# Meteorite fall reported in Madagascar

The Malagasy Republic on the island of Madagascar, some 500 kilometers off the coast of Mozambique in southeastern Africa, is remote from many of the communications channels that spread news of important events around the world. U.S. scientists this week were thus struggling to learn the hard facts behind several reports of a July 30 meteorite impact said to have produced what may be the largest impact crater in modern history, although late conflicting reports were raising doubts.

On that date, according to the French press agency, Agence France Presse, a meteor was seen in the sky over Madagascar's capitol city of Tananarive, accompanied by "noise" and a "bluish light." (U.S. researchers point out that such side effects are typical of large, meteoric fireballs produced by the friction of the earth's atmosphere.) The meteor reportedly broke apart in midair, producing two major fragments that subsequently struck the earth.

The larger fragment, according to both AFP and the Associated Press (which may merely have picked up the AFP account), fell near the city of Fianarantsoa, about 400 kilometers south of Tananarive, creating the 240-meter-diameter crater. The other piece fell in the Ankazobe region, about 100 km northwest of the capital, producing a lesser crater variously suggested to be from 20 to 75 meters across.

On Aug. 2, reports AFP, a team from Tananarive Observatory (which is equipped for seismologic studies) set out "to try and find the point of impact." The earlier reports of the crater sizes and locations would seem to suggest that the impact points were well known, but they may also imply that the observatory team was in fact seeking what could turn out to be yet another fragment. Unfortunately, the observatory was suffering from "a defective machine" (presumably a malfunctioning seismograph) at the time of impact, so that it was only possible to estimate that the recorded impact was somewhere in a radius of about 260 km from Tananarive. The team, however, announced that it planned to begin the search at Moramanga, a town about 150 km *east* of the capitol, further evidence, perhaps, for a third fragment being involved.

Unconfirmed reports of such a spectacular event are a far from ideal basis for speculation. Nonetheless, says Harold Povenmire, assistant director of the American Meteor Society and director of Bishop Planetarium in Bradenton, Fla., "If the report is true, this would be one of the major, if not *the* major, meteorite events of this century . . . and should provide scientists with valuable information for the next 50 years." By comparison, he says, the major "conventional" fall of this century was the Sikhote-Alin event, which occurred in Siberia in 1947 and left craters not much wider than about 40 meters. (It was not yet known early this week whether the Madagascar impacts produced the deep craters characteristic of iron-rich meteorites or merely a surface disturbance more like the Tunguska event in Siberia in 1908.)

A single, substantial 240-meter crater, however, would almost certainly rule out the possibility that the impacting objects were pieces of manmade satellites, Povenmire says; the energy involved would have been far too great. Also, the considerable distance between the initially reported sites of the two major impacts seems to indicate that the assumed meteor tangentially grazed the earth's atmosphere, thus producing relatively flat descent trajectories.

Reports by Wednesday, however, were beginning to cast the giant-crater story into doubt, although a meteorite does seem to have fallen in the area. An earthquake may have taken place near Fianarantsoa about half an hour after a small fall (0.3 Richter) to the northeast near Tanatavè. The facts were still unresolved at press time. □

# Voyager: Multiplanet mission has message

On Aug. 20 and Sept. 1, a pair of spacecraft will be launched on the latest U.S. interplanetary foray, the Voyager project, bound for Jupiter, Saturn and perhaps Uranus and Neptune (SN: 1/1/77, p. 10). Once past the worlds that are their primary goals, however, the two probes will head out of the solar system, bound on a true "star trek" that will take them far beyond the abilities—and lifetimes— of earthlings to monitor their progress. And just on the chance that there may be someone or something out there to detect their passage, each Voyager craft will carry a message.

It's been tried before. The Pioneer 10 and 11 probes carry plaques with symbolic representations of earthlings, the earth and its location in space. A more elaborate message has been transmitted by the huge Arecibo radio telescope (SN: 11/23/74, p. 325), and the earth-orbiting LAGEOS satellite, expected to stay aloft for millions of years, carries a metal scroll for earthlings of the far future (SN: 4/17/76, p. 248). Yet each is but a whisper in the vastness of space.

The Voyager message is the most elaborate yet, an attempted portrait of an entire planet and its life. Conceived by Cornell astronomer Carl Sagan and a host of friends and colleagues, it consists in part of diverse music (from Bach to Chuck Berry to a Navajo chant), samples of 55 languages, dozens of miscellaneous sounds (whales, rain, a truck, a kiss) and 115 pictures of people, places, artifacts and arts (the sun, DNA, the great wall of China, an old man with a dog). All are recorded on two copper disks—one for each spacecraft—accompanied by a ceramic playback cartridge and operating instructions. A full description will appear in an upcoming SCIENCE NEWS.

Yet, say the message's authors, the point is not so much that the record may actually be received (in tens or hundreds of millennia), as to get earthlings to consider the real possibility that they may, indeed, not be alone. □

# Leukemia fighters in the bloodstream

Leukemia consists of the destruction of healthy blood cells by cancerous blood cells. Thus, one might logically ask whether blood transfusions could correct the problem. Indeed, transfusions have been tried from time to time on leukemia patients, and they have led to some occasional but well-documented cancer remissions.

The blood transfusions do not seem to counter leukemia simply by replacing cancerous cells, though. Bone marrow would still produce cancerous cells to invade the fresh blood. Rather, the fresh, healthy blood seems to contain some antileukemia factor, because selective destruction of cancer cells has been observed in leukemic mice, cats and dogs following infusion of healthy blood, healthy blood plasma (the fluid part of blood) or healthy blood serum (coagulated blood plasma).

What might the antileukemia factor be? Robert L. Kassel, Lloyd J. Old, Noorbibi K. Day and William D. Hardy Jr. of the Memorial Sloan-Kettering Cancer Center have made a good start in finding out. As they report in the PROCEEDINGS OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE (155:230), they have concentrated and purified the factor, and preliminary results suggest that it might be complement proteins. There are some dozen complement proteins, and they comprise one squadron of the body's immune fighters. If the factor is indeed composed of one or more complement proteins, it would strengthen the role of the complement system in fighting cancer cells. Also, now that the antileukemia factor has been purified, it can be tested on leukemia patients to see whether it might help fight their cancer.

First Kassel and his co-workers infused a strain of mice known as AKR mice, which had leukemia, with whole blood, blood serum, heparinized plasma (plasma containing an anticoagulant chemical called heparin) or citrated plasma (plasma containing a solution of potassium or sodium citrate or both). Their results showed that heparinized plasma had the greatest antileukemic activity, serum next and whole blood after that. Citrated plasma did not

have any of the activity. Thus, the best source of the antileukemia factor appeared to be heparinized plasma.

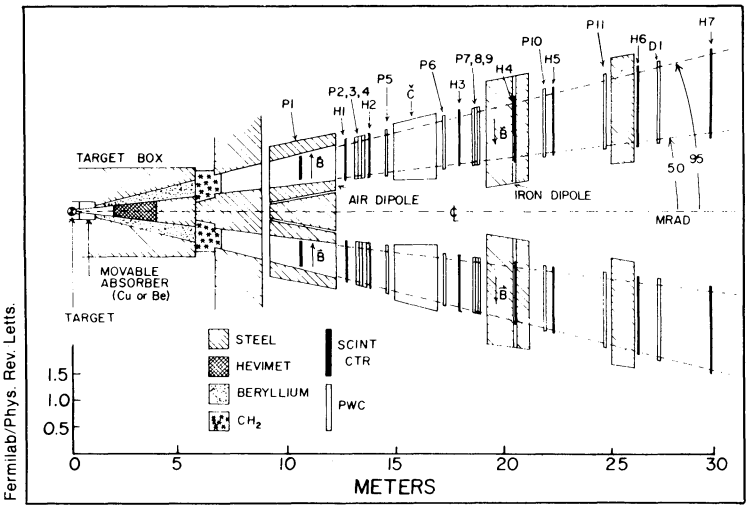
During their experiments, the researchers also observed that heparinized plasma kept overnight at a specific temperature developed a precipitate (a solid separated out from a solution) and that the precipitate contained something with antileukemia activity. Thus, they had reason to suspect that the antileukemia factor might be loosely adsorbed to the precipitate, so they tried to adsorb it onto a calcium phosphate gel. This method of purification, widely used in enzyme isolation, proved successful.

Ever since they isolated the leukemia factor, the scientists have tried to determine what it is. They have reason to believe that it might be one or several complement proteins, and so along with H.J. Müller-Eberhard of the Scripps Research Institute in La Jolla, Calif., they have been screening the gel material for various complement proteins. So far, complement proteins known as C3 and C6 have been detected.

If the factor indeed turns out to be one or several complement proteins, it would strongly suggest that the complement system may be as crucial as some of the other cells and chemicals of the immune system—for example, T cells, macrophages and antibodies—in fighting cancer cells. Several studies have, in fact, shown that complement levels are often depressed in animals and humans with cancer. So giving complement exogenously to cancer patients might help them. However, providing patients with lots of complement through repeated plasma infusions would impose too much of a protein burden on their bodies. Concentrated, purified leukemia factor, in contrast, should provide the same anticancer activity without the danger of a protein overload.

Even if the leukemia factor is not composed of complement proteins, of course, it might still hold therapeutic value for leukemia patients or other kinds of cancer patients. □

# Dileptomania: Heavier and heavier




Fermilab/Phys. Rev. Letts.

*Paths of muon pairs are traced by arrays of detectors. Each arm contains an identical series.*

Dileptomania is a disease first described in print in the CERN COURIER. A malady that strikes particle physicists, its major symptom is an extreme compulsion to search for pairs of leptons (electrons or muons) in the products of various kinds of collisions between particles and particles and particles and targets. The victims tend to regard such leptons as evidence of something important and fascinating, possibly new kinds of particles being created in the collisions. Recently, a variant syndrome, trileptomania (searching for triplets of leptons), has also made its appearance.

The latest seizure of dileptomania is reported from the Fermi National Accelerator Laboratory in Batavia, Ill., and appears to be a particularly heavy one. Sixteen physicists from Columbia University, Fermilab and the State University of New York at Stony Brook (S. W. Herb et al. in the Aug. 1 PHYSICAL REVIEW LETTERS) report that the appearance of unusual numbers of pairs of muons leads them to suspect the existence of something with a mass around 9.5 billion electron-volts. What that something may be is not conjectured. The experimenters call it a "resonance," which may or may not mean a single particle, but 9.5 billion electron-volts is by far the highest mass or energy at which a particle-physics "thing" has yet been found.

Actually dileptomania is a rather clever way to look for things. The leptons come in pairs with opposite electric charges. They are clean evidence, long lived and easy to record, and they tell quite precisely where and when something happened. It is then necessary for expert interpreters of the evidence to try to decide exactly what that something was.

What the data show is, to use a word that physicists often like because it has the vagueness requisite for a situation where they're not sure what they have, a "structure" or as these experimenters put it a "resonance." The experiment consists of bombarding copper and platinum targets with protons of 400 billion electron-volts energy from Fermilab's synchrotron. As the energy available for new creations in the collisions passes 9.5 billion electron-volts, the number of muon-pairs produced takes a sudden upward leap. If a graph of muon-pair number versus available energy is made, the curve at this point resembles the graph of a mechanical resonance. (If a person pushing a swing gradually changes the timing of his thrusts, when he comes to synchrony with the natural period of the swing, the amplitude of the swing will shoot upward; a graph of the amplitude will look similar to the data in this experiment. That is how the word "resonance" got into particle physics in the first place.)

The question is what is responsible for such a resonance? An obvious candidate is the creation of a short-lived particle that gathers up the available energy and then decays into a pair or pairs of muons. If such a particle existed, at 9.5 billion electron-volts, its mass would be in the supercolossal category. Such a large mass also suggests the possibility of a bound state of two or more particles, something that has been seen here and there elsewhere and is coming to be called a baryon molecule or a charmonium molecule. Or the cause could be some non-particulate enhancement of the energy utilization processes. In fact, with these short-lived resonances, the definition of the word "particle" gets a bit strained. When is a particle not a particle? becomes a relevant question.

The present experimenters publish no interpretation of their findings. According to the history of these things, one can expect that several will be forthcoming shortly, but in the proper intellectual order of business, the next step is an experimental confirmation that the resonance does in fact exist. The present paper was published without even the customary review procedure under a new policy of the editors of the journal. Physicists had been complaining that new results are not published fast enough, so the editors decided that if someone with sufficient reputation vouched for a finding, it would be speeded to print without review. In this case, the guarantor is Edwin L. Goldwasser, assistant director of Fermilab.

The only other facility in the world where a confirming experiment of the same type could be mounted is in the Super Proton Synchrotron at the CERN laboratory in Geneva. Confirmation might also come from a different kind of experiment, collisions of electrons and positrons, but this energy level would probably strain the existing colliding-beam facilities for electrons and positrons and might have to wait for the completion of the PETRA facility at Hamburg. That could take a couple of years yet. □