Getting to the core of the TMI accident

Technicians have extracted the first sample, a spoonful of flaky rubble, from the damaged core of Unit 2 of the Three Mile Island (TMI) nuclear reactor. Scientists at various laboratories will analyze this core sample and five others in their search for a better understanding of what occurred inside the reactor during the March 1979 accident that crippled TMI-2.

The rubble consists of a radioactive mixture of crumbled nuclear fuel pellets, fragments of structural steel and flakes of the zircaloy skin that once held the pellets in place within 12-foot-long fuel rods. Recent sonar maps of the reactor's damaged interior show that the entire top 5 feet of the core's fuel rod assembly had collapsed into a bed of rubble. Last year's television camera probe had failed to show that the void left by the fuel-rod collapse extended all the way to the core's edge (SN: 7/31/82, p. 69).

Douglas Bedell, spokesman for General Public Utilities (GPU), owner of TMI-2, says, "There are few, if any, intact fuel assemblies in the core." The best theory as to what happened suggests that the upper 5 feet of the assemblies, which were left without water during the accident, became brittle in the intense heat and then shattered when water was reintroduced into the reactor vessel.

Several factors have slowed the TMI-2 cleanup. All the water that once covered the floor of the containment building has been removed and cleansed, but water in the reactor coolant system continues to circulate through a special purification system (SN: 10/17/81, p. 247). "The radiation levels in the water are down, but they are still significant," says Bedell.

The cleanup schedule was also interrupted last March when three employees alleged that GPU was allowing unsafe practices to occur during the refurbishing of a huge overhead crane that spans the reactor building's dome. Although investigators found no unsafe work, they called for improvements in safety reviews and cleanup procedures. The crane will be used to lift the "head" from the reactor, a step now scheduled for early next year.

By the end of July, GPU had spent about $384 million for the cleanup. This included insurance money and funds from the Department of Energy and from Pennsylvania and New Jersey utility customers. Nevertheless, Bedell says "there still is considerable uncertainty over the levels of funding for the cleanup." Depending on how the funding problems are resolved, the removal of the core and the decontamination of the reactor may not be completed until well into 1988, two years later than initial estimates. —*I. Peterson*

A plan for improving science education

A massive, federally funded teacher retraining program and the creation of 2,000 model schools that can serve as catalysts for upgrading the nation's school system are necessary to make U.S. elementary and secondary mathematics, science and technology education the world's finest by 1995, according to a detailed plan presented this week.

The recommendations are part of a National Science Foundation commission report, "Educating Americans for the 21st Century," that recognizes the need to rebuild the country's educational system. Unlike earlier studies that dramatically decried the quality of U.S. education by referring to "a rising tide of mediocrity" and the country's failure to keep up with competitors throughout the world, this report also offers specific solutions and estimates of the cost of implementing its proposals.

The commission report clearly calls for the federal government to take a strong leadership role and to add about $1.5 billion to the current $9 billion federal education budget. In addition, state governments and local school boards should find ways to attract better science and mathematics teachers by, for example, paying higher salaries and providing better working conditions, the report suggests.

The report strongly recommends that more classroom time be spent in studying mathematics and science — at least 60 minutes per day for mathematics and 30 minutes for science during the first six years of schooling. In addition, high school graduation and college entrance requirements should be raised to include at least three years each of high school mathematics and science, including one semester of computer science, the report recommends. To achieve this, the school day or year would have to be extended.

The commission also suggests a nationwide evaluation scheme that would allow schools, school boards and states to compare how they stack up with one another and to measure progress toward national goals for improving science education. Such a plan would require systematic sampling of educational achievement but not, for instance, comprehensive tests for every student in the country.

William T. Coleman, commission co-chair, said, "We found no excuse for low expectations. *All* children can learn and benefit from mathematics, science and technology." He emphasized, "It is clear that the United States must dramatically improve its educational system. It's clear that it can be done."

The date 1995 is 12 years from now—the time necessary for the education of one generation of children. —*I. Peterson*

Antelope horns: Female perspective?

The dazzling variety of horns that adorn the heads of male antelopes have attracted considerable attention over the years. The short daggers and long spears, with twists, curves and magnificent spirals, are used in clashes between males of the same species. But what of the more modest horns displayed by females in about half the types of African antelopes? An animal behaviorist now suggests these straighter, thinner feminine horns are specialized as stabbing weapons for use against predators. But other biologists counter that this hypothesis is unfounded because antelopes rarely have been seen to defend themselves.

The scientists agree on the principal sex differences in antelope horns. Male horns are about twice as thick as those of females of the same body weight, and the female horns are often less tightly curved and always point away from the head. Craig Packer reports in the Sept. 16 SCIENCE that, according to his statistical work at the University of Chicago, body weight is the principal factor determining whether horns are present in females of a species. He finds no additional association between female horns and other factors previously implicated by researchers: whether the animals are grazers, whether they live in large herds and whether males and females of a species are of similar size.

But Valerius Geist of the Calgary Zoo in Alberta, Canada, is not convinced weight rather than lifestyle is the main factor. "Everything is intermingled," he says. It "requires a little more complex approach than a strictly statistical one."

Packer says, "The correlation between body weight and the presence of horns in females may be a consequence of the relation between body weight and anti-predator behavior in antelopes: small species rely on crypsis [concealment] or flight while large species often show direct defense against predators."

"This is nonsense. It [defense against predators] happens so infrequently that one cannot attribute the presence of horns on females to it," says Fritz Walther of Texas A&M University in College Station. "Predominantly, the horned ungulates [hoofed animals] are chased and killed by their natural predators without any resistance." He suggests in large herds females use horns to interact with each other.

Geist agrees that antelopes only occasionally use their horns in defense and even then the attacker generally gets away without a scratch. But another researcher believes the issue of female horns remains unresolved. He suggests that researchers of "the old school" have concentrated so heavily on male behavior, they may have missed aspects of the female repertoire that are difficult to observe. — *J.A. Miller*