A meteorite messenger from the moon?

Of the 844 pounds of lunar rocks brought back by the Apollo astronauts, barely one-tenth have yet been studied. So why are several researchers now excited about the possibility of being able to establish that a single recently discovered meteorite, the size of a golfball and weighing little more than an ounce, also came from the moon?

Meteorites are, in a sense, space probes for free, providing material samples, cosmic-ray traces and geophysical data without the need for spacecraft. In recent years they have become one of the hottest topics in the study of the solar system, with implications that extend back to before the system even formed. Yet with thousands of meteorites now known and cataloged, scientists have been unable to be sure where even *one* actually came from.

A little fragment known as ALHA 81005, found in January in Antarctica's Allen Hills, may be their chance.

Only a few links between individual meteorites and specific "parent bodies" have even been proposed. Some researchers have suggested that a type of basaltic meteorite known as eucrites may be pieces of the large asteroid Vesta, but the evidence is limited, circumstantial and conflicting, and dynamicists raise the problem of how fragments could get all the way to earth from Vesta's position in the most distant reaches of the asteroid belt. The asteroid Dembowska has been tentatively offered as the source of a particular, one-of-a-kind achondrite, but the evidence there is even sketchier. (The same research group, in fact, blurred the already shaky case for Vesta by suggesting that Dembowska may also be the source of the eucrites.)

The most provocative idea, perhaps, was first raised a few years ago by such researchers as Donald D. Bogard and Laurence E. Nyquist of NASA's Johnson Space Center in Houston, who have suggested that certain rare meteorites may in fact be pieces of the planet Mars. Numerous scientists would love to know that they already have a sample of Mars in hand (a spacecraft to fetch one may be years in the future), and the evidence, though far from open-and-shut, is at least intriguing. The type of melting found on the three cited meteorite types (named shergottites, nakhlites and chassignites, lumped together these days as SNC meteorites) seems much easier to imagine from the heat-producing radionuclides in a planet-sized body than in a mere asteroid. The analyses of Martian surface material by the Viking landing craft have been reported as indicating a composition very similar to shergottites if one subtracts certain elements that could have been deposited on the surface as volcanic gases. And Bogard himself recently announced finding that a shergottite from Antarctica's Elephant Moraine contained trapped rare-gas isotopes whose abundances (an enrichment of xenon 129 and a high ratio of argon 40 to argon 36) are strikingly similar to those of the Martian atmosphere.

The main problem again, however, is determining how pieces of Mars get to earth. Mars is much closer than Vesta, but it is also much more massive, requiring much more energy to get a potential meteorite out of the Martian "gravity well" and started on its way. An erupting volcano would not be nearly strong enough, several researchers agree, but work now in progress by Jay Melosh of the University of Arizona and Ann Singer of the State University of New York at Stony Brook suggests that a major impact by a comet nucleus might generate enough hot, compressed gas to kick free at least some small fragments.

No one is certain, however, whether Marsrocks have actually gotten here, and the same question applies to the moon — unless a moon-spawned meteorite can actually be identified.

NASA/JSC

ALHA 81005: Can its source be proved?

Brian Mason, curator of the Smithsonian Institution's department of mineral sciences in Washington, D.C., is in charge of preparing preliminary descriptions of newly recovered meteorites to aid scientists who may wish to make more detailed analyses. And meteorite ALHA 81005, he says, "doesn't look like any meteorite I've ever seen." It is an anorthositic breccia, composed primarily of the mineral plagioclase feldspar in a brown, glassy matrix, and it promptly reminded Mason of just the sort of rocks brought back by the Apollo 16 astronauts from the highlands of the moon. "The more I've looked at it," he says, "the more convinced I am. I think there's a very good chance that it's lunar."

But what makes ALHA 81005 so exciting is that, thanks to the detailed data already gleaned from the Apollo moonrocks — which have no counterpart in the problems of matching shergottites to Mars or eucrites to Vesta — it may be possible to prove it. Potentially interested scientists have been notified in a special, one-sample issue of the ANTARCTIC METEORITE NEWSLETTER, and research proposals are due at Johnson Space Center by Dec. 1. Three days later, a specially convened session of the Antarctic Meteorite Advisory Group will meet to evaluate the proposals, and the hope is that the selected researchers will have their results in time for the annual Lunar and Planetary Science Conference at JSC in March.

It would be easier to propel a rock to earth from the moon than from Mars, but confirmation that it is possible at all could be inspirational to scientists wondering if they may also have samples of the red planet. *—J. Eberhart*

Construction contracts let for LEP

CERN, the European Laboratory for Particle Physics, located at Geneva, recently announced the award of four major contracts for the construction of its Large Electron-Positron collider (LEP). LEP is designed to accelerate electrons and positrons to energies up to 100 billion electron-volts and collide them against each other. Occupying a tunnel 27 kilometers in circumference that will straddle the French-Swiss border, it will be the largest physics apparatus ever built.

Four contracts are covered in the current announcement. The first concerns underground civil engineering work in the plain between Geneva and the Jura Mountains. It calls for the boring of 24 kilometers of tunnel 3.6 meters in diameter. The winner is a consortium formed around the French firm Fougerolle and including Astaldi (Italy), Entrecanales y Tavora (Spain), Philipp Holtzmann (West Germany) and Rothpletz, Lienhart & Cie (Switzerland). The remaining three kilometers, under the Jura Mountains, will be the subject of a separate contract.

The second contract is for making 3,600,000 precision punched steel laminations for the coils of 3,328 magnets. It goes to the Swiss firm Styner & Bienz. The third contract concerns steel and concrete cores for the magnets. Half of them will be made by Enterprise Industrielle of Paris and half by Porr of Vienna. The fourth contract is for a building for the accelerator that will preaccelerate the particles and inject them into LEP. This goes to a consortium formed by the French firm Mas and the Swiss firm Arn & Wutrich.

Digging is expected to commence in the spring of 1983. The date depends on completion of the process for getting legal authorization for the work in France, where three-quarters of LEP will lie. Authorization for the Swiss portion has already been obtained. *—D.E. Thomsen*

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