system there were far more, and their gravesites today pock the surfaces of the worlds they helped to form, such as Mars and the moon. Even in more recent geological time the earth is struck an average of three times every million years by Apollo asteroids a mile in diameter (twice the apparent size of 1976 AA) or larger, says Shoemaker. Statistically, two of these objects will strike the ocean, but many of the land impacts of the past are still visible. The 17-mile Ries crater in Germany was born of one some 15 million years ago. About 1.3 million years ago, a six-mile impact crater at Lake Bosumtwi in Ghana was blasted into existence. Even larger features, some up to 40 miles across, are known on the North American continent.

Eleanor Helin first spotted 1976 AA on Jan. 7 (only 11 days after Kowal found No. 19—1975 YA), using the 18-inch Schmidt telescope at Palomar Observatory. She relocated it repeatedly on the two following nights. More than half a dozen other observers have seen it since, providing data that enabled Marsden of SAO and James Williams of the Jet Propulsion Laboratory to calculate its orbital characteristics. Spectrographic studies at the University of Arizona and the University of Hawaii have shown the asteroid to resemble a class of meteorites known as carbonaceous chondrites—stony objects containing about two to four percent carbon, often in the form of complex organic compounds, and pocked with spheroidal inclusions of such materials as magnesium-iron silicates.

The new find is not Helin's first such discovery. In 1973 she found one which still holds the record for the highest inclination, or orbital tilt, of any known Apollo asteroid: 68 degrees. It was seen only briefly, and Helin plans to look for it again late this year, although, Marsden points out, its orbit is so sketchily known that it may take a lot of looking. (Relocating the tiny objects, in fact, is a problem more often than not. Only nine of the 20, says Marsden, have been detected on return trips.)

There are known Apollo asteroids larger than 1976 AA—one called Sisyphus, discovered in 1972, is believed to be eight times as big, about four miles across—and others have come closer to the earth, though not in such elegantly matched orbits (Hermes, found in 1937, has come within half a million miles). But No. 20 is currently the focus of attention, drawing a growing number of watchers around the world. (IAU circulars 2899, 2901, 2903, 2905).

Meanwhile, a little more has been learned about No. 19. Observations since its Dec. 27 discovery have shown that Fast-Moving Object Kowal does not, as was first suspected, loop through the orbits of Earth and Venus. Instead, it loops through those of Earth and Mars (IAU circular 2903). □

Armadillos contract leprosy in nature

Armadillos, those armor-plated relics of the once great mammalian order Edentata, are catching what appears to be human leprosy in the American South. And no one is particulary surprised—least of all leprologists and edentologists. They are, in fact, fairly happy about it on one level, albeit worried on another.

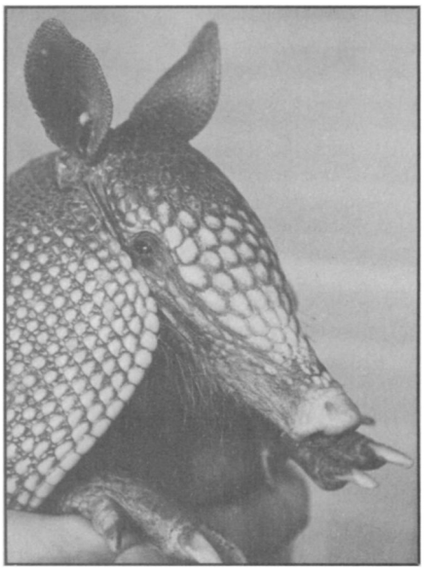
The nine-banded armadillo is a relative newcomer to the southern United States —a migrant worker, one could say, from Mexico, in search of the insect pests in farmer's fields. The climatic heat wave in the Northern Hemisphere during the first half of the century allowed their northward spread. And those that didn't wander to parts of Texas, Louisiana, Florida, Arkansas and Alabama by themselves were imported by farmers.

Along with sloths and anteaters, they are the most primitive living mammals, and share with the others a somewhat inefficient internal heat regulator that is sensitive to external temperatures. It is this primitive heat control that allowed both the migrations and, it turns out, the susceptibility to leprosy.

The same research group that now reports finding leprosy in wild armadillos in the JOURNAL OF THE RETICULOENDOTHELIAL SOCIETY (18:6) discovered that susceptibility experimentally five years ago. Eleanor E. Storrs of the Gulf South Research Institute in New Iberia, La., in collaboration with researchers at the U.S. Public Health Service Hospital at Carville, La., was able, in 1971, to infect armadillos with *Mycobacterium leprae*, the infectious bacillus that causes leprosy in humans (SN: 9/4/71, p. 138). Storrs knew 1) that *M. leprae* grows at lower than body temperatures (the reason it invades the cooler extremities and skin) and 2) that armadillos have a body temperature of 87 to 92 degrees F due to their poor heat regulation. She suspected that armadillos could be infected with the leprosy agent and serve as a badly needed animal model for studying the disease. And she was right. Leprologists have used armadillos in basic research ever since.

But now, Storrs, colleague Gerald P. Walsh and others from Gulf South Research have discovered that armadillos in the wild had the disease all along. They captured seven animals in isolated areas of Louisiana and found, after routine examinations, that they had skin lesions, enlarged lymph nodes, nerve degeneration and diseased spleens and livers. Microscopic examination and biochemical tests revealed a mycobacterium in the diseased tissues. More tests, done since the report appeared in December, have confirmed that at least in one animal thus far, the organism is *Mycobacterium leprae*, the human leprosy agent.

The significance of the finding extends well past the superficial concern that



Armadillos: Leprosy from dirt or insects?

humans come into contact with armadillos on occasion. (More than occasionally, in some cases. The students at the University of Texas have, for example, adopted the armadillo as their counter-culture mascot.) "The most important thing," Walsh told SCIENCE NEWS, "is that suddenly, we find that a reservoir of human leprosy bacillus exists in nature." It was believed until now, he says, that prolonged contact with another leper was the principal, and possibly only, means of transmission. The finding may lead, therefore, to a new understanding of how leprosy is transmitted.

The armadillo, in his natural swampy habitat, eats mainly insects and dirt. The team is now studying both for traces of the human leprosy bacillus. "We don't want to start a panic," Walsh says, "since it is clear that only a small percentage of people are susceptible to leprosy in the first place." (An estimated 10 to 15 million persons now have the disease, 3,000 of them in the United States.) "But," he says, "we are going on the assumption that armadillos and the suspected natural reservoirs should be handled with care."

A species of Bolivian frog, a few rodents and the water buffalo have been reported by other researchers to contract leprosylike diseases caused, most likely, by mycobacteria (bacteria that invade other cells with hairlike appendages). The armadillo, however, is the only animal that shows positive results to tests used to diagnose human leprosy—more evidence that they do catch the same disease.

One lead to natural reservoirs of *M. leprae* may be to investigate rice fields. It is known that the incidence of human leprosy is higher in rice growing areas and where rice consumption is high. It may be signficant that the seven armadillos with leprosy were found near rice growing areas of Louisiana. □