

A scientific emphasis

Last year's Tektite I program (SN: 2/15/69, p. 161) demonstrated that divers can live and work safely under the sea for extended periods. The general success of that civilian effort, in which four divers stayed 50 feet below Great Lameshur Bay off St. John Island in Virgin Island National Park for 60 days, helped soothe some of the pains caused by the troubles and tragedies of the Navy's ill-fated Sealab III experiment.

Tektite II (SN: 11/8, p. 423) is now set to begin on April 1, using the same site and same habitat at the same level as its predecessor. But there many of the similarities end. Tektite II intends to put not four but 62 divers beneath the sea in a series of 17 missions extending over seven months. There are to be no endurance tests or depth-record attempts. The planners are confident that man is now ready, or at least about ready, to move to the next stage of undersea activity: the use of a manned habitat capability primarily to do scientific work on the marine environment.

Forty of the 62 divers are scientists selected on the basis of their research credentials, although they must also have had diving experience.

Lead responsibility for Tektite II has shifted to the Department of the Interior from the Navy, which managed the successful Tektite I, and participation has been broadened. Contributing are the National Aeronautics and Space Administration, National Science Foundation, Smithsonian Institution, Virgin Islands Government, the Navy, Coast Guard, Department of Health, Education and Welfare and the General Electric Co., supplier of the main habitat.

One mission will have an all-female crew. The women, also selected for their scientific qualifications, are Dr. Sylvia Earle Mead of Harvard University, Dr. Renate True of Tulane University and, tentatively, Mrs. Ann Hartline and Alina N. Szmant, graduate students at Scripps Institution of Oceanography. They will perform fish, plant and ecological studies for 14 days in July and will receive logistical assistance from Margaret Ann Lucas, a graduate student in ocean engineering at the University of Delaware.

One engineer has been added to each mission's four-member scientific team to free the scientists from habitat-operation duties.

The final mission of the Tektite II program, in October, will have an all-foreign crew, whose members have not been named. Proposals have been received from scientists in Japan, Britain, France, Australia, Canada and West

Germany. In addition, the Soviet Union has been invited to send surface observers at any time during the seven months.

The first mission will last 14 days. Richard W. Curry and Roger J. Dexter, graduate students in chemical oceanography at the University of Miami, will analyze the daily fluctuation in acidity, oxygen concentration and calcium-magnesium concentration. Dr. Alan J.

TECHNOLOGY ASSESSMENT

Feeling their way

New technologies trigger profound complex and often unforeseen results in society and the environment. The automobile is a unique device for mass transportation; it is also the source of much air pollution and of far-reaching social effects, not all of them desirable. DDT reduced the horrors of pestilence and it allowed great increases in food production. But it also damages organisms other than those it was intended to kill.

This is all wisdom in retrospect; the need for assessing emerging technologies in advance so as to recognize and anticipate possible harmful effects has been evident for several years (SN: 12/24/66, p. 532).

The National Science Foundation is asking for \$28 million in fiscal 1971 for three programs, each of which plans to support some aspect of technology assessment research. And NSF plans soon to begin issuing \$6 million in fiscal 1970 funds for its new Interdisciplinary Research Relevant to the Problems of Society (IRPOS) (SN: 2/7, p. 144), one of the three aimed at least in part at evaluating emerging technology.

There appears, then, to be a determination to implement a technology assessment program. But just how is still unclear.

"The waters are still muddy," concedes Harry Piccariello, head of NSF's Office of Planning and Policy. He adds that a total systems analysis approach will have to evolve at its own rate. "We have to walk before we can fly. We'll look at smaller problems, first. When we have enough smaller studies, we can assemble them into larger and more complex models."

So far, practically all proposals for technology assessment emphasize interdisciplinary, approaches as broad as possible (SN: 1/10, p. 44) which will try to come as close as possible to matching specialists, experiments and models to the cross-disciplinary complexity of the systems being studied. But techniques are still embryonic, and NSF is not yet clear about which of its offices will do what, or whether a new Office of Technology Assessment will have to be created.

Beardsley and William L. High of the Bureau of Commercial Fisheries will attempt to determine essentially how and why fish react to certain traps placed on the bottom.

Seven missions at 100 feet will attempt to show that a nitrogen-oxygen breathing mixture can be used at that greater depth. The tests will take place in a smaller, two-man habitat.

To some extent, the Science Foundation planners are looking on existing efforts as possible models to follow.

One such potential prototype is a Maryland Academy of Sciences committee study of nuclear power plants now under construction at Calvert Cliffs on Chesapeake Bay. It illustrates at least the complexity of an actual exercise in technology assessment; the mission of the committee was not so much to provide parameters for the soon-to-be-completed plants as it was to plan the research that will be needed before more plants are built. The current plants will in effect be ecological pilot operations. One of the recommendations of the committee was to delay future plants until a Maryland state board has enough data from the earlier plants to extrapolate the effects of additional ones.

The Maryland effort was an interdisciplinary one. Chairman Dr. O. M. Phillips of Johns Hopkins University is an oceanographer; the team also included a biologist, an ecologist, a microbiologist and a nuclear physicist.

Dr. Joel A. Snow, IRPOS chief, sees benefit in NSF's lack of clear-cut guidelines for technology assessment. He is convinced the only preconceived criteria should be for the kind of interdisciplinary diversity represented by the Maryland effort.

"Some want a Rosetta Stone which will unravel all problems," Dr. Snow comments. "There isn't any. Each problem will have to be considered on its own merits, and procedures designed for it alone." Any methodology set up in advance would necessarily be inflexible hogwash, he insists.

But he adds that procedures that apply to a certain kind of problem one place may carry over to a similar problem somewhere else. Matching up data and assessment techniques for nuclear power plants on temperate Chesapeake Bay and subtropical Biscayne Bay (SN: 2/28, p. 219) will turn up common threads and interchangeable procedures.

Nevertheless there are limits. Snow doubts that there will ever be any great degree of comparability between studies

of the impacts of freeways on urban slums and of ecological effects of nuclear power plants, for example.

The political and economic future of technology assessments is uncertain. Much depends on how the NSF fares in Congressional budget reviews now going on.

The spending authority the Science Foundation is seeking is currently being reviewed by the research subcommittee of the House Committee on Science and Astronautics. Subcommittee chairman Emilio Q. Daddario (D-Conn.), an original sponsor of the technology assessment idea in Congress, is bound to look favorably at least on the direction NSF is moving. But the actual allocation of funds depends on later review by the Committee on Appropriations. And NSF has never fared well before it.

At the same time, a spate of new bills is being introduced in Congress, aimed at creating new ways to look at emerging technology. Daddario is expected to propose a congressional committee to alert other committees to threats within their jurisdiction. His broader 1967 bill to establish a Technological Assessment Board was proposed, he says, "not as a piece of perfected legislation but as a stimulant to discussion." In addition, Rep. Joe L. Evins (D-Tenn.) is author of a bill that would create National Environmental Laboratories, concerned in part with technology assessment. Various other bills would shift responsibility for assessing certain specific technologies from one Federal agency to another, and a bill by Sen. Mike Gravel (D-Alaska) would establish a commission of outside scientists to look at the Atomic Energy Commission's safety program.

Many private groups are interested in technology assessment. The most ambitious plan to date is Project Eagle, proposed by a group of scientists and others to create regional centers to coordinate interdisciplinary university and industry evaluations of emerging technologies. The group suggests funding of \$10 million this year and \$200 million next, the money to come mainly from industry. Group members are now preparing a detailed proposal for the business-oriented Public Affairs Council. Dr. Robert Cancro, a Menninger Foundation research psychiatrist and a member of the Project Eagle group, is convinced the scheme is more viable than anything proposed by NSF. His proposal is devoted exclusively to technology assessment, he says, and it is flexible enough to provide the rapid decisions that he insists are required as environmental problems grow worse.

Project Eagle will rely on computer models. Other proposals envision various kinds of simulation. □

OAQ OBSERVES

Comet in ultraviolet

The nature and origin of comets is one of astronomy's many long-lived puzzles. A few comets are known to return periodically, but most seem to make only one appearance. The question remains open whether they were originally parts of the solar system or are objects from interstellar space that are captured, permanently or momentarily, by the sun's gravity.

Comets near the sun are surrounded by a coma or cloud of material evaporated by the heat. Astronomers have suspected that hydrogen, which is both the most abundant element in the universe and widely present in interstellar space, is a main constituent of cometary comae. But as long as comets had to be observed from the ground there was no way to be sure; hydrogen identifies itself by wavelengths of ultraviolet light that are absorbed by the air.

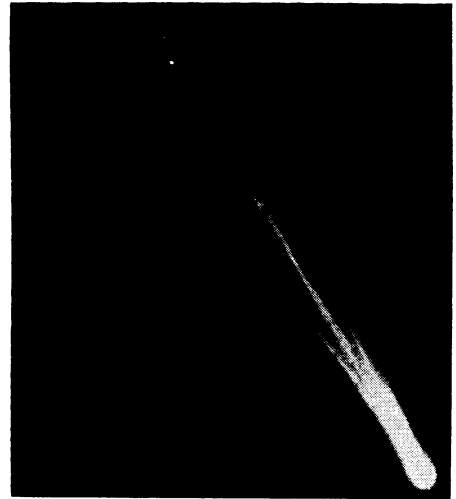
The Orbiting Astronomical Observatory OAO-II was sent up to make ultraviolet observations (SN: 12/21/68, p. 616), and presented the first opportunity to view a comet in the ultraviolet. The University of Wisconsin experiment on OAO-II, directed by Drs. Arthur D. Code, Theodore Houck, Charles Lillie and Robert Bless, is now observing the comet Tago-Sato-Kosaka as it recedes from the sun.

Reduction of the data is not far enough along, says Dr. Lillie, to tell relative quantities of different substances, but certain qualitative conclusions can be drawn. The comet appears brighter than expected in the wavelengths associated with hydrogen, indicating that that element is indeed a major constituent of the comet. The scientists are finding hydroxyl (OH) to be prominent as well.

Simple molecules seem typical of the comet's coma at its present distance from the sun, about eight-tenths of the earth's distance, says Dr. Lillie. Presumably, the heat at that point is enough to vaporize the molecules, but not enough to dissociate them, and those that are being seen are leading to the conclusion that carbon, water, ammonia and oxygen are present in the comet.

Dr. Lillie points out that the substances found in Tago-Sato-Kosaka are typical of planetary atmospheres such as are found around the outer planets of the solar system. Astronomers believe that the inner planets once had those substances in their atmospheres but were unable to hold them gravitationally.

Dr. Lillie suggests that there may be a connection between the comets and the lost atmospheres of the inner



Cerro Tololo

Tago-Sato-Kosaka: Typical of planets.

planets, but he admits that it is very hard to imagine how material escaping from the inner planets could have got to the outer reaches of the solar system where the comets begin their journeys. At present, he says, he is not propounding a new theory of cometary origin; he is merely pointing out an interesting coincidence. □

HEALTH POLICY

Limiting Medicare costs

Health, Education and Welfare Secretary Robert Finch last year set limits on the payments to physicians under the Federal Medicaid program serving the medically indigent. This year, in the face of rising dissatisfaction both with the Federal health care programs and the nation's health system itself, the Administration is seeking to extend the controls. Coming under question are both hospital bills and doctors' payments under Medicare, providing medical care to the elderly.

Indications in key Congressional committees this week are that Congress may well go along, despite objections from the American Medical Association.

According to John G. Veneman, undersecretary of Health, Education and Welfare, if hospital rates were set in advance as the Administration is now proposing, institutions would have an incentive to help control cost.

Under the present program of physicians' fees, says Veneman, customary charges reflect whatever physicians choose to charge in a market where the demand of health personnel exceeds the supply. He suggested doctors' fees all be based on charges received by 75 percent of the medical profession in 1969 so that fees would increase in relation to other parts of the economy, the Medicaid formula.