Whatever happened to all those drugs from the sea?

Oceanic drug research is no longer the talk of Washington and Wall Street. Yet scientists are sure there are treasures to be found.

by Joan Arehart-Treichel

Five years ago the Sea Grant College Program, then of the National Science Foundation and now of the National Oceanic and Atmospheric Administration, got under way, providing additional funds and impetus for scientists to exploit the oceans. The same year the first Drugs from the Sea Conference was held in Kingston, R.I., a small town hovering on the New England coast, which tantalized conferees with briny riches. Sen. Claiborne Pell (D–R.I.), the "father" of Sea Grant, kicked the conference off. He offered personal help in obtaining Congressional support for oceanic pharmaceutical research. Then-Vice President Hubert Humphrey sent conference participants best wishes. Enthusiastic members of the press were present. Wall Street rode the high tide, prophesizing neat profits from oceanic drug research.

Last month the third Drugs [and foods] from the Sea Conference was again held in Kingston. This time the atmosphere was less buoyant. Pell, who was supposed to be a luncheon speaker, did not appear. The Vice President did not send a telegram. Only several members of the press were present. Sea Grant Deputy Director Harold L. Goodwin did give a speech. But even he candidly admitted that oceanic drug research is not at the top of Sea Grant's priority list. Presently, he said, drug research garners $1.3 million of Sea Grant's annual $21 million budget. He played up mariculture—efforts to artificially cultivate ocean animals for food—noting mariculture now receives $6 million of the $21 million.

Sea Grant helps finance some 50 mariculture projects. Hundreds of other projects throughout the United States are receiving financial assistance from other Federal agencies. Some of these projects are already providing food for the consumer, although few—if any—are making profits yet. Full control over the life cycles of marine animals must be achieved if they are to be cultured, Goodwin said. Some important mollusks and crustaceans are now under control. Pompano are almost under control. Several marine species, such as mullet, can be made to spawn on demand. Especially exciting, he asserted, is the emergence of new kinds of mariculture species no one had thought about before, such as the rabbit fish, and the dolphin (the fish, not the mammal) found off Hawaii. "The growth rates of these beasts are enormous . . . and their spawning cycle a lot longer than we had assumed." Sea Grant is trying to bring together lobster culturists, and scientists to find ways of making protein, lipid and bone wastes from marine animals into fertilizers. With growing problems of ocean pollution, Sea Grant is looking into mariculture inland.

Goodwin also touched briefly on Sea Grant funding for drugs from the sea. On the whole, though, his talk left the impression that Sea Grant presently favors mariculture over drug research. If Sea Grant is not careful, he said, it could spend all its budget on screening oceanic pharmacological substances. (In an interview apart from the conference, Sea Grant Director Robert Abel confirmed this impression. He said Sea Grant presently finances four times more mariculture than drug projects.)

However encouraging Goodwin's comments were for mariculturists attending the conference, they deflated many of the participants, who represented the bulk of oceanic drug research laboratories throughout the United States. The tempered enthusiasm Goodwin displayed also pervaded some of the conference sessions. When several speakers, Martin J. Stempien Jr. of the Osborn Laboratories of Marine Sciences in Brooklyn and R. J. Andersen of the Scripps Institution of Oceanography, reported their teams had isolated materials from sponges that show antibiotic activity, John S. Webb of Lederle Laboratories in Pearl River, N.Y., challenged that their materials are active only in tissue cultures, not in experimental animals. Stempien and Andersen did not dispute his remark. Of course, Webb continued, such mate-

Scripps Institution of Oceanography

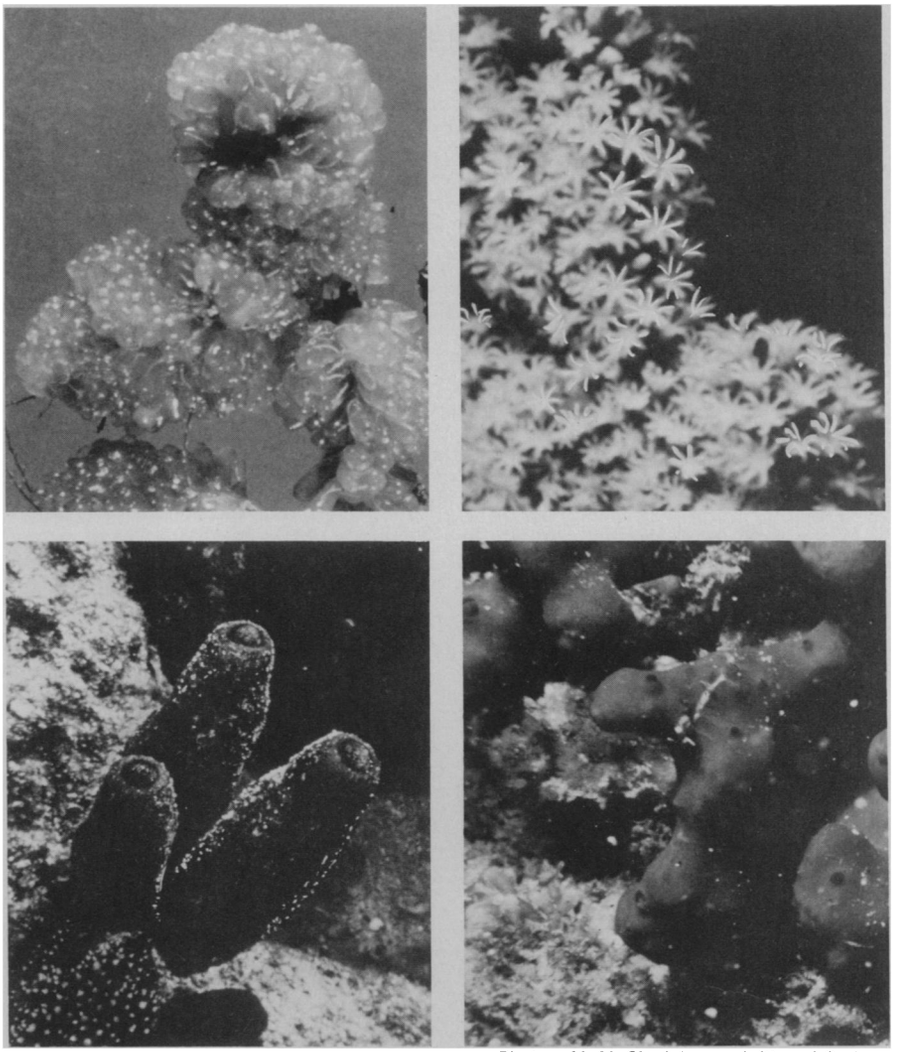
Scripps' Raymond Andersen scuba dives for promising marine drug materials.

rials might be chemically altered so that they would express antibiotic activity in animals, but land antibiotic materials can be altered in a similar manner. So what, he asked, is the point of dredging up antibiotic materials from the ocean?

Webb and Edward Miller, assistant medical director of Hoffmann-La Roche, Inc., in Nutley, N.J., also indicated that, since it currently costs $7 million to $10 million to get a drug marketed, their companies prefer to concentrate on the most economic sources of natural materials and those that appear to offer the most immediate marketing potential. Although Lederle has had one of the most active drugs-from-the-sea research programs of any pharmaceutical company, Lederle has put aside the several hundred oceanic compounds it has collected so it can concentrate on some other, nonocean materials that the company thinks hold more immediate marketing promise. Miller said he has been encouraging Roche to undertake a major oceanic drug research program in the United States, but with no luck. There have been some rumors, though, he added, that Roche may be undertaking such a program in Australia.

Still another hindrance to oceanic drug research, Pushkar N. Kaul of the University of Oklahoma pointed out, is the difficulty of setting up a team of biochemists, organic chemists and pharmacologists to explore the ocean's pharmaceutical potential. "I know," he says, "how industry sweats to bring specialists together."

In spite of these and other current restraints upon oceanic drug research, the conference offered glimmers of progress. Research papers were generally more competent than they were at the first and second drug conferences. Several outstanding contributions of oceanic drug work to pharmaceutical research were detailed. For example, several years ago Alfred Weinheimer, a chemist at the University of Oklahoma and one of the nation's most prolific oceanic drug researchers, found that coral contains prostaglandins, hormone-like substances found in the tissues of man and many animals. He, and scientists at the Upjohn Co. in Kalamazoo, Mich., then determined that, although coral prostaglandins are not active in mammals, coral prostaglandins can be easily converted to prostaglandins that are active. Upjohn is now farming coral from the sea, altering the materials so that they show biological activity in mammals (including man), then shipping the altered materials to prostaglandin researchers around the world. Prostaglandins offer a variety of pharmaceutical promises —labor induction, abortion, nasal decongestion, treatment for asthma.



Photos: M. M. Sigel (upper left) and Scripps

Sea squirt, sea fan and sponges show different kinds of drug activity.

Several scientists from the National Cancer Institute were also present to encourage ocean drug researchers to provide the NCI with potential cancer drugs. NCI's Saul Schepartz said NCI has been screening 15,000 potential cancer drugs annually, but this year it has the funds to screen 30,000. Although most of the compounds NCI screens are provided by the heavy chemical industry, Schepartz said, "We would like to screen more ocean materials." Even if compounds are not active in mammals, he added, they might—like coral prostaglandins—be altered into suitable cancer drugs.

Weinheimer and Kaul are providing NCI with 1,000 potential cancer drugs from the sea this year. M. M. Sigel of the University of Miami School of Medicine has extracted materials from the sea squirt that can extend the lives of rats with leukemia. He has turned samples of the materials over to NCI. These materials, he said, also show immunological activity by lowering antibodies in rats. He is exploring their potential as an immunosuppressant drug.

These results may be modest compared with drugs and drug sources obtained from terrestrial plants and animals. Yet as George Ruggieri of the Osborn Laboratories of Marine Sciences stressed, more than 80 percent of all plant and animal species are estimated to be in the oceans, and only a ten-thousandth of them have been examined with any intensity. Since most ocean organisms live along continental shelves and no deeper than 200 feet, they are fairly accessible to divers. Even if oceanic drug research does not reap immediate drugs, Stempien asserted, it can give society valuable knowledge about marine organisms—knowledge that is indispensable if they are to be exploited (as for mariculture) or if they are to be safeguarded against pollutants.

Ocean drug research may no longer be the talk of Washington and Wall Street, yet ocean scientists are still convinced there are treasures to be had. The pioneers who were diving before 1967 say they will continue to do so, even on limited funds. "Oceanic drug research," Miller declared, "is interesting. It works. It's inevitable." □