

## Cosmic rays? In a fly's eye

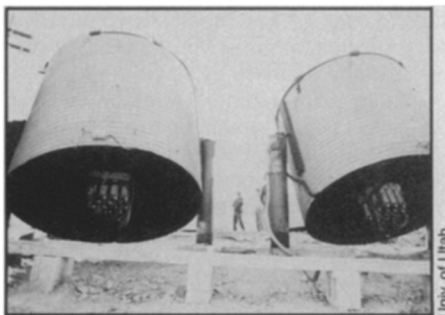
In the early days of particle physics cosmic rays were repeatedly the arena of important new discoveries (SN:7/5/80, p. 10). Particles, usually protons, strike the earth's atmosphere at high energies exhibiting interactions and creating other particles that were otherwise unavailable for study in those days. The development of high-energy particle accelerators brought particle physics into the laboratory. For a couple of decades cosmic rays were studied mainly for their astrophysical interest.

Now particle physics is returning to the cosmic rays. Energies are at play in the cosmic rays that may never be available in accelerators. New methods of studying these highest energy cosmic rays precisely and in detail are coming into being. One such is an arrangement of mirrors called the Fly's Eye located on a hill in the Dugway Proving Ground in Utah and operated by a group from the University of Utah including Haven E. Bergeson, George Cassidy and Eugene Loh. Results of the Fly's Eye's first few weeks of observation, presented by Loh at the Twentieth International Conference on High Energy Physics at Madison, Wis., last week, caused a great deal of excitement, according to more than one participant.

The Fly's Eye consists of 67 mirrors, 62 inches across, arranged on the ground as if they were the lenses of its namesake. A thousand photomultiplier tubes are arranged in groups at the foci of the mirrors so that each tube receives light from a small part of the hemisphere of sky that happens to be in view at any given moment. This point of view of the fly on the ground enables the instrument to track the progress and activities of the ultrahigh energy cosmic rays, those that arrive at the earth with  $10^{17}$  to  $10^{21}$  electron-volts energy. (The highest accelerator energies are less than  $10^{12}$ .)

The Fly's Eye tracks by recording the light from nitrogen atoms that fluoresce as these events take place in their vicinity. This light is extremely faint. Observing can be done only on cloudless, moonless nights. That amounts to about a third of all nights at Dugway, Loh says. Starlight is also much brighter, and "you can't shut off the stars," says Loh. But the fluorescent scintillations are fast, like a hundred-watt bulb (20 miles away) flashing for a microsecond. The electronics are tuned to that. It takes much longer to build up a significant image of a star on a retina or on a phototube, so the system simply doesn't see the stars.

About 30 to 50 useful events are recorded per night of observing, a figure that physicists say is about ten times that expected with other means of observing cosmic rays of this energy. It is still few



Mirrors are turned face down by day to prevent burnout of sensitive photocells.

enough that the observers have made a plastic model of a celestial hemisphere outfitted with an array of light emitting diodes. The LED's fire as data are recorded so the observers can watch each event in real time on this analogue display.

When such a cosmic ray strikes the atmosphere, it initiates a shower of all kinds of secondary particles. Previous observing techniques could record the arrival and composition of such showers. The Fly's Eye can track their progress. It is in this tracking that physicists hope to see something of the behavior of quarks, gluons and other exotica at these ultrahigh energies. Astrophysically the Fly's Eye hopes to be able to determine the balance between protons and heavier atomic nuclei in the primary particles and pinpoint their sources, all of which is important input to the long-standing debate on their origins and the mechanisms that energize them. So far, particular sources within our galaxy have not been singled out. The arrivals seem to come uniformly from around the celestial sphere. That leads to the suspicion that some may be extragalactic. □

## FDA upset about DMSO

The medical uses for dimethyl sulfoxide (DMSO), a purported panacea for everything from chronic pain to cancer, need to be scientifically determined, says the Food and Drug Administration. But DMSO's efficacy has already been accepted by some viewers of "60 Minutes," a matter of some concern to FDA commissioner Jere Goyan.

The popular show ran a segment on DMSO as a treatment for arthritis and chronic pain and now, says Goyan, many people have begun treating themselves with the chemical, an inexpensive by-product of paper-making. DMSO is approved by the FDA only for the treatment of chronic interstitial cystitis, a bladder ailment.

"We are working with the company marketing DMSO as a human drug to see that studies capable of yielding meaningful results are carried out," Goyan said last week. "In the meantime, it's risky business to drink, inject, or apply to the skin any substance not intended for that purpose." DMSO is being tested for use in joint and

spinal cord injuries and scleroderma, a crippling disorder involving the hand and other tissues in the body.

Goyan is concerned with reports that people are injecting, swallowing, or swabbing themselves with impure industrial grade DMSO. He also expresses worry that since DMSO can be absorbed through the skin, it may carry harmful substances with it if they are present on the skin or in DMSO.

The safety of DMSO in high concentrations and large amounts has not been established, and studies done in the 1960s suggest that DMSO can affect vision, Goyan says. The commissioner also says that the drug has been tested for a plethora of diseases, but most of the studies were discontinued when no effects were seen. □

## New ethics for M.D.s

The American Medical Association replaced its code of ethics late last month with a new set of principles, dropping provisions against advertising and working with anyone who violates scientific principles. The Tenets have been the basis of lawsuits and government action against the AMA.

Also not forwarded from the old code: the use of the male pronoun in referring to physicians, and specific rules on income and practice.

The stricture against associating with people who violate scientific principles, interpreted by many physicians and professional organizations to mean chiropractors, has elicited a cautious optimism from chiropractors. "It appears to be a step forward toward what we're hoping for — full cooperation between medicine and chiropractic for the benefit of our mutual patients," says Bruce Nordstrom, vice president of the International Chiropractors Association.

B. J. Anderson, a lawyer for the AMA, says the new principles don't indicate a change in the AMA's attitude toward chiropractors, but "make it easy for people to discontinue misinterpreting." A 1977 AMA Judicial Council opinion made clear, she says, that individual physicians can make their own decisions in regard to chiropractic.

James Todd, a New Jersey surgeon who chaired the committee that wrote the new code, says it is much tighter in terms of patients' rights. Confidentiality is now in the hands of the courts, not up to the individual physicians, and there is more onus on the physician to expose incompetence, he says.

As for advertising and chiropractic, Todd says, "We've always said physicians could advertise, so long as it's honest. We still say physicians can advertise. We've always said physicians could accept referrals from chiropractors. . . . Physicians have the right to utilize the talents of anyone they think will benefit the patient." □