

**The Making of NOAA, 1963-2005**

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**An Evening with Robert M. White**

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For links to the historical documents that created NOAA and its predecessor agencies see  
[http://www.history.noaa.gov/legacy/historical\\_documents.html](http://www.history.noaa.gov/legacy/historical_documents.html)

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## Introduction

JAMES R. FLEMING: It is my pleasure to introduce Robert M. White, our speaker this evening. Robert White is director of the Washington Advisory Group, a team of experienced administrators who advise on environment, energy and climate change and the development and management of organizations and research programs. I realize that most everybody here in the room worked with Bob at some point; perhaps even recently. Bill Hooke is working on Bob's oral history. Bob was president of the National Academy of Engineering from 1983 to 1995. Previously he was president of the University Corporation for Atmospheric Research. We call it UCAR. He was chief of the Weather Bureau. He was U.S. commissioner to the International Whaling Commission. He was U.S. permanent representative to the World Meteorological Organization. And he was appointed the first administrator of the National Oceanic and Atmospheric Administration (NOAA). He served in scientific leadership positions under five U.S. presidents. Dr. White recently was the Karl T. Compton Lecturer at the Massachusetts Institute of Technology. He is a senior fellow with UCAR and at the H. John Heinz III Center for Science, Economics, and the Environment. He's received awards such as the Vannevar Bush Award, the Tyler Prize for Environmental Achievement, the Charles A. Lindbergh Award for Technology and the Environment, the Rockefeller Public Service Award, and the International Meteorological Organization Prize. He holds honorary degrees from many universities. He's a member of the French Legion of Honor and the Academies of Engineering in Japan, the UK and Australia. Dr. White is a graduate of the Harvard Geology Department and has M.S. and doctorate degrees in meteorology from MIT.

Robert White is known for his excellent decisions and wise counsel over more than five decades. For example, while sharing office space with Ed Lorenz at MIT in the mid 1950s, he told Ed that he really should have a computer in his office: the Royal McBee LGP-30. The discovery of the strange attractor of chaos theory, now popularly known as the butterfly effect, was the result. I visited Ed last month at MIT and he was still running simple chaotic models on his much faster office machine—wishing he could somehow slow it down or fool it to print out only every 10,000th data point so he could watch the attractors evolve.

A second, less momentous but more personal example of Dr. White's judgment and advice—and I'm sure everyone here has his or her own examples—Bob called my book, *Historical Perspectives on Climate Change*, “a wonderful book about the antecedents of the present climate debate” and recommended that it should be read by every meteorologist and used as a textbook in meteorology classes. This endorsement actually helped to convince the publisher to issue it in paperback. So I'd like to give Bob the first paperback copy I just received (applause). If you give a speech here at Air and Space, perhaps you'll get a book, too.

Further evidence of Dr. White's central role in environmental issues is that during his tenure at NOAA, he is credited with bringing about a revolution in the U.S. weather warning system through satellite observations and computer technology. I'm sure there are many other examples of his sage advice, judgment and influence that will be revealed in his talk tonight, which is titled, “The Making of NOAA, 1963-2005.” So let's welcome Bob White (applause).

## The Making of NOAA, 1963-2005

ROBERT M. WHITE: Thank you very much, Jim. It's been a wonderful treat for me to meet all of my colleagues, old and new, some of whose names I have forgotten, but some of whose faces are unfamiliar to me today. But after I met them they all became familiar. And I'm delighted at the chance to be here among a group of old friends and old colleagues as well as others who thought they might want to spend a bit of time listening to me. I had a little bit of trouble deciding what to call this talk. I thought the best title for the talk was something I picked up after I selected this title. My afterthought came from the website of NOAA. NOAA called itself the Whole Earth Institution. I think that is very appropriate. Nevertheless we're stuck with "The Making of NOAA." I'm going to discuss my understanding of how NOAA came into being. But let me go back a bit in history since we're among a bunch of history buffs.

We're actually looking at 200 years of meteorological history. In 1807 Thomas Jefferson founded the Coast Survey, the oldest scientific agency of the federal government, which became a central part of the National Oceanic and Atmospheric Administration (NOAA). In 1870 the U.S. Weather Bureau was formally founded after a series of storms on the Great Lakes with major consequences. In my reading I found that the period between 1807 and 1870 was not completely void of meteorological advancement. For example, Captain Fitzroy gained fame as the captain of the *Beagle*, which sailed around the world in 1831-1836. On that voyage, Charles Darwin came up with ideas on evolution he later developed in *The Origin of Species*. Later in life, FitzRoy headed up what today is the British Meteorological Office and issued regular weather forecasts for both sea and land. (Incidentally Fitzroy committed suicide in 1865, two years after the publication of his *Weather Book*.) In 1814, Surgeon General Tilton issued a general order, directing all the surgeons in the U.S. Army to take weather observations. And, in fact, if you want to think of the origins of the U.S. weather service, you might have to go back before 1814 to the first simultaneous meteorological observations taken by Thomas Jefferson and James Madison in 1778.

The United States Commission of Fish and Fisheries was founded in 1871 under the leadership of Spencer Baird at the Smithsonian Institution. The commission conducted marine research and collected museum specimens along the coast of New England, settling on a permanent site at Woods Hole in 1885. The Commission was formed with a \$5,000 appropriation from the Congress. \$5,000 is not even loose change today in government funding. But in those days \$5,000 was a substantial amount of money, at least enough to get it started. Later it was renamed the Bureau of Fisheries, and still later it became the Bureau of Commercial Fisheries. Today its direct descendant is NOAA's National Marine Fisheries Service. In 1890, the National Bureau of Standards was formed. It was an outgrowth of the Coast and Geodetic Survey. A piece of the National Bureau of Standards, the Central Radio Propagation Laboratory, ended up in NOAA. This was the group concerned with conditions in the ionosphere. In 1965 an organization was formed called ESSA, the Environmental Science Services Administration -- some of you may actually have been employed by ESSA -- and in 1970 NOAA was formed. That's a history in very, very brief terms of how NOAA came into being.

But let's go back not 200 years, but just a half century. Let's go back to the election of Jack Kennedy as President of the United States. He was elected in 1960 and was assassinated on November 22nd, 1963. His noteworthy contribution to meteorology came in 1961 when he made a speech before the United Nations in which he called for cooperative efforts among the nations of the world in weather forecasting. He also called upon them to explore methods of

weather modification. During the same period, in 1962 was the publication by Rachel Carson of her book *Silent Spring*. I don't know how many of you have read *Silent Spring* or are familiar with the book. But its publication was a landmark in the environmental movement because on its basis a lot of people began to think most seriously about the environment. In 1963 I was appointed director of the Weather Bureau. I was one of President Kennedy's last appointees: I was appointed in October 1963 and he was assassinated in November, the next month. In that one speech before the United Nations he had set a general course for meteorology in the decade to come. When I was appointed director of the Weather Bureau, we had to consider how to carry out the intent of the president.

By the way, that's not my first exposure to meteorology, being made chief of the Weather Bureau. Actually, my exposure to meteorology goes back to 1940, 65 years ago. In 1940 I was a student at Harvard and Charles F. Brooks, one of the founders of the American Meteorological Society, was professor of geography there. He also had a house at the base of the Great Blue Hill, which had the Blue Hill [Meteorological] Observatory on it, which has maintained one of the most comprehensive records we have of meteorology in the United States. Dr. Brooks asked whether I would become a weather observer, at the Blue Hill Observatory. I said yes. And so for one summer I became a weather observer. I became familiar with nephelometry, the analysis of the clouds. It was a very interesting experience for me. That was my true beginning in meteorology.

What was the challenge for the Weather Bureau as I became chief? Well, first of all, it was to replace Francis Reichelderfer who had been appointed by Franklin Delano Roosevelt. He had studied in Norway, brought the polar front theory to the United States, and insisted that it be used as a basis for weather forecasting. Another task was to modernize the Weather Service as new technology became available. Numerical weather prediction was in its infancy. Actually, the Joint Numerical Weather Prediction (JNWP) unit was founded in 1955. That's about eight or nine years before I became chief of the Weather Bureau.

That was one of the great challenges for the Weather Bureau: How to make more extensive use of numerical weather prediction techniques. Another was how to improve the global weather [observing] system. We had for the first time weather satellites that could give true global observations. The first operational weather satellites, TIROS 9 and the ESSA series, were launched in 1965. That was just two years after I took over the Weather Bureau. Although experimental satellites with weather information had been launched before that, notably TIROS I in 1960.

The number of private meteorologists expanded greatly during this period of rapid technological development. Today I know that a large percentage of the members of the American Meteorological Society now come out of the private sector. Private meteorology has now become a very prominent element in the national and international meteorological and weather forecasting scene.

The organization called the Environmental Science Services Administration, ESSA, was formed in 1965 just two years after I took charge of the Weather Bureau. It resulted from a very particular constellation of individuals. Herbert Holloman was the first assistant secretary for science and technology in the Commerce Department. He and I and Admiral H. Arnold Karo, the director of the Coast and Geodetic Survey, in collaboration decided that we had the elements of an environmental organization in the Department of Commerce. This was the first organization in the federal government that had the word "environment" in its title. No legislation was required to bring these agencies together, only an executive order with congressional approval.

And so it was relatively simple to do. The new Environmental Science Services Administration encompassed the oceans, the atmosphere, and the ionosphere. The Coast and Geodetic Survey, in addition to its major ocean mission, made land observations for its geodetic work. The atmosphere was the Weather Bureau and the ionosphere was the Central Radio Propagation Laboratories (CRPL). Collectively they could represent a comprehensive approach to the atmosphere and the oceans. The agencies also brought much technology together. They assembled all kinds of technology in one organization: ships, aircraft, satellites, radar, and rapidly modernizing communications.

President Kennedy had laid down an international challenge: Collaborate with the nations of the world using technology to bring about significant improvement in the time range and accuracy of weather forecasts. Experiment with weather modification. Apply satellites to obtain global weather information. I remember being asked to go as a representative of the United States to the World Meteorological Organization to pledge \$5 million to the advancement of global weather prediction, for the development and the use of satellites, and for purchase of the automatic picture transmission (APT) equipment, which enabled the receipt of data from satellite altitude.

But there was more than that. The international collaboration resulted in the formation in 1963 of what was called at that time, and is still called, the World Weather Watch. The World Weather Watch was intended to bring and has brought about global observations and improved time range of weather forecasts. The research dimension of the World Weather Watch was the Global Atmospheric Research Program (GARP), which was a collaboration between the International Council of Scientific Unions (ICSU) and the World Meteorological Organization. Many innovative field experiments were undertaken under the aegis of the World Weather Watch and the Global Atmospheric Research Program. One was conducted in Barbados and another from Dakar, Africa. They were investigating ocean/atmosphere interactions. They were very very successful field experiments with many countries participating.

But let's move now to the road to NOAA. It was a congressional initiative. Senators Warren Magnusson and Fritz Hollings were deeply involved. In 1966 Congress passed the Marine Resources and Engineering Development Act to examine the development, utilization, and preservation of the marine environment. Subsequently the Stratton Ocean Commission was formed, chaired by Dr. Julius Stratton. Its formal name was the Commission on Marine Sciences, Engineering and Resources, and it issued a report in 1969 titled *Our Nation and the Sea* that set out a coordinated, comprehensive policy for the responsible use and stewardship of the nation's ocean and coastal resources. It was a landmark occasion and a landmark book. And it certainly affected our national policies on oceans and atmosphere. Although the Stratton Commission was initiated under aegis of President Johnson, its final report was made to President Nixon. Principal interests of this commission were in the oceans. It was an ocean commission. But it did recognize the growth of environmental concerns in the United States, largely as a result of some of us on the commission, like John Knauss and myself. We were able to convince the members of the commission that really this was an opportunity to do something broader and involve not just the oceans but also the atmosphere and hydrology.

The membership of the Stratton Commission was fascinating. Julius Stratton himself had been president of MIT and had been president of the Ford Foundation. Members of the Stratton Commission included a person like Jacob Blaustein, an elderly gentleman at the time and the founder of the American Oil Company, Amoco. The Commission also included Leon Jaworski, a lawyer from Texas, of Watergate fame. It included publicists like George Reedy, who was

President Johnson's public information officer. There were many others on the commission, but those are just a few of the noteworthy names. As I indicated, it was authorized by the Marine Resources and Engineering Development Act of June 1966. One of the things that impelled Congress to try to do something was [the fact that] by that time 45% of the people of the United States lived in coastal areas. That percentage has grown since that time. *The New York Times* recently published a statement saying that commissions are fine but rarely change the light bulbs. Well, the Stratton Commission was different. It really had major effects. President Nixon actually, for all of his shortcomings and all of the unfortunate things that have been said about him, was the person who institutionalized the environmental movement in United States government. His reorganization plans gave rise to NOAA and the Environmental Protection Agency (EPA).

The makeup of NOAA was one of the issues that the Stratton Commission formulated. First of all, ESSA, which was in the Department of Commerce, was the largest element of the proposed organization. The Bureau of Commercial Fisheries came out of the Department of the Interior. The National Ocean Data Center, which was operated by the Navy, came out of the Navy. The Great Lakes Survey came out of the Corps of Engineers. The Sea Grant Program came from the National Science Foundation. In addition there was the Marine Mineral Technology Center of the Department of the Interior and the National Data Buoy Center from the Coast Guard.

Several recommendations of the commission did not go through. First of all we recommended independent agency status. I still support an independent agency. In fact I recently made a presentation to the Presidential Commission on Ocean Policy chaired by Admiral Jim Watkins urging them to declare an independent agency, but they didn't do that. The Coast Guard was recommended for inclusion among the groups that were to make up NOAA. That was not approved. But something did happen. When NOAA was formed, it had a budget of approximately \$300 to 325 million. Its budget this year is \$3.9 billion. It's a remarkable transformation in the financial fortunes of NOAA. That's a 12-fold increase. Measured in constant dollars that is about a 2.4-fold increase.

We had a lot of arguments about the placement of NOAA. Where should it go? As I said, I was an advocate of an independent agency. And most of the other members of the commission were convinced that it should be an independent agency. It didn't happen. Among the departments, the Department of the Interior was favored because it was visualized as an environmental entity. It had many elements of environment in it, like the Geological Survey.

Walter Hickel, the former Governor of Alaska, came to Washington to be the Secretary of the Interior. Apparently there was some kind of a falling out between President Nixon and Wally Hickel. Interestingly, the Department of Commerce was headed by Maurice Stans, who was then the secretary. He and Nixon were very close. Since ESSA was the largest element of the proposed NOAA, the decision was finally to put it in the Department of Commerce. I was asked by the secretary, Maurice Stans, to head this new agency, NOAA. He called me into his office one day and said, "Bob, I want you to go out, get the best people you can. I don't care whether they're Republicans or Democrats, just get the right people for your organization. We were free to appoint whomever we wished to various posts. And there were many posts that needed filling. There was one exception. Howard Pollock was formerly the representative from Alaska and had been defeated in his race for Governor. Stans said, "I would like you to do one thing for me though. Bring Howard Pollock on as your deputy." I did. And he was a remarkably successful guy in that post because he had connections on the Hill.

One interesting aside I might say is how I got the title Administrator. Secretary of Commerce Maurice Stans called me into his office and said, "Bob, you're at a level now where we can call you undersecretary or we can call you administrator." I said I prefer administrator. And he said why? I said because it's less political. You had an administrator at NASA and you had heads of other independent agencies that were nonpolitical. I felt if you called me administrator, it would be much more nonpolitical than if you called me undersecretary.

NOAA was an environmentally-integrated agency. The weather satellites became more than weather satellites. They became environmental satellites. The Weather Data Center became the Environmental Data Centers. The ships we used not just for surveying and charting the coasts. They were used for meteorological purposes, as, for example, in some of these field experiments. Sea Grant developed a major advisory service of the oceans. And one of the things that NOAA was asked to do was act as a steward for various aspects of the oceans and atmospheric environment. I should indicate that as an environmentally-integrated agency, we had the Stratton Commission's recommendations to fall back on. We appointed an associate administrator for marine resources and an associate administrator for environmental monitoring and prediction. These two associate administrators, overlooking all of these different elements of NOAA, were able to bring about the coordination that was required.

There was a lot of policy and politics involved in the formation of NOAA. First in 1970, Reorganization Plan No. 4 brought us into being. 1972 saw the passage of the Marine Mammal Protection Act, the Coastal Zone Management Act, and the Marine Protection Research and Sanctuaries Act. Those three acts really set a new course for NOAA.

The Marine Mammal Protection Act was something I was deeply involved in. At the International Whaling Commission I pumped hard for cessation of pelagic whaling. And we were successful. Actually in 1972 at the first UN Conference on the Environment, in Stockholm, I was at lunch with the secretary of the interior, Rogers Morton, at the ambassador's residence.. Secretary Morton came up to me and said "Bob, I have to stay here. Could you go back to the conference and take over my chair?" I walked into the conference room. The chairperson said, "United States, you're up." Off the cuff I made a speech on the need to save the whales. All the participants started to applaud. It was fantastic. After that we went to the International Whaling Commission where we were successful in getting a cessation of pelagic whaling. I note that the pelagic whaling issue is once again in the headlines. The Coastal Zone Management Act also changed things in a radical way. For the first time, the United States government and the states were going to participate together to look over the coastal zone areas and see what could be done about conserving them. Coastal zone committees and commissions were established in the various states. Money was provided by both the federal government and the states. It turned out to be a marvelous idea. They have been very successful in organizing the use of the coastal zones.

Other legislation had personal effects. One way to satisfy the requirement of the Marine Mammal Protection Act was the placement of observers on all U.S. tuna vessels. The tuna vessel captains didn't like that very much. They protested and struck en masse. Next thing I knew, the Governor of California, Jerry Brown, is in Washington at the White House. He called for my resignation on the steps of the White House. It was very interesting to be the object of that fight. 1978 was the year of the first act by Congress addressing climate. Climate appears for the first time in major legislation. It has since become a central international environmental issue. But it's an issue that affects more than just the environment, it affects everything that we

do. In 1979 I chaired the first World Climate Conference held by the WMO. It was the first international conference to project the consequences and the issues that needed attention.

In the 1970s Dick Hallgren became the director of the National Weather Service. And much happened. For example, NOAA Weather Radio expanded to 300 stations. It was the largest single radio network in the country, which has since been converted to all hazards radio. The 1970s saw the rise of forecasting by computer. We had become dependent on numerical weather prediction, and the computer-generated weather forecast became a staple. Observational technology was automated and acronyms followed. There was AWIPS, which is “Advanced Weather Interactive Processing System.” We had AFOS, “Automation of Field Operations and Services,” and ASOS, “Automated Surface Observing System.” All of these efforts were directed at automating the activities of the weather service. Radars changed from the old WSR57 to the WSR74. Warning stations were reduced in number from 278 to 114. This was an attempt to bring together competent individuals in a smaller number of locations to provide warnings of hazards.

But it was not only the weather service that was undergoing changes. NOAA's stewardship responsibilities for insuring our environmental future became prominent. The Ocean Sanctuaries Act was passed in the 1970s. Today there are 12 marine protected areas in the country with additional ocean sanctuaries being declared regularly.

These areas are protected from fishing and other disruptive ocean activities. They are viewed as fish incubators. We introduced the fisheries management concept, pursuant to the Magnuson Fisheries Management Conservation Act. Regional councils were established with the responsibility for managing fisheries. We had state organizations overseeing the health of the coastal zones. And we began to take action about how one goes about addressing climate warming, an issue which by that time had become very serious.

The global reach of NOAA had become incredible. It was the designated U.S. representative to the World Meteorological Organization, Intergovernmental Oceanographic Commission of UNESCO, and the International Whaling Commission, among other international organizations

International programs proliferated. In addition to the World Weather Watch/Global Atmospheric Research Program, there was the International Hydrologic Decade in 1965 and the International Decade of Ocean Exploration in 1970. Earthwatch was formulated by the United Nations Environment Programme. And the International Decade for Natural Hazard Reduction was launched. Incidentally the planning for the UN program was headed by the president of the U.S. National Academy of Sciences, Frank Press.

What about NOAA's future? I've talked about what's happened in the past. First of all, we've recently had two commissions look at ocean policy issues, the Pew Commission and the Watkins Ocean Policy Commission. These and other groups have generated ideas that range from establishing a Global Earth Observation System of Systems, GEOSS, to ocean and coastal stewardship efforts. Proposals addressing fisheries management from an ecosystem point of view rather than species by species have been introduced. New climate observation and prediction systems have been proposed. Hazardous weather has become a central issue for NOAA. In fact NOAA did a wonderfully successful job in warning of Hurricane Katrina, for example, and warning also of many of the tornadoes that occurred in the mid-section of the country. In ocean observations and prediction new technology is being introduced. And NOAA is now positioned to advance United States in an environmentally sustainable manner. And that is the central problem of the 21st century. Thank you very much.



**Fig. 1.** Robert M. White in 1963 as Chief of the U.S. Weather Bureau.

