

now accepts them. This time the electrodes are connected not to an outside battery, but rather to a motor, to make use of the electric energy. As the electrodes gradually become neutral during the discharge, the ions are released and combine with each other in solution.

Such an organic storage process fits the bill for electric car batteries because it has a high energy density, or quantity of electricity stored per unit weight—a property that will dictate an electric car's possible driving range. The organic battery also has a high power density, or rate of electrical discharge, which is important for automobile acceleration and uphill speed.

In addition to their potential utility for electric cars, organic batteries have other possible applications. They could provide cheap storage for systems that depend on a sporadic source of energy, such as the sun and wind. The batteries also could be charged during off-peak power hours to provide relatively cheap power during later, more expensive peak-power times.

Says MacDiarmid, whose work has been accepted for publication in the *JOURNAL OF THE ELECTROCHEMICAL SOCIETY* and *CHEMICAL COMMUNICATIONS*, "These organic batteries open up a complete new vista in battery technology concepts." □

More TMI questions

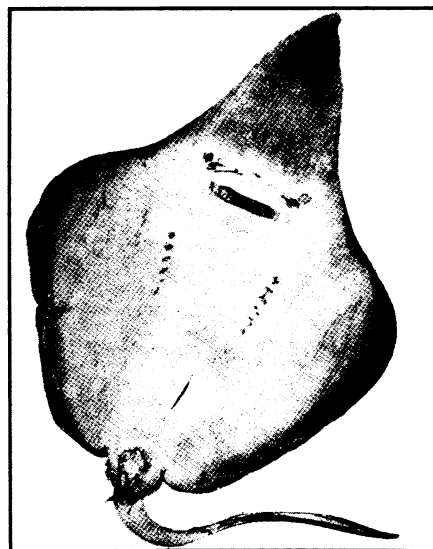
Metropolitan Edison employees failed to provide important information to state and federal officials on the drama unfolding March 28, 1979, at the Three Mile Island nuclear power plant, says a congressional investigation. Not yet established is whether the "communication failure" might have resulted from a willful withholding of facts to mislead those officials as to the seriousness of the accident.

According to the 250-page congressional study released this week, "State and federal officials, judging from information they released during the first two days of the accident, were largely unaware until March 30 of significant information available to and understood by TMI supervisors. As a result, during the most dangerous hours of the accident, state and federal officials were unable to make an accurate assessment of the necessity to undertake emergency measures for which they were responsible." Among such measures was a precautionary evacuation of nearby residents, which a Nuclear Regulatory Commission review group later concluded was warranted as early as 9 a.m. on the day the accident occurred. An evacuation call was made by Pennsylvania's governor, but not until two days later.

As a result of its panels' findings, the House Committee on Interior and Insular Affairs is investigating whether Met Ed violated federal accident-reporting regulations and whether NRC has sufficient authority to require reporting of data like that believed lacking on March 28. □

New stingray from deeper waters

A stingray recently found on a South African beach may be the first known deep-water stingray. Both a new family and new suborder have been created for the fish, named Hexatrygon bickelli and described by P.C. Heemstra and M.M. Smith in the ICHTHYOLOGICAL BULLETIN OF THE J. L. B. SMITH INSTITUTE OF ICHTHYOLOGY. Among the stingray's distinctive features, suggesting adaptation to deep water, are six pairs of gill openings, instead of five; small eyes; closable external flaps on its spiracles (first gill slits); thin black skin on its back, and a snout filled with an acellular jelly and richly supplied with electroreceptors for finding food in the bottom ooze. The small brain of Hexatrygon fills only 3 percent of its head; in shallow-water stingrays the brain fills 80 percent. These features and the chemistry of its liver oil are thought to be adaptive for survival in the deep.



Nature

Pollution rules must stay, new study says

Rumors of a proposed relaxation in regulatory requirements, such as those for controlling pollution, have surfaced periodically from the otherwise tight-lipped Reagan administration—almost as if those rumors were being floated to test the political winds. But a study released last week warns that now is hardly the time to consider slackening air-pollution controls. "If the pessimists are correct," it says, air pollution accounts for three to 10 percent of the total U.S. death rate.

"As the country prepares to burn coal more extensively, we have very little margin for safety," says Richard Wilson, a Harvard professor and one of four scholars who authored the 392-page study: "Health Effects Of Fossil Fuel Burning." According to that report, existing evidence already suggests that 53,000 deaths per year can be attributed to pollution emitted by fossil fuels in the continental United States.

Information correlating fossil-fuel emissions with adverse health effects is voluminous. But it is also "imprecise and inadequate, and to a considerable extent will always remain so," the study finds. For instance, all U.S. retrospective studies relating death rates to air-pollution concentrations show a higher death rate in those geographical regions where the pollution level is highest, the report says. But it is important to know whether this is due to air-pollution alone or to a combination of variables. And three factors helping most to obscure that answer are cigarette smoking habits, occupational differences and migration between communities.

To statistically verify whether deaths attributable to air pollution represent at least two percent of all deaths annually, a prospective study (collection and analysis of current data) of 100,000 persons ex-

posed to polluted air together with a like number exposed only to clean air would be necessary. Since that is unlikely ever to occur, federal policymakers and regulators must be content to work with what is available—voluminous imprecise and inadequate data.

Arguing on purely economic grounds, the study's authors claim that the health risks posed by fossil-fuel pollutants "are worth reducing." However, they are not worth as much as investing to reduce the risk caused by cigarette smoking, "even though the latter is voluntary," they say, and add that at least one "classic paper... suggests that the public accepts risks voluntarily 100 times as dangerous as the involuntary risks."

Assuming the 50,000-deaths-per-year estimate is close to accurate, the authors go through complex calculations to show why it would be worth perhaps \$50 billion per year to reduce the attributable pollution "if we can reduce it completely." However, that, too, being unlikely, the authors suggest a solution more likely to appeal to President Ronald Reagan's advisors: Let the marketplace determine who pollutes and how much. Pollution emissions would be measured "in some acceptable way" and the polluter would be billed at a set rate per unit mass emitted. For instance, a proposed charge of 10¢ to \$6 per pound was suggested for sulfur emissions.

For now, authors Richard Wilson, David Wilson, Steven Colome and John Spengler suggest that industry begin implementing solutions "which are simple and moderately cheap, and which work independent of the source of the hazard." They include: siting powerplants downwind of major urban areas and using fuels other than coal. □