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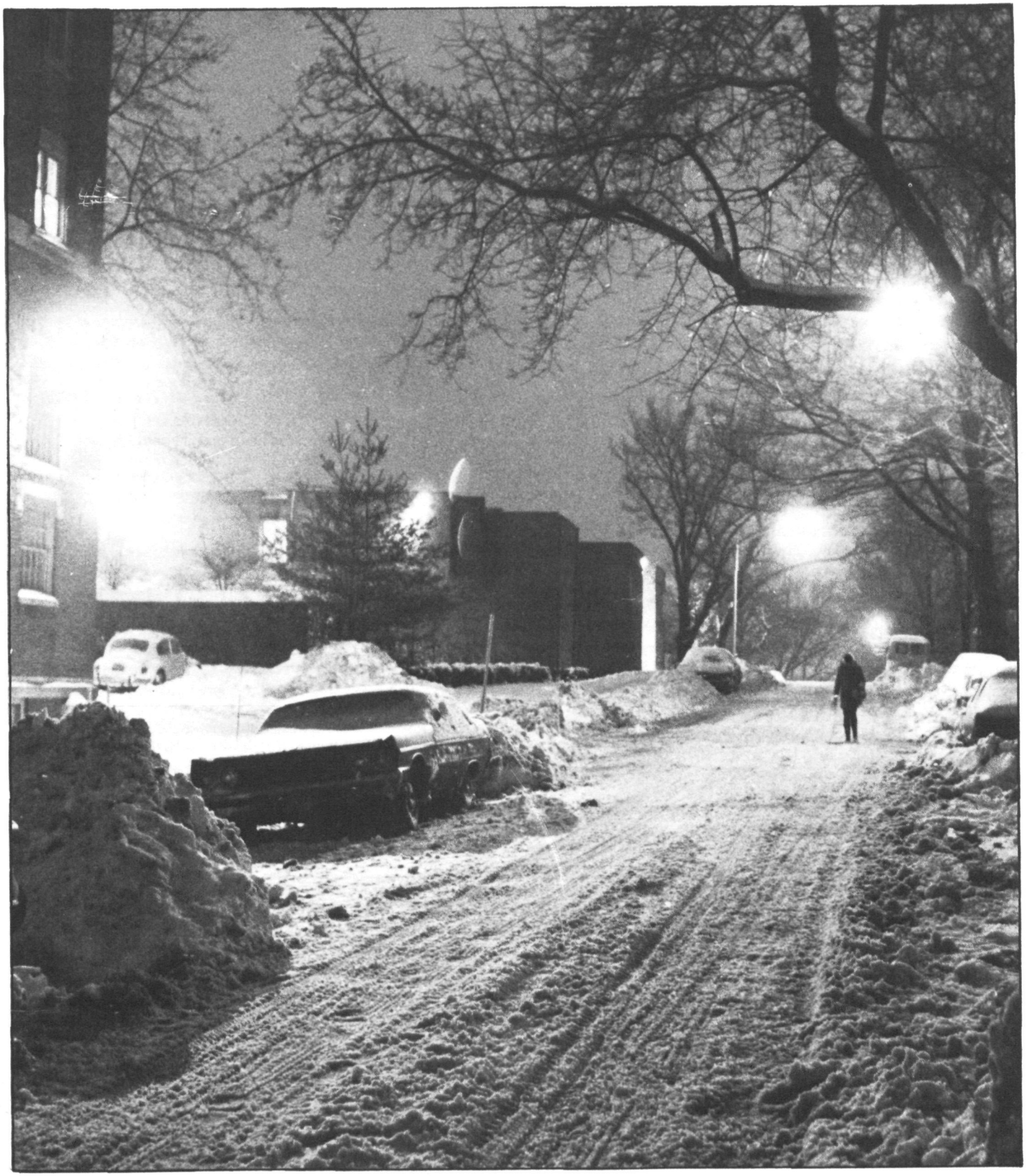

National Oceanic and Atmospheric Administration

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TO OUR READERS

There's a new look to *NOAA Magazine*.

Beginning with this issue, readers will find a trimmer, more economical format to the publication along with several new features designed to provide timely information on NOAA's programs and plans.

In addition to departments familiar to regular readers, *NOAA Magazine* will be carrying topical items such as those found in "Newsline" on the facing page. Some of these brief items will be covered in depth in this or a future issue. Additional information on any story appearing in the magazine may be gotten by contacting the editors.

While we have made some economies and some changes, we hope to maintain the literary and artistic quality which have made this magazine a part of NOAA throughout our agency's lifetime.

The Editors

Newsline 3

An Interview With Dr. John Byrne 4
NOAA's Administrator answers questions ranging from possible resistance to user fees, to reorganization, to a National strategy on the atmosphere.

Impetus for America's Fisheries 6
A 40 percent increase of the fishing industry's contribution to the GNP in the 1980's is the goal of this NOAA effort.

Weather Services and the Nation's Economy 8
Along with knowing whether to wear a raincoat, benefits from the weather forecast run into big saving for farmers, fishermen, and others.

Winter! 11
Beautiful but dangerous, it's called "a state of mind as much as a climatological phenomenon." Common sense could prevent many deaths attributed to the season.

Mineral Treasure from the Galapagos Ridge 14
Scientists from NOAA and the academic community have found and charted a $2 billion ore deposit in the Pacific, putting "polymetallic sulfides" in the news.

Is Long Island An Island? 16
This was an important question for NOAA mappers who helped determine jurisdiction over 172 square nautical miles of the Continental Shelf.

Atmospheric Echoes At Poker Flat 18
A new, high-powered NOAA radar in Alaska is revealing secrets of the upper air that will help weather forecasters, pollution control experts, and pilots.

Directions 20

City Scape 22
NOAA aerial photographers clicked over the heart of Manhattan producing an unusual view of some of New York's most notable landmarks.

The Climatologist and the Contractor 26
The building industry is benefiting from climatological data from NOAA when it comes to such costly items as insulation and electrical requirements.

Sea Fare 27
Delicious party treats featuring fish and shellfish are real icebreakers during winter get-togethers.

U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

National Oceanic and Atmospheric Administration
Dr. John V. Byrne, Administrator

A. Joseph LaCovey
Director, Public Affairs

Anna F. Vinci
Art Director

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Newsline

Finding The Shuttle's Ill Wind

When you fly a 103-ton greased brick named Columbia to a deadstick landing at 227 miles per hour—and there's no second chance—you want all the help you can get. NOAA will be providing that help to future space shuttle flights.

A laser wind sensor developed in the Environmental Research Laboratories' Wave Propagation Laboratory has, in fact, won its wings already. The sensor, which measures winds above the site before, during, and after the landing, and warns of potentially dangerous crosswinds and wind shear, was used in November's picture-perfect sitdown. Other shuttle aids from NOAA: regular status reports on solar activity, and National Weather Service support, a whole story in itself.

For Builders: More On Max And Min

Home builders are discovering a new tool to help them decide how much weather protection is enough. The Environmental Data and Information Service has produced maps showing probable extreme minimum and maximum temperatures for all States save Hawaii (where the temperatures are seldom astonishing anyway) and Alaska.

Originally prepared for the Nuclear Regulatory Commission, which uses the information to design power plant safety systems and components, the maps are based on data from about 2,000 weather stations, covering periods from 15 to 100 years, and showing highs and lows in 2, 50, and 100-year cycles. Architects and builders find the information valuable in determining heating, insulation, and air-conditioning needs.

The package, titled Probability Estimates of Temperature Extremes for the Contiguous United States, can be purchased from the National Technical Information Service, Springfield, VA 22161 for $8.

NOAA 6-7: Firefighters In The Sky

Forest firefighters have new tools, 540 miles in the sky.

They are infrared sensors on the NOAA-6 and NOAA-7 spacecraft, which easily detect heat radiated from forest fires which normally burn at temperatures exceeding 500° F. Specialists at the National Earth Satellite Service's field service station in Redwood City, Calif., through National Weather Service fire weather forecasters, alert the U.S. Forest Service to the presence of hot spots which may indicate fire. Bill Aldridge, station manager, says dozens of blazes, generally in the Northwest, have been pinpointed by the sky eye, giving the Forest Service a more-than-welcome leg up.

Alaska Oil Increase Data Demands

The opening of the Naval Petroleum Reserve in Alaska to commercial oil and gas leasing in December 1980, has brought the industry to NOAA's door with more than a hundred orders each week for geological and geophysical data. The Environmental Data and Information Service's National Geophysical and Solar-Terrestrial Data Center in Boulder responds promptly, with the entire cost borne by user fees.

The information requested includes seismic reflection and well logs, gravity and magnetic observations, aerial gamma ray measurements, and interpretive maps and reports.

To meet the demand, the center had to reformat about 3,300 nonstandard raw field tapes of seismic reflection data, duplicate 1/2 million square feet of charts and maps, photocopy 200,000 pages from 3,000 data reports, and provide quality control and supporting documentation. It duplicated 12,000 finished tapes for customers in the petroleum industry in a very short time.

The data sets vary widely in size, and range in cost from as little as $10 up to several hundred thousand dollars.

Of the orders received each week, the center acknowledges 95 percent within 2 working days, and fills 65 percent within a week, 80 percent within 2 weeks.

Big Push Planned In Fish Sales

A major push to sell fish overseas, and make a noticeable dent in the Nation's export-import picture has been launched by the National Marine Fisheries Service.

A year of intensive activity is planned, on the heels of several highly successful promotions toward the close of 1981. At the ANUGA '81 World Food Market in Cologne, West Germany, seven U.S. firms sold more than $10 million as compared with a $1 million showing at the same exposition last year. U.S. seafood companies also sold more than $1.4 million during a 6-day sales mission to England, France, and the Netherlands, with future sales expected to triple that amount. Other nations are showing new interest in fish which aren't normally available to them. Meanwhile, NMFS has set up a computer system to help identify possible foreign buyers.

New Look at Ozone Shield

Coming up in the next 5 years: a NOAA satellite sensor to detect changes—and causes of changes—in ozone content, presently measured from the ground.

Ozone filters ultraviolet radiation from the sun. The ozone shield which encapsules the Earth is vital to life on the planet. NOAA and NASA have agreed on a preliminary design for the instrument, and the National Earth Satellite Service has slated it to fly on the NOAA-G satellite. Its detection of changes in the sun's ultraviolet radiation output will allow researchers to make more accurate distinctions between natural and human causes of atmospheric ozone change.

New From NOAA: Flotsam Shedder

NOAA has developed and tested a device to prevent flotsam from jamming current meters used to study water circulation in rivers and estuaries. Trash and debris had been immobilizing rotor-type current speed sensors on meters used by the National Ocean Survey in New York's Hudson and East Rivers. Delays were encountered when the meters had to be taken aboard the NOAA Ship Ferrel, and the rotors freed. The Ferrel's skipper, NOAA Corps Cdr. John Callahan, designed a device of steel spokes radiating from a nose cone which sheds off large pieces of flotsam, and lets the meter move unimpeded.

Satellite Maps Aid Eye Research

Erosion of the Earth's ozone shield and the resultant increase in ultraviolet radiation may lead to further "snow blindness" among Eskimos already suffering from the disease, a Newfoundland researcher believes.

Data from NOAA satellites has led Dr. Gordon J. Johnson of Memorial University of Newfoundland to conclude that the cornea-degenerating disease, Labrador keratopathy, is caused by ultraviolet radiation, intensified by reflection from snow and ice. Maps derived from satellite data reinforce Dr. Johnson's observation that areas between 50° and 56° N. are especially dangerous to the largely-Eskimo population. Areas south of these latitudes have less snow-cover. Ice charts bear this out. Areas north of the 55-56° N. zone are snowy longer, but temperatures are so much colder that residents stay inside more lessening their exposure to ultraviolet rays.

An Interview With Dr. John Byrne

The National Oceanic and Atmospheric Administration has a bright future of service to the Nation, Dr. John V. Byrne, its new Administrator, says.

In a wide-ranging interview with the editors of *NOAA Magazine,* Dr. Byrne touched upon virtually every facet of the agency's programs and goals.

Following are highlights from the conversation, which took place November 25, 1981.

Q. ***There seem to be a lot of ideas about how NOAA should be organized; that Fisheries belongs at the Interior Department, that the Weather Service should be an independent agency, that the Coast Guard belongs in NOAA. Do you see NOAA losing any of the fundamental responsibilities it now has or acquiring any new ones?***

A. Answer to the first question is no, I don't see us losing any responsibility. Answer to the second question is yes, I see that we'll be picking up all sorts of new responsibilities as new uses and services needed with respect to the ocean begin to develop.

Q. ***The question of whether NOAA should be part of the Department of Commerce is also raised from time to time. Are you aware of any significant support for removing NOAA from Commerce and either establishing it as an independent agency or combining it with another agency?***

A. No, not at this time, but I think that question has come up and probably will continue to come up. The fact is that we are a part of the Department of Commerce and we should be playing a leadership role in the Department and taking advantage of the opportunities that the Department offers in other areas as well as providing assistance to other parts of the Department.

Q. ***The Department of Commerce would like to consolidate a number of NOAA elements, Public Affairs, Congressional Affairs, and the Office of General Counsel into their counterpart operations within the Department. How do you view this recommendation?***

A. There are some functions we have which are common to other elements within the Department of Commerce, and to the extent that economies of scale or efficiencies can be improved, I have no problem with consolidation. I think NOAA should be taking a leadership role in this. One, because we do think we do things well, and two, because we are roughly half of the Department. Three, there are ways that we can assist the other parts of the Department and I think we'll all benefit from that.

Q. ***What are your thoughts on the reorganization of NOAA?***

A. The question pertains to management. It seems to me there is probably an optimum size of units for management purposes. The purpose of reorganization should be to improve our management so that we can better provide service to our users and conduct research in support of those services. I think that from a management point of view there are some changes that need to be made to give us a somewhat more even-handed approach to how we manage the agency.

Q. ***In view of the current budget cuts, what do you feel are NOAA's most important missions; what activities must we keep and what activities might be curtailed?***

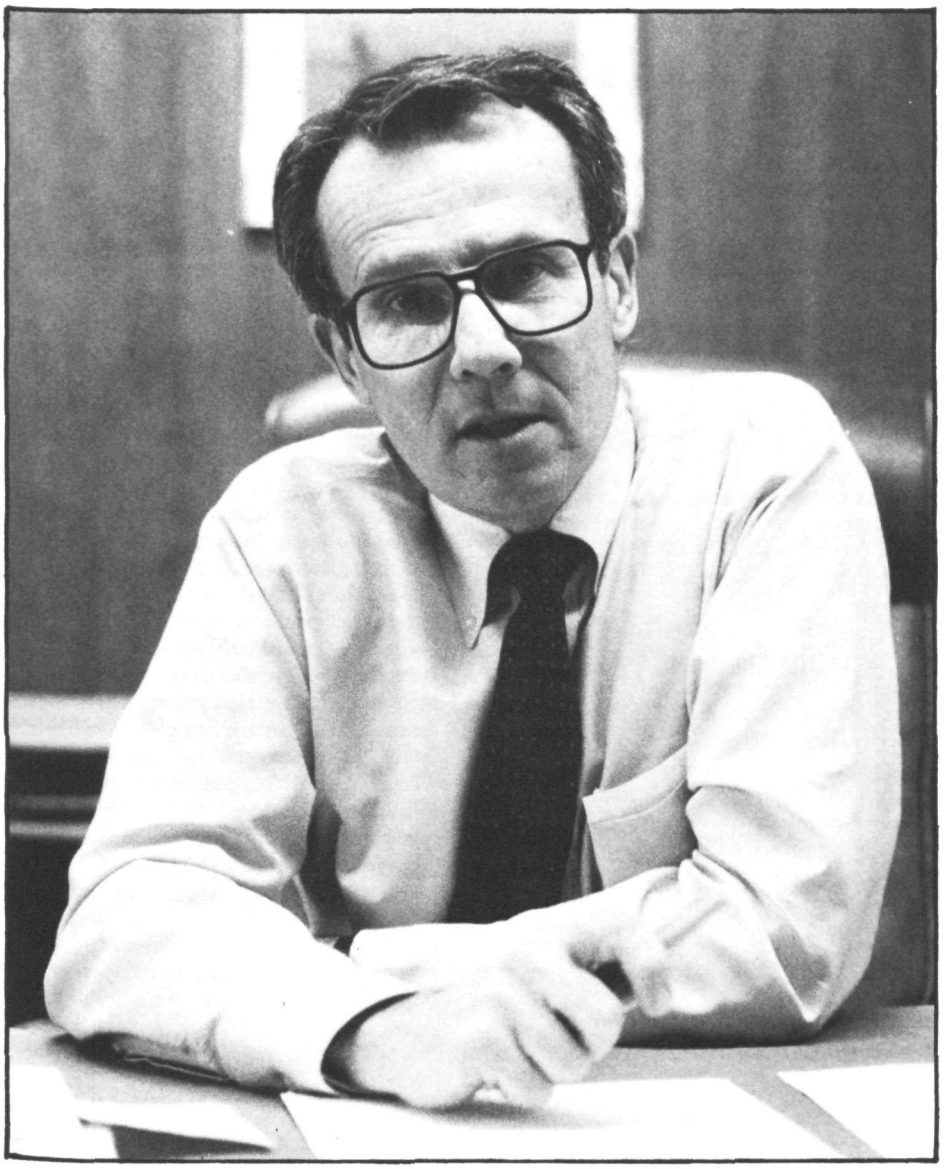
A. At the very top of the list are those missions, those services, that protect life and property. Immediately below are those services which support those civilian operations which bolster the economy of the United States and lead to resource development. I regard NOAA primarily as a service agency which has a scientific research capability that supports the service function. A third element of our activity involves regulation and management. As we change the way we do business, by involving the private sector to a greater extent, I anticipate regulatory and management aspects, with respect to ocean and atmosphere, will increase.

Q. ***Given the Office of Coastal Zone Management's reduced budget, what do you anticipate for State coastal management programs over the next 2 or 3 years?***

A. I anticipate that the coastal zone management program will continue. It will flourish, but in a different way. The coastal zone program is too important to the United States for us to let it diminish. We may need to find other ways of funding the program, however. One of the funding issues that's presently under consideration is so-called "revenue sharing." This is simply another way of acquiring funds for the support of coastal zone managment programs. It's too early to say how that will be resolved.

Q. ***What about the relationship between OCZM and the coastal States?***

A. The relationship between the Office of Coastal Zone Management and the States has been very good. I see OCZM serving as a kind of locus within NOAA for many NOAA-State interactions which may be outside the area of coastal zone management. I'm impressed that the people in the OCZM know very well how State governments are structured, how their politics work. The people of the CZM office really are a pool of expertise that could be used, I think significantly, not only by NOAA but by the rest of the Department of Commerce.



Q. ***You're on the record as a staunch supporter of the National Sea Grant Program. Will the program ever again regain the multimillion dollar muscle that it developed in the 1970's, and how do you see NOAA in relationship to the University Sea Grant Program over the next 5 years?***

A. I am a staunch supporter of assistance to universities; whether or not that kind of support survives as the Sea Grant program that we've known in the past remains to be seen. It's essential that the Federal Government, in whatever way it can, continue to support universities for two reasons. One, universities provide trained womanpower and manpower for the future. Once we shut off the source of trained personnel our progress is going to slow down. We will lose the vitality and new ideas that new personnel bring to the organization. The second thing is that it's very difficult for an operational agency to protect funds for fundamental research. I feel NOAA should continue to support universities—one, for the manpower they provide. Whether the manpower—using the term broadly—ends up within NOAA or some other responsible agency is not that important, just so long as we have the trained manpower. And secondly, we must continue to support that fundamental research which is generally related to our mission.

Q. ***It's been suggested that NOAA get out of the satellite business and turn this function over to private industry. Do you believe this is a realistic option?***

A. It's a potentially realistic option. We're in the process of studying the implications, and the mechanics, of how we might do this first with respect to Landsat. We have a responsibility to provide services to the people of the United States, particularly those services that cannot be provided by the private sector because of the way it's structured. If we do transfer certain services to private enterprise, I suspect that the specifications for those services will be monitored carefully. In the areas that we have been responsible for we will be the monitoring agency.

Q. ***You've spoken of the need for a National ocean strategy. What do you mean by this, what would such a strategy mean for the United States, and what would NOAA's role be in devising such a strategy?***

A. "Strategy" to me involves policy, a plan, and action. We need to bring the various components of ocean activity together to decide the direction in which we should be going and how activities should be coordinated. We see ocean legislation created which sometimes is in conflict with other ocean-related legislation—all of it created for good reason—but often in an isolated fashion so that conflicts develop within a single structure—namely the Federal Government. I think we're smart enough to be able to avoid conflicting laws. The ocean laws we make should be part of our policy, part of our coordinated plan. We are addressing this. There is a group in Washington called the Ocean Principals which consists of the leaders of those agencies involved with the oceans and we are focusing on this very matter of an ocean strategy. What should each agency be doing, how can we help each other, what is a coordinated approach to our uses of the ocean?

Q. ***Maybe an example of where an ocean strategy is needed is ocean dumping—ocean disposal. What is NOAA's role in determining U.S. policy and practice?***

A. Traditionally our role has been one of doing the fundamental research that tells us what happens to materials put in the ocean. I see us continuing to do that. But I think it's clear waste disposal is a fundamental social problem—what do we do with waste? Do we put it in the ocean, do we put it on the land? Whose land do we put it on? Where in the ocean should we put it, what's the best way

(Continued on p. 24)

Impetus For America's Fisheries

Gerald D. Hill, Jr.

In the past, the Federal Government has been so involved in the activities of many U.S. industries that it has, at times, placed a burden on the industries rather than assisting them.

This has been true with the fishing industry. Too often the Government has conducted programs for the industry that the industry should have conducted itself. The result has been in high Federal costs and, in some cases, lower industry productivity.

But this relationship between industry and the Federal Government is changing.

The Reagan Administration is committed to making fiscal changes in the country that will reverse runaway inflation, high interest rates, and high unemployment.

Key elements of the Administration's economic recovery plan involve reduction of Federal spending which will reduce the size of the Federal Government, tax cuts, and removal of unnecessary regulations which burden U.S. business and industry.

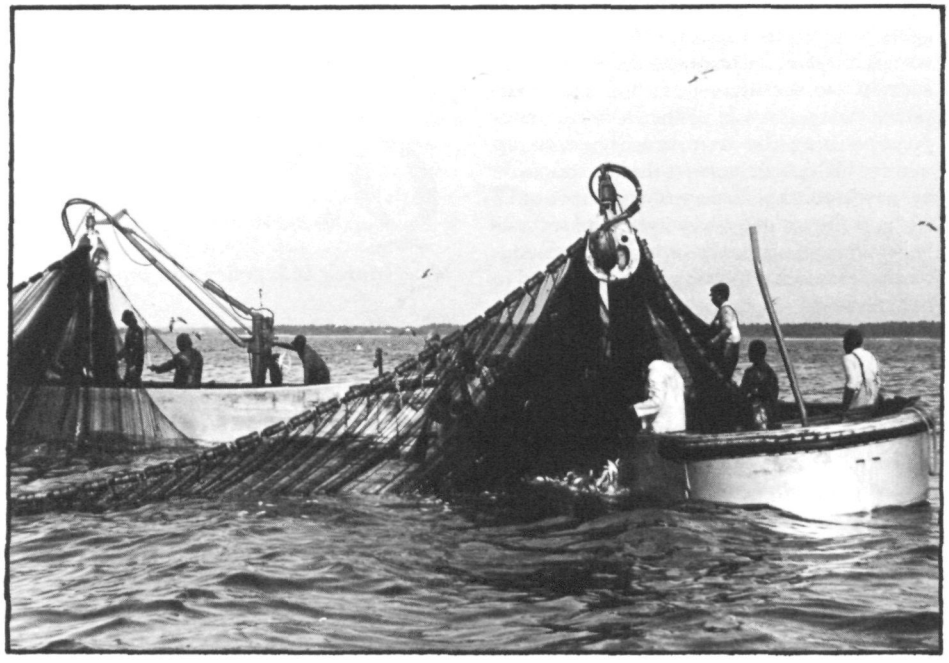
One goal of the U.S. Department of Commerce is to increase the commercial and recreational fishing industry's contribution to the Gross National Product by 40 percent in this decade. Commerce must direct its efforts toward assisting commercial and recreational fishing industries to meet this goal by their own actions without direct government involvement in their activities. Within our notion of federalism, industry, not the Federal Government, should carry the load.

With reduced funding and a new emphasis, Government must determine those functions that are clearly Government and those that should be left to industry.

We need to look at Federal regulations and their effect on industry. Government must develop and implement new and more flexible means of managing the fisheries. If we succeed in these areas, the industry will be able to grow on its own and become more productive in an arena of free enterprise.

With the protected renewable fishery resource available within U.S. waters and close Government and industry cooperation, a stable fishing industry can be maintained to compete effectively in both domestic and foreign markets. ■

William G. Gordon
Assistant Administrator for Fisheries



America has off her shores perhaps the largest fishery resource of any nation in the world, but Americans don't eat as much fish per capita as the people of many other lands.

This paradox has hurt the quarter of a million people involved in the U.S. fishing industry, and has given rise to another paradox—we import far more fish than we export. So many, in fact, that fisheries is the fourth largest item in the country's balance of payments deficit.

But the situation is changing, and the National Marine Fisheries Service is helping industry see that the changes continue. In fact, one of the major goals of the Department of Commerce during the 1980's is to increase by 40 percent the commercial and recreational fishing industries' contribution to the Gross National Product—with fewer regulatory controls, a smaller number of taxpayer's dollars, and less Federal involvement.

"Catch America" was the opening gun in the new Administration's campaign. A million-dollar effort organized by the National Fisheries Institute, the National Fisheries Education and Research Fund, the Food Marketing Institute, regional fishery foundations, and the National Marine Fisheries Service, it began with seminars across the country in March, and culminated with a summer publicity effort tied in to supermarket and restaurant promotions. Points of sale materials, Catch America logos, brochures, posters, banners, and special releases to the news media increased consumer awareness and acceptance of seafood products.

Some of the results:

° Dominick's in Chicago sold 30,000 pounds of shrimp one weekend, and set up a buying plan with a major brokerage firm;

° Bell Stores in Buffalo upped their periodic fish sales from 1,600 pounds before the promotion to 6,000 pounds while it was going on, and have leveled off at 4,000 pounds regularly since then;

° About 100 stores in the South now carry fresh fish where before Catch America they stocked only frozen.

That kind of effort is increasing American use of the resource. A second direction of attack is the effort to boost fisheries exports. Here, too, a successful opening gun.

Sales missions to Europe in September and October 1981 resulted in sales of more

than $11 million of U.S. seafood products, with additional contacts and agreements that could mean an additional $3 million in sales.

Just starts, and the growth potential is enormous. No longer does the U.S. fisherman have to compete with huge foreign fishing fleets off our shores, thanks to the Fishery Conservation and Management Act of 1976. Within the 200 nautical miles of our coasts that constitute the conservation zone, it has been estimated, swims a protected and renewable resource that could be hauled in to the tune of 10 to 15 million metric tons annually. In 1980, U.S. fishermen landed 3.5 million metric tons worth $2.2 billion, while foreign fleets operating under permit caught 1.6 million metric tons. Because of the Act, and the management scheme it set up, foreign fishermen catch only species of no particular interest to American fishermen, or species found in such large numbers that U.S. fishermen cannot take full advantage of them.

Marine recreational fishing is important to the United States because of its popularity, economic contribution, and source of food. In 1975, it is estimated that 16.4 million anglers added approximately $3.5 billion to the Nation's economy. In 1980, the estimate rose to about $6 billion.

All in all, 1980 was a record-shattering year for U.S. commercial fishermen, with new highs set in more than a dozen categories—the American fishing industry landed, processed, and exported more fish in that year than in any previous year in history.

The changes are beginning to make a dent in the negative balance of payments problem. The amount of fishery products imported by the U.S. in 1980 dropped 10 percent from the 1979 figure, to 2.1 billion pounds, while U.S. exports increased by four percent to almost 574 million pounds.

But there's still a long way to go, as that gap between 2.1 billion pounds imported and 574 million pounds exported indicates. The "fish and chips" policy is helping remedy that.

"Fish and chips" means, quite simply, that allocations of fisheries quotas to foreign nations will be linked to their expanded purchases of U.S. seafood products—our fish for their chips.

Under this policy South Korea—one of the big fishing nations in our fishery conservation zone—doubled its imports in each of the past two years, from $7 to $14 million in 1979, to $28 million in 1980. Spain and Taiwan, two other nations whose flags are seen frequently in our fishing zone, doubled imports in 1980 to $6.6 million and $10 million, respectively. Portugal has agreed to import a minimum of $7 million worth of U.S. fishery products—nearly 10 percent of its total fishery imports.

More recently, the U.S. fishing industry has become increasingly involved in joint fishing ventures with foreign nations. By agreement, U.S. fishermen catch species not liked by American consumers and sell them to foreign processing vessels stationed within the 200-mile zone...in 1981 more than $30 million worth to ships from the Soviet Union, Poland, Bulgaria, West Germany, Korea, and Japan.

What's coming up to build on these beginnings, and to help Commerce and the U.S. fishing industry attain its goal? Here are a few things:

- An increase in the number of joint ventures;
- Increased efforts in exports through the "fish and chips" policy;
- Development of a comprehensive national seafood quality improvement program to make U.S. seafood more attractive to foreign buyers;
- Reduction of Federal regulations to increase commercial and recreational fisheries contributions to the gross national product;
- Development and implementation of new and more flexible means of fishery management; and
- Continuation of the "Catch America" program.

The fishing industry has a bright future. With increased exports, expanding joint ventures, fewer regulations, and new and more flexible means of fishery management, the industry has the potential of becoming one of the world's leaders in fishery products. ■

U.S. TRAVEL SERVICE

Weather Services And The Nation's Economy

Don Witten

The life-saving role of severe weather warnings undoubtedly is valued by anyone who has been threatened by a tornado, hurricane, blizzard, or flood.

The day-to-day utility of routine weather forecasts is appreciated by the millions of Americans who used the information to make decisions like whether or not to carry a raincoat to work or shopping.

But it is questionable if many people realize the economic worth of accurate weather forecasts as applied daily in such industries as farming, fishing, and ocean transportation. Such forecasts, when used with other information, help keep production and operating costs down, factors ultimately reflected in lower consumer prices.

The hub of the Nation's weather information collection, processing, prediction, and dissemination operations is NOAA's National Weather Service. Each year, the Weather Service issues more than two million meteorological forecasts and warnings. Thousands of television and radio stations, newspapers, private meteorologists, and other users all over the country utilize this information.

Most of the National Weather Service's forecasts are prepared and disseminated as localized products by the more than 300 weather offices throughout the United States. Many of these offices disseminate additional climate and weather information which, when used with the forecasts, provide a valuable tool for the farmer, fisherman, and sailor in making their daily decisions.

According to Paul Llanso, Weather Service Agricultural Weather Program Leader, "Weather information has always been important to farmers. But it becomes most significant when mated to the results of research in agricultural production. The applied forecasts and operations advice give the farmer key inputs for decisionmaking

"The end result is greater production efficiency and lower costs for the farmer," added Llanso," keeping our food affordable and available."

Research at NOAA's Agriculture Weather Service Center, Stoneville, Miss., in cooperation with local universities, produced one computer model now used by over 2,400 rice growers farming 588,000 acres in Louisiana, Arkansas and Mississippi.

Gene Rench, Meteorologist-in-Charge of the NOAA Center in Stoneville, said that use of the model and forecasts has increased rice yield ten bushels an acre for the participating farmers. This, he noted, accounts for the 14 percent increase in rice grower participation over the past year, with a corresponding increase of 58 percent in total acreage.

The rice production model is based on the fact that rice plant growth is highly correlated to the average daily temperature above 50 degrees Fahrenheit. Here is how it is put to work: Participating farmers notify county agents at the time the rice plants first emerge from the soil. The agents then give this information to NOAA, where it is processed and used as a basis to develop forecasts for individual crops. These forecasts include the time the crops will reach critical stages of development. Armed with this information, the farmers can best decide when to irrigate, flood the fields, control pests and weeds, and even when to schedule harvest.

"Our program is operating in a region which grows two thirds of the U.S. rice crop. I foresee expanded benefits which could ultimately play a significant role in world food production," said Rench.

The dramatic increase in the cost of fuel and oil-based fertilizers and herbicides in recent years has enhanced the value of accurate weather forecasts to the farmer. Now, more than ever, they must make the most economical use of these expensive products in their operations.

The weather can determine the best timing for chemical spraying because certain products often depend upon conditions at that time. Some herbicides, for example, require rain or other moisture to be activated. Pesticides, on the other hand, become less effective when diluted or washed away by rain.

"Weather forecasts save U.S. farmers at least $750 million a year in the production costs of the major commodities such as corn, wheat, soybeans, cotton, and fruit," said Professor James E. Newman, extension climatologist at Purdue University, Lafayette, Ind.

"Michigan's fruit industry uses the weather information to eliminate two to three pesticide sprays a year, saving at least $4 million," said Ceel Van Den Brink, Agri-

cultural Meteorologist at Michigan State University, East Lansing.

This year, Michigan harvested fruit from 123,000 acres of trees including apples, cherries, pears, plums, and peaches. The State is the tart cherry capital of the world, and usually ranks third in the Nation for apples of all kinds.

Accurate forecasts of minimum temperatures also are as vital to the Florida and California fruit grower as they are to the asparagus farmer in Illinois when it comes to cold weather. With 24 to 36 hours advance warning of frost or freezing weather, these farmers can harvest early to save their crops.

Reliable cold weather warnings not only save crops, but they help conserve diesel fuel and electricity for heaters and blowers by indicating when they are needed to ward off the frost.

In Maine the fight against the potato blight is aided by a computerized system that tracks the temperature and wetness of the potato field. This data makes it possible to provide more accurate predictions of the blight, a disease related to excessive temperature and humidity. Consequently, there are fewer unnecessary and precautionary applications of expensive pesticides today than in the past.

Predictions of low temperatures have proved valuable to potato transporters. "It has been estimated that at least $100,000 dollars was saved last year, in Maine, when potato bruising was curtailed," according to Augie Sardinha, Agricultural Meteorologist at the National Weather Service office in Portland.

"Potato 'bruises' occur when they are exposed to freezing conditions," Sardinha explained. "Now, transporters can know when to use covered troughs to protect potatoes which are being trucked to processing plants," he continued. "The total savings to the transporter could reach $500,000 next year as more farmers use this piece of weather information," he added.

Weather forecasts help save energy and money in other ways. With advance notice of a coming rain, a farmer might decide not to irrigate, saving electrical costs of running the water pumps. Timely weather forecasts also help farmer eliminate unnecessary tractor trips to the crop fields, conserving many gallons of precious fuel. A field in need of cultivation, for example, often can wait a few days when the farmer knows that it is going to rain. Knowing that it will rain, saves the energy used in eliminating weeds that would only spring up days later.

Accurate, fast weather services are critical to agricultural activities such as harvesting (opposite page) and spraying (below).

The Waialua Sugar Company on the island of Oahu in Hawaii credits meteorological forecast information with saving $1 million each year in its harvest operations.

When ready for harvest, sugar cane is first set on fire deliberately and the remains are then gathered and hauled to the mill. Tactical procedures for burning a particular field depend heavily on wind direction and speed. Burning also must abide by State and Federal air pollution regulations.

After burning, the sugar cane remains must be harvested within 24-36 hours to avoid spoilage. Any significant rainfall during this critical period interferes with the movement of the heavy harvesting vehicles in and out of the fields. Rain also hastens the deterioration of the burned cane.

In a typical harvesting operation, 50 to 100 acres of sugar cane are burned at one time, leaving about $350,000 worth of burned cane lying on the field at the mercy of the weather.

Before 1960, cotton farmers in the Mississippi Delta region of the United States planted their seed as early in the spring as possible. If a cold snap wiped out the seed, the farmers replanted—often several times—until a crop emerged. Seed, fertilizer, and labor costs were a comparitively small investment.

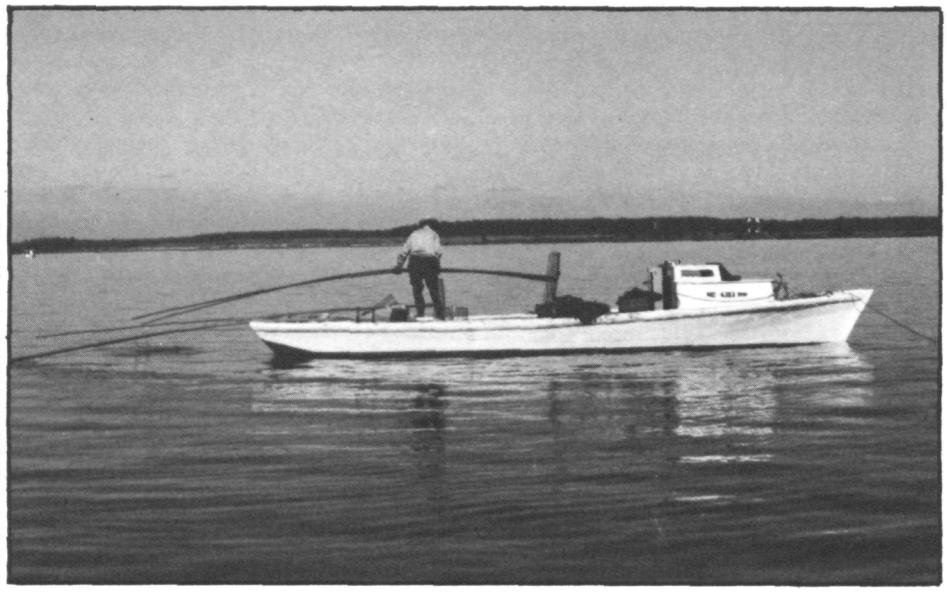
When the use of complex machinery replaced hand labor for cotton production in the early 1960's, costs increased dramatically and the weather factor could no longer be ignored. It became necessary to schedule cotton planting more efficiently through application of a combination of climatological, current observations, and weather forecast information.

Today, information on the soil temperature and 5-day weather forecasts allows these farmers to plant their cotton seed with good assurance that it will emerge the first time. The estimated savings for the cotton growers in southeast Missouri alone was about $1 million in 1970.

Accurate information on the relative humidity at harvest time also proved valuable to the cotton grower—about a $35 increase in value per bale. Using the Weather Service's humidity forecast, harvesting was restricted to lower humidity days because the cotton contained less moisture and won't deteriorate as quickly while baled and stored in wagons waiting for processing at the cotton gin.

Just as inland offices adapt forecasts to farmers and others in their region, the coastal Weather Service offices provide marine forecasts for the fishermen and others who make their living on the ocean. Accurate marine forecasts from these offices help the fishermen outmaneuver poor weather in protecting not only their lives and ships, but their valuable catch as well.

"There were over 1500 registered commercial fishing vessels of all sizes plying the New England waters in 1980. They caught 788 million pounds of fish of all types that



DEPT. OF CHESAPEAKE BAY AFFAIRE

MARYLAND PORT ADMINISTRATION

Mariners of all types, from the Chesapeake oyster dredger (top) to the skipper of a sleek container vessel, need the best weather information for safety and economy.

year, valued upon return to port at $327 million," said Patricia Kurkul, economist for NOAA's National Marine Fisheries Services at the Northeast Regional Headquarters in Gloucester, Mass.

The smaller New England fishing vessels depend upon the day's weather forecast received in port to decide whether or not to sail. Accurate forecasts allow them to gain the maximum number of fishing days.

"Often, the extra time at sea can mean the different between staying in business and going broke for some of the fishermen with small boats," said Duncan Amos, Commercial Fisheries Specialist at the University of Rhode Island.

The larger New England vessels travel to fishing grounds 200 miles off the coast and may remain at sea for up to 9 days. Generally, these fishermen will ride out rough weather on the fishing grounds.

The ideal situation for the larger vessels is to stay on the fishing grounds long enough to fill their holds and return to port without delay so that the fish will not deteriorate and diminish in value. Accurate weather forecasts help the vessel's captain to decide when to head for port without getting caught in a storm. Fighting headwinds can delay a vessel several days.

"Not only do the forecasts help these fishermen protect their valuable catch, but the weather reports also help them preserve their precious fuel," said Amos.

New England fishing vessels ranging in size from 50 to 200 tons use from 10 to 22 gallons of fuel an hour.

One significant measure of the value of accurate weather forecasts to the fisherman is the success of an expanding marine weather program in which the fishermen are volunteering to observe and report weather and sea state conditions to the National Weather Service.

"Thanks to the cooperation of the commercial fishermen, we are able to improve the quality of our forecasts to the mutual benefit of all concerned," said Paul Jacobs, Chief of the Marine Weather Services Branch at National Weather Service headquarters.

"The thousands of fishing vessels operating within the 200-mile fishing conservation zone along our coasts represent a wealth of previously untapped weather information," Jacobs added.

"In many places, fishermen are the only source of information. They see their participation as a self-help program. The payback is more reliable marine forecasts and greater responsiveness by the Weather Service to changing weather conditions. That means cost savings," Jacobs said.

To date, the Mariner Reporting or MAREP program covers the northern Gulf of Alaska and waters along the Aleutian Islands, the coastal waters of Washington and Oregon, and the southern New England fishing grounds 200 miles out to Georges Bank and as far south as Cape May, N.J.

Word of the success of the New England reporting program, established in August 1981, already is spreading. Fishermen in Maine are now interested in establishing a similar program in their area and efforts are underway to involve charter boats in South Carolina. Jacobs hopes that the MAREP program can be extended to all major fishing centers around the country.

Good weather forecasts are as valuable to the marine transporter as they are to the fisherman. The daily operating costs of a large vessel can run as high as $50,000 a day. Berthing space and stevedore services, costing many thousands of dollars, must be contracted in advance and paid whether used or not. Thus, immediate dollar savings can be realized by any marine forecast or weather warning that aids a vessel in reaching port on time.

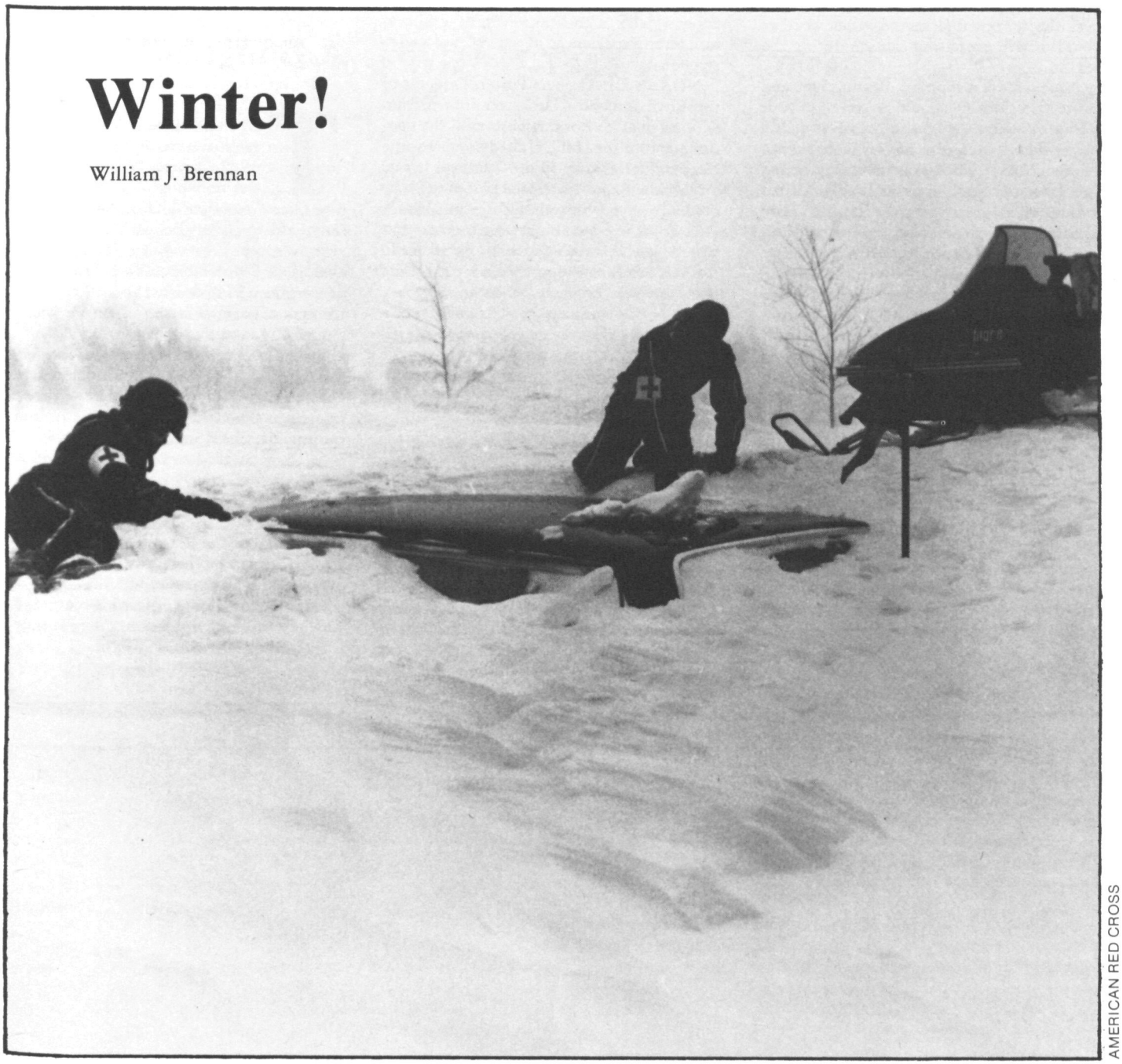
Marine forecasts produced by the National Weather Service daily help the captains of ocean vessels make decisions involving costs. Waves of greater than 15 feet require a cargo ship at sea to reduce speed to prevent damage to the ship's hull or cargo. Based on the marine weather forecast, the ship's captain often must decide whether or not to circumnavigate a possible storm or to proceed on the most direct course and risk the consequences.

According to Dr. Richard E. Hallgren, Director of the National Weather Service, "good weather forecasts are inflation fighters whose value to many industries can be measured in terms of dollar savings."

"In a free market place, this usually means lower prices for the consumer," added Hallgren. ■

Winter!

William J. Brennan



AMERICAN RED CROSS

White snow softly blanketing the earth, hiding its defects and muffling sounds in a mantle of purity and calm. Ice shimmering on the surface of the pond where skate-clad youngsters glide effortlessly. Frosty mornings opaquing the windowpanes with intricate, unreproducible patterns of beauty.

White snow clogging the roadways, sending cars skidding, and moving drivers to snarls and curses. Ice shimmering on the sidewalk where overcoat-clad pedestrians creep awkwardly, and fall heavily. Frosty mornings coating the windshields in solid panes of ice, defiant to the plastic scraper.

Winter. A state of mind as much as a climatological phenomenon.

Perhaps only two unarguable statements can be made about winter; by its very nature it gives rise to arguments—See the related story, "Worst Winter"—and also by its very nature it can take claim to being the year's most dangerous season.

There's no dispute about the latter. Cold, hard statistics, as cold and hard as winter weather can be in some parts of our land, show winter's cold a deadlier killer than heat waves, hurricanes, tornadoes, lightning, or earthquakes. A projected 450 persons are expected to be killed by cold weather this season, based on the 10-year average for the years 1969 through 1978.

The tragedy is that simple common sense could prevent many of the deaths.

That's the comment National Weather Service Director Dr. Richard D. Hallgren makes when he cautions that special safeguards are called for in winter.

"Whenever the Weather Service issues a winter storm watch, you should reconsider carefully whether you have to be out in the elements," Hallgren says. "And when the watch becomes a warning—meaning severe weather conditions are imminent—people should not go outside at all."

The casual attitude with which so many of us face winter undoubtedly accounts in part for the apparent increasing numbers of cold-related deaths. So, too, some experts believe, does the fact that the Nation's population is getting older, and that older persons are more sensitive to the effects of low temperatures.

The secret to avoiding winterkill includes planning for potential severe winter weather coupled with exercising caution during the season.

Adequate food supplies, heating fuel, and protective clothing should be stored in your home, ski lodge, or hunting camp in case a blizzard or ice storm maroons you there for a number of days. The risk, of being marooned is greater, of course, if you are in a rural area when a blizzard strikes, than it is if you live in a metropolitan area. But residents of Chicago, Buffalo, and even Rockville, Md., don't have to think too far back to remember winter storms that clogged their streets, closed down neighborhood food and drug stores, and for all intents and purposes cut them off from many essential supplies for several days. Now if you live in Miami, Phoenix, or San Diego, it's another matter, but how many of us do?

Even bronzebodies from those cities and others relatively immune from winter's ravages do on occasion travel by car in areas where winter storms are a reality. And they, just as the rest of us, should be sure their cars are "winterized" in more ways than one. The vehicle, itself, should have received checks of the brakes, tires, fuel system lights, windshield wipers, exhaust systems and antifreeze levels. And the trunk should have been "winterized" by the addition of tire chains, a shovel, extra warm clothing, blankets or sleeping bags, a first aid kit, a flashlight that works, candles and matches, and bags of sand or gravel for tire traction in ice or snow.

While all these items may add a somewhat ungraceful droop to the rear end of your car, you'll be glad they're close at hand should you get caught on an open highway in a blizzard and be forced to spend a day or night in the car.

Should that happen, remember three things: resist the temptation to leave the car and walk to safety; conseve the car's fuel by running the engine only intermittently; and, keep a window cracked open so you don't run out of oxygen. It's a good idea, too, to clear away snow from the car's exhaust pipe periodically, to prevent chances of carbon monoxide poisoning.

Finally, if you're outside on foot during winter, dress appropriately. Thin layers of wool clothing trap body heat but permit air to circulate. Additionally, if you begin to perspire—an open invitation to frost bite—you can remove one layer without giving up all your protection.

No matter how good a head of hair you may have—and some of us may be found wanting in that department—you should wear a hat in winter. Heat escapes quickly from the top of your head, and a hat will slow down this loss. Gloves and warm footwear, obviously, are called for, as well.

Regarding this business of being outside on foot in wintertime, a phenomenon recognized by skiers and winter hikers, but not really appreciated by others, is deserving of mention. This is the "sudden cold" phenomenon; a quick, significant drop in temperature often experienced at the onset of a winter storm.

NOAA's Dr. Thomas Potter, Director of the Environmental Data and Information Service, says it's not uncommon in the continental interior of the United States for the temperature to drop 40 to 50 degrees in just a few hours, and that folks planning to be outdoors all day long should dress as if they were going to be in a colder region than that where they're walking or hiking. Hikers in the Virginia Blue Ridge, for example, should dress for New England weather.

While it's unlikely we'll experience a situation similar to that recorded in Rapid City, S.D., on Jan. 10, 1911—when the temperature plunged from 55° F. at 7 a.m. to 8° F. at 7:15 a.m.—any of us could be fooled by a rapid temperature drop.

We could be fooled, too, by relying too much on what our thermometers show. Just because the sun is shining brightly and the thermometer registers 35, for example, doesn't mean we can forego wearing warmer winter clothing. What's the wind speed? A 20-mile wind with a 35 degree temperature has the same chilling effect as an actual temperature of only 12 degrees. Remember wind chill; the acceleration of heat loss by the wind passing over exposed flesh. NOAA Weather Radio provides wind chill, and other vital weather information routinely. Listen to it. ■

A Dangerous Time

The most up-to-date data available is for the 30 years from 1949 through 1978; a period during which 10,655 persons died from "excessive cold" in the U.S. That averages 355 a year. But look at the 10-year averages: 1949 through 1958, a yearly average of 266 deaths; 1959 through 1968, an average of 346 deaths; and, 1969 through 1978, an annual toll, on the average, of 454 fatalities.

If that isn't convincing enough, consider this: in 1949 some 185 persons died in the U.S. from "excessive cold." In 1954, the figure was 230. In 1969 it rose to 357, and continued upward in 1966 when it was 365. The year 1972 saw 490 deaths, and in the last 2 years for which figures are available, grim records were set; 634 deaths in 1977 and 652 in 1978.

The total of the last 2 years of the 30-year period, 1,286, is more than 10 percent of the entire 30 years, 10,655, and in those 2 years the death rate equaled three persons per million population, the first time it ever exceeded two per million.

NEWSDAY, LONG ISLAND

Worst Winter? Take Your Choice

Winter by its very nature gives rise to arguments. Perhaps the second favorite indoor sport during winter—the first, of course, is watching television—is arguing about what part of the Nation has the worst winters.

This is a discussion of which NOAA's people at the National Climatic Center in Asheville, N.C.—depository for weather and climate records of all sorts—want no part whatsoever. They're smart enough to know that the harshness of winter is all relative, and that determining what area has the worst weather depends to a large extent on how you measure it; coldest day, longest cold spell, greatest snowfall, heaviest snowfall within a given period of time, extent of property damage, *ad infinitum.*

Is a -60° F. temperature, as recorded in Parshall, N.Dak., on Feb. 15, 1936, worse than 47 consecutive days when the temperature doesn't rise above zero except for a few hours of one day, as happened in Amenia, N.Dak., during the winter of 1936? Is either as bad as 8 days during one month when temperatures never were higher than -15° F? That's recorded for Fort Snelling, Minn., in March 1843.

Try telling eastern Massachusetts residents that frigid temperatures make for the worst winter weather, however. They'll come right back with statistics about the blizzard of the century for their area, in early February 1978. Heavy snowfall with northeasterly winds exceeding 125 miles an hour, and severe coastal flooding. More than 1,000 coastal homes flooded, 23,500 persons evacuated to temporary shelters, and a 1-week ban on all traffic. Now that's winter weather!

Unless you happen to live in Buffalo, and everyone knows what kind of winter weather blows in off Lake Erie.

Isn't it at least possible to state unequivocally that the northern Great Plains had worse winter weather than anywhere else in the U.S.? Only maybe. What about the Blizzard of '88 when Washington, Philadelphia, New York, and Boston all were cut off and immobilized; drifts 30 to 40 feet deep covered houses in New York State and southern New England, and hundreds of towns literally were buried in snow from Maine to Maryland?

While NOAA statisticians working with weather records refuse to be drawn into the controversy, they do provide specifics you could use to tip an argument one way or the other.

To wit: the lowest temperature ever recorded in the U.S. was -78° F., observed at Prospect Creek Camp in the Endicott Mountains of Alaska on Jan. 23, 1971. In the lower 48 states, Rogers Pass—148 feet below the summit of the Continental Divide in Montana—experienced -69.7° F. on Jan. 20, 1954.

The lowest annual normal temperature for the 48 states is 29.6° F. at Mount Washington, N.H., a peak notorious for its sudden and dangerous changes in weather, on which hikers have died of exposure in the middle of summer. The lowest winter normal temperatures are in northwestern Minnesota (5.3° F.), and Langdon Experimental Farm in northeastern North Dakota (5.6° F.). ■

Mineral Treasure From The Galapagos Ridge

Jack Stringer

An undersea ore deposit worth at least $2 billion has been discovered at a depth of 8,500 feet in the eastern Pacific Ocean off the coast of Ecuador by Dr. Alexander Malahoff, Chief Scientist of the National Ocean Survey.

He and other scientists from NOAA and the academic community mapped the deposit during a 3-week investigation in which they studied the dynamics of mineral formation of the rifts and fractures of the Galapagos Ridge, an underwater ridge about 200 miles east of the Galapagos Islands. An impressive array of samples weighing 240 pounds was brought back to Washington. They were found to contain copper and silver, a large percentage of iron sulfide, plus vanadium, tin, and other metals.

"The samples Dr. Robert Embley and I brought back from the Galapagos Ridge," Malahoff said, "represent probably 80 percent by weight of all the massive submarine polymetallic sulfides collected so far, and include the largest samples ever collected by a submersible." He explained that polymetallic sulfides are metallic precipitates on the ocean floor and are formed through hot water or hydrothermal activity along ocean floor vents.

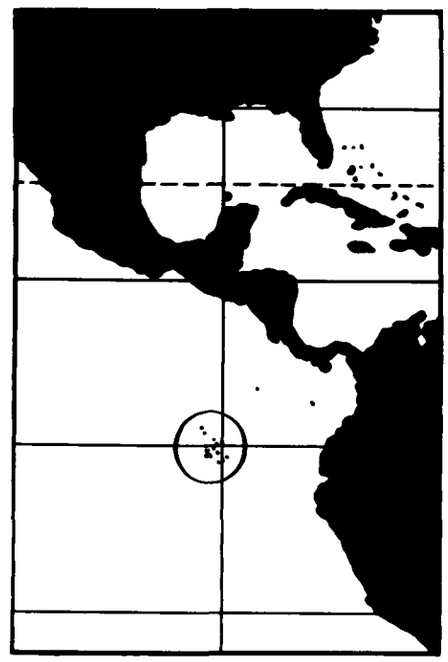
The Galapagos Ridge, a segment of the worldwide rift system, is an eastward extending branch of the East Pacific Rise within the Pacific Basin. Malahoff has covered only a few miles of the rift system in the Galapagos area when he discovered the massive deposit of polymetallic sulfides along a fault of the rift valley.

The samples were recovered through the use of Alvin, the famous Navy submersible operated by Woods Hole Oceanographic Institution—the only submersible in the world capable of picking up the large samples that Malahoff now has in his office in Rockville, Md.

Compared to a copper deposit on land, which may be 1 or 2 centimeters in thickness, the Galapagos deposit is about 656 feet wide and about 3,000 feet long and 100 feet thick. Because the deposit is so concentrated, Malahoff estimates that there are 26 million tons of this material which contain about 10 percent copper worth perhaps several billion dollars. The mineralogy and crystallography of this deposit is very similar to that of many continental sulfide deposits now being mined.

Malahoff said the discovery was made by using very detailed bathymetric maps produced by the U.S. Navy for the Office of Naval Research in the mid-70's. "We zeroed in on two faults, as potential sites for polymetallic sulfide deposition," he said, "and followed up our ideas by using the submersible Alvin." NOAA's Manned Undersea Science and Technology Office helped make this possible.

The sulfides were formed through venting of heavily mineralized, superheated water along a series of what are called "smokers" or "stacks," that have the appearance of chimneys. These chimneys, some of which are as high as 60 feet, are formed of sulfides, and are located along the sloping fault face in what may be described as a forest of coalesced stacks. The deposit found by Malahoff in the Galapagos Ridge valley is so far the most extensive submarine polymetallic sulfides deposit of this kind found in the world.



"Previous to our dives," said Malahoff, "it was generally considered that the sulfides were formed along the axis of active rift segments. In other words, as the crust opens up, hot water comes up through the ocean floor and precipitates a deposit, but the volume of the sulfides that were found at 21° North along the East Pacific Rise was not particularly great. It wasn't until we started exploring the marginal faults that we found the massive deposits."

In June, Malahoff had completed a survey of the Gorda/Juan de Fuca Rift systems located 70 and 180 miles off the coasts of Oregon and Washington, respectively. "These rifts are segments of the East Pacific Rise system," he said, "and show elements of geological structure that are very similar to those of the Galapagos."

Based on the scientists' geological analyses, Malahoff suspects that the Gorda and Juan de Fuca rifts are also possible sites for polymetallic sulfide deposits, and he is planning a 1982 expedition to the ridges. He will use a new technique called SEABEAM, to locate the sulfide sites. This particular technique produces real-time shipboard contoured maps of the ocean floor, thereby providing what may be called a very high-resolution road map that can guide NOAA scientists to potential sulfide sites.

"The concentration of the metals that we may find in the sulfide deposits together with the possibility that these deposits may occur in very rich concentrated bodies," Malahoff said, "could mark a dramatic turnaround in our assessment of the volume of accessible worldwide deposits of minerals such as copper, zinc, tin, and vanadium."

In comparing sulfides and manganese nodules, Malahoff said that the big distinction is that sulfides are formed very rapidly—probably within the space of a few hundred or a thousand years—and they are formed from the emanation of hot fluids along fissures of the mid-ocean ridge areas. The manganese nodules, however, may take up to a hundred thousand years to form and are formed on the floor at deep ocean basins by the slow growth of manganese and other metals around such objects as sharks' teeth.

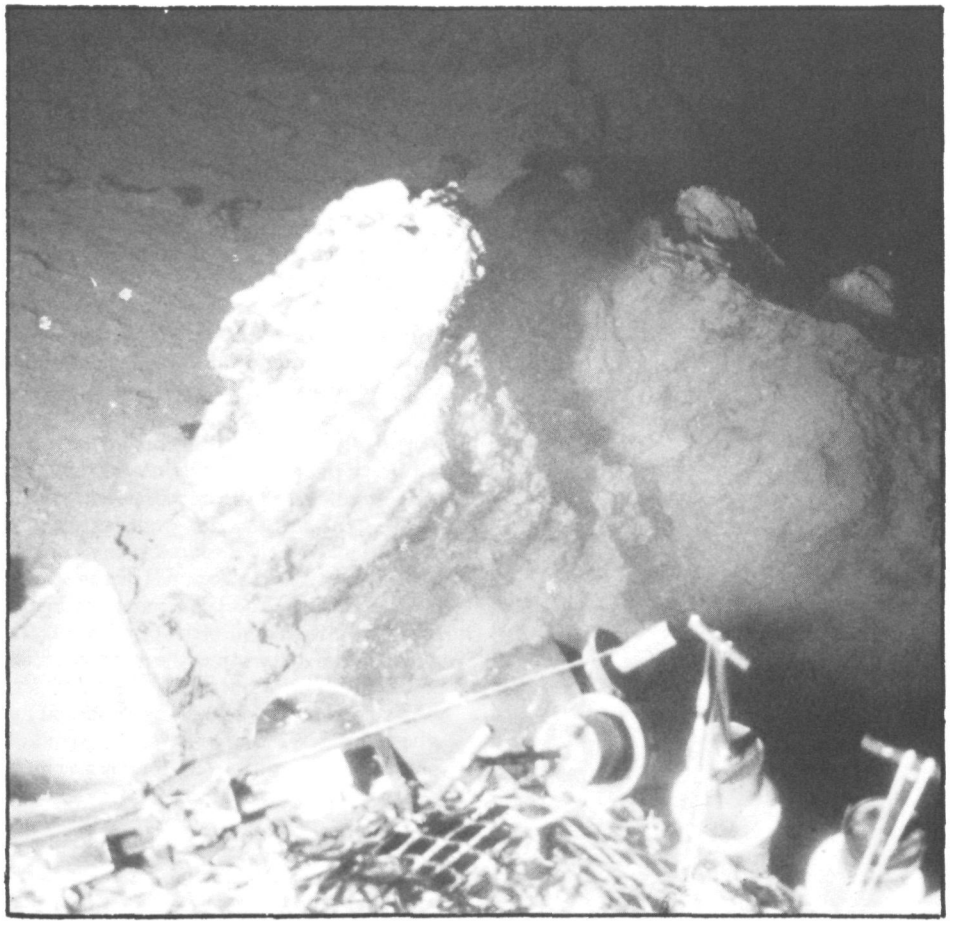
"The mineralogy of the manganese nodules is different from that of the polymetallic sulfides," he said. "The sulfides are richer in

copper, zinc, silver, tin, and lead."

Malahoff insists that the technology for underwater mining is available. "We could accomplish mining within ten years; but the practical aspect of ocean mining is bound up with the Law of the Sea and other international considerations that are difficult for us to address at this time."

On the other hand, Malahoff said that until now the United States hasn't had the tools to look at the geological settings on the ocean floor for these types of deposits. "Out in the open ocean, for instance, even with satellite navigation, your positioning can put you a mile out of the way in the Pacific and when you're trying to find a deposit that's only three-quarters of a mile long, it is easy to miss it." He said that access to the ocean floor is now a reality via the submarine guided by the maps produced with sophisticated systems such as SEABEAM.

Malahoff dismisses the idea that dredging could be a problem at 8,500 feet. "The problem right now," he said, "is to have a massive enough dredge that is capable of breaking up the minerals and bringing them to the surface. The technology of mining manganese nodules, for instance, is already perfected for 18,000 feet. ■



Dr. Alexander Malahoff shows a large polymetallic sulfide sample taken from an 8,250 foot depth on the Galapagos Rift, 350 miles west of Ecuador.

Is Long Island An Island?

Roland D. Paine

Everybody knows that the common dogwood tree bears a big white flower—the state flower of Virginia and North Carolina.

Sorry about that, everybody. The common dogwood bears a yellow flower, so tiny that it is hardly ever seen. The thing that looks like a big white flower is a bract.

Now comes the smallest State in the Union, the one with the longest name—the State of Rhode Island and Providence Plantations—to say that Long Island isn't an island.

The United States, for its part, contends that New York's East River isn't a river.

As further evidence that things are not always what they seem, the court case in which this geography is being thrashed out is called, for reasons too long to go into here, the United States v. Maine.

Into this definitional dust-up have stepped NOAA's R. Lawrence Swanson, Charles A. Parker, and Michael C. Meyer, plus American University's Michael A. Champ, now on a temporary assignment with NOAA. Among them, the doughty four possess two NOAA Corps commissions, two PhD's, innumerable maps and charts, and a library of books of history, linguistics, science, and poetry.

At issue is jurisdiction over 172 square nautical miles of the Continental Shelf. If the United States wins, it gets to regulate the fisheries and other activities there. If it loses, the State of Rhode Island and New York (yes, New York—not Maine) get to split the take, run the area according to their State laws, and derive tax revenue therefrom.

And a fundamental issue is whether or not the East River is a river.

When Long Island's status as a real island was questioned in court, a NOAA team helped define some basic geographical terms. In this photo by NASA's Landsat satellite the disputed area is in the upper portion of the picture where Long Island Sound and the East River separate Long Island from the mainland.

To understand this, you've got to know that the territorial sea—which extends from the coast 3 nautical miles—is under jurisdiction of the States. Beyond that, out to the 200-mile limit of the fishery conservation and management zone, the waters are under the jurisdiction of the Federal Government.

When you draw a line (normally the mean low water line) along the coast to determine where the territorial sea begins, every so often you come to a body of water—the mouth of an estuary as the Chesapeake Bay, for example. So then you usually draw a line from one headland to another, and that is called the closing line; that's where the territorial sea is measured from the waterway.

All these years the closing line from the tip of Long Island has gone to Plum Island and Fishers Island, thence to Napatree Point, Rhode Island. The United States considers Long Island to be an island, and Long Island Sound as historic inland waters.

No, says Little Rhody, Long Island is part of the mainland, because it is separated from Manhattan Island by a river, the East River. The closing line therefore should shoot out from the tip of Long Island in one of several possible ways, including going from Long Island to Block Island and then to Point Judith, R.I. This would put the territorial sea quite a bit further out to sea, and so extend state jurisdiction over the continental shelf.

Well, think about it. If East River is a river, then isn't Long Island part of the mainland? Islands aren't separated from the mainland by rivers; they're separated by bays, or straits, or sounds, or bights, or large stretches of sea that may not have a generalized appellation.

So if the East River isn't a river what is it? And what about the Harlem River, which also helps delineate Manhattan Island?

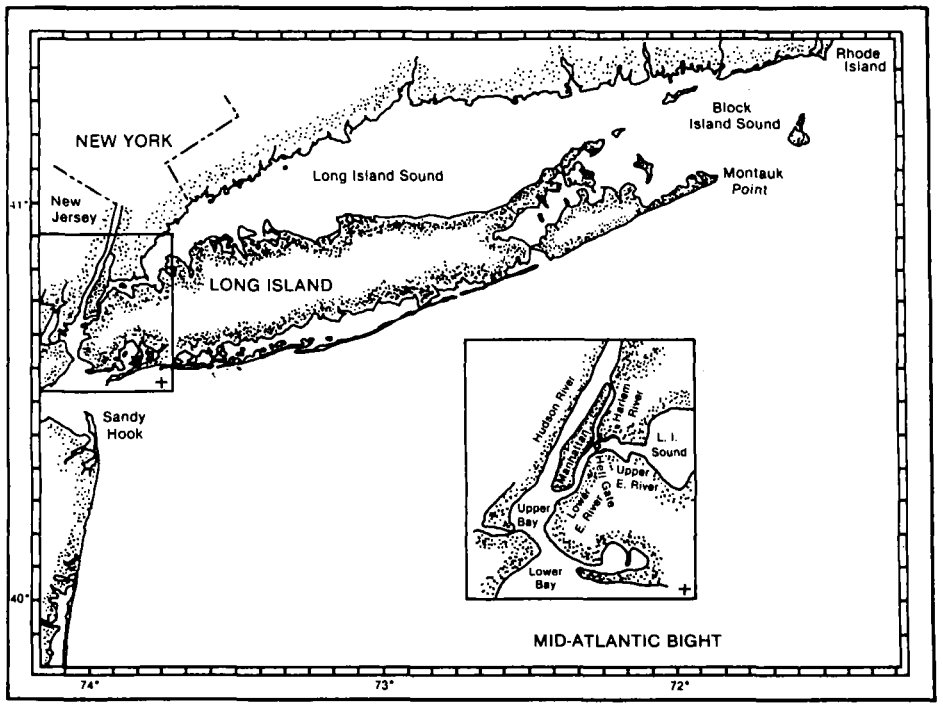
Says the United States: the East River is a strait, and so's the Harlem River. And Long Island is too an island.

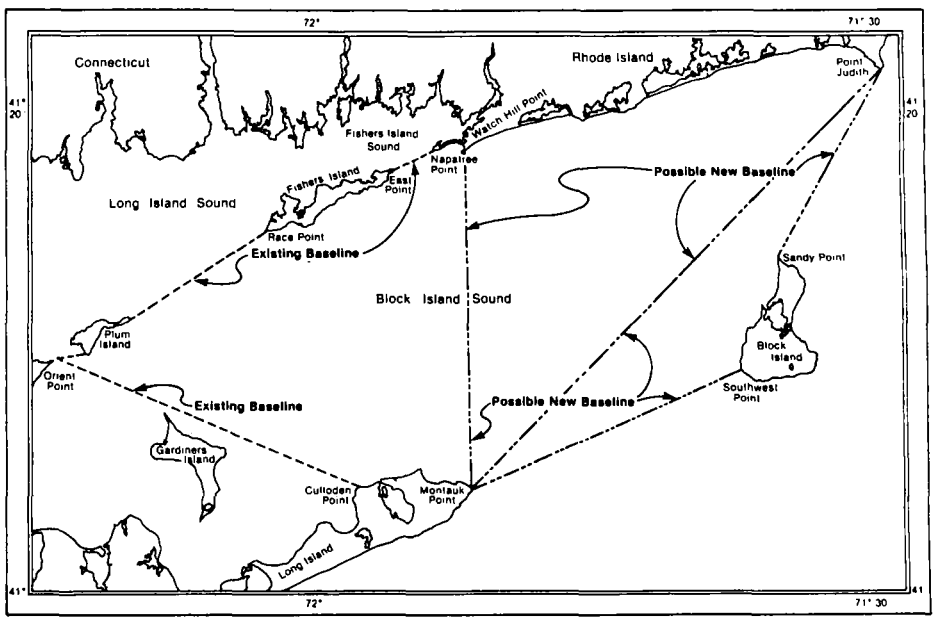
The case may ultimately be settled by the application of any number of principles, including physical characteristics, historical usage, local custom, and government and institutional ties between Manhattan and Brooklyn. Larry Swanson and friends became involved because the Department of Justice asked NOAA to review the physical characteristics and determine the nature of the bodies of water in question.

If you have never had any doubts about whether a river is a river, or an island an island, ponder what they found, and published in a 44-page paper.

The East River is slightly less than 14 nautical miles long. At one end, it joins western Long Island Sound at a point on the mainland called Throgs Neck. At the other

Charts of the New York coastline show Long Island and details of the waterways in question, and the existing baseline as well as several possible new baselines. If the baseline was redrawn, New York and Rhode Island jurisdiction over territorial waters would be extended eastward to include valuable ocean areas now regulated by the Federal Government.





end, in the vicinity of The Battery and Governor's Island, it joins New York's Upper Bay, which opens out into the Lower Bay and the Atlantic Ocean. The incoming tide at Throgs Neck has a range about 1 meter greater than the incoming tide at The Battery, and it comes in about 3 hours later. The East River's tidal cycle is derived from those two tides.

The Harlem River is a channel something over 6 1/2 nautical miles long connecting the Hudson River at the north end of Manhattan Island with the East River near Hell Gate (from the Dutch "Helle Gat," or "hole through hell"), a natural rock sill that divides the East River almost exactly in half. It was an appropriate designation in the early days when rock reefs, swift currents, and a tortuous channel made navigation extremely dangerous. That was before the Corps of Engineers removed enough rock to facilitate shipping.

The area was settled by both English and Dutch, so terminology got gummed up from the very beginning. The Hudson River used to be called the North River. And the Dutch—in *Remonstrance of New Netherland*, 1649—referred to the East River as bordering the north side of Long Island; in other words, what we now call Long Island Sound.

A lengthy review of the definitions of river, strait, stream, channel, and river outflow led the Swanson team to conclude that a river is generally accepted as having a fresh water source, flowing generally in one direction controlled by the difference in elevation between source and mouth; in cases where the downstream current is affected by tides, there is no net salt transport upstream.

Their working definition of a strait is a relatively narrow waterway connecting two larger bodies of water in which water movement is determined by the interconnected bodies.

If you've been paying strict attention, you now have a clue as to how all this comes out.

They conducted a lengthy analysis of currents and tidal flows in the East and Harlem rivers, and found them to be controlled by the tidal wave that moves from the Bay into the Hudson River, on the one hand, and by the primarily standing tidal wave in Long Island Sound.

They found no flow generally controlled by difference in elevation.

And they found salt water being transported against the flow of the fresh water.

So their conclusion: "It is with confidence that we state that, based on the physical processes, the East and Harlem Rivers are straits. It is also nice to know that as a result of these findings Long Island is still an island and not part of the mainland."

Which takes care of everything except the poetry book.

From that, the learned quartet excerpted, from *Crossing Brooklyn Ferry*, Walt Whitman's lines:

Others will enter the gates of the ferry and cross from shore to shore,
Others will watch the run of the flood tide,
Others will see the shipping of Manhattan north and west and the heights of Brooklyn to the south and east,
Others will see the islands large and small;
Fifty years hence, others will see them as they cross, the sun half an hour high
A hundred years hence, or ever so many hundreds years hence, others will see them,
Will enjoy the sunset, the pouring-in of the flood-tide, the falling-back to the sea of the ebb-tide. ■

Atmospheric Echoes At Poker Flat

Louise Purrett-Carroll

A powerful new radar to probe into the upper reaches of the atmosphere is nearing completion in Alaska. It, and others of its kind, will provide the means for more accurate weather forecasts and warnings, understanding the effects of pollution, or guiding planes into fuel-saving tailwinds. The ultimate benefits, say NOAA scientists, could be enormous.

The radar, designed at NOAA's Aeronomy Laboratory and built with funds from the National Science Foundation, has been in partial operation for 2 years. It has already produced new—and sometimes puzzling—information on how the atmosphere works. Located on the University of Alaska's research range at Poker Flat, it is a delicate-looking mesh of poles and cables strung across nearly 10 acres of Alaskan meadow. Sixty-four small white sheds provide power for the pulses of energy this giant antenna sends into the atmosphere.

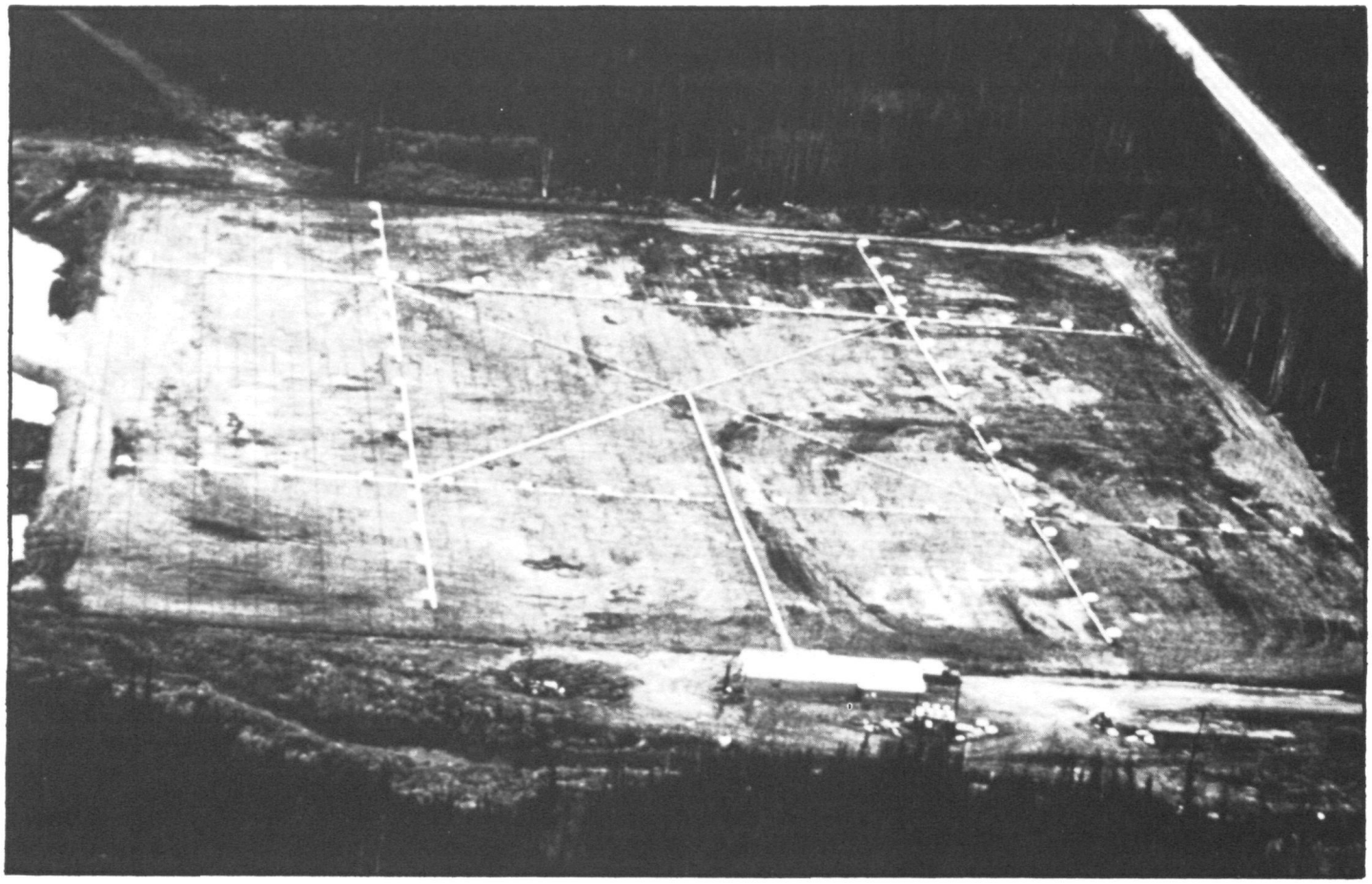
It is actually three independent radars, each projecting beams upward in a different direction. Measurements of wind velocities along each beam provide a three-dimensional diagram of the wind field. The Poker Flat radar is a special type of radar called MST (mesosphere-stratosphere-troposphere). It looks skyward into the troposphere (the lowest, or "weather layer" of the atmosphere), the stratosphere, and the mesosphere (the tenuous region that begins at a height of about 30 miles and extends outward to about 48 miles).

The Poker Flat radar is a descendant of the NOAA Sunset radar, built by Aeronomy Laboratory scientists in 1973 in a narrow mountain valley near Sunset, Colo. That radar, with its two-acre antenna of 700 steel poles connected by nearly 4 miles of nylon cord, obtained the first ground-based, all-weather measurements of the tricky winds over the Rocky Mountains, and the turbulence that has given rough rides to many airline passengers landing at Denver's Stapleton airport.

Radars using the MST technique can see things that conventional radars cannot. The Sunset and Poker Flat radars have wavelengths of 24 and 20 feet, respectively. These unusually long wavelengths, combined with the radars' increased sensitivity, allow them to see farther up in the atmosphere than most radars. A radar perceives movements such as turbulence on a scale comparable to half its wavelength; conventional weather radars, with wavelengths of 4 inches, would see fluctuations of about 2 inches and work very well near the ground, where there is turbulence on all scales. Higher up in the atmosphere, the smaller scales are damped out, leaving large-scale movements that can be perceived only by a radar with a long wavelength.

Conventional weather radars can observe winds only by detecting airborne targets such as dust or water droplets. Because of its

The antenna of NOAA's Poker Flat radar is a mesh of poles and cables covering nearly 10 acres.



large antenna area and transmitter power, the Poker Flat radar is also more sensitive than most radars, and can obtain echoes from the air itself.

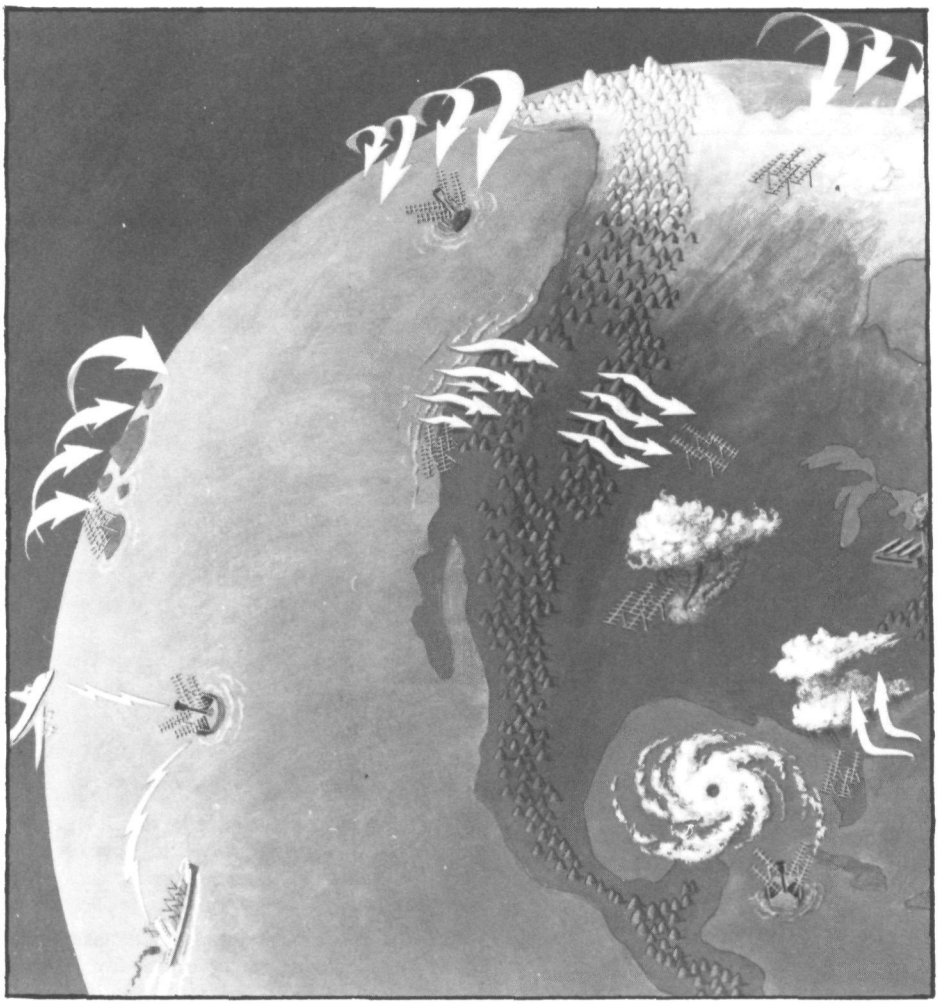
The Poker Flat radar's location not only gives it a unique, high-latitude perspective on the atmosphere, but allows it to operate in conjunction with a variety of other research facilities. Large experimental rockets designed to study the mesosphere are launched from the Poker Flat research range. Additional radars for tracking meteorological balloons and for studying the ionosphere (the electrically charged region of the atmosphere) are also located nearby. All together, these various tools make an ideal team for studying the atmosphere in detail.

The Poker Flat radar has been in partial operation since February, 1979, and some 2 years of data have now been collected. It has proven its ability to operate unattended and continuously. Even operating at less than full power, it has probed as high as 59 miles and brought back some surprising results.

One "real enigma," says Dr. Ben B. Balsley, who heads the team that built and operates the radar, is a layer of very strong echoes at an altitude between 48 and 54 miles. The strong echoes appear only in the summer; the scientists had expected, and detected, a lower, weaker echoing layer in winter. But the summertime echoes are 200 times stronger. "We knew we could see up that far," says Balsley, "but the strength of these echoes surprised us. We also know that it's a high-latitude phenomenon." Radars in Germany and Colorado haven't detected it. The radar beam reflects from different things at different altitudes; in the mesosphere, most reflections come from abrupt changes in the density of electrons, explains Balsley. "But we don't know what causes these summertime echoes. That's the intriguing part of this kind of research."

This type of radar, say the Aeronomy Laboratory scientists, could have a variety of important applications. A network of similar but smaller systems could complement existing weather radars and other instruments to clarify the complete dynamics of the atmosphere and aid development of the numerical models of atmospheric circulation that are used in weather prediction. The radars' ability to make continuous measurements gives them a tremendous advantage over the twice-daily balloon measurements that are traditionally used to collect upper-air data.

In one experiment with the new Poker Flat radar, the wind measurements made at different levels by an ascending balloon and by the radar were compared. As it passed through each level, the balloon measured one velocity and direction, while the radar showed a great deal of variability in these quantities over the duration of the balloon's ascent. At 6 miles altitude, for example, the balloon measured a wind velocity of 17 miles an hour. The radar showed that during the 40 minutes of the balloon ascent, the wind speed at that height varied by 22 miles an hour and the direction varied by more than 55 degrees.



NOAA scientists see many uses for smaller, more mobile versions of the Poker Flat radar: studying pollution plumes, guiding aircraft, tracking hurricanes, providing weather data at sea.

By simultaneously observing the troposphere, stratosphere, and mesosphere, such radars can help improve understanding of coupling between the upper and lower atmosphere. This could help unravel one of the more controversial questions in meteorology today: whether sunspots and solar flares can influence Earth's weather. Scientists know that the energy from these events can affect the upper atmosphere, but have yet to discover how this effect could filter down to the troposphere, where most of our weather takes place.

Less powerful radars of the Poker Flat type, probing just the troposphere and stratosphere, say the researchers, could have a variety of special purposes. One proposal calls for a system of portable radars, with a power generator, operations room, and antennas set up quickly and easily. They could be used for studies of the sea breeze, mountain lee waves, or the path of pollution from a factory. They could even operate unattended in remote areas, their data relayed to the laboratory by satellite. Such radars would be inexpensive enough to set up a network for a study of medium-scale weather features like large storm systems, or the effects of mountains on wind patterns. Another use for these systems, says Balsley, could be finding jet streams for aircraft. It has been estimated that riding with the jet streams can result in tremendous savings aircraft fuel.

Compact versions of the radars could even be installed on ocean buoys, to send continuous data on winds aloft by satellite to a central station. There is very little weather information for large expanses of the ocean; the buoys could provide information to greatly improve weather reports and forecasting to aid shipping and aviation.

So far, these are ideas on paper. But the Poker Flat radar is reality, and its scientific bounty is already being harvested. The wealth of information it provides on how the Arctic atmosphere moves will add a large price to the puzzle of Earth's weatherworks. And as the puzzle is filled in, our ability to predict the weather, and cope with its vagaries, grows surer. ■

Directions

Major Programs Scheduled

Elsewhere in this issue, Administrator John V. Byrne discusses the general directions he expects the agency to be taking in the near future.

On these pages, the specific, high-priority objectives of NOAA leaders—the programs which will determine our course over the next several years—are outlined.

Despite budgetary constraints and changing times, the management objectives of NOAA reveal an organization committed to vigorous, diverse and imaginative efforts to serve the Nation.

NESS To Improve Data

A 5-year research plan detailing efforts for the National Earth Satellite Service (NESS) to improve and expand information provided by the GOES and TIROS-N satellite systems has been launched.

Current efforts will be evaluated against priorities to be spelled out in the plan, with changes to be made where called for.

At the same time, NESS is planning to replace and modify ground systems which handle satellite data. Much existing GOES telemetry and command ground system requires modification to be compatible with NASA's Deep Space Network, which supports GOES launches and spacecraft checkout. Additionally, the GOES data processing system—already nearing its anticipated lifespan—will be updated and modernized.

For NWS, Automation

A program to automate the collection of surface observations—fundamental information for weather warnings and forecasts—is under development at the National Weather Service.

The program is being conducted in conjunction with the Federal Aviation Administration, and the Department of Defense.

Primary goal is to develop a standardized, automatic, observing system to gather and process data used in preparing forecasts, advisories, and warnings. It also will support aviation operations.

Temperature, pressure, wind speed and direction, precipitation, and other data is now recorded manually each hour at more than 1,000 sites. About 1,200 National Weather Service employees are involved.

Typically, the recording and processing of surface observations takes at least 25 percent of an observer's time. Severe or changing weather often can double that time, just when warnings must be issued and other critical services performed.

Automated observations will allow meteorologists to devote more time to the preparation of warnings and forecasts. This in turn will open the door to more efficient use of the forecasters in consolidated operations.

Other NWS initiatives will bring improved service in a wide variety of areas in 1982, notably:

- Adding four new local warning radars, in South Bend, Ind., Tuscon, Ariz., Savannah, Ga., and Tupelo, Miss.
- Development of specialized agriculture weather programs and defining improvements to the climate analysis program for agriculture.
- Development of plans for comprehensive hydrology programs.
- Improvement of systems for providing energy-related weather information to users.

The National Weather Service is planning to phase the Automation of Field Operations and Services (AFOS) program into full operation by October 1982.

AFOS is a major program to apply modern technology to the day-to-day operations of the National Weather Service. Its primary aim is to reduce response time between the detection of hazardous weather and public warnings.

The AFOS program also will make it possible to provide good weather forecast and warning services despite strict personnel ceilings and rising costs by increasing the efficiency and productivity of the field staff. The ultimate beneficiaries of these improvements will be the public and other end users of weather warnings and forecasts.

The program involves the installation of modern minicomputers and visual display systems at about 200 NWS field offices and national centers. These units wll augment or replace aging systems now being used.

Computer Upgrade Planned

NOAA's Office of Management and Budget is moving to upgrade facilities at the Suitland, Md., Federal Building #4 Computer Center. It plans to acquire a more powerful computer system to handle operational programs of the National Earth Satellite Service and the National Meteorological Center. The present system cannot handle proposed new applications.

Management and Budget is reviewing proposals, and plans to install the new system, with its advanced technology, early in FY 1983.

EDIS Streamlines System

Shooting for completion in 1985, the Nation's environmental information storehouse plans a streamlined system for accumulating, sorting and storing literally billions of bits of data, some of which have been piling up from as far back as 1870.

Until recently, valuable data on such diverse concerns as weather records, ocean current measurements, geophysical data, and trackings of glaciers and sunspots have gone into three separate processing systems covering climatology, oceanography and geophysics. The Environmental Data and Information Service has begun to consolidate the three into one grand design called DAMUS, (Data Management and User Services).

A second major activity within EDIS will be the design and development of an operational ocean pollution data and information network, scheduled to be in place in 1985.

EDIS's National Oceanographic Data Center will handle the assignment.

Five-Year Research Plan

NOAA research and development can be as basic as trying to understand heat exchange in the oceans, or as applied as improving the electronics used in weather forecasting, but it all has a common purpose—improving NOAA's capability to perform its missions. Research and Development will team up with NOAA operational groups to draft a 5-year plan covering the major areas of research: regional weather services, marine resources, atmospheric and marine quality assessment, climate, and ocean services.

Drafts of each section, due by August 1983, will link research and development to mission needs. Thus, accelerated research on ocean winds, ice, waves, and storm surges should promote better forecasting of hazardous coastal and ocean conditions.

RD is also gearing up a 5-year research program to assess the potential of polymetallic sulfides—those large chunks of ore on the seafloor. If they appear commercially attractive, a regulatory framework will be created to encourage private investment.

A third major push will build on the successful PROFS (Prototype Regional Observing and Forecasting Service) project. The aim is to develop a system for predicting severe storms in a hurry, in an area with about a 100 kilometer radius.

So far, PROFS has used satellite and ground-based equipment to obtain critical atmospheric measurements on a short-time fuse basis. This work will be integrated into a new overall system, new forecast models will be developed, short range forecast techniques and display capabilities will be improved, and new observing technology such as Doppler radar will be incorporated. The object: to have this advanced forecast service ready for use by the National Weather Service by 1990.

Deputy Administrator Sworn In

Dr. Anthony J. Calio, new NOAA Deputy Administrator, being sworn in by Administrator John Byrne (right) on Dec. 23, 1981, as his wife Cheryll holds the Bible. Dr. Calio was previously the Associate Administrator of the National Aeronautics and Space Administration.

New Ways For NOAA Corps

Seniority alone no longer carries the weight it did when it comes to promotion for NOAA Corps officers.

This year, new promotion policies for the 365-member "Seventh Service" place greater emphasis on the individual's performance, though length of service still counts in the final decision to upgrade an officer. The new promotion policy is one of several actions taken recently to improve the management and utilization of NOAA's commissioned officers.

NOAA Corps officers also are being integrated into a wider range of agency programs and missions beyond the traditional roles (such as ship operations and geodetic surveying) established in earlier years.

NOS Plans Port Assistance

The National Ocean Survey plans to improve the productivity and safety of 10 major ports by providing real-time navigational information in the form of digital data. By 1984, the Survey hopes to have a firm fix on user requirements in major cities with critical needs for such data as channel clearances, navigational aid location, and marine obstruction information.

The Nation's horizontal and vertical geodetic networks, consisting of more than 750,000 permanently-mounted control points, will be readjusted by 1985 and 1987, respectively.

The control points are primary sources of position control for a broad spectrum of private and governmental users. Two new space technology systems, slated to operate by the end of 1984, will insure the integrity of the horizontal geodetic control network. They will provide continuous monitoring of very small, long-period distortions caused by Earth crustal motion.

The automated system for production of print-ready nautical chart negatives for the Southeast Atlantic and Great Lakes will be completed next year.

NMFS Seeks Twin Goals

Two major goals highlight the National Marine Fisheries Service's plans for the next several years: restoring and maintaining living marine resources and their environment, and increasing fishery contributions to the gross national product.

The goals are scheduled for accomplishment or near-completion by the middle of the decade, through numerous short-term programs.

The Service plans to:

- Establish cooperative arrangements with coastal States for shared responsibility in research, data collection, and habatat and marine mammal protection.
- Improve the timeliness and quality of information about marine resources and fisheries.
- Re-examine development policies.
- Improve seafood quality and re-examine regulations governing quality.
- Identify and develop overseas markets, emphasizing species little-used domestically.
- Reduce Federal involvement in the administration of the Pribilof Islands.
- Establish alternative sources of funding for hatchery operations, fish passage protection, and fishway construction and maintenance.

Progress At Sand Point

The Western Regional Center in Seattle, to be the largest research facility of its kind in the Nation, continues toward completion.

The Operations Building was completed and occupied during 1981. Structural steel has been erected for the Research I Building, and exterior work is under way on the Research II and Employee Service Buildings.

When the 360,000 square-foot facility is completed, more than 800 of the agency's scientific, technical, and administrative employees will work there.

OME Will Aid Industry

The Office of Ocean Minerals and Energy, charged with regulating deep seabed mining, is establishing a legal and regulatory system to aid private industry in recovering at least 10 million tons of manganese nodules annually by 1995.

The nodules, which contain manganese, cobalt, nickel, and copper, lie in several thousand feet of water in the Pacific Ocean. Commercial recovery, not anticipated until the 1990's, could cost a billion dollars per mine site. In addition, OME is working with several other nations with deep seabed mining capabilities on a "reciprocating states" agreement to ensure that their mining regulations are compatible with our own.

In the field of ocean thermal energy conversion (OTEC), which can generate electricity from the tropical oceans' waters, the minerals and energy office hopes by the end of the 1980's to license OTEC powerplants whose total output would be about 500 megawatts.

NOAA's coastal zone management office expects that by 1985 the basic structure of coastal management for the Nation will be completed. This includes not only establishing State coastal programs with sources of funding other than Federal grants, but operation of an expanded marine and estuarine sanctuary system as well. Thus far, 26 States have Federal approved management programs in place, covering some 86 percent of the U.S. coastline.

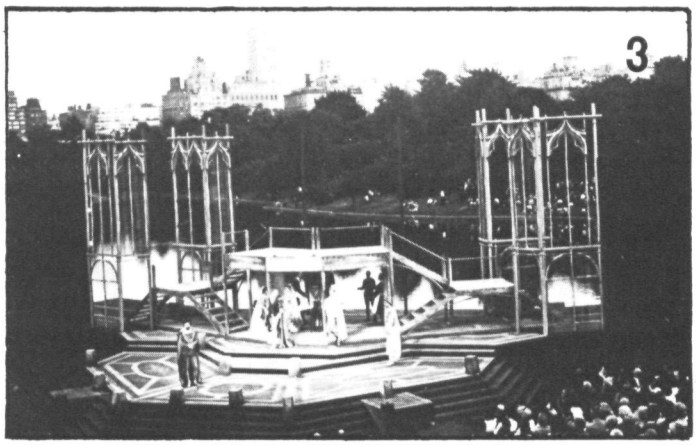
CITY SCAPE

New York, New York, It's A Wonderful Town...

From a high-flying National Ocean Survey airplane, the Big Apple blends into a series of rectangular blocks with little character. But the plane's aerial survey camera—pointing straight down over eastern Manhattan and the Hudson River—has captured on film an area of remarkable cultural and scenic interest.

From ground level, heading north up Broadway (the wide, curving avenue at the photograph's center) you pass (1) the New York Coliseum, the city's centrally-located meeting/exposition hall off Columbus Circle. In Central Park at upper right you might hire a carriage (2) to take you for an old-fashioned leisurely turn around the ponds and woodlands, or perhaps to Delacorte Theatre (3) where, in summer, plays, dances, and concerts are conducted in a delightful open-air setting. For the more serious-minded, the American Museum of Natural History (4) and the Hayden Planetarium (5) lie on the park's eastern border. And, finally, there's the magnificent Lincoln Center (6) which includes the Metropolitan Opera flanked on the left by the New York State Theater and on the right by the Avery Fisher Hall.

N.Y. CONVENTION & VISITORS BUREAU



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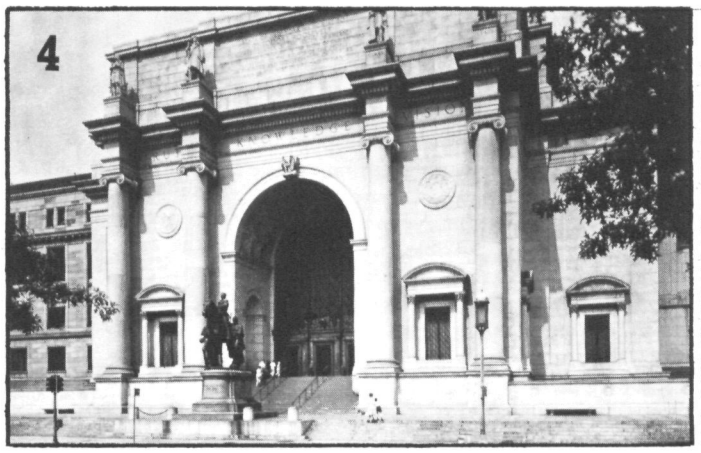
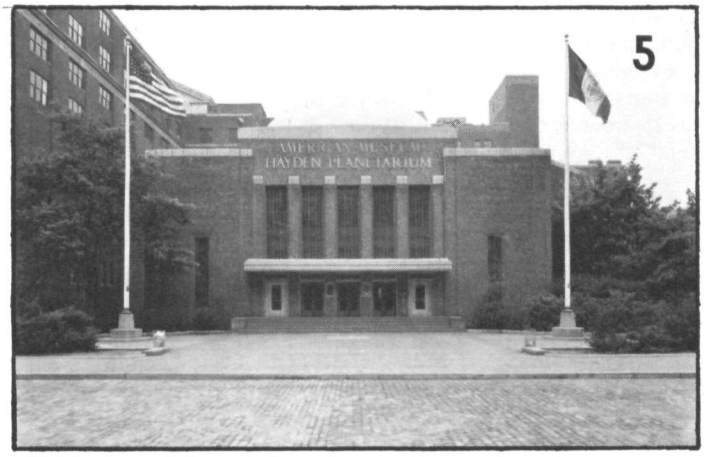


N.Y. CONVENTION & VISITORS BUREAU

U.S. TRAVEL SERVICE



HAYDEN PLANETARIUM

U.S. TRAVEL SERVICE

(Continued from p. 5)

of handling this material? We need to address this whole problem in a rational fashion and to come up with a reasoned Federal posture on the general problem of waste disposal.

Q. ***Our fisheries contribute a lot of nutrition to the people and strength to our economy, yet they're constantly in conflict—with foreign fishermen, with native American fishermen, with oil rigs or potential oil rigs, and different parts of the fisheries with each other. What roles do you see NOAA playing in the future in resolving these problems and developing our fisheries?***

A. Our general position is not going to change from what it has been. We are responsible for managing the renewable and the non-renewable resources of the oceans surrounding our Nation. We must insure to the extent possible that the fisheries resource continues to be renewable. We may be forced to limit the degree to which people can catch fish in order to insure that renewability. And the problem that you encounter there is one of short-term expediency versus long-term conservation—to me conservation means wise use. That's where the problem lies. Right now we're faced with very severe economic conditions throughout the country and certainly within the fishing industry. It would be very simple to step back and say, "We know you people are in trouble. Go and catch all the fish you can." It's quite possible that the fishery would be fished out and they'd be out of business next year. With some control, some constraint, we could probably keep the fishery renewable for years to come. It's a very difficult situation I don't have a magical solution for the problem. As in everything else, all we can do is the best we can.

Q. ***Polymetallic sulfides—those deposits that apparently hold a wealth of available important mineral resources that you were involved in early during your academic career. Is NOAA pursuing this lead and what are our responsibilities*** vis-a-vis ***private industry in exploring and exploiting this potential?***

A. We're pursuing it because we have a responsibility to understand the oceans and to develop our knowledge of potential resources. We should continue to carry out basic research on what the deposits are, where they are, their characteristics, and so on. Certainly, any company interested in mining these deposits will conduct much more specific research on any particular deposit than NOAA would. Our mission is to provide fundamental information about those resources and then to get out of the way as much as possible so that private enterprise can develop and exploit the resource.

Q. ***As a follow-up on that, do you see much of a NOAA role in establishing regulations like we're doing for manganese nodules or establishing a climate for helping industry get into it?***

A. Yes. This comes down to legislation, but I think where the legislation exists and where we are the appropriate lead agency we should be the monitor of those activities. We should provide regulations which will allow the wise development of those resources.

Q. ***The National Weather Service right now is replacing many of its systems with automated and modernized equipment—AFOS, NEXRAD, automated service offices. With the budget reductions becoming a way of life, what impact do you think such retrenchment will have on NOAA's long-range efforts to modernize and automate its systems to meet better its responsibilities in protecting life and property?***

A. Budget constraints will make it more difficult for us to modernize the Weather Service in the time frame we would like. It's inevitable that the Weather Service 20 years from now will be much more highly automated than the Weather Service of today. Basically, the budget will determine the rate at which we make the change. Without the budget restrictions that we're faced with, or think we're going to be faced with, we would do it much more quickly.

Q. ***I asked that question in light of the fact that many people think we should have been automated a long time ago.***

A. I agree. I think that question can be extrapolated to many of the things that we do in NOAA. One of the limitations any Federal agency has, is that there are many things you're doing, that you want to do better. As you make changes to stay close to the state of the art you must at the same time continue to provide essential services. The essential services become a higher priority than making the changes to meet the future. Not being able to do both the way you would like leads to frustration, of course.

Q. ***User fees for NOAA products are being examined carefully as a source of funding. What services within NOAA are prime candidates for user fees now?***

A. There are a number of them. Agriculture weather is one that's been mentioned. Fire weather is another, nautical and aeronautical charting—aeronautical charting in a sense already is being supported to a great extent by user fees. It's a complicated matter. For example, we don't give away nautical charts, we sell them. The cost of the chart essentially pays for the reproduction and distribution; it doesn't pay for the fundamental survey that serves as the basis for the chart. When you look at the pricing structure needed to pay for the basic survey, you could very easily run the cost of the chart up to the point where no one would buy it. Clearly, there's a cutoff point at which the user fee doesn't work. We need to look at ways in which user fees can be implemented. The ways we implement such fees may be a more fundamental and more important question than determining which services and products we charge for.

Q. ***Do you detect or do you expect any strong resistance to the concept of user fees from any quarter?***

A. Oh, yes. Where you have been receiving something that you think of as free—that the entire citizenry is paying for—and you're asked to pay for it, there's going to be a negative reaction. On the other hand, if you'd ask the question a different way, "Are you willing to pay for it or forego the service completely?" you get a different answer. It's something we have to work on carefully with the users. That leads to another line of thought. We really need to determine what the users need. Are we really responsive to the people who need our services and our products? Are we providing exactly what they need, and if we are, are these things something that they could be paying for.

Q. ***I'd like to shift to the general subject of climate. Climate in human activities has important economic implications. Will the United States pursue a National Climate Program of any consequence, considering the current retrenchment?***

A. I think so. We're going to try to reinvigorate the National Climate Program. It's too important to let it diminish and disappear. Certainly the scientific community recognizes that very small atmospheric or oceanic changes which occur on a day-to-day basis are extremely significant when you extend the scale. We need to know what these small changes are so that we can adjust the way we live, for the future. One of my concerns is that studies of many of these small changes which persist over a long time seem to be vulnerable to the changes in the Federal system as a result of political processes. Somehow we need to develop a mechanism by which we can insure that studies of these changes that develop slowly over decades are carefully monitored, are planned for. The National Climate Program is an example of a National mechanism that we've established for monitoring these relatively small but persistent changes.

Q. ***You expressed a need, several times, for a National strategy on the atmosphere. Could you mention some of the basic constituents of such a policy and explain how it could be of effective use in protecting the atmosphere?***

A. We do need a coordinated research approach to studies of the atmosphere. We're going through an exercise right now where we're faced with budget reductions—at the same time we have a Clean Air Act which is subject to amendment or change; we have increasing concern about acid rain. More and more of the concerns we have with respect to the pollution of the atmosphere are coming to the fore. At the same time our knowledge of how severe weather develops has improved. We find that as we look around the Government there are a number of agencies involved, to some extent or another, in atmospheric science programs. There is constant communication, among atmospheric scientists, just as there is between the elements of the ocean community. But I'm not sure we're always pulling in the same direction. We need an assessment of all of our atmospheric programs and if we're found to be duplicating programs to a considerable extent, then we may need to develop that strategy for the atmospheric sciences.

Q. ***In connection with the contamination of the atmosphere—acid rain, carbon dioxide—in light of the declining Federal budget, how can NOAA be expected to help preserve the atmosphere?***

A. As the lead civilian agency for the atmosphere, we have the responsibility and obligation to do what we can to understand atmospheric conditions, to assist the people who develop regulations in putting together wise regulations. The fact that we're faced with limited financial resources simply makes the job more difficult, and our responsibility even greater.

Q. ***You've mentioned both resources and economics, and the two are tied together. The first public statement that I remember the Secretary making when he was first appointed was his commitment to revitalize the Nation's economy and also to reduce regulations. What will NOAA be doing in the near future to achieve these goals?***

A. We have developed, with the Department of Commerce, a series of common goals and objectives. Part of our role is to enhance the wise development of ocean resources and the wise use of those resources. The degree to which the resources are developed frequently involves business activity, international trade, economic affairs of one form or another. This argues strongly for keeping NOAA within the Department of Commerce where there is a focus on economic development. I see NOAA's role with respect to the economic development, to be one of emphasis. With respect to the reduction of regulation, there are essential regulations—regulations which directly control the way we manage a resource. I don't have a problem with those regulations. the problem I have is with what I term second- and third-order regulations, those which are designed to regulate the regulatory process. Those are the ones that are difficult to cope with because they're not all within NOAA. To me, those are the ones we should be attempting to reduce.

We're taking a hard look right now at the matter of fisheries management and the regulations associated with that management. Hand-in-hand with reducing regulations is the matter of assigning responsibility and accountability to those managers who are closest to the action. What we will say to the regional fisheries director is, "You have the responsibility to manage that resource. We're not asking you for recommendations, we're asking you for action." I think that a lot of the paper work related to regulations will disappear because fewer people will be involved in monitoring the action of other people. We need to reduce regulation. We need to reduce the paperwork involved with regulation, but in order to do that we need to put the authority for making decisions close to where the action is. If we are to reduce regulation, we must also change the management process.

Q. ***Does that mean that programs like the Marine Sanctuary Program, which rely heavily on regulations, won't be expanded in the future, or will the regulations just change?***

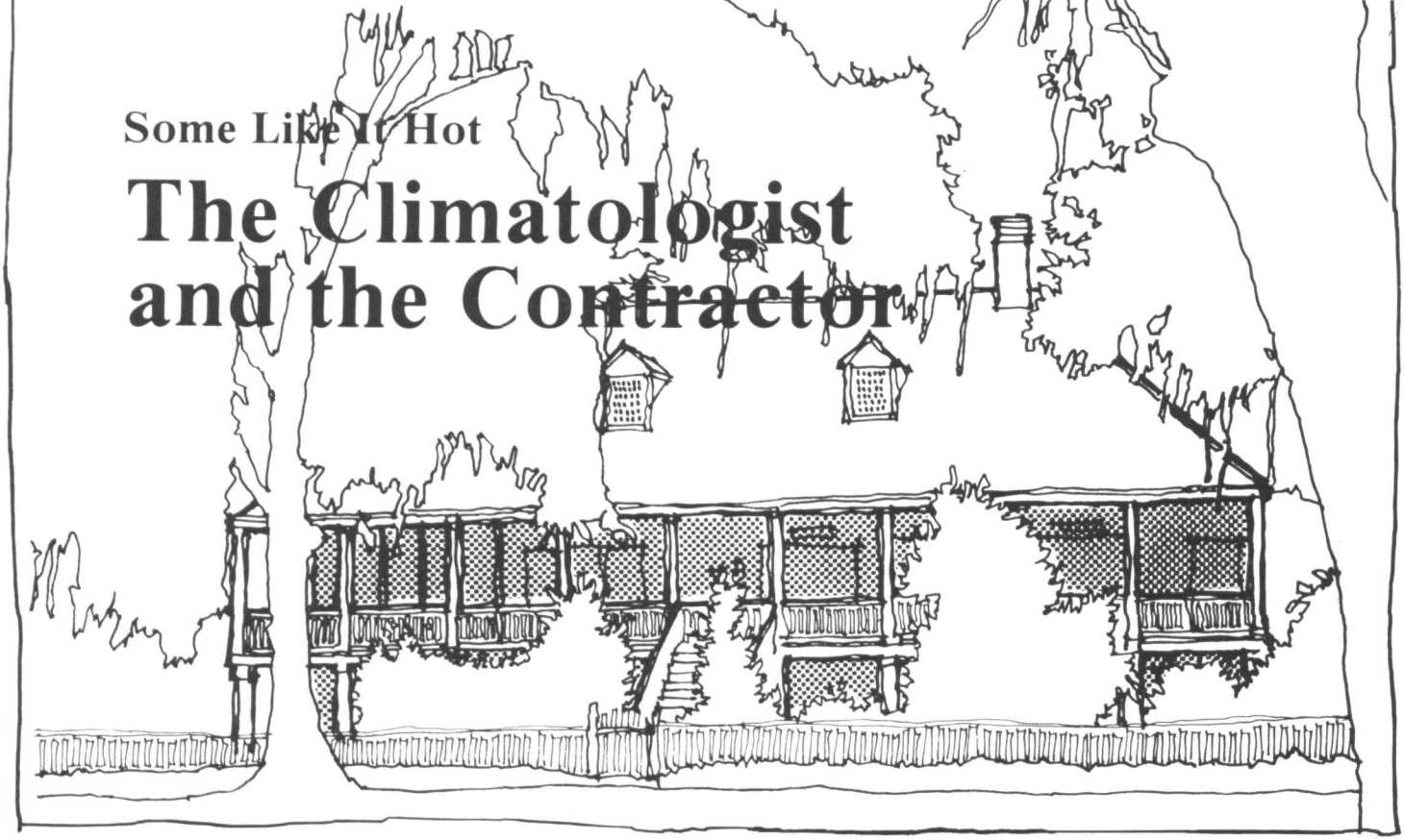
A. I think they'll change. I foresee the Marine Sanctuary Program as being more and more important, particularly as we begin to develop more of the ocean. I think we need to protect limited portions of the ocean for study in the future. We've gone beyond the point where we can say we've got to leave the environment the way it was. It's too late for that. But we can save portions of it. We still don't know all of the answers about the ocean. We don't even know what questions we'll be asking in the future. We need places we can turn to in the future where we can still find the answers to questions about how nature behaves. The sanctuaries will be those places.

Q. ***National prestige, I think, plays an important role in the way a lot of agencies are run. I guess NASA—the space program—is a prime example of the driving force that pride and prestige can make in an agency. With talk about the possibility of turning the satellite program over to private industry, possibly some cutbacks in the charting program at NOAA, which is probably the best in the world, reducing research—do you see a danger of both NOAA employees and people in general losing some of the sense of pride they have in the agency?***

A. There's always a danger of that, but I think that you derive pride not from the quantity of what you do but from the quality of what you do. If we can continue to do things better than anyone else in the world, even though we're doing fewer things we can still maintain that high level of pride. My perception of NOAA, having come to it from outside the Government, is it has a lot to be proud of. There are some excellent things taking place. We provide excellent services. We're doing outstanding research, second to none in the world. These are the things you take pride in. It's a great agency. I'm proud to be part of it. ■

Some Like It Hot

The Climatologist and the Contractor



Vivian Loftness

The Nation's hot spot, climatologically speaking, is down near the southern California-Arizona border, where temperatures reach 116° on the average once every 2 years.

Similarly, the coldest area is east of Bemidji, Minn., where temperatures drop below -40° once every 2 years.

This kind of information can be useful to architects and building contractors trying to determine how much heating, air conditioning, and insulation to put in their structures. It can also help the Nuclear Regulatory Commission design nuclear power plant safety-related systems such as air conditioning and pumps that will operate at local temperature extremes.

So, upon request of the NRC, climatologists M. L. Nicodemus and N. B. Guttman of the National Climate Center in Asheville, N.C., conducted a study whose results have been made public for use by the building industry.

If you were going to build a motel, say, or a chicken coop, on highway 95 north of Yuma, Arizona, you'd want to know what kind of temperatures you'd have to protect your guests, or your hens, against. You'd find out from the study that temperatures in that area can be expected to reach 120° F. on the average every 50 years, with a small hot spot right on the California border where the mercury will top 124° F.

In the course of a century, temperatures of 124° F. can be expected in an area ranging from the Mojave Desert almost to Phoenix, Arizona.

The question you then would ask yourself, taking into account the local costs of insulation and electricity, is whether it will pay you to add the extra capacity to take care of temperatures above 124° F. or whether you should just chance a loss—of complaining guests or of chickens, and thereby of profits—once a century.

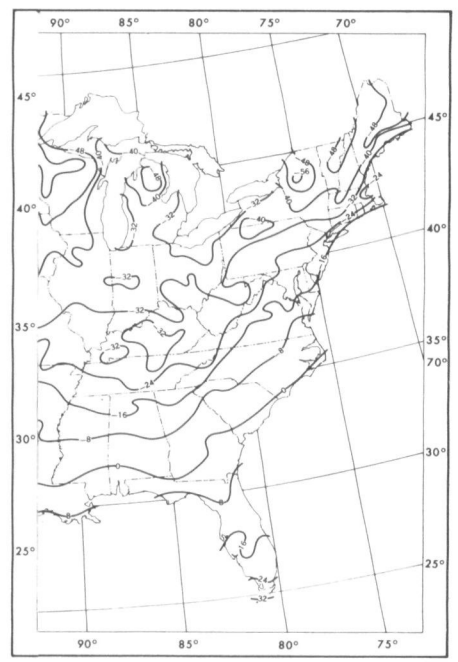
You might opt to spend such an extra-hot summer up in Bemidji, where you wouldn't be likely to find the temperature much above 90° F. But the winter might daunt you. Native son Paul Bunyan not only had to button up against temperatures of less then 40 below zero, but over a 50 year period the mythical logger would have had to protect himself against a low temperature of 56 below, and he would have shivered through much of northern Minnesota, North Dakota, and Montana.

Generally, once in a hundred years temperatures reaching 64 below zero can be expected in parts of Montana and central Wyoming.

These figures come in the form of probability estimates of extreme maximum and minimum temperatures throughout the continental United States. The NOAA climatologists produced them for return periods of 2, 50, and 100 years, and put them in the form of maps for ready consultation by the public.

A look at the maps shows, for example, that Chicago will experience an annual high temperature of about 96° F. and an annual low of about 12° F. on the average once every 2 years. About once every 50 years the Windy City will feel the effects of 106° F. summer heat, and -32° F. in the winter.

Once every century Chicago will get hit with a 110° F. reading in the summer, and will have to cope with a winter where the mercury plummets to 34 below zero.



Nicodemus and Guttman used Environmental Data and Information Service records on high and low temperatures recorded at about 2,000 National Weather Service observing and cooperative stations, over periods varying from approximately 15 to more than 100 years, to come up with their calculations, which they then translated into high and low temperature contours on six maps. The maps, and an explanation of the statistical methods used to arrive at the contours, are contained in an NRC report available from the Commerce Department's National Technical Information Service. ■

Oceanic Hors d'oeuvres

An appetizer buffet sets a party off on the right foot. Your guests will welcome the wide variety of oceanic hors d'oeuvres which can be prepared from fish and shellfish.

CLAMDIGGER DIP

1 can (7½ or 8 ounces) minced clams
1 package (8 ounces) cream cheese, softened
1 tablespoon lemon juice
1 tablespoon grated onion
1 teaspoon chopped parsley
1 teaspoon Worcestershire sauce
¼ teaspoon salt
⅛ teaspoon liquid hot sauce
Assorted chips, crackers, or raw vegetables

Drain clams and reserve liquor. Cream the cheese. Add seasonings and clams. Mix thoroughly. Chill at least 1 hour to blend flavors. If necessary to thin dip add clam liquor gradually. Serve with chips, crackers, or vegetables. Makes approximately 1-1/3 cups.

NEW ORLEANS CRAB SPREAD

1 can (12 ounces) blue crab meat or other crab meat, fresh or frozen
or
2 cans (6½ or 7½ ounces each) crab meat
¼ cup tarragon vinegar
1/3 cup mayonnaise or salad dressing
3 tablespoons chopped pimento
2 tablespoons chopped green onion
1 teaspoon salt
½ teaspoon freshly ground pepper
1 tablespoon drained capers
Assorted chips, crackers, or raw vegetables

Thaw frozen crab meat. Drain crab meat. Remove any remaining shell or cartilage. Flake the crab meat. Pour vinegar over crab meat. Chill for 30 minutes. Drain. Add mayonnaise, pimento, onion, salt, and pepper. Mix thoroughly. Garnish with capers. Serve with chips, crackers, or vegetables. Makes approximately 2 cups.

SKEWERED SHRIMP

1 pound frozen raw, peeled, cleaned shrimp
2 large green peppers
8 slices bacon, cut in sixths
3 cans (4 ounces each) button mushrooms, drained
1/3 cup melted fat or oil
1 teaspoon salt—Dash pepper

Thaw frozen shrimp. Rinse with cold water. Wash green peppers and cut into 1-inch squares. Alternate shrimp, bacon, mushrooms, and green pepper on 48 skewers or round toothpicks, approximately 3 inches long. Place kabobs on a well-greased broiler pan. Combine remaining ingredients. Brush kabobs with sauce. Broil about 4 inches from source of heat for 5 to 7 minutes. Turn carefully and brush with sauce. Broil 5 to 7 minutes longer, basting once. Makes approximately 48 hors d'oeuvres.

PARTY SHRIMP

1 pound cooked, peeled, and cleaned shrimp, fresh or frozen or
4 cans (4½ or 5 ounces each) shrimp
Avocado Dip

Thaw frozen shrimp or drain canned shrimp. Cover canned shrimp with ice water and let stand for 5 minutes; drain. Fill a bowl with chopped ice. Place a small bowl in center of the ice bowl. Arrange shrimp on the ice. Fill small bowl with the Avocado Dip. Provide toothpicks for dipping.

AVOCADO DIP

2 ripe avocados
2 tablespoons mayonnaise or salad dressing
2 tablespoons lemon juice
1 tablespoon grated onion
1 teaspoon Worcestershire sauce
½ teaspoon liquid hot pepper sauce
¼ teaspoon salt

Cut avocados in half lengthwise and remove seeds. Peel and mash avocados until smooth. Add remaining ingredients and mix thoroughly. Cover and chill 1 hour. Makes approximately 1½ cups dip.

MAINE SARDINE CANAPES

3 cans (3¾ or 4 ounces each) Maine sardines
½ cup butter or margarine, softened
2 tablespoons prepared mustard
10 slices sandwich bread
Pimiento strips

Drain sardines and split in half lengthwise. Combine butter and mustard. Spread with mustard-butter. Remove crusts. Cut each slice of bread into thirds. Place a sardine half on each piece of bread. Garnish with pimiento strips. Makes 30 canapes.

CRISPY FRIED MAINE SARDINES

4 cans (3¾ or 4 ounces each) Maine sardines in tomato sauce
1 can (8 ounces) tomato sauce
1 cup dry bread crumbs
1/3 cup grated Parmesan cheese
½ cup flour
Cocktail sauce

Drain sardines and reserve the sauce. Combine tomato sauce and sardine sauce. Combine crumbs and cheese. Roll sardines in flour, dip in tomato sauce, and roll in crumb mixture. Place in a single layer in a fry basket. Fry in deep fat, 350° F., for approximately 1 minute or until brown. Drain on absorbent paper. Serve with cocktail sauce. Makes approximately 24 hors d'oeuvres.

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See Story Page 6