Since the head was not well lit, being situated outside the cone of light emitting from the strobe, structure must be guessed from shadows. In the whole-body picture, also, part of the curved neck is missing from the photo, probably as a result of uneven exposure from the strobe.

Indistinct as they are, coupled with sonar traces the photos lead to certain conclusions about the nature of Nessie—pointedly consistent with the bulk of anecdotal lore. The creatures would be roughly 20 feet long, including a slender neck that is somewhat longer than the torso. The weight may be more than a ton, much of this concentrated in the compact trunk that is about six feet in diameter. Long projections extend from the top of the head, leading some scientists to speculate that the animals can breathe through these without otherwise breaking the surface. One member of the party photographed two parallel wakes on the lake, made by something moving under the water; the spacing between the wakes was almost exactly the same as the distance between the two "horns" in the head photo.

Analysis of the evidence has centered so far around the possibility of hoax, the qualifications of the researchers and alternative explanations of the indistinct photographs. The whole episode must also be considered a test-case for the legitimacy in modern science of the work of dedicated amateurs—in the sense, in this case, of persons not professionally trained in zoology and doing their research as an avocation.

The current article has four authors, none a zoologist, but each with impressive skills relative to their task (all are MIT alumni). Robert H. Rines, president of the Academy of Applied Research, is a lawyer with an engineering background who specializes in patent law. He also holds patents for inventions in the field of sonar and radar. Charles W. Wyckoff owns a photography company and has pioneered photographic techniques used underwater and on the moon. Harold E. Edgerton, an MIT professor emeritus, originated stobelight photography. He was awarded the National Medal of Science in 1973 "for his vision and creativity in pioneering the field of stroboscopic photography and for his many inventions of instruments for exploring the great depths of the oceans." Martin Klein is an electrical engineer who has designed numerous sonar devices for underwater exploration and searches.


*Three successive frames (left) taken 1.2 minutes apart, with "Nessie" in middle frame, about 25 feet away; part of the neck not illuminated. Apparatus set-up (below) shows position of the sonar, main camera on ledge and auxilliary camera suspended.*




Speculation and hoaxes have attached a stigma to work at Loch Ness, frightening off "establishment" scientists. To their credit, Rines and his colleagues have refrained from speculating about the identity of Nessie (though others have suggested it looks a lot like the supposedly extinct plesiosaur). Yet the British museum zoologists chose to criticize the work along lines in which none of *them* had expertise. They overlooked the lighting set-up used

in the whole-body photograph and concluded the "head" and the "body" were probably two separate entities, perhaps simply gas bubbles carried by swarms of larvae. Yet such swarms can be distinguished from solid objects by sonar, and the man who performed the computer enhancement of the photo concluded: "I detect no evidence of fraud. These objects are not patterns of algae, sediment or gas bubbles."

The press, in general, also went beyond their proper skepticism in covering the story. As TECHNOLOGY REVIEW managing editor Dennis Meredith points out, the widespread interpretation of Nessie's new name, *Nessiteras rhombopteryx*, as an anagram could easily backfire. Rearranging the letters can not only spell out "Monster Hoax by Sir Peter S." (Sir Peter Scott, another colleague of Rines), but might as easily be construed to be "Extortion by Press Shamer" or "Yes, Both Pix Are Monsters. R."

At a press conference in New York, Rines announced plans for an even more ambitious project at Loch Ness this summer. Presumably, his academy will have gained sophistication in handling announcements of the work, while professional zoologists may be less quick to judge work done outside usual channels.

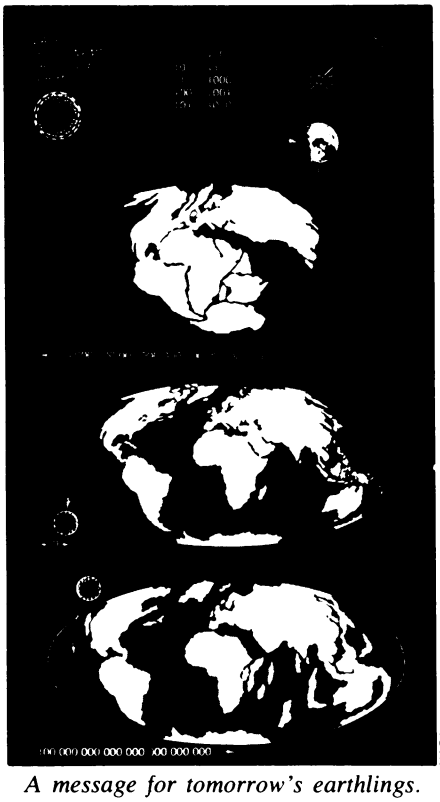
Meanwhile, George R. Zug, curator of the Smithsonian Institution's Division of Reptiles and Amphibians gives a succinct statement of what might be considered the current professional consensus: "I believe these data indicate the presence of large animals in Loch Ness but are insufficient to identify them. This new evidence on the existence of a population of large animals in Loch Ness should serve to encourage research . . . and remove the stigma of 'crackpot' from any scientist or group of scientists who wish to investigate." □

# An orbiting message for the future

A 60-centimeter ball, bedecked with mirrors like a dancehall centerpiece, will be launched into space early in May carrying a message. The message is not for extraterrestrial eyes, like the plaques being carried out of the solar system aboard the Pioneer spacecraft, or ears, like the digitized pictograph broadcast by the Arecibo radio telescope in Puerto Rico (SN: 11/23/74, p. 325). The intended recipients are earthlings—but they may be the earthlings of 10 million years in the future.

The bearer of the message, the mirrored ball, is LAGEOS, the LAser GEOdynamic Satellite. Its primary role is not to carry messages but to provide an extremely accurate, passive but predictable target for laser beams from the earth's surface, to be used in precise measurements of continental drift and other crustal motions. The satellite carries no transmitters, power supplies or other instruments—it will just quietly orbit the earth. ("Testing LAGEOS," says one National Aeronautics and Space Administration official, "is a little like training your pet rock.") The timing of the pulses should enable scientists to calculate changes in the distance between the satellite and the laser ground stations to within a few centimeters, thus allowing the changing distance between ground stations, due to earth movements, to be monitored to within two or three centimeters over thousands of kilometers. Negotiations are in progress with "about 10" foreign countries who plan to use the satellite, and the hope is to establish at least two tracking stations on each of the earth's crustal plates.

To give LAGEOS as stable an orbit and as long a life as possible, it will be aimed at a near-circular orbit about 5,900 kilometers above the earth, crossing near the poles (110° inclination) so that it will be accessible from anywhere on the planet. The high orbit will put it above the drag that would be caused by even the rarefied fringes of the atmosphere, and project scientists expect it to stay aloft for as long as 10 *million* years. In addition, to minimize the effects of such disturbances as the solar wind, the sphere has been made as heavy as possible: its two hemispheres are fastened together by a large bolt, around which is a cylindrical weight giving the whole satellite, including its 426 reflectors, a weight of 903 pounds. Also wrapped around the bolt, in the event that distant future generations should retrieve the satellite and take it apart, is the message.


NASA

*A message for tomorrow's earthlings.*

Actually there are two identical copies of the message, each engraved on a 10-by-18-centimeter stainless steel sheet. It was designed at the request of NASA by Cornell astronomer Carl Sagan, in hopes of being able to communicate where and when the satellite came from, but without the use of words. If, as predicted, the probe stays aloft for a longer time than humans have so far lived on this planet, who knows what language its finders, if any, will speak?

Besides a drawing of the satellite itself (and, just in case, its name in words), the message includes the numbers 1 through 10 written in the binary system, a method, using only 1's and 0's, that would almost surely be recognizable to any technological society, since it is common in computers that recognize only the terms "on" and "off." Next to the numbers is a representation of the sun and the earth in its orbit. An arrow on the orbit indicates the direction of the earth's motion, thus also establishing that a rightward-pointing arrow indicates the future.

The rest of the message is dominated by three maps of the world, all drawn in the same projection. The first shows the estimated position of the continents about 225 million years ago, in the Permian period, as they were just beginning to separate into separate land masses from the supercontinent known to plate-tectonic theorists as Pangaea. A binary number beneath the map indicates approximately 268 million years, with a left-pointing arrow to represent the past. (The number could have been made more precise, but it was rounded off—as a binary number—"to avoid the appearance of spurious accuracy.") The second map shows the continents in their present positions, with a binary 0 and opposite-pointing arrows to indicate the present. There is also a picture of LAGEOS, with an arrow representing its launch from Vandenberg Air Force Base in California. The final map also shows LAGEOS, with a downward arrow suggesting that this is the time of the satellite's descent, and a number-and-arrow indication of about 8.4 million years in the future. The continents are shown here in their predicted positions at that time, including the separation of much of California from the rest of the United States. "This separation, along the San Andreas fault," Sagan points out, "is an expected consequence of the crustal motions which LAGEOS is designed to measure."

The maps are only conceptualizations, not precise predictions, Sagan says, but they should serve to give the discoverers of LAGEOS an idea of the origins of what they have found. "Whoever is inhabiting our planet in that distant epoch," he says, "may appreciate a little greeting card from the remote past." □