

begin monopolizing the tracking stations through which the orbiter sends data. If the orbiter can keep going, it may be available to provide additional data on its second season of Martian dust storms and on changes in the polar caps, and even search perhaps for signs of possible dust rings and additional satellites.

Though many key Mars questions remain unanswered, there is by now a veritable mountain of spacecraft and earth-based data about the place—a problem of another sort. Analyzing such data, in all their diverse formats, can be a time-consuming and expensive task—and funds for seemingly mundane data analysis can sometimes be as hard to come by as the larger amounts for the spacecraft themselves. At the DPS meeting, therefore, Hugh H. Kieffer of the U.S. Geological Survey urged scientists with Mars data to consider contributing them to a “consortium,” based at the USGS, where they would be translated into a common format that would facilitate ready comparisons with other data in the collection. Various kinds of maps and thermal measurements have already been “formatted” to the consortium’s specifications, but far more, from radar to radio-occultation data, are eligible. The consortium cut its teeth on a similar project to adapt the diverse data about earth’s moon.

**Jupiter:** Fresh from the two Voyager encounters as well as new earth-based studies, Jupiter dominated the DPS agenda almost as it does the solar system, accounting for nearly 80 separate presentations. Topics ranged from the planet itself to its spectacular, volcanic moon Io to its newly discovered ring system. Even the tiny satellite Amalthea, closer to Jupiter than any of its other moons except one discovered mere weeks ago (SN: 10/20/79, p. 263) had its moment, as Cornell’s Joseph Veverka showed a highly computer-enhanced Voyager photo revealing enough surface detail to enable a crude map. (This despite the fact that Amalthea measures only an irregular, and approximately 270 by 165 by 153 kilometers, says Veverka, and was seen by Voyager from no closer than about half a million km.)

But again, major questions remain unanswered, such as the nature of the substances that color Jupiter’s brilliant cloud patterns, and the delays in the long-sought Galileo mission — which would actually penetrate the clouds, sampling all the way — were an oft-heard discussion topic. The probe was originally to have been carried from earth aboard an orbiter, but the combined payload proved too much for the space shuttle to carry, given the shuttle’s projected development status by the original 1982 launch date. So Galileo’s liftoff has been delayed until 1984, and split into two separate launchings — one each for orbiter and probe. This is also expected to add nearly 40 percent to the mission’s cost, and the extra time in the budget, said one DPS member, could also make it more

vulnerable to congressional trimming. NASA makes confident noises about Galileo’s future; some scientists are less convinced.

**Saturn:** On Sept. 1, Pioneer 11 got the first close look at Saturn, but even the project’s own scientists are eagerly awaiting the Voyager 1 and 2 flybys, in 1980 and 1981 respectively. Some of the Voyager scientists, meanwhile, were expressing concern at the meeting about being able to cram the same amount of science into the craft’s onboard computer that was available during the Jupiter encounters. A proposed mission to send probes into the atmospheres of Saturn and its largest moon, Titan, is years in the future, but the Pioneer 11 data provided plenty to think about, including revisions in the ring structure and the possibility of previously unknown satellites. Several of these satellites — one photographed by the spacecraft, another (informally dubbed “Pioneer Rock”) detected by charged-particle and magnetic-field measurements, and yet another (loosely known as S-11) noted in a previous earth-based photo — may all be one and the same, says the University of Arizona’s Tom Gehrels. Charged-particle data, however, may have located what could be taken as some outer ring structure, says James Van Allen of the University of Iowa, but it may consist of large enough chunks to be described as “a belt of little satellites.”

**Uranus:** The message here is that, for all the spacecraft, earth-based data still have a major role. The planet’s rings were discovered from earth, and a rotational period for the planet ( $12.8 \pm 1.7$  hours) has been calculated by M.I.T.’s Edward Dunham and colleagues using earth-based observations of the elliptical, outer ring’s precession rate.

**Neptune:** The earth-orbiting, 2.4-meter Space Telescope, to be lofted by the shuttle, may have to fill part of the spacecraft gap. A team working on a charge-coupled device (CCD) camera for the ST’s planetary studies gave a hint of its potential with a CCD image, made through a 1.54-meter telescope, showing what the University of Arizona’s H. J. Reitsemma described as “discrete cloud features” in the northern and southern hemispheres of Neptune, separated by a dark equatorial band. The ST will have an improved CCD, a 56 percent greater focal length than that used for the Neptune image, and freedom, in earth orbit, from atmospheric distortion.

**Pluto:** It could be decades before earth-based data are supplanted by anything from closer in, but the University of Hawaii’s Dale Cruikshank has been able to infer the possible presence of gaseous methane, and Larry Traflet of the University of Texas told the DPS that, if present, the methane gas would have to be mixed with a heavier gas that would not freeze out (such as argon or heavier) to keep it from escaping into space. An argon atmosphere for Pluto? □

## Three Mile Island: The verdicts begin

Citing “serious weaknesses” in Metropolitan Edison Company’s operations, management, radiation-health programs and emergency preparedness, the U.S. Nuclear Regulatory Commission has proposed levying the heaviest fines in its history — \$155,000 — against the utility for actions surrounding the accident at its Three Mile Island nuclear-power plant last March 28 (SN: 4/7/79, p. 227). The fines would have been much higher — \$725,000 — but for the existence of the Atomic Energy Act, which limits to \$25,000 the total civil penalties that can be levied for any 30-day period.

NRC’s action represents what may be only the first wave of measures taken against individuals and organizations involved in the chain of events that ultimately destroyed the core of the Three Mile Island #2 power plant and released significant amounts of radiation into the atmosphere.

According to NUCLEONICS WEEK, the fines NRC proposed cover 148 separate violations, infractions and deficiencies by the utility. “We believe the course of the accident would have been altered, if not prevented entirely, had compliance with NRC requirements been achieved,” wrote Victor Stello, NRC’s director of inspection and enforcement, in an October 25 letter to Met Ed announcing the proposed fines and outlining the findings of an NRC investigation into events surrounding the accident.

Consideration of additional action against the utility for what appear to be several reporting violations has been temporarily deferred, Stello said last week. NRC officials added that it is even possible — though not likely — that the utility will have its operating license revoked. Met Ed has 20 days to pay the fines or to appeal; utility spokesmen say there will be an appeal of at least some of the penalties cited.

Although NRC’s proposed fines amount, financially, to little more than a stinging slap on the utility’s wrist, it is not likely that future violators will get off as cheaply. Already legislation is moving in the Senate that would increase NRC penalties for individual violations and remove the 30-day ceiling on total fines in the hopes of providing a stronger incentive for utilities to institute more effective safety measures.

Addressing the safety issue in June 14 testimony before a Senate committee, NRC Commissioner Victor Gilinsky said, “What I think is lacking up and down the line in the commercial use of nuclear energy is sufficiently meticulous and disciplined attention to detail. The cure may require a profound alteration of the relationship between NRC and the industry: The regulators are going to have to get tougher.” He

said this does not require writing new legislation but just providing "more forceful regulation" of existing rules.

But the President's Commission on Three Mile Island (SN: 5/5/79, p. 292), headed by Dartmouth College President John Kemeny, takes strong exception to that claim in its report, issued this week. Chief among its long list of findings was the claim that "with its present organization, staff and attitudes, the NRC is unable to fulfill its responsibility for providing an acceptable level of safety for nuclear-power plants." Harry McPherson, a lawyer on the Kemeny panel, added at a press conference Tuesday that the Commission had found "serious deficiencies" in NRC's regulations too.

It comes as no surprise, therefore, that the panel headed its list of 44 recommendations to the President and Congress with suggestions that NRC be restructured as a new Cabinet-level agency — something like the Environmental Protection Agency — and that its present five-member commission be abolished. In justifying the recommendation, Kemeny said, "Our finding is that no one is running that agency."

Other recommendations in the 179-page report include:

- making the issuance of new construction and operating licenses for nuclear plants conditional on federal approval of specific local emergency plans, which would include evacuation procedures,
- subjecting each operating licensee to periodic performance reviews,
- drawing up a grading and reporting system to measure overall improvements or declines in reactor safety, and
- establishing an independent oversight committee on nuclear-reactor safety, answerable to the President and Congress, to take over the group decision-making role of the present nuclear-regulatory commission. □

## No more smallpox

Last week, the world was officially declared free of smallpox, a disease that has been with us at least since the time of the Egyptian pharaohs. The announcement came from Haldan Mahler, director general of the World Health Organization, at a special ceremony in Nairobi, Kenya.

WHO had been close to eradicating smallpox four years ago, but some cases were reported in Bangladesh, India, Ethiopia and Nepal (SN: 8/2/75, p. 73). This time WHO is more secure.

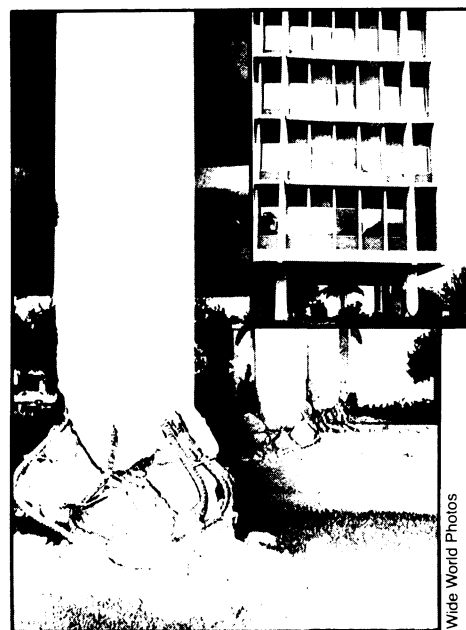
In coming months WHO will recommend that member countries stop all vaccinations against smallpox, and travelers will no longer need smallpox certificates. These steps, Mahler says, will save the world community \$1 billion that can be diverted to solving other health problems. □

## California quake: Another lesson

Every earthquake is a learning experience for geologists; the Oct. 15 Imperial Valley, Calif., quake is no exception.

The 6.4 Richter magnitude quake — the strongest quake to hit the 48 contiguous states since 1971 — had its epicenter 10 miles east of Calexico on the Imperial Valley fault, a major branch of the San Andreas fault system. For researchers such as Carl Johnson of California Institute of Technology, who study the cyclic behavior of a fault — the baseline seismicity, the gradual building of stress, the sudden release and the subsequent shifting — this was a rare opportunity. A 1940 quake broke the same section — though twice as much — of the fault and the two events share many characteristics, Johnson says. When the data gathered during and after the 1940 quake are compared with those of the recent one, he says, scientists may have a complete picture of the seismic cycle of a fault, an aid in prediction.

And for engineers, earthquake-resistant building codes received the ultimate test. The six-story Imperial County Services Building — built by 1967 codes for quake resistance — tilted 3 feet to one side as support pilings gave way. Inside, recording its responses to the quake.



Wide World Photos

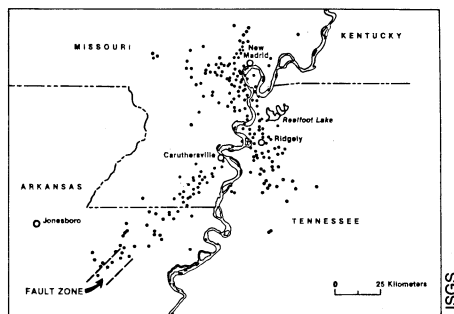
Damaged building provides quake data.

were about 20 instruments that provided "by a significant margin, the best data on building response to an earthquake," according to Cal Tech's Paul Jennings. In spite of the damage, the building did its job, "though we'd like a building to survive without that much damage," he said. The data will be analyzed to determine exactly what gave way and will be used in models to test updated codes. □

## Finding fault in Arkansas

From Dec. 16, 1811, to Feb. 7, 1812, three great earthquakes — believed the most violent series of quakes in U.S. history — shocked the area around New Madrid, Mo. The area near the junction of Missouri, Kentucky, Tennessee and Arkansas continues to be the most seismically active area in the central United States. Yet, though they knew one must be present, seismologists had been unable to link the activity to a specific fault.

Now the culprit has been uncovered. A fault zone that appears to be related to the seismic activity has been found, according to a team of U.S. Geological Survey scientists. Borrowing a technique developed by the oil industry, the researchers obtained east-west and north-south seismic profiles — pictures of the underground rock structure obtained by bouncing sound waves through the ground — of a region in northeastern Arkansas. In both profiles, says Robert M. Hamilton of the USGS in Reston, Va., the researchers found, coincident with the seismic zone, the vertical offsets characteristic of a fault zone. The researchers mapped only a small area of the fault, previously undetected because it lies beneath the soft sediments of the Mississippi River Valley, but they believe it may continue north for about 100 kilometers. "The most important thing is that now



Dots represent quake epicenters; new-found fault indicated at lower left.

we can tie the seismicity to a specific geologic structure," says Hamilton, a member of the team that included Mark D. Zoback of the USGS in Menlo Park, Calif., David P. Russ, Anthony J. Crone and Stanley R. Brockman, all of the USGS in Golden, Colo.

Recent measurements of magnetic and gravitational fields in the region also have found evidence for a very broad rift zone — an area where the plate structure may have been weakened by ancient volcanic activity. The fault zone appears to be related and parallel to the rift zone, Hamilton says, and may prove to be the means by which the weakened rift zone adjusts to stress. □