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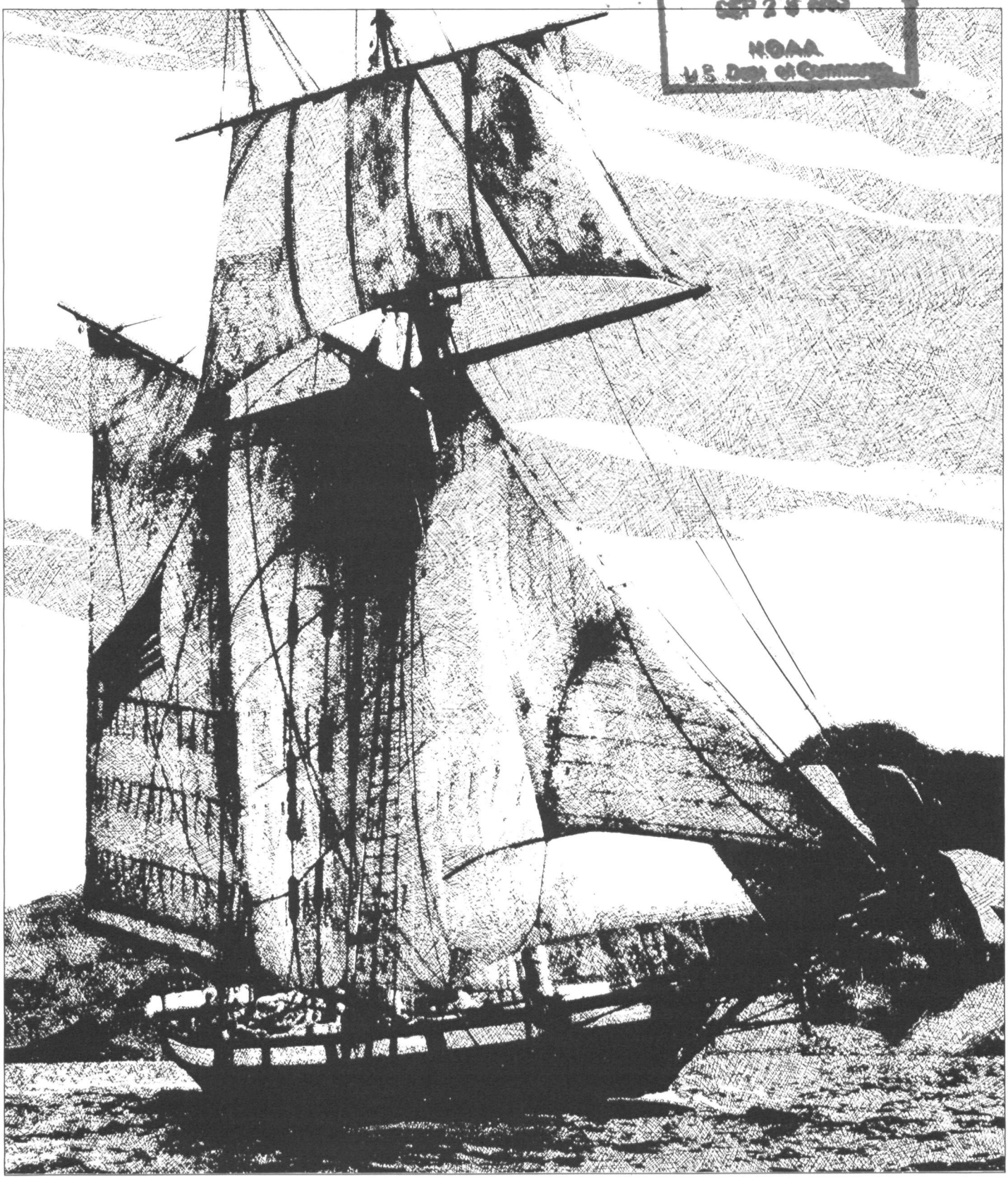

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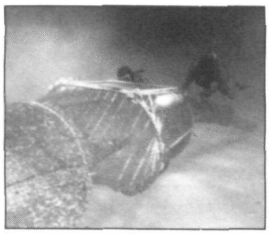
COVER: The Pride of Baltimore carries a cargo of good will for her homeport and a number of weather instruments for NOAA. See the story beginning on page 10.



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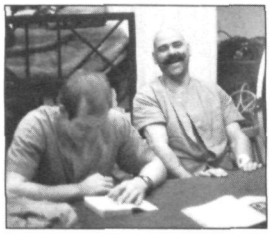

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Newsline

Anniversary Month Activity

Happy birthday, NOAA; you were 12 in October. The agency celebrated its approach to the teens in several ways: with an Awards Luncheon to honor its top performers (among thousands of fine performers); with a weeklong celebration in Baltimore as the city's guest, with exhibits, demonstrations and a major users' conference; and with open houses across the Nation. In laboratories, on ships and aircraft, and many other places, we invited the people we serve to visit us. They did, by the thousands.

NOAA Names In The News

Welcome aboard to Jeanne E. Moore, joining NOAA as Director of Congressional Affairs after a distinguished career with Standard Oil of California. Other recent appointments: Joseph W. Angelovic, Director, Office of Science and Environment, NMFS; Jack Brawner, Director, Southeast Region, NMFS; Robert L. Edwards, Technical Assistant to Assistant Administrator, NMFS; Anthony F. Durham, Director, NEXRAD Joint Systems Program Office, NWS; Robert L. Sorey, Director, Office of Meteorology and Oceanography; Russell Koffler, Director, Office of Data Services, NESS; Bruce C. Douglas, Director, Geodetic Research and Development Laboratory, NOS; and Michael Chinnery, Director, National Geophysical and Solar Terrestrial Data Center, ERL.

Sunbelt Move Is Saving Energy

Because of the swing to the Sunbelt during the 1970's, the Nation saves a half billion dollars annually in energy costs, the National Climatic Center has found. We pay $1.3 billion less each year in heating costs—but an additional $100 million in air-conditioning costs. The Center based its calculations on population-weighted heating and cooling degree days—measurements of energy consumption used by utilities. They showed a National decrease of 144 heating degree days, amounting to a three percent saving in heating energy, and an increase of 62 cooling degree days, a five percent rise in air conditioning costs. Don't look for a trend, however; the Center says if the relative population in the South continues to grow—so will the air-conditioning bill, and the whole thing just might become a wash.

Striper Comeback In Chesapeake?

Striped bass production in the Chesapeake Bay may be on the way up for the first time in several years. Sample densities of inch-long fry in the Potomac River, a major striper nursery area for the Bay, have been 100 to 1,000 times greater than those of last year, when production was the lowest on record. Ideal water temperatures, stable flows, and an abundance of food are believed responsible, according to Dr. F. Douglas Martin of the University of Maryland. Similar observations have been made in the Rappahannock, one of the major striper rivers, by Dr. John Olney of Virginia Institute of Marine Sciences. Their projects are sponsored by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

New Sensor Slated for NWS In '83

Expect a new look in National Weather Service offices late next year. Four hundred hygrothermometers will be delivered, at a cost of $1.8 million, to improve measurements of temperature and atmospheric moisture across the Nation. The instruments, replacing an aging, 20-year-old system, use cooled mirror sensors to record accurate atmospheric moisture (dewpoint) over a wider range than the existing units. Platinum resistance temperature detectors will provide precise temperature readings.

Going Under? Now Hear This!

An average of 125 scuba divers die and many more of the Nation's two million divers are crippled annually, often needlessly. Proper training and equipment use can prevent many of these tragedies, NOAA experts say. Highlights: get a dive plan and stick to it, stay ashore when you don't feel well, take special training for such risky pursuits as cave and wreck diving, and don't give in either to overconfidence or panic. In an emergency stop what you are doing, breathe easily, get control, think, and then act. And remember the phone number of the nationwide diving accident hotline, where immediate medical help can be found. It's 919-684-8111. Dive safely!

Acid Rain—Humans, Nature, or Both?

There's a new twist in the continuing discussion of whether nature or humanity is primarily responsible for acid rain. Acidity—some occurring naturally and some from manmade causes—has been found in rain in five isolated, widely separated areas. From manmade causes: in Bermuda and Alaska; from a mix of natural and manmade causes, in Venezuela, Australia, and the Indian Ocean. Meanwhile, NOAA oceanographer Herbert Curl of the Pacific Marine Environmental Laboratory reports that cruises to Ecuador and Alaska have turned up as many as 10 times more dymethyl sulfides in the ocean than previously had been found. Although more analysis is needed, dymethyl sulfide is considered the most significant single indicator of acid rain in the oceans, which would appear to implicate them as a natural source of acid rainfall.

Record Penalty For Fish Gaffe

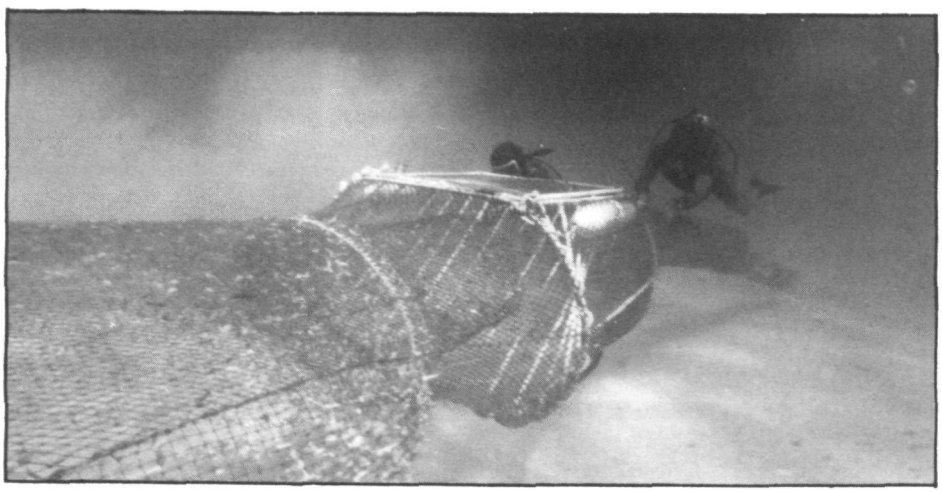
The United States is cracking down—hard—on violators of the Magnuson Fishery Conservation and Management Act. A Japanese firm, Matsuban Suisan Co., Ltd., will pay $850,000—the highest penalty ever imposed for such a violation—for a 1980 lapse. The company's longline vessel, Ryuho Maru No. 38, was seized by the Coast Guard for underlogging its Bering Sea catch of sablefish by approximately 40 percent and overlogging the Pacific cod catch by approximately 57 percent. The seizure occurred 1 day after the owners had paid a $215,000 fine for a 1979 violation. The vessel also was denied a permit to fish within the U.S. 200-mile zone in 1981. Over the past 5 years, Japan has paid more than $6 million in fines for fishing violations.

Cleveland Spill Drill Tests NOAA

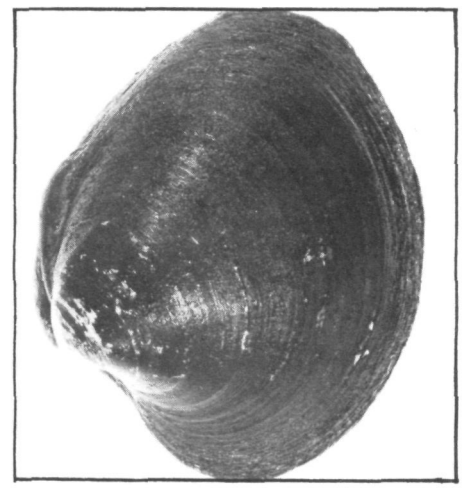
Cleveland didn't know anything about it but, theoretically, the city was in a mess on Monday, August 16. At 7 that morning the mythical barge, Buckeye, carrying five different chemicals, smashed into a Cuyahoga River bridge. NOAA and Coast Guard teams rushed to the scene to determine whether the chemicals were explosive, or merely poisonous. Not 24 hours later another chemical-laden barge, the Erie, blew up and sank in Lake Erie near the city's water intakes. The double-disaster was not real; the response was part of a NOAA-staged drill to sharpen the skills of its experts. For 3 days, the environmental war game tested specialists from NOAA, the Coast Guard, and other agencies, all seeking to establish what had happened and what to do about it. NOAA teams took every action expected in a real crisis, while scientists from around the Nation used computer data bases to gauge the flow and effects of spilled chemicals. Scientific support coordinator was NOAA Corps Lt. Jay Rodstein, who will do the same job if a real spill occurs in the Great Lakes.

Real World Solutions From NOAA Laboratories

Gerald D. Hill, Jr.



A shrimp net with the trawl efficiency device installed to permit the escape of sea turtles.



Laboratory procedures made possible a multi-million dollar quahog clam industry.

A purse seine introduced in the late 1950's proved a boon to yellowfin tuna fishermen . . . and almost destroyed the industry. The story of a too-efficient net and how NOAA helped save a fishery is one example of how technology developed in the centers and laboratories of the National Marine Fisheries Service is being transferred to the fishing industry—to the benefit of the American consumer.

For a number of years commercial fishermen went one-on-one with the yellowfin tuna. Likely waters were chummed with buckets of minced fishbait and as the tuna swarmed hungrily to feed near the surface, strong-backed fishermen armed with pole and line flung feathered hooks among them. When a fish took the lure, it was lifted in a flat arc over the fisherman's head to land on the boat's deck. A practiced shake of the line often was all that was needed to free the unbarbed hook from the landed fish's mouth and the line was flung out again into the churning waters. It was back-breaking work, but it was the way one took tuna commercially 25 years ago.

The new nets put an end to all that. The introduction of the purse seine immediately resulted in larger catches with much less effort. But the increased efficiency and greater catches caused a new problem. While circling the tuna, the fishermen also would encircle porpoises that were found with the tuna and thousands of porpoises died each year in the nets.

With the passage of the Marine Mammal Protection Act in 1972, the industry faced the possibility of having to curtail its efforts and possibly returning to means that would not kill porpoise when they caught tuna.

Problem Studied

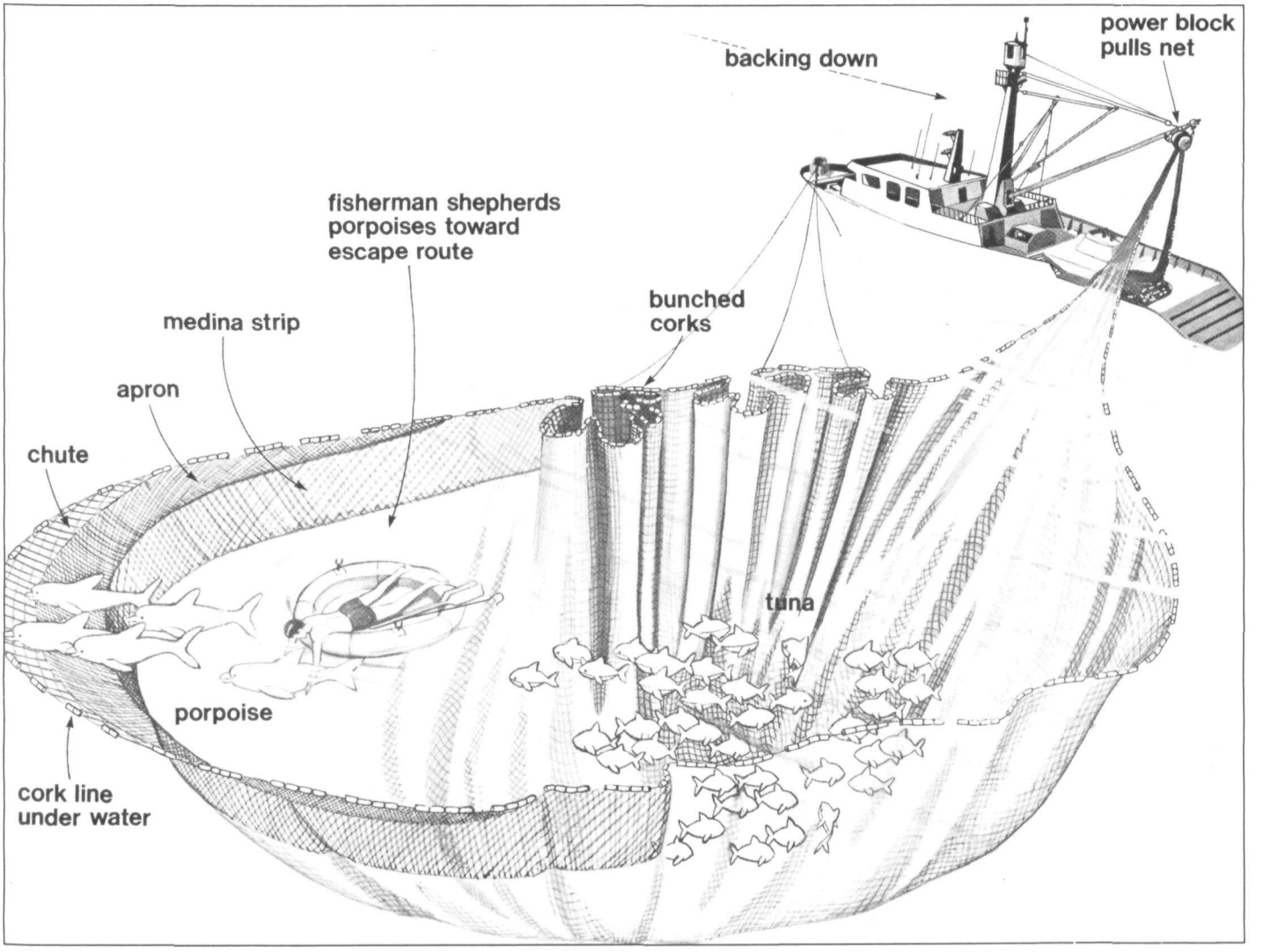
Then the National Marine Fisheries Service began to study the problem and search for a solution that would permit the industry to continue to use the efficient nets and at the same time reduce or eliminate the porpoise kills.

The industry working with scientists and engineers of the Northwest and Alaska Fisheries Center began to develop procedures and equipment that would solve the problem. One of the first innovations developed by the industry was a technique of reversing the large purse seine fishing boats so that the back of the nets would dip under the water permitting the porpoise to escape from the net.

This helped some but the number of porpoises killed continued at an alarmingly high number. To further reduce the killing, the engineers at the Center began to experiment with various net designs that would permit the porpoise to escape. Finally a net was designed that has small webbing in the back of the net to prevent the porpoise from getting entangled and in addition a shelf-like portion was built into the net so that the porpoise would be directed from the depths of the net to the more shallow portion at the back of the net and over the net when it dipped below the surface.

Porpoise Loss Reduced

Through the combined efforts of the industry and government engineers, the number of porpoises killed each year was reduced from more than 300,000 in 1971 to



An early example of a tuna net designed to permit porpoises to escape.

less than 20,000 in recent years.

Without question, this technology saved one of the country's multimillion dollar fishing industries.

A similar problem exists in the southeast section of the country. Shrimp fishermen make their catch by dragging a trawl net along the bottom which scoops up the shrimp into the net. The problem is that the nets are not selective and anything on the bottom is caught with the shrimp. Most of the other sea life caught is not wanted by the fishermen and in some cases their catches contain creatures that are protected by Federal law—endangered sea turtles.

Scientists and engineers at the Southeast Fisheries Center's lab at Pascagoula have been working on a device for several years that will permit the turtles to escape without a loss of shrimp. Recently the device was perfected and now is available to commercial shrimp fishermen.

The Trawl Efficiency Device (TED) consists of a trap door placed in the net so that the weight of the turtle permits it to open the door and escape while permitting the shrimp to continue past the door to the end of the net where they are trapped. The TED permits 97 percent of the turtles to escape from the nets while at the same time achieving, in most cases, a 7.5 percent increase in the catch of shrimp. The $400 cost of the device can be recovered quickly and, in the long run improve the profits of the shrimp fisherman.

Unwanted Items Excluded

In addition to excluding the turtles, tests have shown that the device also rids the net of skates, sharks, sponges, horseshoe crabs and other unwanted items. As this is being written, demonstrations of the device are being held for the Indonesian government which is having similar serious problems.

Thus a problem of the shrimping industry had been turned around by technology developed by the Government which not only solved the problem but benefited the fishermen in other ways.

Other gear work has been done by the Northeast Fisheries Center in Woods Hole and their labs. Through their efforts and research, vents have been developed in lobster traps that allow undersized lobsters to escape while still trapping the legal sized ones. They have done considerable work on developing lobster traps that have a portion of them designed to rot away and free the lobsters that have become caught in pots that are lost and cannot be retrieved by the fishermen. In addition their research has developed the proper net mesh size for the New England groundfish industry so that undersized fish are permitted to escape and the legal size can be kept. Other work had dealt with solving the problems of scallop drags and clam dredges resulting in increased efficiency of the equipment.

Fish "Holders"

Some of the technology developed is rather simple, but was unproven until the labs tested some of their theories. A number of fisheries around the world take advantage of the pelagic fish's habit of gathering beneath or near floating objects. Fishermen in Indonesia, Japan, Malta, and the Philippines use various anchored rafts, logs, and bamboo mats to attract and hold fish.

In 1977, Southwest Center's Honolulu lab

began a program to see if these anchored devices would attract and hold fishes like tuna, and if the devices could be maintained in the rough sea conditions around the islands. The devices deployed by the lab were effective in attracting and holding the schools in the vicinity long enough to allow commercial fishermen to catch the fish with a minimum of bait and fishing time. The devices also were useful to recreation and charter boat operators by reducing the number of zero-catch trips. The tuna handline fishery found that the devices allowed them to begin fishing during the day in a fishery that was traditionally a nighttime one. The success of the program prompted the State of Hawaii to implement a statewide system of fish aggregating devices in 1979. Initially the State deployed 26 of the devices and because of their continuing success they are planning on installing 28 more in 1982. The program's success has created wide interest in the fish aggregating device programs among the many Pacific island entities.

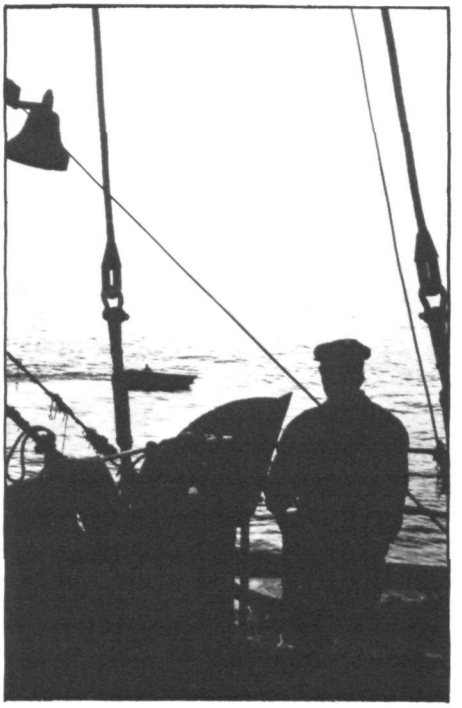
Keeping Fish Fresh

Not all of the fishery technology has dealt with gear development and improvements of existing gear. A lot of work has been done and is continuing in the processing and storage aspects of the industry.

More than 15 years ago, the Center in Seattle began experimenting with the use of up to 90 percent carbon dioxide to replace the air surrounding seafood products to improve quality and increase fresh storage time of some species of fish. Recently increased interest in the process has been shown and bulk shipments of fresh fish, especially salmon, have been successful with current shipments of about one million pounds a year. Recent research has demonstrated that fresh trout can be held significantly longer when shipped in a carbon dioxide environment. A large processor is currently preparing to make large shipments using the process.

An epicurean delight in this country and abroad is the tasty and succulent oyster. Efforts made by industry, as well as various State and Federal health authorities, to ensure the high quality of oysters have met with considerable success. Although human illness caused by enteric viruses such as hepatitis A virus, has seldom been linked to consumption of oysters or other shellfish, occasional problems with viral contamination can, through release of inaccurate information or exaggerated publicity, create severe market depressions and a lack of consumer confidence in the overall safety of shellfish.

Researchers at the Southeast Fisheries Center's Charleston, S.C., laboratory have developed extraction and assay procedures for enteric viruses to better monitor the sanitary quality of oysters and thus limit adverse publicity. Technology transfer is in progress to provide this new methodology to concerned user groups, including on-site training in the application of the techniques. Initial results of field trials indicate that levels of one type of enteric virus found in the human intestine, the enterovirus, are negligible in commercially harvested oysters.



Setting a purse seine. This efficient fishing method almost destroyed the tuna industry when it began to endanger incidentally caught porpoises.

Oyster Studies

Oystermen are restricted to harvesting from shellfish beds approved by State health authorities, based primarily on bacterial quality of growing waters. Preliminary research findings, however, suggest that oysters grown in borderline quality waters, i.e., waters in which oysters cannot be routinely harvested, may be safe from a virological perspective. This work may form the foundations from which many oyster beds, presently restricted to fishermen, may eventually be opened to the benefit of the shellfish industry and the connoisseur of fine seafoods. Overall, the application of more specific monitoring tests will increase public confidence in products of the industry and permit broader industrial investments.

The Northeast Center's Gloucester laboratory has been working for several years with retailers to improve the quality of fresh fish. Scientists determined that the most serious detriment to increased consumption of fresh seafood was the unreliability of the quality of seafood available. Working with local processors and supermarkets, the lab developed new handling techniques to ensure quality. During a 2-year study period, they were able to demonstrate that assurance of quality of fish at the point of sale would increase the consumption of fish in the test supermarkets. Within 10 years the handling techniques grew to 10 processing plants distributing about 11 million pounds annually to more than 1,100 supermarkets in 15 northeast States. Based on the retail value of the products sold during the period it was determined that an initial investment of $200,000 returned approximately $30 million for a benefit to cost ratio of more than 150 to 1.

Thawing Frozen Fish

The same lab, in cooperation with industry, designed, constructed, and tested a microwave oven to thaw frozen blocks of fish fillets or shrimp. The old method of slow thawing was time consuming and presented a problem of possible contamination. Six microwave ovens have been installed in the industry and have saved approximately $150,000 a year each. During the past 10 years the meat industry has installed over 100 ovens and the process has since spread to overseas seafood and meat processing plants. It is estimated that the benefit-cost ratio is more than 530 to 1.

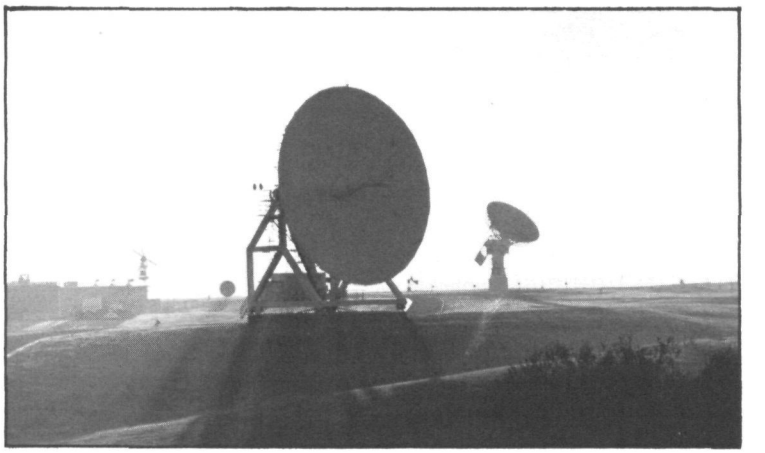
The Gloucester laboratory also investigated impediments to the use of ocean quahog clams and determined that the main reason they weren't being used was the strong iodine taste; also they were found tough and too dark for human food.

Further investigation revealed that the unpleasant taste was caused by water soluble concentrated clam flavor, that the texture could be controlled by varying the amount of pressure cooking, and the color could be neutralized. Since the ocean quahog industry began, it is estimated that $72.5 million in revenue has been generated on an investment of $120,000 with a benefit–cost ratio of more than 604 to 1.

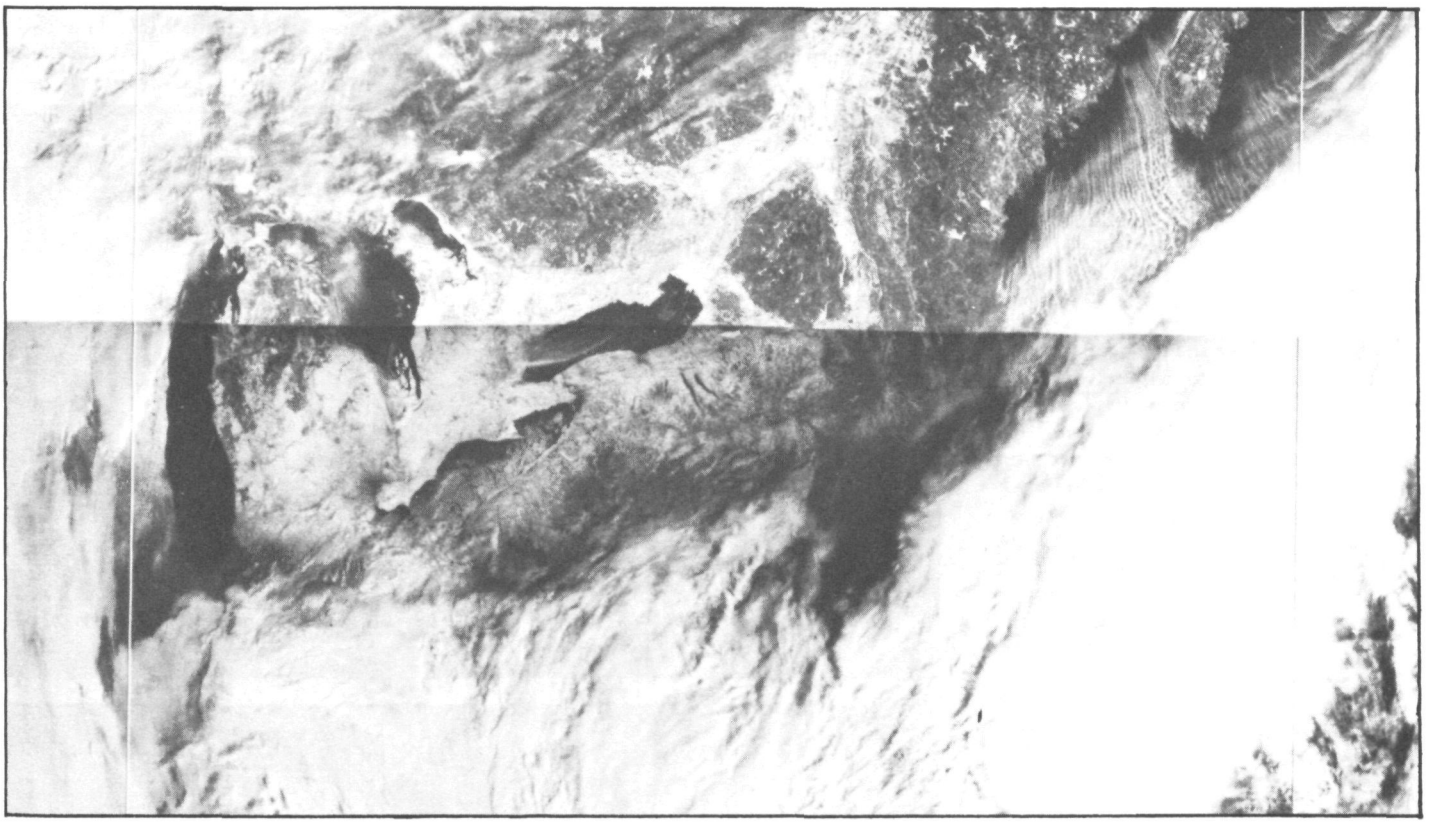
Technology transfer is growing. As part of the Southeast Fisheries Center's fisheries utilization research activities, an expanded Experimental Processing Laboratory (EPL) has recently been completed at the Charleston, S.C., laboratory to facilitate needed technology transfer of contemporary fish processing/product opportunities involving undeveloped and traditional species in the southeast region.

The EPL provides the capability for carrying out most types of fish processing (at the industrial level) and is currently being used to collect quality, yield, and economic data on the relationships between various species of fish, processes, product forms, and equipment requirements. The Center also plans cooperative studies with other fishery development partners in the southeast, to provide direct experience or hands-on-technology transfer with personnel of industrial organizations. The provision of such demonstrations and economic-related tests with industry will permit direct benefit-cost comparisons of different process-product options and will provide valuable experience to lessen investment risk as the private sector expands its operations into new species and products. ■

Popular (and Profitable) Photography from Space



William J. Brennan



Snow and ice cover large portions of the Great Lakes' region in this NOAA Satellite photo. The exact location of frozen and ice-free areas is of great value to shipping interests.

Sports magazines, move over. In certain circles, your action pictures, no matter how dramatic, are taking a back seat to pictures from space.

This is not to say that fishermen, sailors, pilots and others are losing interest in looking at a picture of an unbelievable catch in the end zone. But in many instances, given the choice, they'd rather have a good clear satellite picture to examine with care. A satellite picture after all, can help them earn more money, or make life less hazardous.

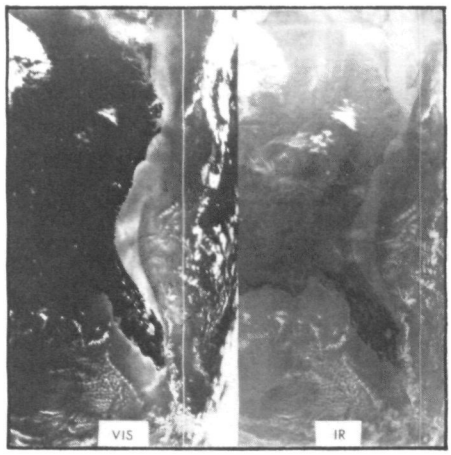
Satellite pictures perform for their viewers. They show where fishing for certain species probably will be more productive, where helpful currents can move a ship to its destination faster and at less cost, where rapidly building storms are and how they can be avoided.

Wrinkles Tell the Story

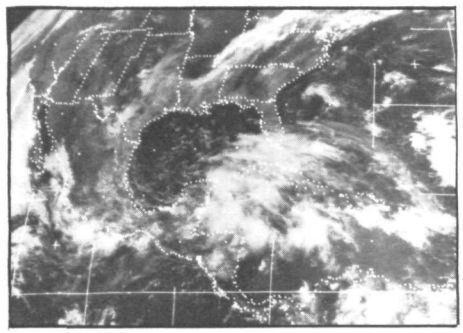
Additionally, satellite pictures are getting better with wrinkles. Can you say that for most aging sports heroes? The more wrinkles you see on a satellite picture, the better, because its the truth you're looking for: the details of ice cover on the Great Lakes, the precise position and track of a hurricane in the Gulf of Mexico, or the extent of snow cover over the Great Plains.

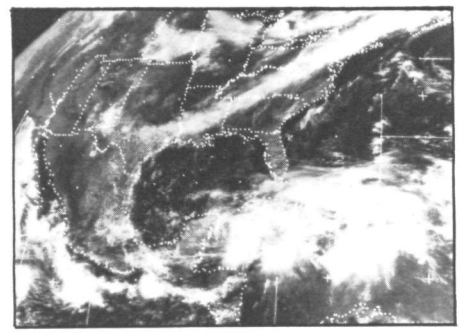
Satellite pictures attract a huge audience. Scores of television weathercasters are using imagery to show their viewers how cloud patterns moving across the United States influence local weather.

While TV viewers compose the lion's share of those who look at satellite pictures,



"Normal" and infrared NOAA satellite photos reveal subtle details of cloud cover and oceanic processes, including the location of the Gulf Stream.





Perhaps the most dramatic use of space photography is hurricane tracking. Here in day-by-day sequence beginning June 15, 1972, the formation and movement of Hurricane Agnes comes to life. In the second frame (June 16), the clouds begin to thicken

they fall into the category of those who thumb through the pages of sports magazines in the doctor's office rather than the dedicated readers examining every detail of a sports picture to identify a game-winning move. And perhaps even counting the fishermen, sailors, and pilots as satellite viewers is cheating a bit, since in reality someone else usually does their looking for them, and then describes what he or she has seen.

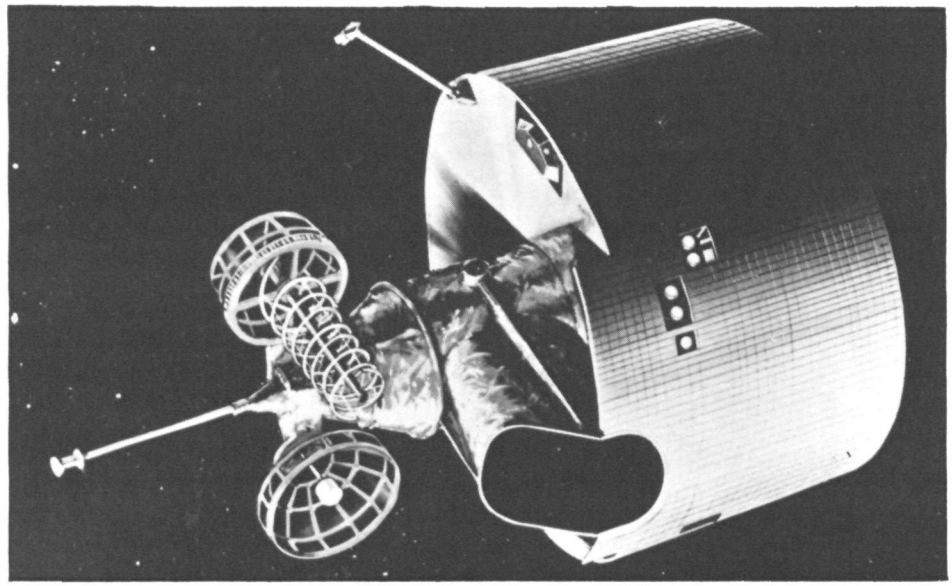
In this instance, the someone else probably is a meteorologist or oceanographer with a fishermen's association, a ship routing firm, or an airline weather office. They are among the 400 or more users of satellite data who obtain near-real time imagery from NOAA's National Earth Satellite Service through GOES-taps; plugging electronically into a computer at a Satellite Field Services Station to receive a picture every half hour, within 5 minutes of the time the image has been composed on Earth after its flight across 22,500 miles of space from a GOES (Geostationary Operational Environmental Satellite) spacecraft.

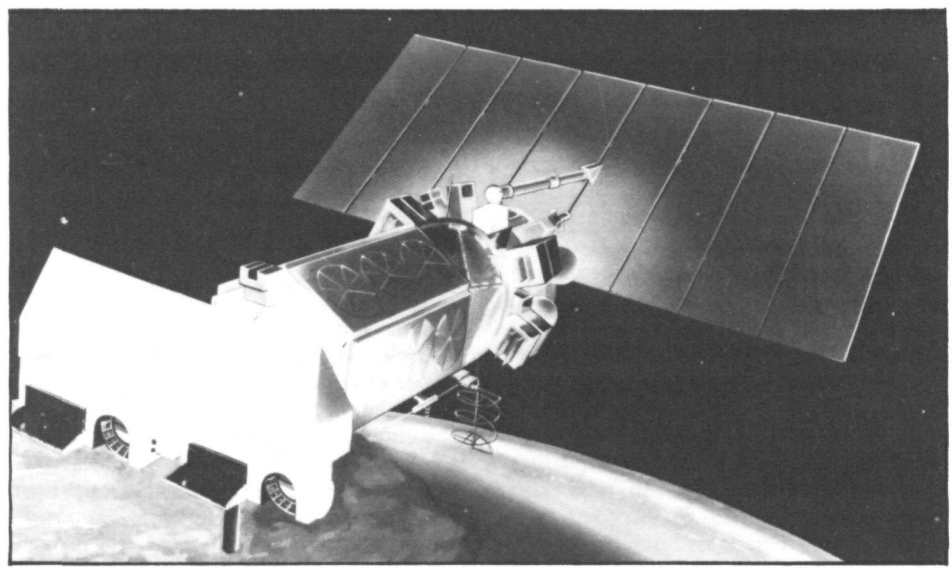
Signals from Space

The data, in a stream of radio signals from the satellite, arrive at an 85-foot diameter antenna at NOAA's Command and Data Acquisition Station at Wallops, Va. From there they are transmitted to NESS headquarters in Suitland, Md., for processing and distribution to seven field stations, in Washington, Miami, New Orleans, Kansas City, San Francisco, Anchorage, and Honolulu.

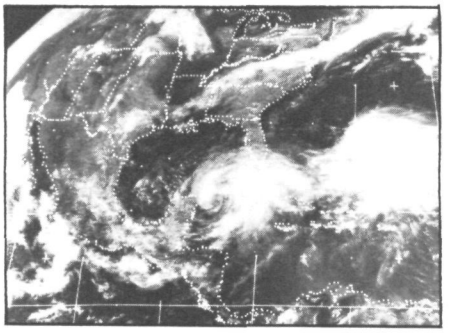
Many GOES-tap recipients are educational institutions where the imagery is used in research and in the teaching of meteorology students and those of other earth science disciplines. The Federal Aviation Administration, the Air Force, and other Federal and State government agencies also have rented high-quality, dedicated telephone lines to tap their receiving equipment into the Satellite Field Services Stations.

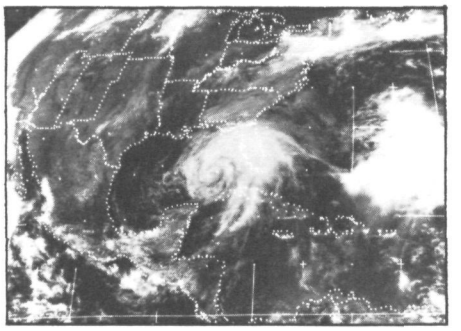
Every half hour, NOAA's two operational GOES satellites jointly view our side of the globe, from the Atlantic coast of Africa west to beyond Hawaii, and almost from Pole to Pole. A second satellite system, the TIROS-N/NOAA series of twin spacecraft in polar orbit, provides imagery of the full earth. Each satellite circles the globe about every 100 minutes at an altitude of about 540 miles. During any 24-hour period, these

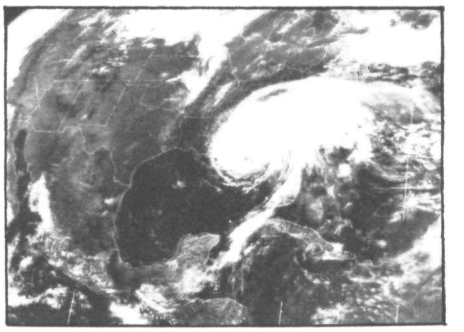




Workhorses of the National Earth Satellite Service are GOES (for Geostationary Operational Environmental Satellite) and TIROS (for Television InfraRed Observational Satellite) N/NOAA series.







ominously south of Cuba. On the following day the familiar clockwise swirl of the hurricane is apparent between Cuba and the Yucatan Peninsula. On the 18th, Agnes is sweeping north toward the Gulf Coast, and in the last photo, the storm moves ashore to become one of the costliest natural disasters in U.S. history—a $2 billion nightmare of record-breaking floods.

polar-orbiters view every part of the earth twice.

Direct Reception for Some

Images from the two spacecraft of this series—currently NOAA-6 and NOAA-7—are obtained in two ways by those needing the information quickly. The satellites transmit sensed information continuously as they speed through space. These line-of-sight transmissions can be received directly by a user with relatively inexpensive antenna and receiver equipment. Additionally, selected polar-orbiter imagery is transmitted over the GOES-tap after being received and processed by NOAA facilities.

The polar-orbiters also carry tape recorders which capture the sensed data, transmitting it to the Wallops, Va., station and a second Command and Data Acquisition Station near Fairbanks, Alaska, as they pass over these sites. The data are then retransmitted to Suitland for processing, distribution to users, and storage.

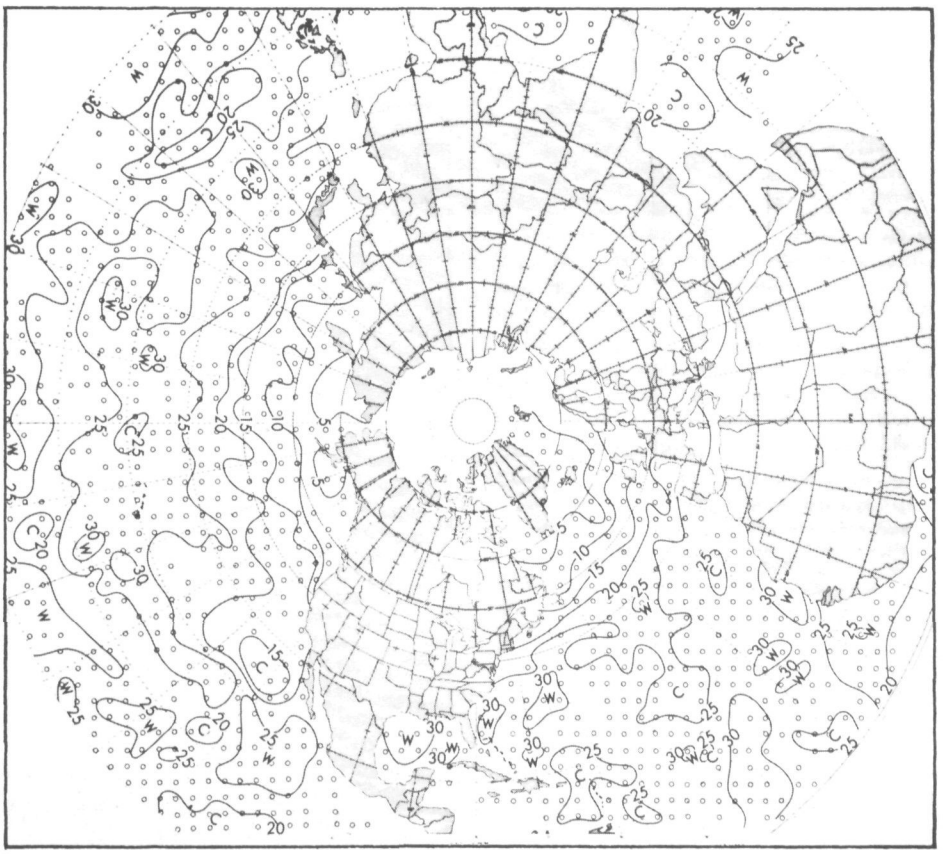
All remotely sensed environmental data are archived by NOAA's Environmental Data and Information Service, which does a lively business in providing imagery and digital data by mail on a fee basis. Its customers run the gamut from serious-minded research institutions concerned with cloud structure over the steppes of Russia, to high-flying advertising agencies attempting to relate their clients' public images with the progressiveness generally accorded space activities.

Satellite imagery has affected society with such intensity it is difficult to evaluate its full effect. It is known that commercial fishermen seeking certain species of fish are having greater success at lower cost; that Atlantic coastal shipping has benefitted financially from knowing the location of the Gulf Stream and its whirls and eddies; that air search and rescue missions have been shortened in time, with accompanying fuel savings; and that unreported forest fires have been sighted by satellites and fire fighting crews dispatched to the scene.

Analysis Benefits

Four years ago, W. John Hussey and E. Larry Heacock, both with the National Earth Satellite Service, attempted to identify and quantify, to the extent possible, a number of the most dramatic economic benefits being derived from the NOAA satellite systems. Examining nine non-weather forecasting applications of satellite data—including commercial fishing, ice monitoring, support of agricultural activities, snow cover mapping, and others—Hussey and Heacock estimated annual savings to industry and Government agencies involved at more than $170 million. Since 1978, a variety of new applications have been developed, wide use made of earlier-recognized applications, and savings presumably have increased substantially; just how much awaits a reevaluation by the two NESS managers.

Satellite users, while enjoying the economic benefits and the wealth of new information now available, are quick to admit that the pictures of Earth they examine with such care may not have the drama of a goalie spearing a puck as it flies towards the net. But the satellite pictures, they point out, in their own way are every bit as exciting, arousing an interest in those secrets the Earth until now has kept hidden, and a desire to unveil. ■



Another potential use of satellite data is determining sea surface temperatures over vast portions of the world's oceans. Such data is a fundamental step toward longer-range environmental prediction and is impossible to gather by means other than satellite.

Pride of Baltimore

A Tall Ship Helps Fill A Data Gap

Don Witten

It's the Pride of Baltimore, a sleek 90-foot wooden schooner which in its first 5 years logged more than 100,000 miles, visited 104 ports of call in 12 countries and islands, and enthusiastically touted her homeport to more than 125,000 visitors each year.

On October 31, she set sail on a 17,000 mile round trip, through the Panama Canal, to Vancouver, British Columbia, on a goodwill mission to stimulate economic development and tourism in Baltimore and do a bit of showing off.

The Baltimore Clipper also is on a special mission for NOAA.

Each day at sea on its year-long journey, Pride of Baltimore is radioing weather information back to shore as part of a cooperative demonstration of the value of on-the-spot observations from coastal waters to improve marine weather forecasts.

High seas observations are available from about 2,000 merchant ships that voluntarily participate in the U.S. Cooperative Ship Observing Program administered by the National Weather Service. Other offshore observations are provided by NOAA's satellite-reporting buoys located from 150 to 200 miles off the Nation's coasts.

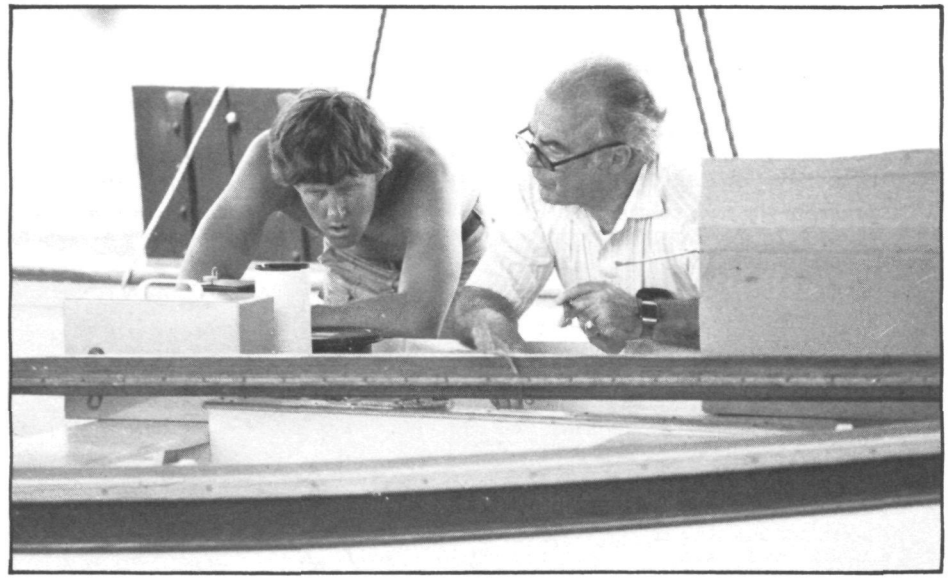
But the cooperating vessels sometimes cease their observations when within 100 miles of the shore because of their need to concentrate on navigation.

"A single weather observation in a data sparse area of the ocean or the coastal waters can make a significant difference in the quality of our marine forecasts issued to protect ships against adverse weather," says Jerry Nickerson, who delivered loan equipment and briefed the Pride crew on weather observing techniques in August.

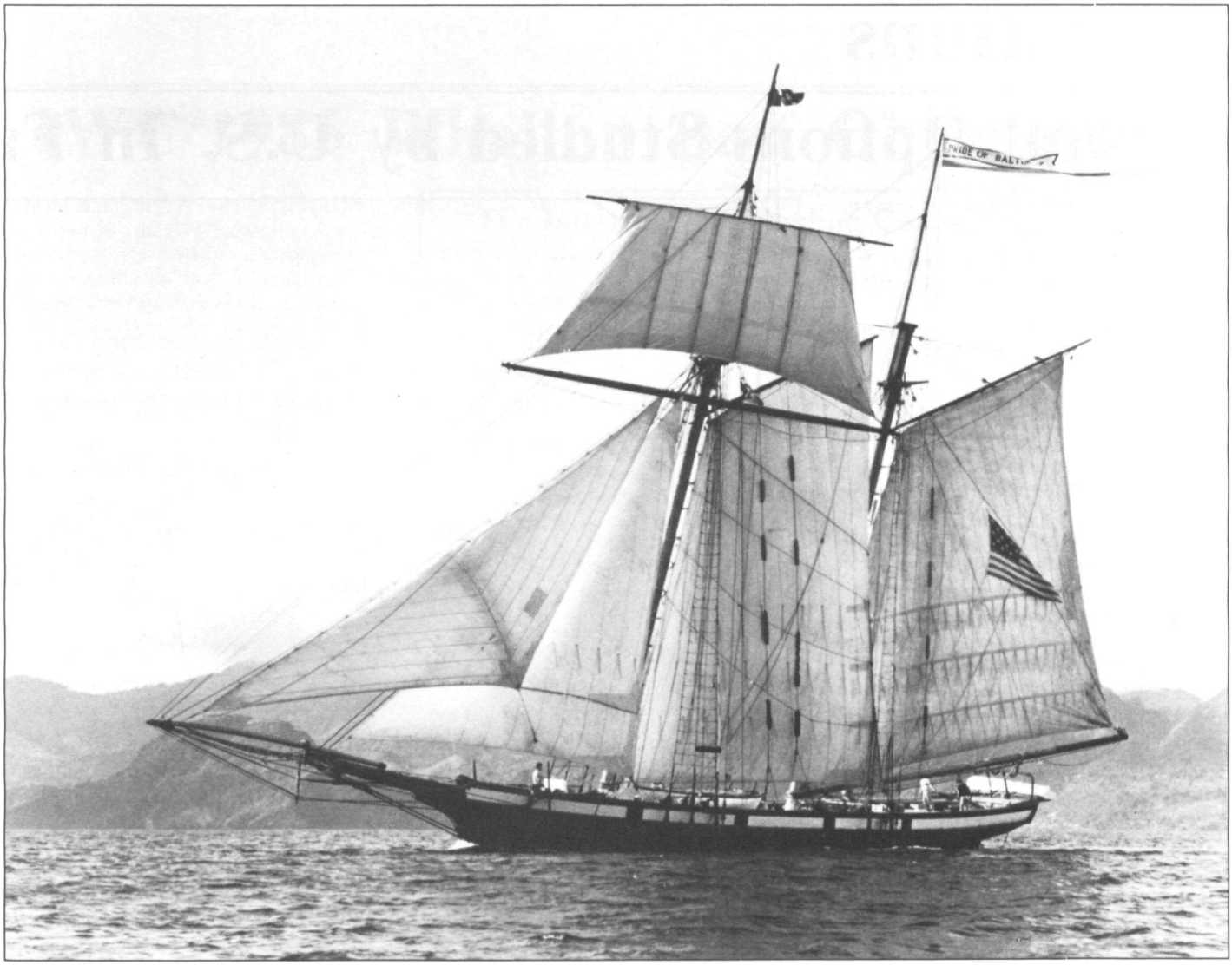
In addition to adding value to marine weather forecasts, the Pride's daily reports allow the vessel to be tracked more closely than usual. This information could prove vital in locating the ship if communications were interrupted.

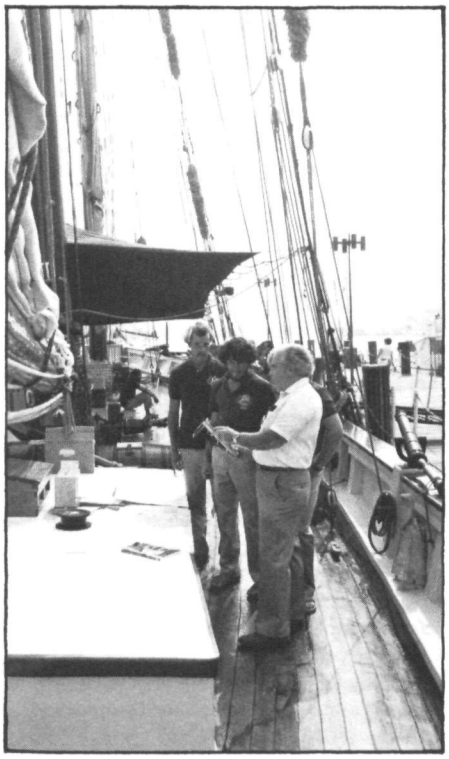
The City of Baltimore built and owns the Pride of Baltimore which is a careful copy of a class of sailing ship last constructed over 100 years ago. A team of blacksmiths, artisans, sailmakers, riggers, and carpenters used traditional boatbuilding methods and materials to construct a totally new but completely authentic Baltimore Clipper.

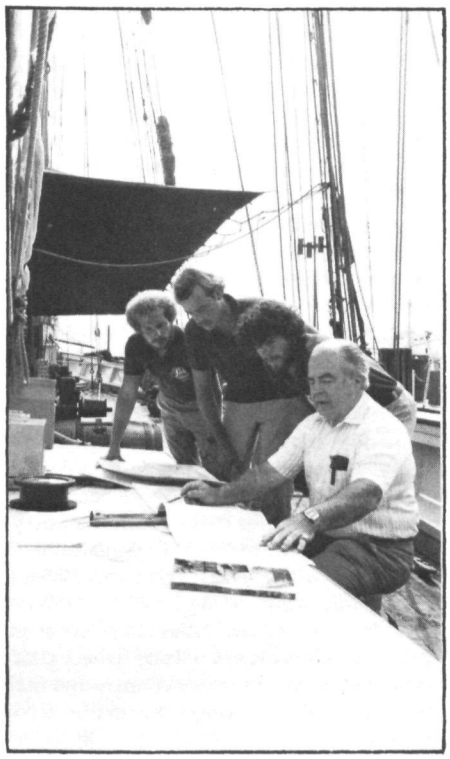
NOAA wishes her *bon voyage*. ▪



Charter C Kays pays strict attention (top) as meteorologist Jerry Nickerson explains the workings of a recording barometer. With familiar Baltimore landmarks in the background (bottom), Second Mate Christopher Rowson tends the rigging on the Pride's bowsprit.







Built in 1976 by the city of Baltimore, Pride of Baltimore is a composite of the best of her predecessors. Sleek, fast and carrying an enormous amount of sail, they served our young nation as privateers and revenue cutters. Today, she carries a crew of 12 men and women.

With other weather gear spread out before him, Jerry Nickerson shows Christopher S. Rowson and First Mate Stephen King a seawater dip thermometer, and then, with Paul Ticcione looking on, explains how to keep a weather log.

Directions

Several Options Studied by U.S. In Face

The U.S. has reacted quickly and strongly to objections by Japan, the U.S.S.R., Norway, and Peru to an International Whaling Commission decision to end all commercial whaling in late 1985.

Dr. John V. Byrne, NOAA Administrator and U.S. Commissioner to the IWC, declared that the action "will in no way diminish the strong support and commitment of the United States to the IWC's determination that all commercial whaling must halt.

We will continue to work vigorously with all Commission members to attain that goal," he said. He pointed out further that any nation may withdraw its objections at any time.

Secretary of State George P. Shultz, asking the government of Japan to consult further on the matter, informed the Japanese that their objection could trouble the wide-ranging U.S.-Japan fishing relationship. The governments of Japan and Norway have stated that their objections do not mean they have made a final decision on the issue.

Seven whaling nations—Japan, the U.S.S.R., Norway, South Korea, Iceland, Brazil and Peru—voted against the 25-7 decision at the Commission's meeting in Brighton, England, last July.

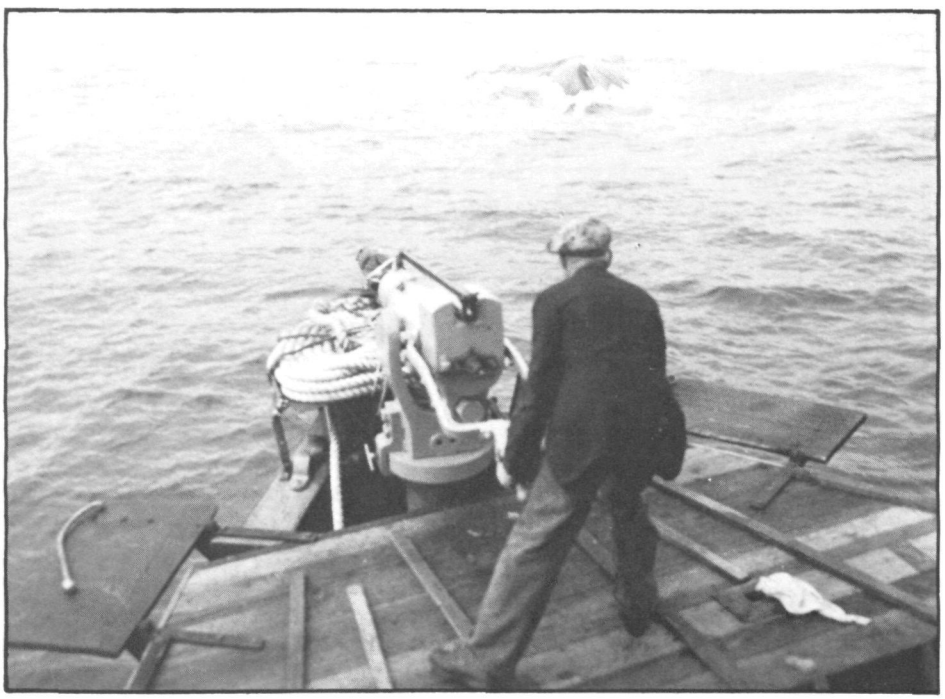
The vote culminated efforts of the United States and a growing majority of countries for many years to end practices which have threatened to decimate the world's whale population. At the time Dr. Bryne hailed the IWC vote as "perhaps its most momentous decision ever."

The 39 Commission members had until Nov. 4 to object to any decision reached at the IWC meeting. The effect of the objection is to extend until Feb. 3, 1983, the period for filing additional objections.

Dr. Byrne pointed out that whaling would not, in any case, actually cease until late 1985, to allow sufficient time for commercial whaling nations to make necessary transitions to other activities.

"The vast majority of IWC members supported the vote to ban commercial whaling and now they should be prepared to sustain that commitment," Byrne said.

Japan is the world's leading whaling country, taking nearly one-third of the 14,000 animals killed last year. Despite the government's action, most Japanese appear to think the country should honor the IWC decision. A poll taken by the Nippon Research Center recently established that 76 percent of the population believed Japan should accept the IWC vote.



Gunning for whale. The IWC proposal may signal the end of an era.

There are cogent reasons for whaling nations to honor the vote. U.S. law provides sanctions under the Pelly and Packwood-Magnuson Amendments to a domestic fishery measure passed in 1967 and 1976.

The Pelly Amendment allows the Secretary of Commerce to recommend to the President that the Treasury Department embargo fishery products of a country whose whaling operations diminish the effectiveness of an international fishery conservation program, or an international program for endangered or threatened species.

The sanctions are discretionary; the President does not have to impose them. Not so, however, the Packwood-Magnuson Amendment: it provides that once the Secretary of Commerce certifies that a foreign country is operating contrary to IWC regulations, its allocation of fish taken from the 200-mile U.S. fishery zone be cut by at least 50 percent. If the sanctions remain in effect after a year, the U.S. must rescind any fishery allocation then in effect for that country and make no further allocation until the certification is terminated.

Japan last year took almost 1.2 million metric tons of fish from the U.S. conservation zone, more than all other nations combined. Inasmuch as Dr. Byrne has cited the probability that sanctions would be imposed if indicated, cutting away from the IWC would represent a major decision.

If the IWC vote is unchallenged, it will end a saga that began in the 1800's, when at one point America had 729 registered whaling vessels and employed upwards of 70,000 men.

A century later, in 1946, the United States became one of 15 original signers to the International Convention for the Regulation of Whaling, which organized to safeguard whales as a resource. This organization created the IWC.

In most parts of the world, whaling has been only a shadow of its former self for some time. The last U.S. whaling station closed in 1971; it had taken only a few whales in its waning years.

Public objection to whaling on other-than-economic grounds is relatively recent. Until the 1970's, primary differences of view were between whalers, who wanted more, and scientists, who were asked to advise on how to insure future supplies. Long before the 70's, in fact, the IWC had imposed quotas and even bans on whaling for certain species (the original 1946 convention for-

# of IWC 1985 Whaling Ban Objections:

bade the taking of gray and right whales, and in the mid-60's the IWC halted the taking of blue and humpback whales and severely restricted hunting for fin and sei whales).

The real drive to save whales on environmental grounds surfaced in 1971 when the Congress passed a resolution calling for the moratorium, and in 1972 when the Congress passed the Marine Mammal Protection Act, covering not only whales but porpoises, seals and sea lions. That year, too, the United States first called for a moratorium on whaling at the IWC.

It took 10 years of struggle to obtain the necessary three-fourths majority of IWC members to support a 10-year moratorium. During that time, however, IWC quotas substantially cut the world's whale catch. The 1972 quota was about 46,000; this year, as the United States entered negotiations, it had dropped to 14,070, including an outright ban on sperm whaling in the North Atlantic and fin whaling in the North Pacific and the Southern Hemisphere.

The International Whaling Commission in Brief

The International Whaling Commission was established by the International Convention for the Regulation of Whaling, signed in Washington in 1946. The Convention, which entered into force years later, was the successor to several previous international agreements on whaling, dating to the 1930's

The IWC has continued to review the condition of the world's whale stocks, meeting at least once a year to fix open and closed seasons and areas, protect threatened species, and set size and catch limits. The IWC also maintains an observer program to oversee whaling operations at sea and at whaling stations on land.

The United States joined the IWC in December 1946. At that time the Commission had 15 members. Today there are 39: Antigua, Argentina, Australia, Belize, Brazil, Chile, Peoples Republic of China, Costa Rica, Denmark, Dominica, Egypt, France, Federal Republic of Germany, Iceland, India, Jamaica, Japan, Kenya, Republic of Korea, Mexico, Monaco, Netherlands, New Zealand, Norway, Oman, Peru, Philippines, St. Lucia, St. Vincent, Senegal, Seychelles, South Africa, Spain, Sweden, Switzerland, USSR, UK, USA, and Uruguay.

The U.S. Commissioner and the Deputy Commissioner are appointed by the President in consultation with the Departments of Commerce and State. They serve at the pleasure of the President. The current Commissioner is Dr. John V. Byrne, Administrator of the National Oceanic and Atmospheric Administration. His deputy is Thomas R. Garrett.

NOAA Is Nucleus For New Western Center

A pilot project designed to increase the efficiency of Department of Commerce management was launched in Seattle October 1. The organization, hosted by NOAA and called the Western Administrative Support Center, will serve all Commerce units in 10 western States including Alaska, Hawaii, and the Trust Territories.

The Center has started assuming responsibilities for all personnel systems, real property and space management, personnel property management, publications, and personnel services. Over a phased period, the Center also will assume responsibilities or payroll and administrative payments.

NOAA's Northwest Administrative Service Office, under the direction of Dale C. Gough, is the nucleus for the new activity, with the managers of the NASO functioning as the administrative support staff for the Commerce Department units being served. The Administrative Operations Division is headed by John Hinman, the Personnel Office by Carroll McCutcheon, the Finance Office by Clayton Terry, and the Facilities and Engineering Management Division by Jim Watkins.

The Center is funded through a service agreement between the host (NOAA) and client units. Annual reviews with senior field managers will help determine service levels and responsiveness. Costs will be distributed on a per capita basis, at least initially, with the Center converting to billing for actual usage as soon as possible.

The Center will assume administrative supervision over existing administrative support staff at the National Weather Service Western, Alaska, and Pacific Regions, and some personnel Research Support Services at the Environmental Research Laboratories in Boulder, Colo. Disruption of established operations will be avoided and adverse impacts on employees will be at a minimum.

This development comes as a result of a major review of administrative functions undertaken last year at the direction of Arlene Triplett, Assistant Secretary for Administration at the Department of Commerce. The objective of the study was to improve Department of Commerce management and make the Department a more completely integrated organization. The initial effort covered Department activities in Washington, D.C. Later, the project was expanded to include field units. With the new Western Center established as a model, the potential exists for the creation of additional centers in other areas of the country. As many as four additional centers could be established in the future.

Over the past several months, a great deal of effort and time has been spent in establishing communications between the organizations to be served and the setting up of processing procedures and organizational relationships. Directives have been prepared including delegations of authority. Announcements have been distributed to officers and employees explaining the change-over. Work is continuing on the development of a standard service agreement and evaluation standards.

With the support of all the various elements involved in this project, it represents a unique initiative. It has the potential for the establishment of a more cost effective administrative system with the elimination of duplication and overlapping activities. It will provide more consistent policy and management work. Through the use of current technology, in processing systems, it means more effective support for all Commerce Department agencies involved.

Area Served by New Center

Rapture of the Deep!

Jack Stringer

"It felt like someone sticking a knife in my knee," said Marc Kaiser nearly 3 days after he had "surfaced" from 200 feet below sea level in the thick-walled hyperbaric chamber at Duke University.

"There were shooting pains everywhere. In my knees, shoulder, and hips . . ."

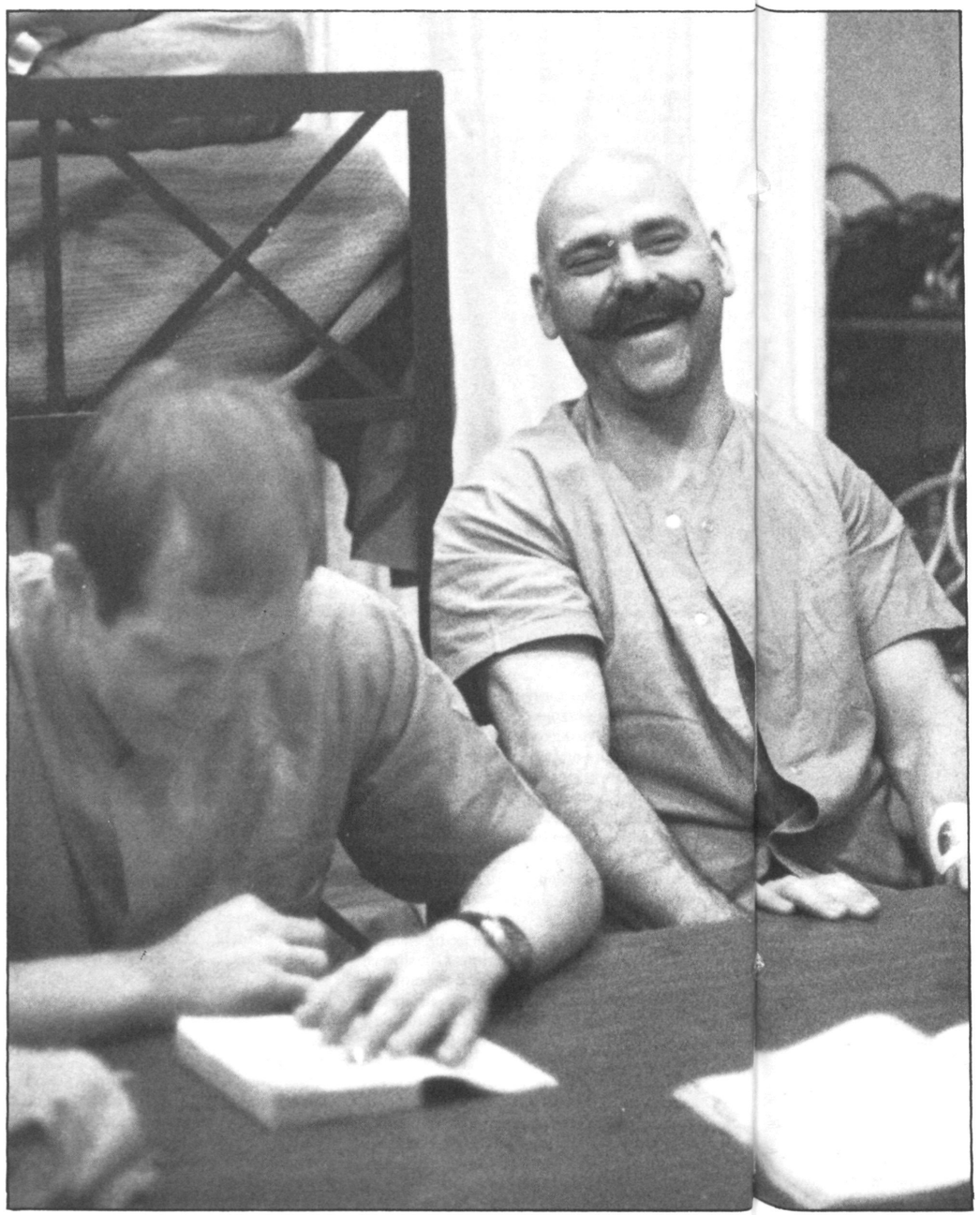
Kaiser was one of ten divers from NOAA who was sealed into two small pressure chambers for 9 days to help researchers study nitrogen narcosis or "rapture of the deep"—a condition similar to inebriation which could seriously affect a diver's safety.

Kaiser compared nitrogen narcosis to the effects of a three double-martini lunch. "You may believe you are functioning normally but you're not," he said. "You're acting as if you are intoxicated and it takes a considerable amount of concentration to perform simple intellectual and mechanical tasks.

To a diver, who must constantly be in top shape physically and mentally in the alien and sometimes hostile undersea environment, a moment's inattention, a few seconds delay, a slight hesitation when prompt action is called for, can spell disaster. The divers at Duke were to expose themselves to nitrogen narcosis to study this deadly malady and pass on what they learned to fellow divers throughout the world.

The diving study was financed by the commercial diving firm Oceaneering International, Inc., of Houston. NOAA provided nine divers, and a tenth diver was recruited from the Navy.

Dr. Peter B. Bennett, director of the Duke University's F. G. Hall Environmental Laboratory which houses the world famous hyperbaric chamber, said the divers breathed a special nitrogen-oxygen mixture.



During the third day of the 9-day test, William Phoel, an oceanographer from Woods Hole, begins to find things uproariously funny while Cdr. Robert V. Smart attempts to concentrate.

Daily Tests

"Each day, the divers' performance ability was tested to measure how well the diver could remember, do simple arithmetic, and other intellectual tests," he said.

Researchers believe that nitrogen subjected to undersea pressure affects the chemical properties of the nervous system, resulting in a feeling of intoxication and impaired intellectual and mechanical abilities. At present, this intoxicated state makes it impossible for divers to complete simple tasks, such as welding, at depths deeper than 150 feet.

Although research dives such as the one at Duke University are obviously important milestones for recreational divers, they have a wider significance.

Presently, compressed air diving stops at about 150 feet because of the narcotic effect of the nitrogen. However, when the Duke study proved that some divers can adapt to the nitrogen and work effectively at depths greater than 150 feet breathing compressed air, its commercial application was apparent. Compressed air now can be substituted for the expensive non-narcotic helium-oxygen, greatly reducing diving costs without affecting diver safety.

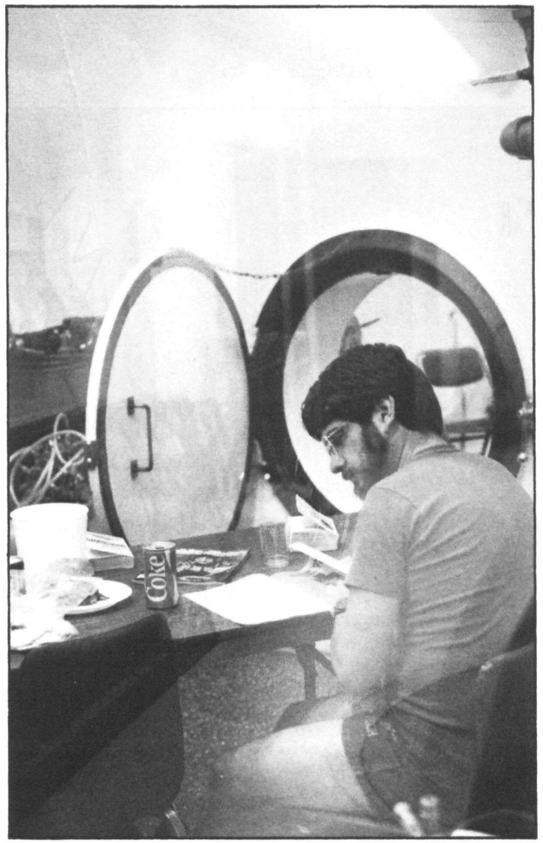
Problems with Helium

The problems of transporting and storing large amounts of helium gas also are major drawbacks, particularly for offshore oil rigs. Aside from the safety factor, compressed air is easier to deal with, and does not have some of the intrinsic problems helium has in deep diving operations.

Diving at deeper depths is increasingly important for the economic stability of the United States. Resources such as petroleum, minerals and food are gradually running out as the world population increases dramatically. The ocean floor which equals about 70 percent of the planet should help restore these depleted resources in the years to come.

"There is no question that the oceans are our greatest untapped resource," Bennett said. "Any way we can learn to adapt to live and work under the seas is a significant step to the present and future utilization of the ocean's resources."

The test went better than Bennett and Dr. David Youngblood, principal investigator for Oceaneering International, had anticipated. "There were two phases of improvement," said Youngblood. "The first one occurred after a few hours, and this we believe to be an adjustment to the state of narcosis and not a true reduction in narcosis.



Above, Lt. (jg) John W. Blackwell quickly adapted to nitrogen narcosis, and failed to experience many of its symptoms of intoxication.

Danger In The Depths

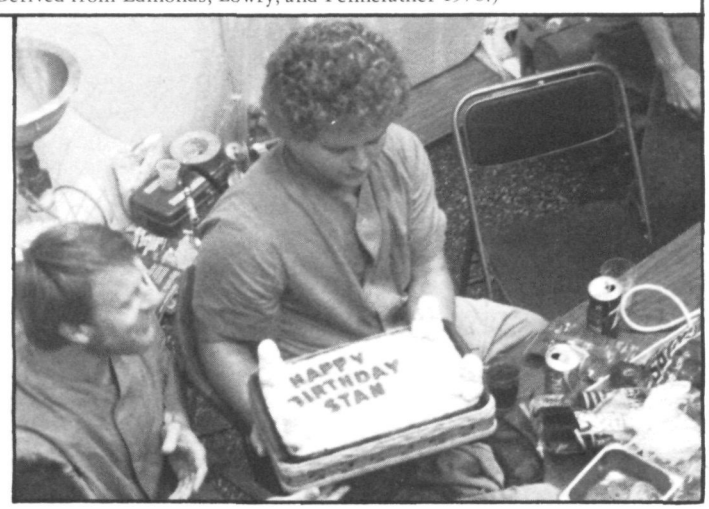
"At greater (than 100-foot) depths the majority of compressed air divers show impairment of thought, judgment, reasoning, memory, and ability to perform mental or motor skills .... The diver may have feelings of elation and well-being (euphoria) and a sense of detachment from the environment accompanied by a dangerous overconfidence, an uncontrollable desire to laugh, and a tingling and vague numbness of the lips, gums, and legs. There may be an inability to make correct and rapid decisions or to concentrate effectively on a task. Errors may be made in recording or compiling data or computations. Novices, especially, may develop terror rather than euphoria. Narcosis is a significant danger to divers because it not only increases the risk of accident but diminishes the ability to cope with an emergency."

Excerpt and chart from
NOAA Diving Manual

Narcotic Effects of Compressed Air Diving

(30-100 ft)	Mild impairment of performance on unpracticed tasks. Mild euphoria.
(100 ft)	Reasoning and immediate memory affected more than motor coordination and choice reactions. Delayed response to visual and auditory stimuli.
(100-165 ft)	Laughter and loquacity may be overcome by self control. Idea fixation and overconfidence. Calculation errors.
(165 ft)	Sleepiness, hallucinations, impaired judgment.
(165-230 ft)	Convivial group atmosphere. May be terror reaction in some. Talkative. Dizziness reported occasionally. Uncontrolled laughter approaching hysteria in some.
(230 ft)	Severe impairment of intellectual performance. Manual dexterity less affected.
(230-300 ft)	Gross delay in response to stimuli. Diminished concentration. Mental confusion. Increased auditory sensitivity, i.e., sounds seem louder.
(300 ft)	Stupefaction. Severe impairment of practical activity and judgment. Mental abnormalities and memory defects. Deterioration in handwriting, euphoria, hyperexcitability. Almost total loss of intellectual and perceptive faculties.
(300 ft)	Hallucinations (similar to those caused by hallucinogenic drugs rather than alcohol).

(Derived from Edmonds, Lowry, and Pennefather 1976.)



Some Divers Adapt

"The second period of performance improvement occurred after several days in which a large percentage of the divers showed a significant improvement in their test scores, an improvement believed to be a true physiological adaptation to high nitrogen pressure."

Some individuals showed no improvement and remained in a state of significant narcosis throughout the study. Others still felt the narcotic effect of the nitrogen, but could control it, and towards the end of the study, showed significant improvement.

Because the volunteers were all trained divers, they were accustomed to diving, but not necessarily being enclosed in a pressure chamber for 9 days. It was not, therefore, an unusual experience for them, but it was quite unique to have ten people living inside two chambers, six in a 20-foot-diameter sphere and four in a cylinder 12½ feet long and 10½ feet wide. The chambers were interconnected by a tiny third chamber.

Dr. J. Morgan Wells, director of the NOAA Diving Office in Rockville, Md., and one of the volunteer divers said that they were trying to help solve a physiological and challenging problem: Will divers adapt to compressed air intoxication? Until now, little if any data existed as to the effects of adaptation to the narcosis at depths greater than 150 feet for more than 5 successive days.

Wells said that the results of the test indicated the need for thorough screening and pretesting of divers prior to conducting operational dives at 200 feet for an extended period.

"Most of the divers were responsive in a number of testing areas," he said. "Four divers, however, like Kaiser, suffered from the 'bends' shortly after leaving the chamber or during its 'ascent'."

"Narked" for 5 Days

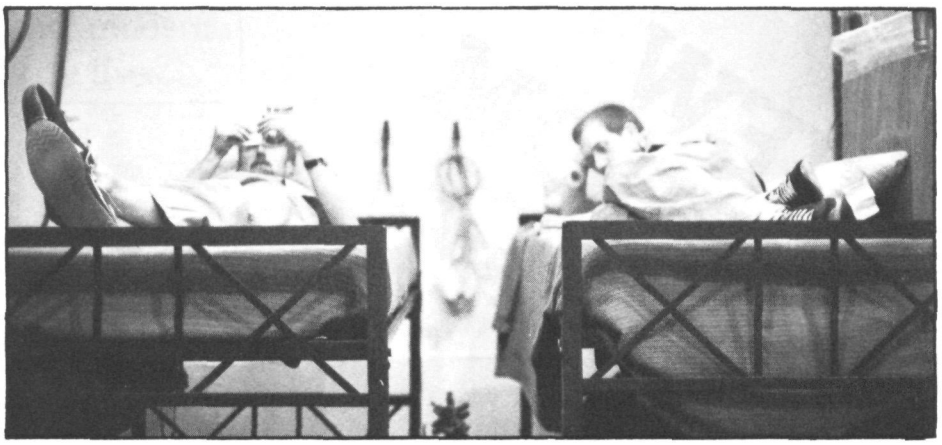
Diver Robert Smart, a commander in the NOAA Corps said, "I stayed just as happy as a bug in a rug for 5 straight days." When the 38-year-old officer finally got back to the surface and was allowed to see some of the graded results of some of the tests, he discovered that he was one of the most "narced" people in the group.

"I had no idea that my efficiency had been impaired that much," he said.

Narcosis really begins to manifest itself at about 130 feet. Diving much deeper than 130 feet using scuba, the risks of narcosis and other risks are greatly increased.

Smart acknowledged that narcosis begins to take affect in a very subtle manner which was evident in the diary he kept while in the chamber.

Interspersed with his philosophical reasoning concerning the development of the human nervous system and its adaptation to



Life in the chamber included mid-morning snacks from clinician Norma Mann and a birthday party (opposite page). Monitoring the tests was Dr. Peter B. Bennet, but the major activity at a simulated 200 feet below sea level was reading. Participants included (first row) Steven Urick, Lt. (jg) John W. Blackwell, Lt. (jg) Robert W. Maxson, Cdr. John C. Albright, (second row) Cdr. Robert V. Smart, Marc Kaiser, Lt. Stanton M. Ramsey, William Phoel, Dr. Paul Barry, and Dr. J. Morgan Wells.

environmental conditions, there were strange, equivocal fantasies in which he had become a primitive, club-wielding caveman.

"The effect I felt," Smart said, "was definitely moving me back."

Macho But Risky

Smart believes the results of the Duke study will help keep a few divers alive. "It's a macho thing," he said, "to dive to 150 feet. I now know the risks!"

When Marc Kaiser came out of the chamber, he said he really felt good. But 68 hours later when he got out of the plane at Miami airport, he had "shooting pains in his knees, shoulders, hips, and everywhere."

At NOAA's diving office in Miami, Kaiser was put on "Table 6," a decompression sickness treatment schedule, for five treatments over a 2-week period. The sixth treatment was on the osteomyelitis table at 45 feet for 110 minutes. Today, Kaiser is riding his bike 20 miles daily, hangs for 10 minutes by his feet in his inversion boots, and does at least 30 situps from that position. He suffers no ill effects.

The youngest diver in the group, 22-year-old Steve Urick said it was his first saturation dive. "During the first 5 days, everything amused me," he said. "When we began our ascent, I realized that I had been narced out."

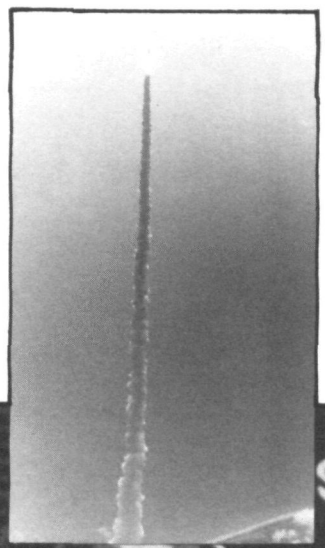
On the third day of Urick's ascent, his leg went numb, and he was put on the laboratory's Table 6 and run down to 60 feet breathing 20-minute periods of oxygen and 5 of air. These were gradually decreased to 30 feet where he had the same breathing periods for 5 minutes.

"My interest and willingness to continue diving has not been affected," Urick said. "I am, however, more concerned about narcosis."

Since it was found that some divers can dive under water at greater depths without breathing more expensive gas like helium-oxygen, the safety and cost effectiveness for a commercial or recreational diver is apparent. If compressed air is used, all that is needed is a compressor.

VIEW FROM SPACE

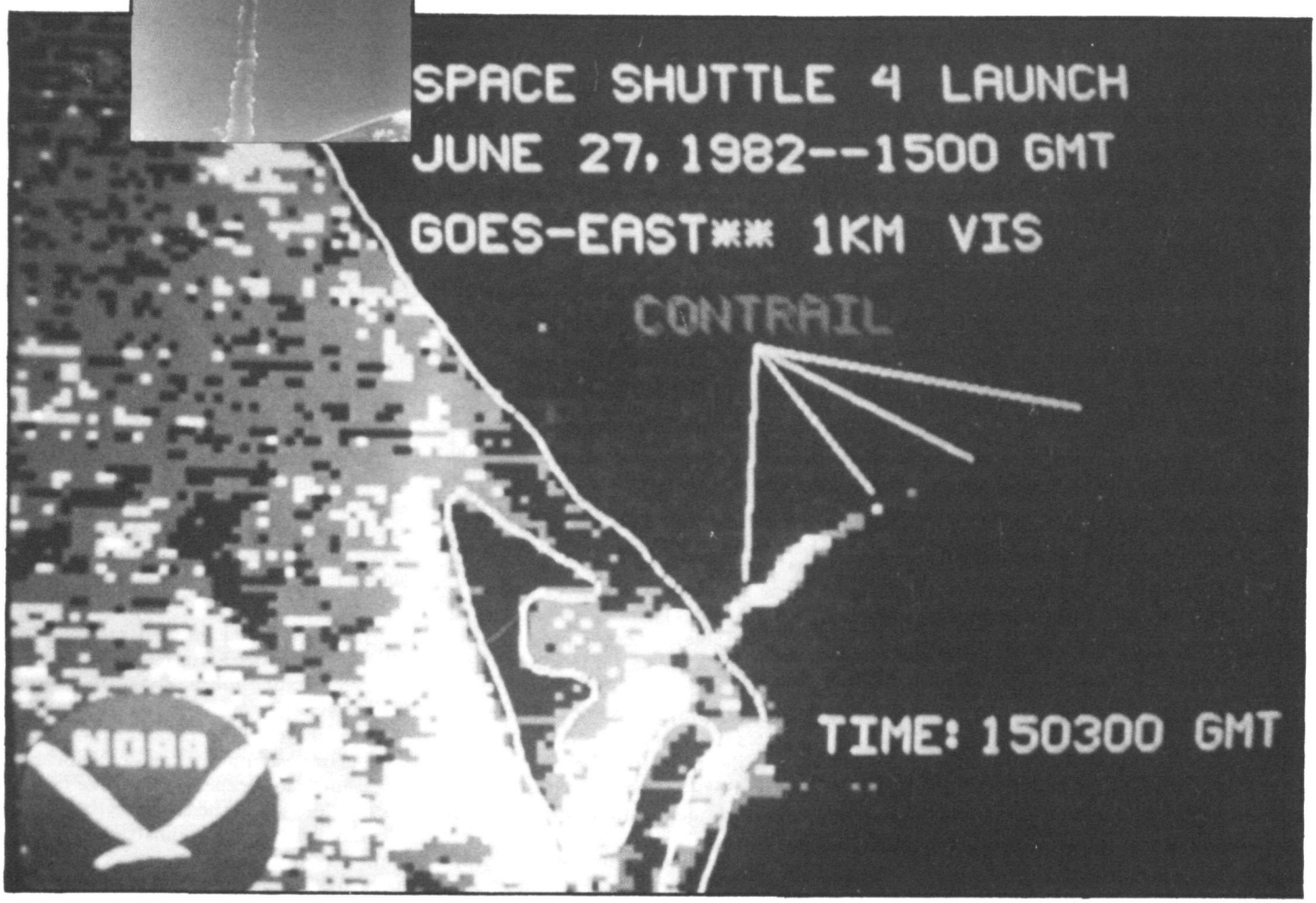
An All-American Cloud



From 22,300 miles in space GOES-East doesn't miss much when it comes to clouds over the western hemisphere. One cloud in particular caught the eye of National Earth Satellite Service scientists June 27, the day NASA launched the space shuttle, Columbia, on its latest mission. As the thrust of its solid rocket boosters and liquid-fueled main engines hurled STS-4 down range from its Florida launching site, a great contrail, or cloud of condensed water vapor, was formed and recorded by the NOAA satellite.

The little squares which give form to the cloud and land masses are called "pixels' (for picture elements) and are 1 kilometer wide. Such a satellite image is said to have 1 kilometer resolution. The contrail in this picture stretches out over the ocean for about 30 miles.

The NASA photo of Columbia's cloud producing launch was taken from a chase aircraft by Astronaut John W. Young, doubling as pilot and photographer. Below the haze at the bottom right of the picture can be seen the white line of the Atlantic Ocean beach. ■



NOAA-sponsored research and modern CPR techniques combine to save lives.

Drowned . . . and yet they lived!

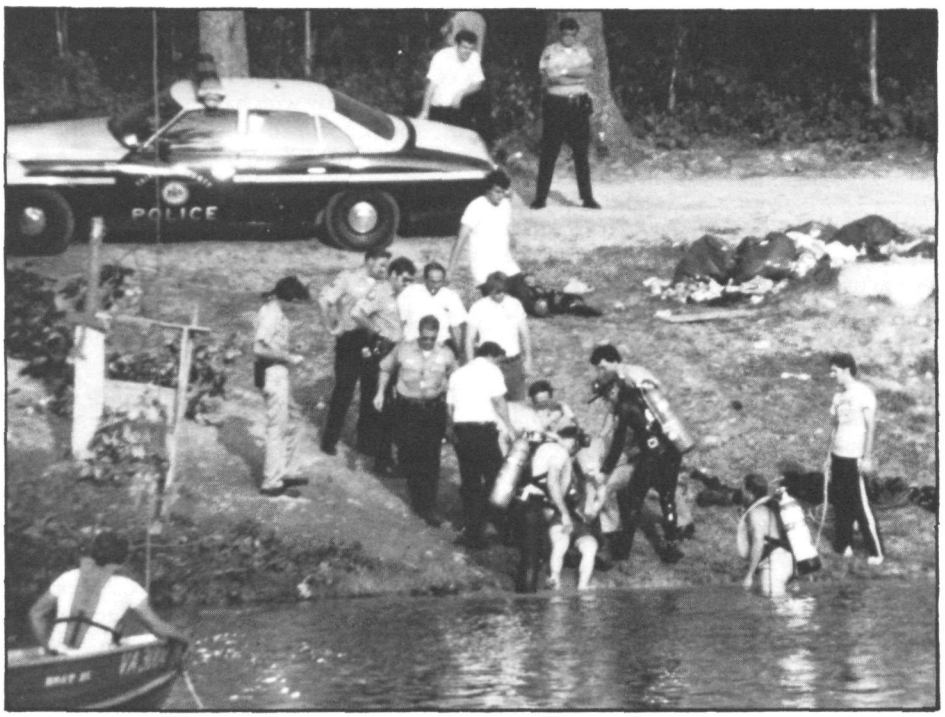
It's a visceral, gut-wrenching panorama, repeated all too frequently on Nation's rivers, lakes, and seaside. On shore: the police and rescue squad vehicles, the little knot of people drawn to the water's edge by life and death drama. On the water: the little boats criss-crossing, scuba-masked heads bobbing at the surface, then disappearing to search the airless depths. For a time it's almost peaceful, but the tension is unbearable.

And then, a commotion near the shore, all eyes focus on the limp form of a fellow human, so incredibly less fortunate than the onlookers; a human, lifeless . . . breathless . . . suffocated by drowning. It's a scene you never forget.

About 8,000 people drown each year, according to the National Safety Council, making drowning the third leading cause of accidental death in the United States. A tragically high figure, but medical science believes the total could be much lower. Many apparently lifeless drowning victims may be revived if proper treatment is started promptly and continued aggressively, the experts say.

NOAA-sponsored research has shown that a person who drowns in cool (less than 70° F.) water may automatically shut down the flow of oxygen to all but the most vital areas, sustaining life for remarkable periods without breathing. This involuntary response, called the mammalian diving reflex, in one case permitted resuscitation of a drowning victim after more than 30 minutes under water. A number of other cases are on record in which persons have been recovered from cold water in a seemingly lifeless state and survived.

Scientists are not certain how or why this primitive reflex is touched off in the human body. It may be akin to a similar mechanism in diving mammals like whales, porpoises, and seals which are able to survive long periods under water. This is what happens: When the body comes in sudden contact with water at 70° F. or below a complex series of body responses shuts off blood circulation to most parts of the body except the heart, lungs, and brain. The little oxygen remaining in the blood is transported to the brain where it is needed most. Though there may be only a small amount of oxygen in the bloodstream, it can be enough to support life as the cooled brain requires much less oxygen than normal.



". . . a fellow human, so incredibly less fortunate than the onlookers. It's a scene you never forget."

The diving reflex cannot protect everyone, of course. Studies show that survival depends on how long the victim is under water, how cold the water is, the victim's age, and how well the rescuers do their job.

The University of Michigan, a leader in studies of the mammalian diving reflex, recommends the following procedures in a cold water drowning emergency:

- ***Clear the air passage and begin mouth-to-mouth rescue breathing and external heart massage (CPR)*** *immediately.* Do not worry about getting water out of the victim's lungs . . . the body will absorb it quickly.
- Prevent the victim from losing more body heat, but *do not* rewarm the victim. Improper rewarming may harm the victim.
- Get the victim to the nearest medical facility *quickly.* CPR must be continued uninterrupted until the victim is under the care of competent medical personnel.
- *Do not give up!* Drowning victims look dead. Their skin is blue and cold to the touch. There is no detectable heart beat or breathing. The eyes are fixed and dilated, and there is no other sign of life. However, if the water was cold there is still a good chance of survival.
- Children and young people are the most frequent drowning victims. However, they are also good candidates for resuscitation since they have a more pronounced diving reflex. In research at the University of Michigan Hospital, two-thirds of the cold water drowning victims that were successfully resuscitated were 3½ years old and younger. The colder the water and younger the victim, the better the chance for survival.

First Aid For Cold Water Drowning Victims

First Aid for Cold Water Drowning Victims

Prompt and continued first aid treatment, in spite of the absence of any sign of life, can save the life of a drowning victim, particularly if the water is cold (70° F. or lower) and the victim is young. Rescue breathing and external heart massage should be started immediately and continued until the victim can be turned over to professional medical help. The following advice on the resuscitation of drowning victims is from the U.S. Coast Guard pamphlet "Cold Water Drowning, A New Lease on Life" (CG-513, June 1978).

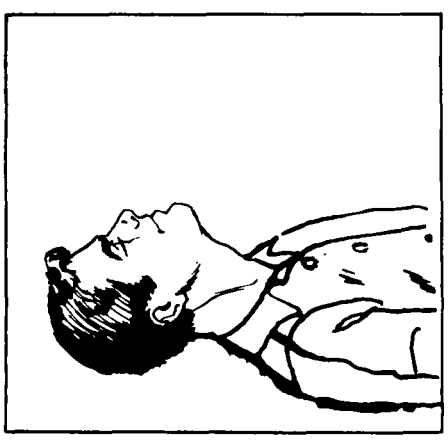
Resuscitation is a general term which covers all of the measures taken to restore life or consciousness to an individual who is apparently dead. These measures include artificial respiration to restore normal respiratory function, and external heart massage to restore normal heartbeat. Mouth-to-mouth or mouth-to-nose artificial respiration should be started at once in any case where breathing has ceased.

Only after artificial respiration has been initiated and after it has been determined that the heart has stopped, should external heart massage be started and combined with artificial respiration to give cardiopulmonary resuscitation.

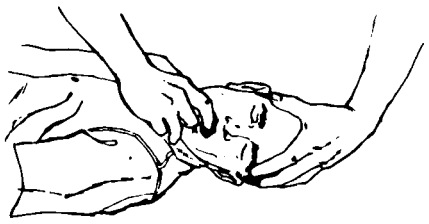
The following techniques should govern cardiopulmonary resuscitation (CPR) procedures:

Mouth-to-Mouth Breathing

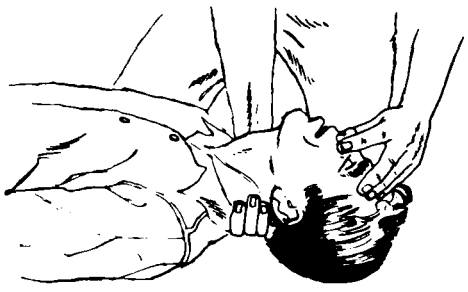
1. This is *ALWAYS* started first, and then the necessity for external heart massage is determined.
2. Place victim on back.



3. Kneel beside the victim's shoulder.
4. Clear the victim's mouth and air passages of foreign objects, i.e., chewing gum, dentures, seaweed, etc.



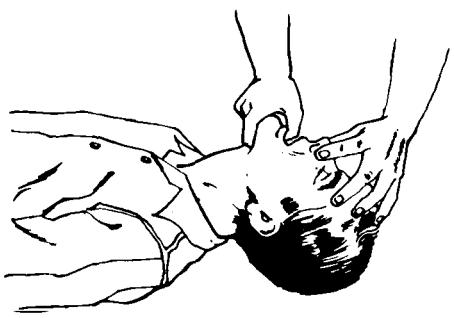
5. Place one hand under victim's neck.
6. Place other hand on victim's forehead so that thumb and forefinger can close the nose.
7. Lift gently with hand under neck while pushing down with hand on forehead. This will extend the neck and open the air passages in the vast majority of cases.



8. Initially, give the victim four (4) quick breaths without interruption, then take a deep breath (about twice the normal), open your mouth wide, place your mouth over the victim's mouth, and blow.

9. Watch for victim's chest to rise. As soon as this happens, remove your mouth from the victim's and allow the air to expire naturally from the victim's chest.
10. Repeat 12-14 times a minute for adults, 18-20 times a minute for children and infants.
11. If the chest does not rise, one or more of the following conditions exists and must be corrected:
    a. Airleak.
       (1) Make sure that there is an airtight seal between your mouth and the victim's and that the seal on the victim's nose is secure.
    b. Airway obstruction (more likely).
       (1) Insert your finger in the victim's mouth and remove any foreign objects (false teeth, etc.), vomit, and/or blood clots.
       (2) For adults: With the victim on his back, straddle his pelvis and, with one hand on top of the other, thrust forcefully into the upper abdomen. This compresses the lungs and expels the residual air in the lungs. The foreign object will often pop out of the victim's windpipe like a cork from a bottle. A second person, if available, should be ready to remove the foreign matter from the mouth. If the victim vomits, the mouth should be cleaned out immediately by turning the head to one side and wiping out the mouth with your fingers or a cloth.

       (3) For children: Roll infant over your forearm and give a sharp blow between the shoulder blades.
12. If the chest still fails to rise, remove hand from neck, insert your thumb into the victim's mouth and grab lower jawbone between the thumb and finger, lift jawbone upward, holding it in this position while you continue to perform mouth-to-mouth breathing.



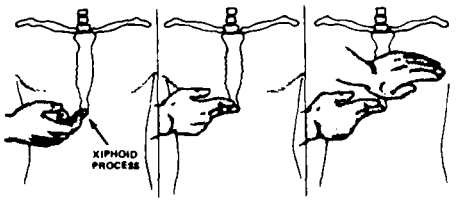
13. In children and infants, a lesser amount of air is necessary. In infants, the amount of air that can be held in your cheeks may be sufficient. The rescuer must cover both the mouth and nose of the

infant or child with his mouth. Inflate the lungs once every 3 seconds (18-20 per minute). Forceful backward tilting of the infant's head may obstruct the breathing passages. Therefore, do not exaggerate the head tilt position.

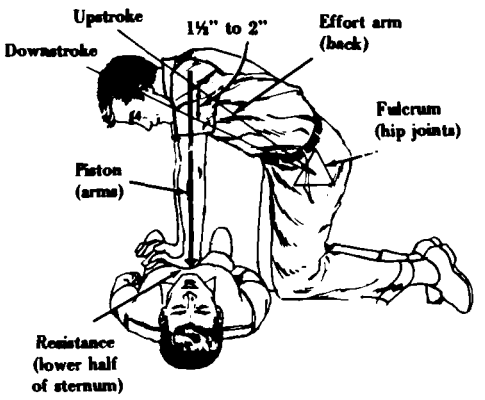
14. Mouth-to-nose breathing may be carried out using much the same technique as for mouth-to-mouth, except, of course, the victim's mouth is held closed while your mouth is placed over the victim's nose.
15. If you are hesitant to place your mouth over the victim's satisfactory mouth-to-mouth breathing may be carried out through a handkerchief. Airways and tubes should not be used. Not only are they dangerous when used by untrained personnel, but also are usually not available when such an emergency arises.

External Heart Massage

1. After artificial respiration has been instituted with four quick breaths, (and only then) check to see if external heart massage should be started.
   a. It is needed only if the heart has stopped.
   b. In many cases, the initiation of artificial respiration will be sufficient to cause resumption of the heartbeat.
2. Check for pulse.
   a. The best pulse to check is the carotid in the neck. This is a large artery lying close to the surface on either side of the Adam's apple. Practice feeling your own carotid pulse.
3. Check the pupils.
   a. If the pupils are dilated and do not constrict (get smaller) when light hits them, the blood flow to the brain is insufficient.
4. If there is no pulse and/or the pupils are dilated and do not constrict, start external heart massage.
5. For external heart massage to be effective, the victim must be on a firm surface, i.e., ground, spineboard, or floor.
6. Locate notch at top of breastbone.
7. Locate the lower end of the breastbone. Great care must be exercised *not* to place your hand over the tip of the breastbone (xiphoid process).
8. Measure two fingerwidths up from the xiphoid process, and place the heel of one hand over the lower one-third of breastbone, and the other hand on top of the first.



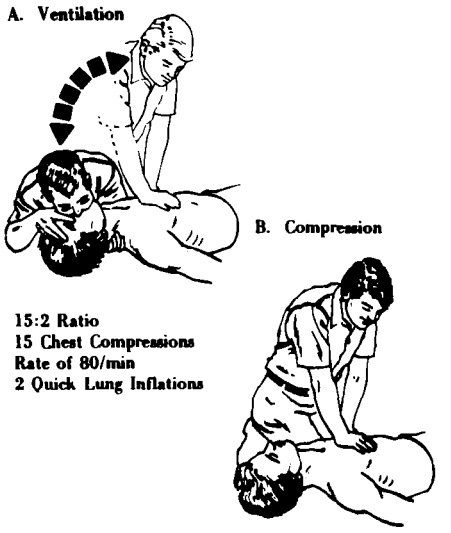
9. Bring shoulders directly over the victim's breastbone. Keep your arms straight and rock back and forth slightly from the hip joints exerting pressure vertically downward to depress the lower breastbone.



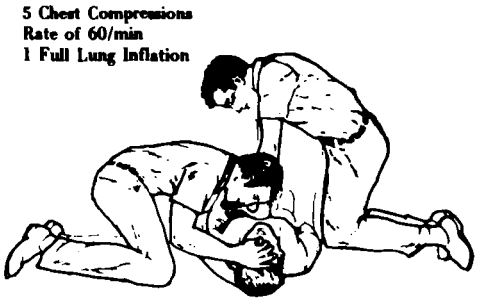
10. Then release pressure immediately. Compression and relaxation must be of equal duration. Do not remove the heel of your hand from the victim's chest when the pressure is released. Be sure that the pressure is completely released so that the breastbone returns to its normal resting position between compressions.
11. The breastbone should be compressed 1½ to 2 inches for adults. For small children only the heel of one hand is used; for infants, only the tips of the middle and index finger are used to compress the sternum. In small children and infants, the heart lies higher in the chest and external compression should be applied over the mid-sternum.
12. The cycle is repeated 60-80 times per minute in adults, 80-100 times in children, and *should be in a smooth, rhythmic fashion.*
13. Keep your fingers away from the victim's ribs to avoid fractures. Fingers may be interlocked during this procedure to assist in keeping them off the chest wall.
14. Check pulse frequently to see if the victim's heart has restarted.

Techniques of CPR for One and Two Rescuers

1. If only one rescuer is present, both artificial respiration and external heart massage can still be administered. This can be managed by interrupting external heart massage every 15 beats to give two deep lung inflations. Because of the interruptions for the lung inflation, the single rescuer must administer each series of 15 chest compressions at a more rapid rate, 80 compressions per minute, in order to achieve an actual compression rate of 60 compressions per minute. The two deep inflations must be administered in quick succession, within a period of 5 seconds. *DO NOT* allow full lung exhalation between breaths.



1. If two rescuers are present, they should work as follows:
   a. One, positioned at the victim's head
      (1) Administers artificial respiration
      (2) Monitors pulse at carotid artery (neck) without interrupting artificial respiration.
   b. The other, positioned on the *opposite side* of the victim's body at shoulder level, begins external heart massage.



Some Additional Factors in Cardiopulmonary Resuscitation

1. The victim's stomach may become distended with air. Although this is not dangerous, it may interfere with lung inflation. It may also indicate a blocked airway. It can be remedied by applying pressure over the stomach with the palm of your hand. This expels the air but may also lead to regurgitation of the stomach contents, so you must be ready to turn the victim's head to one side and clean out the mouth with your fingers or a cloth.
2. Cardiopulmonary resuscitation, once started, must be continued until spontaneous breathing and heartbeat occur or until the victim is turned over to a physician. In many cases, this will mean that the procedures must be continued while the victim is being transported to a medical facility. Under no circumstances should cardiopulmonary resuscitation be interrupted for more than a 5-second period. ■

The Challenge of the Pacific

Hal Alabaster

NOAA's Pacific Marine Environmental Laboratory, (PMEL) in Seattle conducts oceanic and atmospheric research programs dealing with the planet's largest body of water, the Pacific Ocean, 64,186,000 square miles in area, containing 46 percent of the world's water.

The scope of the laboratory's role is easier to grasp through a mental grand tour of the Pacific to areas where some PMEL projects have been conducted. We start in Puget Sound, the site of an extensive study of the marine ecosystem, go north to the Gulf of Alaska where in 1980 scientists from Canada along with other Government agencies and educational institutions completed a major study of the relationship and exchange of energy between the ocean and atmosphere. Going further north we reach the Bering Sea where an assessment of living resources on the outer continental shelf has been in progress for a number of years. Heading southwest we reach the Kurile Islands. A tsunami research project there included a joint US-USSR experiment involving the emplacement of bottom pressure gauges and current meters to help detect these dangerous seismic sea waves. Moving further south, we arrive in China where in 1980, in conjunction with the US-China exhcange program, scientists participated in the East China Sea cruise aboard the NOAA vessel Oceanographer. Also, during that cruise, a three week experiment was conducted in the Sulu Sea measuring currents and temperatures. The data collected confirmed the existence of very large internal waves in the Pacific. At the midpoint in the tour, we are in the South Pacific, in the area between Hawaii and South America, where PMEL scientists have accumulated extensive experience in the potential effects of mining on the deep ocean floor. Traveling to the east, we reach the Galapagos Islands, where a study of planetary ocean waves and their relationship to the atmosphere began in 1979. These studies may lead to a better understanding of the climate over the United States. Moving north, near the starting point, is the infamous Columbia River bar, an historic danger to marine shipping. There, direct field observations along with remote data gathered from an orbiting satellite and surface radar have been used to study the transformation of waves as they move shoreward from the open ocean and interact with local currents and wind.

Susan Hamilton performs hydrocarbon separations for analysis by gas chromotography. This process identifies various elements in a sample by their absorption during a filtering process.

Specific Programs Outlined

To view the programs of PMEL from a geographic standpoint is to see only the general sweep of the effort. A more complete understanding requires consideration of the specific programs being undertaken. That perspective requires an ability to deal with a kind of mixed up alphabet, called acronyms, where such terms as DOMES, OCSEAP, EPOCS, and STREX when interpreted take on a very important meaning.

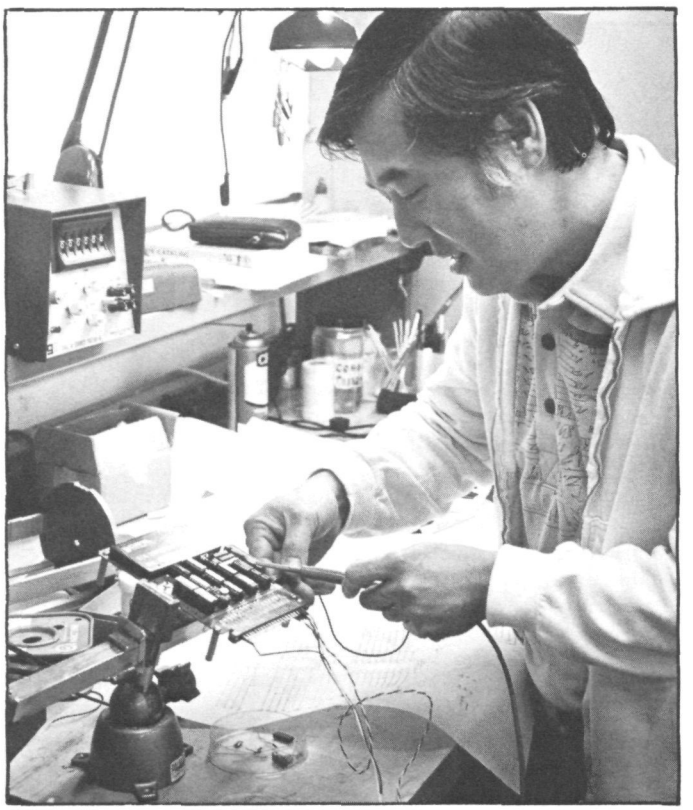
The term DOMES stands for Deep Ocean Mining Environmental Study. The project began in April 1975. It was concerned with potential environmental problems expected from the deep ocean mining of manganese nodules (which also contain amounts of copper, nickel and cobalt). The goal of DOMES was to identify the problems early

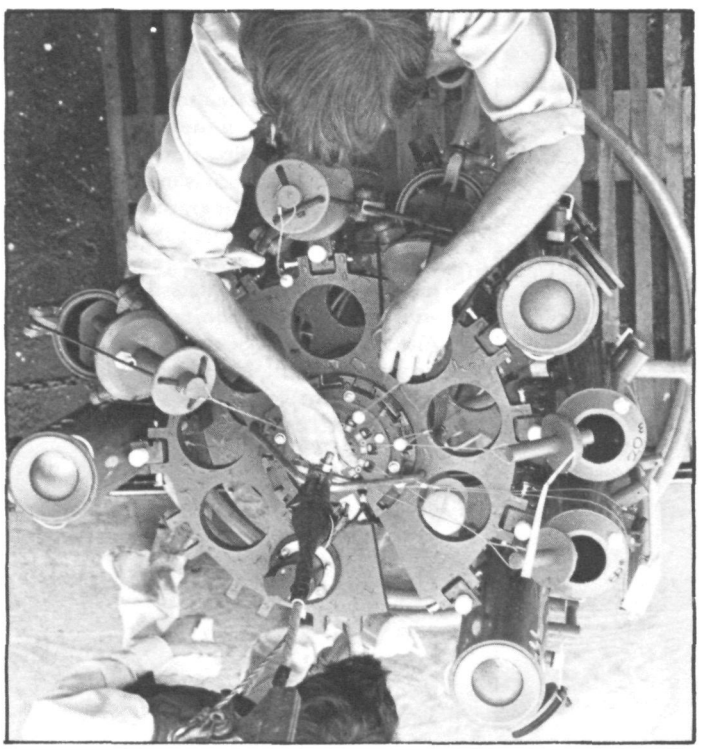
Richard Feely (left) and Gary Massoth colelct a gravity core from Elliott Bay, Seattle. The core will be analyzed to determine the amount of trace metal accumulation present in the sediment.

enough to respond to the requirements of the National Environmental Policy Act, to Law of the Sea negotiations and to legislation concerning mining operations in international waters. Further, the identification of those problems would be helpful in the development of guidelines, equipment, and operating techniques for the mining industry. A number of experiments were conducted over a period of 4 years. An area was selected in the Pacific, just north of the Equator, where the concentration of nodules on the ocean floor was sufficient for pilot mining. The initial study involved the collection of data establishing the natural condition of the site prior to dredging. These data would then serve as a base from which to measure the effects of the actual mining. In November 1978, a pilot mining test was conducted. Scientists studied the plume, generated as the nodules were brought to the surface. Additional information was collected on the dispersion of the material as it settled down through the water column and a study made of the ocean floor including photography. This second phase was then measured against the information collected during the first experiments. In 1979 scientists returned to the site of the pilot mining and conducted further studies to determine long-range or lingering effects. The scientists are continuing their analysis of the data collected during the various phases of the DOMES project. However, there is sufficient knowledge available now to indicate little likelihood of any damage to the environment sufficient to prevent the mining of minerals from the deep ocean floor.

Alaska Oil and Gas Study

The Outer Continental Shelf Environmental Assessment Program (OCSEAP) was for a number of years the largest single effort conducted by the laboratory. Funded by the Bureau of Land Management and managed by NOAA, this program is directed toward gathering information needed for an enviromental assessment of the impacts of oil and gas development on the outer continental shelf of Alaska. The impact of transporting oil through coastal waters is also of great concern. The PMEL studies include the circulation pattern of the ocean and the various physical forces that maintain those patterns. With such information it was possible to develop models which will be useful in predicting the course and effect should an oil spill occur. Other aspects of the study involved the distribution of small marine life named plankton, the concentrations of hydrocarbons and the distribution of suspended particles in the water. While some programs such as the DOMES project have definite goals with starting and ending points, the OCSEAP study is a continuous process. Thus, as new information is developed it becomes the base for further exploration and additional investigation.





At PMEL (clockwise from upper left), Gary Kimura in a computer image analysis laboratory; Alex Nakamura in the engineering shop; Gary Massoth prepares suspended matter samples for analysis; and scientists prepare a water sampling rosette.

Conducting research in the marine environment involves not only the ocean but the atmosphere above. The laboratory conducts many studies dealing with the relationship between the atmosphere and the ocean. One example is the Equatorial Pacific Ocean Climate Studies (EPOCS). The study will extend over several years of experimentation. The relationship between the ocean and atmosphere is the main element of this research. The atmosphere is the more changeable component. It is active with storms, jet streams, and other changing aspects. On the other hand the ocean is more stable, it retains energy in large amounts. A key location for such a study is the Pacific, in that region near the Equator. Scientists feel the lessons to be learned in that area will be key factors in achieving a better understanding of world climate. The abnormal sea surface temperatures in the eastern tropical Pacific are of particular interest. These warmer or colder variations from the long-term average cover vast areas of the ocean. The study focuses on these differences, on the conditions that cause them and the processes they set off. Scientists are also reviewing existing information gathered by previous experiments and observations.

Pacific Storms Eyed

The air-sea interactions were also the subject of an experiment titled STREX for Storm Transfer Response Experiment. This effort was conducted in cooperation with scientists from major research institutions in the United States, other Federal agencies and Canadian authorities. In October of 1979 the many participants came together in special offices in Seattle, Wash. Aircraft from NOAA, the National Aeronautics and Space Administration and the Air Force were staged at local airfields. The observation system also included 23 drifting buoys as well as the satellites, anchored buoys, and merchant ships which provided observations to a global network. Through the experiment, one of the most comprehensive volumes of information describing the structure of storms over the North Pacific and the structure of the upper ocean was compiled.

Closer to home, scientsits using modern aircraft, satellite information, optical sensors, and direct observations are conducting studies to provide information needed to improve weather forecasting. Increased fishing activity in the Bering Sea and

throughout the Pacific Northwest coastal areas has emphasized the need for more accurate forecasts of ice movements, and other weather data, to prevent the loss of expensive fishing gear and provide for ship and crew safety. Research now underway is aimed at forecasting coastal and inshore winds, predicting the movement of the Bering Sea ice edge, predicting coastal wave conditions, and improving tsunami forecasts and warnings.

Virtually in the laboratory's back yard, scientists have been engaged, for the past several years, in studies of Puget Sound and the Strait of Juan de Fuca estuarine systems. This project, named MESA for Marine Ecosystem Analysis, is part of a program being conducted by NOAA's Office of Marine Pollution Assessment (OMPA) and the Environmental Protection Agency. In Puget Sound the emphasis has been on understanding the Sound's ability to accommodate pollutants including municipal waste and the identification of the various forces that might affect the distribution of spilled oil. Studies of the presence and effects of trace metals and other chemicals from the industrial areas have been the subject of intense investigation. These studies have had an important role in the decision making process by government and political leaders in determining the future shipping and other industrial activities in the area.

While the work of the laboratory is, for the most part, directed toward the Pacific Ocean and its coastal areas, scientific and technical personnel have traveled around the world on specific projects involving the marine environment, working with other governments, institutions of higher education, and other scientific organizations. The Joint Institute for Study of the Atmosphere and Ocean (JISAO) directed by John M. Wallace is at the Univeristy of Washington. Formed in 1978, the institute has a strong association with the laboratory in the areas of climate, estuarine studies and environmental chemistry. In addition to sponsoring visiting scientists, the institute has an important role in organizing workshops, seminars and specific projects such as STREX.

In Hawaii, the Joint Institute for Marine and Atmospheric Research, under the leadership of Dennis Moore, conducts research on climate, equatorial oceanography and tsunamis.

A Look Ahead

The future? The laboratory's plans for work to be accomplished are as ambitious as the projects in the past indicate. The work in Puget Sound has a high priority with special emphasis on investigating the pollutants found during earlier studies. Do they migrate to new locations? Do concentrations remain at the same levels? These are but two of many questions that must be answered. Work with Canadian scientists will continue in the Strait of Juan de Fuca and the nearby shelf to understand better the effect of storms forcing water into Puget Sound. A major experiment will deal with the movement of water and erosion in Puget Sound. Additional information will be provided to the National Weather Service with emphasis on sea ice forecasting in the Bering Sea and hazardous waves at the mouth of the Columbia River.

One particular project which many feel has great potential is the prospect of finding valuable deposits of minerals off the coasts of Washington, Oregon, and California. Called polymetallic sulfides, some deposits have been located near the Galapagos Islands. There are indications that the ocean floor in the area of the Gorda and San Juan Ridge may produce similar deposits. Should this be the case, a multidisciplinary project will be undertaken involving, in addition to PMEL, other NOAA components including the National Ocean Survey and the Northwest and Alaska Fisheries Center.

The EPOCS study will continue with scientists reviewing information already collected in an effort to explain the process affecting the surface temperatures in the eastern Pacific. Investigators will also take part in a new field program to study the circulation in the Pacific Ocean east of the Galapagos. Also at the Galapagos, sea level measurements will be continued as part of studies of wave propagation along the Equator. A new study of the Japan current, called the Kuroshio by the Japanese for "Black Stream", will be undertaken in the vicinity of the Emperor Seamount Chain.

Thus, scientists from the Pacific Marine Environmental Laboratory will continue their wide ranging programs directed to achieve a better understanding of our climate, the world's natural resources, and the many forces at work in the ocean and atmosphere, factors that will affect our lives today, tomorrow, and far into the future. ■

PMEL, An Historic Perspective

The first indication that Seattle would be the site of a major oceanographic and atmospheric research facility came in 1962 with the establishment, by the Coast and Geodetic Survey, of a ship base on Lake Union. One year later the Western Oceanographic Research Laboratory was created with the mission of processing data, performing direct current measurements, and conducting geophysical observations. In 1964 the name was changed to the Marine Science Center. An increased staff, under the leadership of Dr. T. V. Ryan, was divided into two functional areas, physical oceanography and marine geophysics.

The creation of the Environmental Science Services Administration (ESSA) in 1965 combined the functions of the Weather Bureau, the Coast and Geodetic Survey, and several other Government activities. At that time, the Marine Science Center became the Pacific Oceanographic Laboratory, under the Institute for Oceanography headed by Dr. H. B. Stewart. Additional research groups were formed involving the Joint Oceanographic Research Group at the University of Washington under Dr. R. E. Burns, and the Joint Tsunami Research Effort at the University of Hawaii under Dr. G. Miller. In 1967 the Institute for Oceanography was disbanded. Its components were reorganized into the Pacific Oceanographic Laboratories with Captain W. D. Barbee as Acting Director. This activity included the ongoing efforts at the University of Washington and Hawaii and a counterpart organization, the Atlantic Oceanographic and Meteorological Laboratories was established in Miami, Fla.

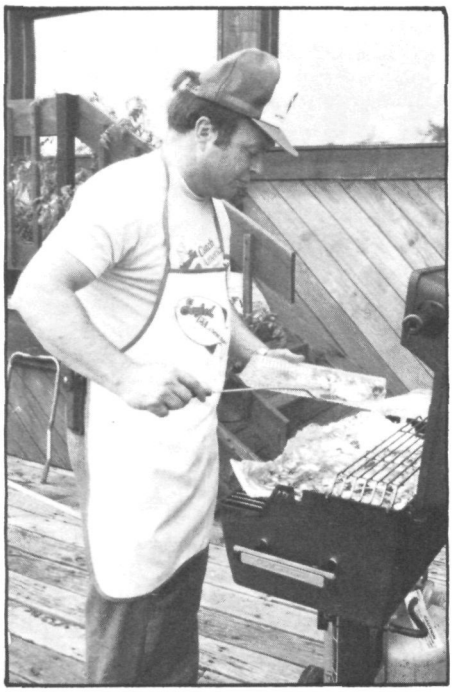
In 1973, three years after ESSA had been merged into the National Oceanic and Atmospheric Administration, the Pacific Marine Environmental Laboratory was established with Dr. Burns as Acting Director. The new facility included staff from POL and personnel from the Marine Minerals Technology Center located in Tiburon, Calif. The new PMEL was given the responsibility to conduct basic and applied research along the Pacific Coast and in selected areas in the Pacific Ocean. Initially the laboratory had a full time staff of 18 with 11 stationed in Seattle and 7 in Hawaii. To execute its increased mission the staff was increased, and the facility moved from the Pacific Marine Center on Lake Union to new quarters on campus at the University of Washington.

In 1976, Dr. John R. Apel was appointed as the first permanent Director of the laboratory. By October of that year, the staff of the facility had grown to 94, including scientists, NOAA Corps officers, and administrative support personnel.

To accomplish its mission the Pacific Marine Environmental Laboratory requires a varied staff with a broad background of scientific knowledge, backed up by a strong technical staff. Currently the laboratory, under the leadership of Acting Director Dr. Eddie Bernard, is organized into six research groups. These units and their directors are: Geochemistry, Dr. Herbert Curl; Coastal Physics, Dr. Glenn Cannon; Deep Sea Physics, Dr. Bruce Taft; Theoretical Studies, Dr. Rudolph Preisendorfer; Marine Meteorological Studies, Dr. James E. Overland; and Engineering Studies, Hugh Milburn. These groups work in cooperation with other NOAA components including the Pacific Marine Center, the Office of Marine Pollution Assessment, the Northwest and Alaska Fisheries Center, and the National Weather Service.

Bill Gordon: Government Gourmet

Gordon, with help from Ruth Barritt, attends to the halibut. Arleen Joyce looks on.



After about 25 minutes of cooking in its foil pouch, the sea trout is tender and moist, ready to serve.

Bill Gordon, who heads NOAA's National Marine Fisheries Service, doesn't confine his fish-related work to the office. He also likes to get out and catch some of the creatures NMFS is charged with managing.

On a balmy Monday evening last August, Gordon shared his catch of sea trout of the day before with about 75 members of the Washington ocean community assembled at the Nautilus Press offices along the Potomac River. Shrimp and Alaska halibut rounded out the menu.

He also shared his considerable cooking and organizational skills—with help from staff members Beverly Barton and Arleen Joyce—by preparing and cooking the food as well. The recipes—Oriental Barbecued Halibut, Grilled Shrimp, and Foiled Fish—were of necessity uncomplicated, requiring minimal preparation, all of it suitable to offers of assistance from friends. Cooking, again to keep things simple, was outdoors on a charcoal grill.

If you're not cooking for 75, you might want to modify the recipes a bit. The Foiled Fish can just as easily be baked in an oven (put the fish, in its foil package, on a cookie sheet) and the shrimp and halibut dishes can be cooked under a broiler in your kitchen. No matter how you prepare any seafood, however, be careful not to overcook it. Don't be afraid to test it for doneness frequently, especially at the end of the estimated cooking time.

Fish and summer sunshine on the Potomac.

Grilled Shrimp

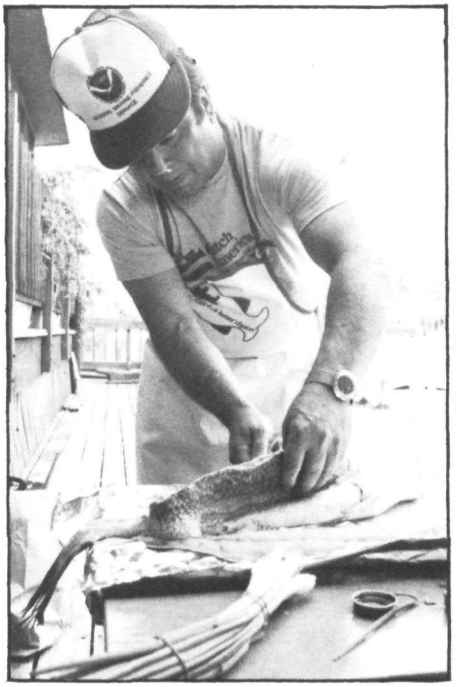
2 lbs. peeled, cleaned fresh shrimp
1 cup melted fat or oil
1/3 cup lemon juice
2 teaspoons salt
1 teaspoon Worcestershire sauce
½ teaspoon white pepper
Dash liquid hot pepper sauce

Combine marinade ingredients. Place shrimp in well-greased, hinged wire grills. Baste shrimp with marinade. Cook about 4 inches from moderately hot coals for about 3 to 5 minutes, basting occasionally with marinade. Turn shrimp, baste, and cook for 3 to 5 minutes more. Serves 6.

Slices of fresh lime and tomato flavor the sea trout and help keep it moist during cooking.

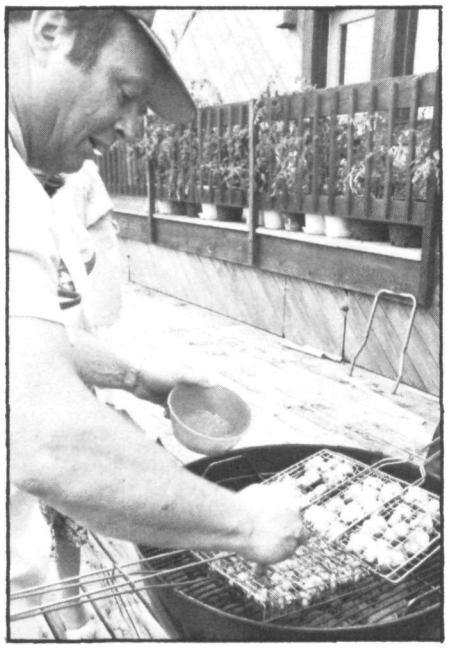
Dick Gutting, left, describes something fishy to Gordon.

Dr. and Mrs. John Byrne, center, with co-hosts Gordon, in hat, and Jack Botzum of Nautilus Press, far right.



Filleting the sea trout in preparation for grilling.

An insouciant Bill Gordon prepares to reveal his foiled fish to Ruth Barritt, center, and Arleen Joyce.



A liberal coating of marinade keeps shrimp from drying out during cooking.

Oriental Barbecued Halibut

2 lbs. halibut steaks or fillets
¼ cup orange juice
¼ cup soy sauce
2 tablespoons melted fat or oil
2 tablespoons chopped parsley
1 tablespoon lemon juice
½ teaspoon oregano
½ teaspoon pepper
1 clove garlic, minced

Place halibut in a single layer in a shallow dish. Combine remaining ingredients. Pour marinade over fish and let stand for at least 30 minutes in refrigerator, turning once. Remove fish, reserving marinade for basting. Place fish in well-greased, hinged wire grill or on a well-greased broiler pan, approximately 13 × 10 inches. Cook over hot coals or under broiler, about 4 inches from source of heat, for 4 to 5 minutes. Turn and baste with marinade. Cook for 4 to 5 minutes more or until fish flakes easily when tested with a fork. Serves 6.

Foiled Fish

6 pan-dressed fresh sea trout
(approx. ½ lb. each) or 1 3-lb. fish
2 cups sliced mushrooms
½ cup chopped onion
3 tablespoons butter, melted
1 cup chopped tomato
2 tablespoons dry white wine
½ teaspoon seasoned salt
½ teaspoon crushed thyme
¼ teaspoon sugar
⅛ teaspoon pepper

Clean, wash, and dry fish. Cook mushrooms and onion with butter until onion is tender. Remove from heat and add remaining ingredients. Cut 6 pieces of heavy-duty aluminum foil, 18 × 18 inches each. Grease lightly. Place fish in center of foil. Stuff each fish with a tablespoon of sauce. Spread remaining sauce over top of fish. Bring foil up over fish and close all edges with tight double folds. Place packages on a grill about 6 inches from moderately hot coals. Grill for 25 to 30 minutes or until fish flakes easily when tested with a fork. Serves 6. ■

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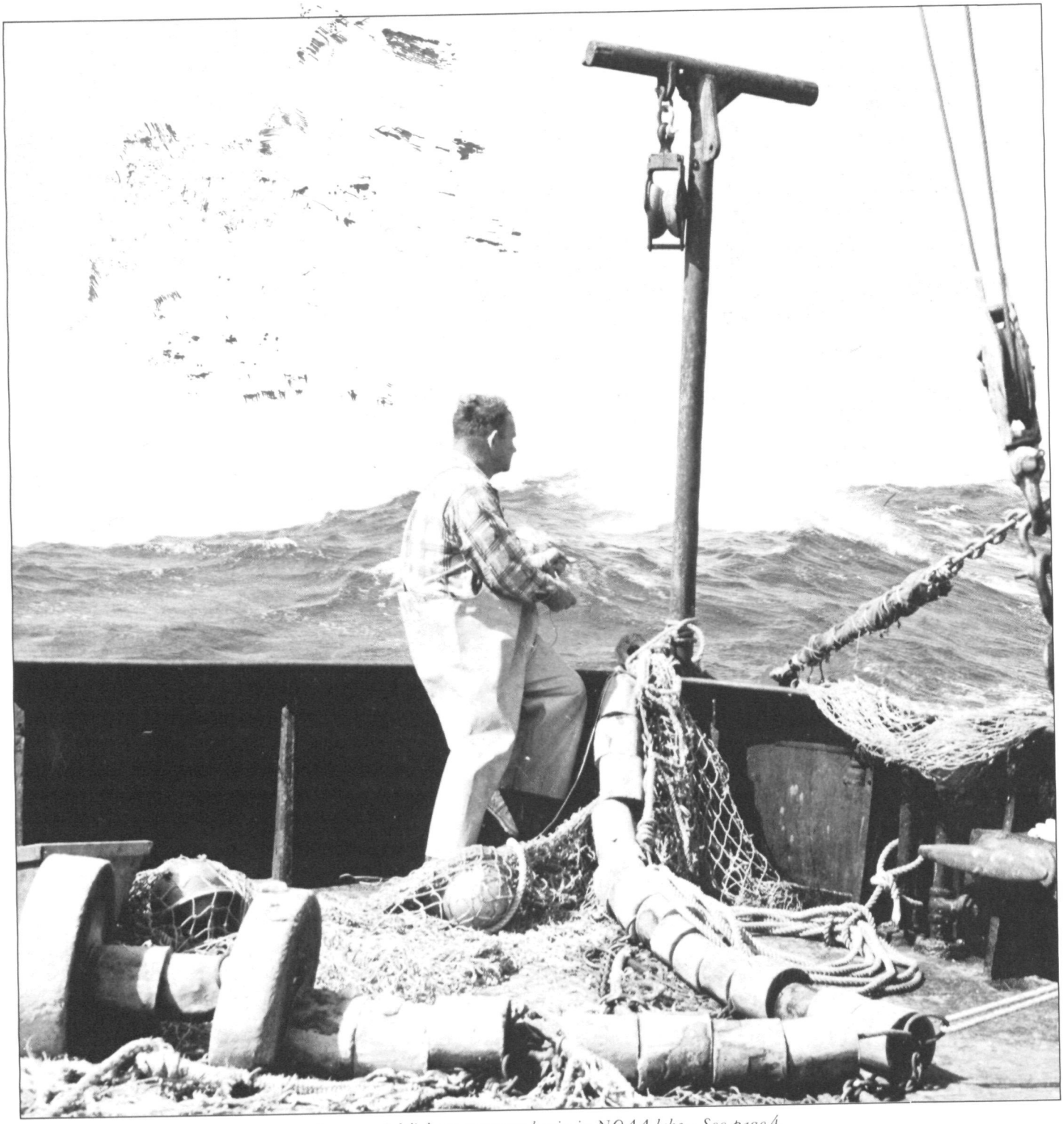

Commercial fishery concepts begin in NOAA labs—See page 4.