

CLIMATE ALERT

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World Climate Conference Slated for Cairo

The Climate Institute is preparing to hold a World Conference on preparing for Climate Change in Cairo, Egypt in early December 1989.

Suzanne Mubarak, First Lady of Egypt, has agreed to serve as the Conference's Honorary Chairman. The focus of this 5-day conference is to stimulate thoughtful responses to climate change by scientists and private citizens in countries throughout the world. Precise logistical arrangements are now being negotiated. Further details will be announced in the next issue of *Climate Alert*.



Suzanne Mubarak,
Honorary Conference
Chairman.

Participants from around the globe will gather to discuss the implications of climate change on most regions of the globe and response strategies for major sectors—agriculture and fisheries, water resources, public health, coastal protection, forestry, wildlife and parks, urban planning, transportation, industrial planning, and energy.

Dr. Hind Sadek, who serves as a Senior Fellow of the Institute, will be World Conference Coordinator. Dr. Sadek is a native of Egypt and holds a Ph.D. in Anthropology from Harvard University. She held the post of Director of the National Museum of Natural History in Iran for a number of years and was a member of the Department of Environment Council where she participated in the planning of national parks and wildlife refuge areas. At present, she is International Council of Museums consultant to the Egyptian Antiquities Organization and vice chair of the Board of the Children's Museum of Egypt. Dr. Mostafa Tolba, Executive Director of UNEP, will be an awardee at the Cairo Conference.

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Montreal Protocol Nears Enforcement

On October 17 and 18, seventy of the world's leading atmospheric scientists and ozone experts met at The Hague to review the current state of ozone layer depletion and to accelerate the control measures of the 1987 Montreal agreement. (For more details on the conclusions of this group, see separate story on Antarctic Ozone Hole in this issue.)

Three days earlier, the European Community (EC) agreed to ratify both the Vienna Convention for the Protection of the Ozone Layer and the Montreal Pro-

tol which restricts production of ozone-destroying chemicals. The EC plans to ratify the Montreal Protocol on chlorofluorocarbons (CFCs) and halons within the next few weeks, in time for the January 1, 1989 deadline. Three weeks earlier a U.S. report, citing a new analysis painting an "even worse scenario than anticipated," asserted further diplomatic steps would be needed even after rapid ratification of the Protocol.

Ten EC members had previously ratified

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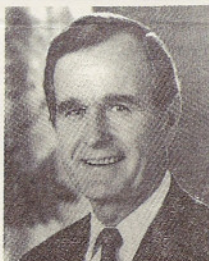
Climate High on Bush Agenda

For the first time in a Presidential campaign, protection of the environment this year became a widely discussed issue. And although this campaign revealed sharply divided stands on many issues, both major parties came to remarkable agreement on the importance of the threat of global warming. President-elect Bush has

promised to call a global conference on the environment at the White House. "It will include the Soviets, the Chinese, the developing world as well as the developed," he said in a speech delivered on August 31 in Erie Metropark, Michigan. "All nations will be welcomed—and indeed, all nations will be needed."

Governor Dukakis also asserted that if elected he would immediately call for an international environmental and conservation summit to bring together world leaders to confront urgent climate problems.

The U.S. Congress as well as the White House is looking to this issue. Partisan divisions were not a factor when a group of 42 Senators wrote a letter to President Reagan on March 31, 1988 urging him to "continue and expand recent initiatives on the international environmental problem of the greenhouse effect and global climate change." Twenty-four Democrats and 18 Republicans were among the signatories.



President-Elect George
Bush.

Africa Conference Slated for May 1989

The people of Africa may suffer the most severely from climate vagaries and yet the climate of the continent has had the least intense scrutiny. Turning its attention to this situation, the Climate Institute is convening a conference on "The Implications of Climate Change for Africa," at Howard University in Washington, D.C., on May 3-5, 1989. The conference will be co-sponsored by the United Nations Environment Programme.

The conference will examine the implications of climate change for African agriculture, the vulnerability of river systems such as the Nile to climate change or sea level rise, the regional climatic effects of deforestation, and the susceptibility of coastal areas to damage from sea level rise. The conference will also assess the potential harm to marine and terrestrial food chains from UVB radiation.

The meeting has already drawn an enthusiastic response from the African diplomatic community with a number of embassies involved in the planning of this conference. Ambassador Stephen Lewis, Chairman of the Toronto "World Conference on the Changing Atmosphere," who is currently serving as Special Advisor to the Secretary General of the United Nations on Africa, has agreed to participate.

Carl Cole, Director of Administration of the Climate Institute, is serving as Conference Coordinator. Dr. Hind Sadek, an Egyptian who is coordinating the Institute's "World Conference on Preparing for Climate Change," in Cairo in December 1989, will also assist with this conference.

The Remote Sensing Laboratory of the University of Maryland has agreed to make visual presentations of changes in vegetative cover in Africa from 1981 to 1989.

Climate Institute Honors Rowland, Mitchell, and Benedick

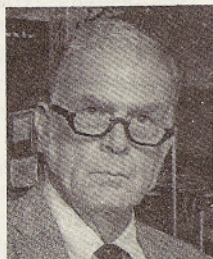
At a dinner on December 6, the first night of the 3-day Second North American Conference on Preparing for Climate Change, the Climate Institute will present awards to three individuals who have made outstanding contributions to furthering knowledge of the global climate system and to controlling damage to the stratosphere.

Dr. F. Sherwood Rowland is recognized for scientific research advancing our understanding of the stratospheric ozone layer.

In a paper published in the British journal *Nature* in 1974, F. Sherwood Rowland and his co-author Mario J. Molina first established a possible link between chlorofluorocarbons and eventual stratospheric ozone depletion. He has remained at the forefront of stratospheric research since then, playing a central role in NASA's Ozone Trends Panel. The March 1988 Panel Report established that global ozone levels have dropped appreciably in recent years. This finding culminated in international policy action in the Montreal Protocol in September 1987.

Fluorocarbon depletion of stratospheric ozone is one of the many interests of this scientist whose prodigious research activities include work on the chemical effects of nuclear transformations, radiation chemistry, tracer reactions, isotopes applied to geochemistry, and tropospheric as well as stratospheric chemistry of halocarbons, methanes and other hydrocarbons.

Dr. Rowland has been Daniel G. Aldrich Professor of Chemistry at the University of



Dr. F. Sherwood Rowland.

California, Irvine, since 1985. He also serves on the National Academy of Sciences Board of Environmental Studies and Toxicology, the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions, and the Ozone Committee of the International Association of Meteorology and Atmospheric Physics, as well as being a member of the science advisory board of the Max Planck Institute of Cosmochemistry and Geochemistry in West Germany.

Dr. Rowland received his Ph.D. degree from the University of Chicago and has also taught at Princeton University and the University of Kansas, Lawrence.

Dr. J. Murray Mitchell, Jr., is cited as a pioneer researcher on climate change. He was the first scientist to study paleoclimatic data to explain large scale past climate change and also the first to look into data records for the importance of human impacts. He was in the vanguard in plotting climatic futures based on climate sensitivities and carbon dioxide burdens.

Except for occasional semester sabbaticals at academic institutions around the country, Dr. Mitchell has spent his entire career in research in the field of climatic change with the Federal Government. Starting with what was then called the U.S. Weather Bureau, he continued his work through various governmental transformations of that agency to what is now the National Environmental Satellite, Data and Information Services (NESDIS). Dr. Mitchell has recently retired from NESDIS.



J. Murray Mitchell, Jr.

Ambassador Richard Elliot Benedick

is honored for his very significant role in drawing the diplomatic community into a realization of the implications of climate change and toward a willingness to consider international approaches to preparations for change.



Ambassador Benedick was principal negotiator for the Montreal Treaty concluded in 1987, a landmark international agreement limiting the dispersion of chlorofluorocarbons and halons into the atmosphere.

Last March, he chaired a symposium on the "Impact of Climate Change on the Third World: Implications for Economic Development and Financing," in Washington that was so successful it was repeated for members of permanent missions to the United Nations in New York in June. Nearly two dozen ambassadors expressed appreciation for this initiative, and papers from the symposia have entered the policy process of governments. The symposium was sponsored by the Climate Institute and co-sponsored by The Conservation Foundation.

Ambassador Benedick has also spoken at many meetings and conferences around the world, drawing lessons and implications from the successful Montreal negotiations for future actions among nations to ameliorate global atmospheric problems. He is now Senior Fellow at The Conservation Foundation.

This is the second year in which Climate Institute awards have been made. Last year the awards were made to Dr. Roger Revelle, University of California, San Diego, for scientific achievement, and to Senator John Chafee for his contributions to public understanding of climate problems.

Power Company Will Subsidize Tree-Planting

In a first attempt to counteract global warming resulting from emissions of carbon dioxide, a U.S. power producer will spend \$2 million to plant 52 million trees in Guatemala.

AES Thames, a coal-fired plant in Uncasville, Connecticut, worked with the World Resources Institute in Washington, D.C., to develop a program which links alleviation of the greenhouse effect with saving tropical forests. The Connecticut company is a subsidiary of Applied Energy Services of Arlington, Virginia.

The company has given a grant to CARE, the international relief and development organization, to help 40,000 smallholder farmers in Guatemala plant more than 52 million trees in 10 years. CARE will work

with the Guatemalan forestry service and the Peace Corps on forest management and soil conservation. The project will include woodlot plantations, agroforestry, live fences, soil conservation and forest fire protection.

The outcome of this effort is expected to mitigate the 15 million tons of carbon which will be emitted during the expected 40-year life of the power plant. The company estimates that two square miles of woodlots are required to mitigate one megawatt worth of carbon emission. The initial grant has been able to attract additional support from other agencies, including the Guatemalan forestry service, CARE, the Peace Corps and U.S. Agency for International Development.

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Nations Around World Focus on Climate Concerns

(Based largely on information provided by Dr. Alan Hecht, Director, National Climate Program Office.)

ASIA

Vietnam

The University of Hanoi has formed a climate impacts group within the Resources and Environment Center. The group will prepare a proposal for climate impact assessment of rice production in the Red River Delta, land degradation in the midlands, ecosystem vulnerability and wildlife status in the Mekong Delta.

People's Republic of China

The US-PRC Joint Working Group on cooperation in the field of atmospheric science and technology held its 7th session in April 1988 and agreed to continue to work together on joint studies on mechanisms of global change.

Japan

An advisory group to Director-General Toshio Horiuchi, Head of the Environment Agency, called upon Japan to assume a leadership role in devising long-term, worldwide strategies for global warming due to CO₂ emissions and stratospheric ozone depletion. The report advised the government to adopt emergency measures to protect tropical forests and increase cooperation with UN environmental organizations.

A recent government poll showed that 67-75 percent of the Japanese people are concerned about global environmental issues including the destruction of tropical forests, ozone depletion and global warming.

Soviet Union

F. I. Morgun, newly appointed Chairman of the USSR State Committee for the Protection of Nature, described the nation's deteriorating environmental controls at a recent Party Congress. Future environmental planning will be carried out in close cooperation with government and academic organizations.

Alan Hecht of U.S. and M. Budyko of USSR, Co-chairmen of the US-USSR Bilateral on Environmental Protection, Working Group VIII on Climate, are preparing a joint report on future climates, in response to last December's Reagan-Gorbachev communique.

SOUTH AMERICA

Brazil

Scientists attending a week-long conference at San Jose dos Campos in early March warned of climatic changes on a global scale unless action is taken to control deforestation in the Amazon Basin. As

much as 10 percent of the rain forest has been deforested since 1978.

Costa Rica

Costa Rica President Oscar Arias Sanchez signed a resolution declaring 1988 the year of the environment in his country. Costa Rica was the beneficiary of a debt-for-nature swap of \$3 million U.S. dollars with the World Wildlife Fund (WWF).

Ecuador

In another WWF debt-for-nature swap, the Ecuador debt was converted through the central bank in Ecuador into local currency which will be used for the maintenance and conservation of Ecuador's national parks and reservoirs.

EUROPE

Eastern Europe

A tripartite environmental protocol promoting cooperation on pollution problems, the first such accord within Eastern Europe, was signed in March by Czechoslovakia, Poland, and East Germany. All three countries are heavily dependent on burning coal for energy.

Western Europe

The European Community Commission established on July 19, 1988 a special internal working group to examine the range of problems associated with the greenhouse effect. Clinton Davis is the commissioner responsible for environmental policy.

Italy

Environmental effects of pollution—including ozone depletion—and climate change were debated at a meeting June 10-11, 1988 at the National Academy of the Lincei, one of Italy's leading scientific institutions. Italian Minister of the Environment Giorgio Ruffalo promised to meet with producers and consumers of CFC's to discuss industrial reorganization.

United Kingdom

In an address to the Royal Society of London for the Improvement of Natural Knowledge on September 29, Prime Minister Margaret Thatcher spoke of—among other scientific topics—current concerns about the environment. She dis-



Prime Minister Margaret Thatcher of Britain.

cussed the increase in greenhouse gases, the hole in the ozone layer, and acid deposition and the need "to consider the wider implications for policy—for energy production, for fuel efficiency, for reforestation." She also stated, "The Government espouses the concept of sustainable economic development."

Sir Crispin Tickell, permanent representative of the United Kingdom to the United Nations, and a Climate Institute Board member, made a speech to the UN General Assembly on October 24 entitled, "Conservation of Climate as part of the Common Heritage of Mankind."

Sweden

Spurred by public opinion polls showing environmental concerns outweighed even such issues as health care, economic growth, tax reduction, welfare system improvements and expanded child care, all parties in the September elections made promises to act to cleanse Sweden's forests, seas, and skies. The Greens Environment Party, campaigning to "launch an all-out attack on the ongoing devastation of the environment," won more than 5 percent of the total vote, and representatives were sent to parliament for the first time. The Greens are represented in about half the country's municipal governments.

NORTH AMERICA

Canada

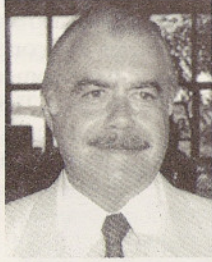
The nation has established a marketing policy to label products that are environmentally safe, i.e., do not contain CFC's. It proposes to host conference in 1992 on means to achieve sustainable environment, a follow-up of the Brundtland Report. Energy Minister Marcel Masse announced on June 6 an environmental action plan to work with Canadian industry and the geoscience community to develop earth-observation technologies capable of monitoring the environment.

United States

At the initiative of Jeremy Rifkin over 100 activists from 30 countries gathered in Washington, D.C. October 10-12 to organize a Global Greenhouse Network. The Conference participants included representatives of consumer groups, animal welfare/rights groups, environmentalists, and religious groups. The conference statement is available from the Foundation on Economic Trends, 1130 17th Street, NW, Suite 630, Washington, D.C. 20036. Telephone: 202/466-2823. Fax: 202/429-9602.

Brazil's President Announces Steps to Slow Rain Forest Destruction

Brazilian President José Sarney in October announced a series of steps to slow the destruction of the Amazon's rain forests. The impetus for action, Mr. Sarney said, came from a report by Brazilian scientists that they had found more than 6,000 fires burning in the Amazon in one day.



President José Sarney of Brazil.

The fires set by Brazilian farmers are on such a massive scale that scientists are worried about the effects on both the Brazilian and the global climate. The shrinking of the rain forest, they believe, has already caused a drop in rainfall in Brazil's drought-prone northeastern region.

The Brazilian scientists have begun a new program to monitor fires via satellite and are still gathering information on this year's damage. They reported that in 1987, 77,000 square miles of land burned, close to 40 percent of it virgin rain forest. The

fires in the last three months of the dry season have been worse this year, they have said.

The preventive steps announced by President Sarney include:

- subjection of all agricultural and industrial projects to rigorous environmental controls.
- suspension of tax breaks and other official incentives for development projects that may harm the environment.
- limitation of cattle raising in the Amazon region and forbidding of it in the dwindling Atlantic forest.
- establishment of six working groups and ordering of studies to determine which areas in the Amazon basin and elsewhere would be used for agriculture and which must be preserved.
- strengthening of governmental environmental agencies.
- a total ban on the export of logs.

The new measures appear to address concerns increasingly raised by such international lending agencies as the World

Bank and the Inter-American Development Bank. Formerly these organizations have lent Brazil huge sums for new roads and other development projects in the Amazon Basin. They have recently shown reluctance to approve new project loans and have stalled or cut off disbursement of funds.

This year an area the size of West Germany is expected to go up in flames. Some say fires in the vast region will produce one-tenth of the carbon dioxide rising into the atmosphere. Carbon dioxide is responsible for approximately 50 percent of the impetus for greenhouse warming.

According to the Brazilian Government in Para, Brazil's second largest state, which still has large stretches of virgin jungle, 14 percent or 180,000 square kilometers were deforested between 1975 and 1986, ten times the area cut by settlers in the previous 100 years. Brazil's Forestry Agency, in a recent assessment, has said that only 5 percent of trees cut in the Amazon reach the market. The other 95 percent are burned or left to rot.

1988 U.S. Wildfires Burn 6,600 Square Miles

Wildfires in the U.S. in 1988, usually set by lightning or human carelessness, consumed about 4.2 million acres, nearly 6,600 square miles. There were 70,000 fires this year, up from 50,862 in 1987. Interaction of the fires and climate is still being assessed. The summer's heat and drought, conditions which are expected to become more common in continental interiors under greenhouse warming, contributed to the spread and intensity of the fires. On the other hand, smoke from the fires may have produced alterations in local climate.

Last year 1.3 million acres burned. The fires continued to smolder 6 weeks after being ignited by lightning strikes in late August, engulfing 772,500 acres in Northern California and 135,281 acres in southern Oregon, the U.S. Forest Service said. Smoke changed daylight to twilight throughout the region.

Sandia National Laboratory sent a Twin Otter aircraft to sample cumulus clouds that formed above large smoke plumes in 1987. The University of Washington dispatched a C-131 research plane to follow a huge smoke plume 400 miles over the

Pacific, farther than a smoke cloud had ever been tracked before.

In 1982, Alan Robock, a meteorologist at the University of Maryland, found smoke from Canadian forest fires chilled Midwest areas 3 to 7 degrees below forecasts, although temperatures in adjoining non-smoky areas remained consistent with forecasts.

Causes of the 1988 U.S. fires included damages done by swarms of mountain pine beetles which have been cutting a swath through the West, creating fuel for forest fires as they kill huge, dense plots of trees from Montana to New Mexico and Colorado to California. The insect destroys about two million acres of timber a year throughout the country. Last year it afflicted more than 2.4 million acres. The year before it wiped out 3.4 million acres, a figure comparable to this year's forest fires consumption of 4.2 million acres.

In addition to the insect damage, there was a record drought which left the trees weak and the deadwood drier than ever. Not only was the weather hot and dry this year, but fuel was plentiful in many areas.

One Forest Service scientist estimated that this summer every acre of Yellowstone contained 40 to 45 tons of small dried matter—pine needles, discarded branches, rotted trees, and old brush—which accumulates till it is recycled by rot or fire. Because Yellowstone is high and has a dry climate, the season for growing and rotting is very short. Three years of low rainfall across the West, hot weather and abundant fuel combined with low humidity and strong winds to create fires on a scale unseen in Yellowstone since 1850. Because wind-driven wildfire is so capricious, leaving a mosaic of burned and unburned patches, only 30 to 70 percent of the area was actually touched by flames.

Infrared aerial photographs showed that less than 1,400 of the 1.4 million acres were burned severely enough to wipe out life entirely. Very intense fires can destroy organic material such as seeds and the roots of grasses below the surface of the soil. Areas that were burned less severely are expected to come back eventually without artificial reforestation or reseedling, the park officials reported in October.

EPA Assesses Effects of Global Change on U.S.

The devastating effects of global warming caused by human activities perturbing the atmosphere, and the robust measures that will be needed to forestall damage to forests, agriculture, water quality, coasts and wetlands, were summed up in graphic detail in a draft report to the U.S. Environmental Protection Agency's Science Advisory Board. The report, which has not yet been approved by the advisory board, was requested by the Senate Environment and Public Works Committee. The full report will be followed by a second report from the agency, due at the end of the year, recommending policy steps to be taken to reduce the pollution producing the global warming.

Looking at major sectors, the report found:

- Forests may be unable to adapt quickly enough to a rapid increase in temperature, estimated at 3 to 8 degrees Fahrenheit, by the middle of the next century. Forests in the nation could begin to die back in 30 to 80 years. The composition of the forests will shift and the range of some species is likely to shrink.
- With a global sea level rise of one to three feet because of the oceans' thermal expansion and glacial melting, most of the nation's coastal marshes and swamps would be flooded by salt water. Louisiana might lose up to 85 percent of its ecologically rich wetlands.
- While developed coastlines and beaches could be protected by bulkheads and dredging, the cost could amount to as much as \$111 billion by the year 2100. Even so, 7,000 square miles of land now dry would be lost.
- Changes in snowmelt and runoff could cause water problems in California. Less snow and faster evaporation might reduce the level of the Great Lakes, and less water in other areas would bring higher concentrations of pollutants in water supplies.
- Diseases and pests may spread to larger areas.

"Global climate change will have significant implications for natural ecosystems," the report concludes, "for when, where and how we farm; for the availability of water we drink and water to run our factories; for how we live in our cities; for the wetlands that spawn our fish; for the beaches we use for recreation, and for all levels of government and industry."

The planned release date of the report, entitled, *The Potential Effects of Global Climate Change on the United States* (draft), prepared by the Office of Policy, Planning, and Evaluation of the U.S. Environmental Protection Agency, is November 20. It may be obtained from the Government Printing Office or inspected at EPA regional libraries.

Scientists at Hague Meeting Find 1988 Ozone Hole is Smaller

Antarctic ozone measurements in 1988 indicate less depletion than in '87 and '85, but levels similar to those in '86 and '84, according to a group of 70 of the world's leading atmospheric scientists meeting in The Hague, Netherlands on October 17 and 18.

The higher ozone level does not mean the danger of ozone depletion has declined but appears to be due to natural fluctuations in the atmosphere. Even if the Montreal Protocol limits are observed, the scientists concluded, the predicted atmospheric burden of chlorine in the Antarctic hole would remain forever. Stronger regulatory measures, up to a complete phase out of emissions, may be necessary, they said.

Representatives of the developing countries expressed concern about the availability of food and other resources which will be adversely affected by ozone depletion.

Total ozone has decreased about 4 percent in the winter months since 1970, in latitudes 30 to 64 degrees North, allowing for such natural variables as the solar cycle.

Temperatures high in the atmosphere have been a few degrees warmer this year, reducing cloud formation in the stratosphere. Chlorine compounds in the clouds tend to do the most damage to ozone.

A sensor aboard a new satellite, NOAA-11, launched on September 24, will meas-

ure ozone levels around the world at various altitudes. This will improve the ability of scientists to track over long periods even small changes in the extent and location of ozone loss. After checkout and calibration, the sensor is expected to make its first readings in January. It is thought to be sensitive enough to reveal ozone changes of one to two Dobson units.

Other instruments aboard the satellite will assist in studying warming of the atmosphere by measuring the clouds and humidity which increase as the earth slowly warms.

Instruments sent up in balloons from the Antarctic have measured an average of 200 Dobson units in October compared to 135 last October and 165 in October 1986. The ozone level was as high as 250 units in 1980. A Dobson unit is a measure of the concentration of ozone made by comparing the absorption in the air of different wavelengths of sunlight.

According to plans discussed at the scientists' meeting in The Hague, an assessment process, evaluating and reviewing control measures for ozone-depleting substances, will begin immediately and be completed by about mid-1989. The review will be based on available scientific, environmental, technical and economic data, and will include the role of potential substitutes.

Montreal Protocol

Continued from page 1

the Vienna Convention, which has already achieved the minimum signatories to go into effect, and the remaining two are expected to take action shortly. Signers of the Vienna Convention, concluded in 1985, agreed to cooperate in research, systematic observation, and exchange of technical data on the ozone layer, which protects the earth from solar radiation. The Montreal Protocol was signed in 1987.

Beginning in mid-1989, EC producers must freeze their production, use, and importation of CFCs at 1986 levels. By 1993, these levels must be cut by at least 20 percent, and by 1998 another 30 percent. Restrictions on halon production will take effect in 1992.

"The Community is one of the world's major producers of CFCs," according to Laurens Jan Brinkhorst, Director-General of Environment, Consumer Protection and Nuclear Safety for the EC Commission. The EC Commission has adopted a resolution to conclude voluntary agreements

with industry to achieve the greatest possible reduction of CFCs and halons.

A U.S. Environmental Protection Agency (EPA) report released in late September, projected a more extensive and faster-moving threat to the stratospheric ozone layer than previously realized, prompting U.S. officials to call for a new diplomatic initiative to accelerate the phasing out of CFCs.

Even with full global participation, the EPA report said, the concentration of ozone-depleting chemicals will at least double in the next 87 years. Concentration of the chemicals has in the last 25 years resulted in a 3 percent depletion of the ozone layer over North America and Europe.

One official said EPA will press for elimination of CFCs and halons by 1998 and will seek to freeze use of methyl chloroform, a common industrial solvent which was not covered by the Montreal Protocol.

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Severe Hurricanes Expected to Occur More Frequently

Hurricane Gilbert, the most intense storm on record, is seen by some scientists as a harbinger of things to come in a warmer world.

"A change in sea-surface temperature of 1 degree Centigrade will change the minimum sustainable pressure in hurricanes by 15 to 20" millibars, Dr. Kerry Emanuel, a professor of meteorology at the Massachusetts Institute of Technology, reported in a paper published in the July-August issue of *American Scientist*, shortly before Hurricane Gilbert struck. "An increase of a few degrees (as may occur, for example, as a result of the greenhouse warming associated with an increase of atmospheric CO₂) could cause a substantial increase in the severity of hurricanes," he continued, in an article entitled, "Toward a General Theory of Hurricanes."

Hurricane Gilbert which began September 8 as a "depression" in the eastern Caribbean with 30 mph winds, became the most severe storm in the history of barometric pressure readings. Barometric pressure is measured as the height in inches which the atmosphere will force a column of mercury in an evacuated tube. By September 13 the barometric pressure was 26.13 inches with highest winds of 175 mph. The previous barometric pressure low was 26.35 inches in a 1935 hurricane that hit the Florida Keys. (Names

were not used to designate storms until 1953.) Gilbert was a category 5 storm, the highest classification, which includes winds greater than 155 mph and central pressure less than 27.17 inches. Only three category 5 storms have hit the U.S., the 1935 storm in Florida, Hurricane Camille which struck the Mississippi coast in 1969, and Hurricane Allen which hit Texas in 1980.

More than 100 people were killed in Jamaica, Haiti, the Dominican Republic, Honduras, and the Yucatan peninsula, before the storm reached Mexico. Jamaica took the worst beating with 36 dead, an estimated 500,000 people left homeless, and \$8 billion in property damage. In the Yucatan, 29 died and as many as 300,000 lost their homes.

The huge hurricane, which spread devastation over southeastern and northeastern Mexico for four days, left at least 136 dead, caused more than \$880 million worth of damage, and destroyed the homes of more than 193,000 Mexicans.

One of the world's leading oceanographers, Dr. Carl Wunsch of the Massachusetts Institute of Technology, told a hearing of the U.S. Senate Committee on Environment and Public Works on September 14 that the frequency and ferocity of hurricanes could be expected to increase if the world experiences a greenhouse effect induced warming.

La Niña Drops Temperatures in Equatorial Pacific

A research scientist at the Scripps Institute of Oceanography in California has recently reported detection of an unusual climate phenomenon in the Pacific. It is a part of the Southern Oscillation, a giant meteorological system linking the Pacific ocean and atmosphere.

The new phenomenon, known as La Niña, "the girl," in Spanish, is a counterpart to El Niño, "the boy" or "Christ child." El Niño, which scientists refer to as ENSO (El Niño/Southern Oscillation), usually appears about Christmastime, bringing warm water and winds from the western Pacific. Its effects can spread far beyond the anchovy fishing off western Peru where it was first recognized; there was a particularly severe ENSO episode in 1982-3.

Temperatures in the 1982-3 ENSO were as much as 8 degrees warmer than normal. In the La Niña now being studied ocean temperatures off equatorial South America dropped last summer by 7 degrees Fahrenheit. The conjunction of the cooler water with a patch of unusually warm water may have shifted the atmospheric convergence zone (a storm region over warm water) northward from the equator, pushing the jet stream north of its usual path into a pattern that sent rainfall far east of its ordinary midwest destination. Some scientists are forecasting a colder winter and a significant but temporary deceleration of planetary warming. The last La Niña occurred in the mid 1970s.

Ecology Artist Offers Climate Poster for Sale

A poster called "Failed Atmosphere," illustrating the planet earth with a ruined biosystem, by ecology artist Jerry Carter, will be available at the Climate Institute's Second North American Conference on Preparing for Climate Change in December.

The artist, who describes his work as "lobbying for the planet" while he makes his art and says his subject matter is "survival," will be exhibiting his work in 1989 in Finland and the Federal Republic of Germany.

This summer in the Soviet Union, a Tass weekly magazine called *Echo of the Planet* featured an article on Carter and carried photographs on the back and inside cover.

A red likeness of the poster has been on the cover of an American Association for the Advancement of Science exhibit brochure.

His masterpiece, a mosaic called "Second Genesis," was commissioned by the City of Ravenna, Italy, the first fine art mosaic commissioned in 13 centuries.

The poster, which is in color and measures 20 x 28 inches, will be sold for \$15. Checks should be made out to the Climate Art Fund. After the December Conference, orders may be placed by phone at 202/649-5019, or by mail to the Climate Art Fund, 10602 Bucknell Drive, Silver Spring, MD 20902.

Toronto Conference Statement

A Statement prepared by participants at the "World Conference on the Changing Atmosphere: Implications for Global Security," held in Toronto June 27-30, 1988 has been distributed so that action on its recommendations may begin. Conference Proceedings will be printed later this year. The Statement may be obtained from H. L. Ferguson, Conference Director, 4905 Dufferin Street, Downsview, Ontario, Canada, M3H 5T4. Telephone: 416/665-4760.

Glantz Details Climate Responses

In a work published in October on societal responses to climate change, case studies take a close look at regional scenarios based on actual, prolonged, outlying climatic events that have occurred recently in North America. The book has been edited by Dr. Michael H. Glantz, head of the Environmental and Societal Impacts Group and senior scientist at the National Center for Atmospheric Research. It is entitled, *Societal Response to Regional Climatic Change: Forecasting by Analogy*.

Besides assessing perceptions and responses of local, regional, and Federal participants in communities and agencies dealing with climatic change, the book reviews the regional scenario approach, its policy implications, the use of analogies, and the role of extreme events in climate impact assessment.

The volume is available from Westview Press, 5055 Central Avenue, Boulder, CO 80301, for \$40.

Calendar of Climate-Related Events

1988-89

December 6 *White Plains, NY*
Science and Technological Issues in Environmental Law: Biosphere Problems. Pace University School of Law
Contact: Richard Ottinger, 914/681-4244

December 6-8 *Washington, DC*
Second North American Conference on Preparing for Climate Change, convened by Climate Institute. Mayflower Stouffer Hotel.
Contact: John Topping, 202/547-0104

December 6-9 *Groningen, The Netherlands*
International Congress on Nature Management and Sustainable Development, organized by the Foundation for Nature Management and Sustainable Development and the University of Groningen.
Contact: Prof. Dr. W.D. Verwey, (int+)(31)-(0)50-138323
P.O. Box 1141, 9701 BC Groningen, The Netherlands

December 7 *Washington, DC*
Global Environmental Concerns and Energy Policy in the 101st Congress, sponsored by Council on Alternative Fuels
Contact: Michael S. Koleda, 202/898-0760

December 13-14 *Washington, DC*
Meeting of Ocean Sciences Board, National Research Council, 2101 Constitution Avenue, NW. December 13—Room 250; December 14—Room 180. Open to the public but please give advance notice.
Contact: Mary Hope Katsouras, 202/334-2714

December 14-15 *Washington, DC*
Meeting of advisory panel for U.S. component of Temporal Ocean Global Atmosphere. National Research Council, Georgetown Facility, Green Building, Room 118. Open to the public but please give advance notice.
Contact: Ken Bergman, 202/334-3511

1989

During 1989 *Japan*
Pacific Rim Conference to discuss alternatives to CFC's targeted for production cuts under Montreal Treaty, co-sponsored by Japan and U.S.

January 16-18 *Turin, Italy*
Conference on "Global Environmental Issues," sponsored by foundation of the Instituto Bancario San Paolo di Torino.
Contact: Dr. Gastone Chiangari, 202/296-1610

January 29-February 3 *Anaheim, CA*
Symposium on the Role of Clouds in Atmospheric Chemistry and Global Climate.
Contact: Amer. Meteorology Soc., 617/227-2425

February 1-2 *Boulder, CO*
"Global Change and International Law: The 'Greenhouse Effect,' Comprehensiveness and the Third World," sponsored by Nicholas R. Doman, Society of International Law, University of Colorado School of Law.
Contact: Daniel B. Magraw, 303/492-1288

February 3-5 *Boulder, CO*
Conference on Global Change, University of Colorado Environmental Center.
Contact: Lynn Buhlig, 303/492-8308

February 13-17 *New Orleans, LA*
Energy from Biomass and Wastes, sponsored by Institute of Gas Technology.
Contact: Donald L. Klass, 312/567-3881

February 20-22 *Ottawa, Canada*
Conference on Legal and Policy Aspects of Protection of the Earth's Atmosphere, sponsored by Canada.

February 20-22 *Washington, DC*
The 1989 International Development Conference: Building the Future as it Ought to Be. Washington Convention Center.
Contact: Kathy Morrell, 202/638-3111

February 22-23 *Delhi, India*
Climate Change Meeting: Perspective from Developing Countries: The Indian Sub-Continent.
Contact: George Woodwell, 508/540-9900

February 27-28 *Santa Clara, CA*
Electronics, Stratospheric Ozone and CFCs—the New Realities, co-sponsored by American Electronics Association, EPA and the Environmental Health Center
Contact: Bud Ward, 202/293-2270

February 28-March 3 *Itasca, NY*
Conference on Global Environment Change: Connecting Science and Policy. Sponsored by Global Environment Program, Center for Environment Research, Cornell University, and National Patent Development Corporation.
Contact: Christine C. Harwell, 607/255-4676

March 5-7 *Charleston, SC*
Climate and Agriculture: Systems Approaches to Decision Making
Contact: Albert Weiss, 402/472-6761

March 7-10 *Charleston, SC*
Sixth Conference on Applied Climatology.
Contact: Amer. Meteorological Soc., 617/227-2425

March 29-30 (tentative) *Washington, DC*
Meeting of Board of Atmospheric Sciences and Climate, National Research Council.
Contact: Ken Bergman, 202/334-3511

April 17-31 *Ottawa, Canada*
Tenth Conference on Fire and Forest Meteorology

April 25-26 (tentative) *Washington, DC*
Meeting of Climate Research Committee, National Academy of Sciences.
Contact: Ken Bergman, 202/334-3511

May 1-3 *Washington, DC*
Forum on Global Change and our Common Future, sponsored by National Research Council's Committee on Global Change.
Contact: June Ewing, 202/334-2235

May 3-5 *Washington, DC*
Symposium on "Implications of Climate Change for Africa." Armour J. Blackburn University Center, Howard University. Sponsored by Climate Institute and UN Environment Programme.
Contact: John Topping, 202/547-0104

May 16-19 *San Diego, CA*
18th Conference on Hurricanes and Tropical Meteorology.
Contact: Amer. Meteorology Soc., 617/227-2425

July 31-August 11 *Reading, UK*
Fifth Scientific Assembly, International Association of Meteorology and Physics. Local organizing committee, Department of Meteorology, University of Reading.
Contact: Ross Reynold, +44 734 875 123
2 Earley Gate, Whiteknights, Reading RG6 2AU

August 21-25 *Seattle, WA*
Symposium on Ice and Climate with International Glaciological Society

Fall *Ottawa, Canada*
Symposium on "Impact of Climate Change in the Arctic," sponsored by Climate Institute.
Contact: John Topping, 202/547-0104 or J.A.W. McCulloch, 416/734-2064

September/October *Annapolis, MD*
Symposium on "Impact of Climate Change on the Chesapeake Bay," sponsored by Climate Institute and Laboratory for Coastal Research, University of Maryland.
Contact: John Topping, 202/547-0104 or Stephen Leatherman, 301/454-5167

November 13-17 *Buenos Aires, Argentina*
Third International Conference on Southern Hemisphere Meteorology and Oceanography

December *Cairo, Egypt*
World Conference on Preparing for Climate Change, sponsored by Climate Institute.
Contact: John Topping, 202/547-0104

Note: To date, Climate Alert has been largely on a complimentary basis. To insure continued receipt, please use the form below:

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Members who have already paid the previous higher rate will have their membership term extended.

Severity of Floods in Bangladesh Linked to Deforestation

The monsoon floods of early September 1988 in Bangladesh, the worst in the country's history, were another illustration of the vulnerability of Third World nations to climate-related catastrophes. Official figures put the dead at 1,000 but according to unofficial estimates more than 2,000 died. A U.S. AID report to President Reagan said 25 million people lost their homes, five million acres of rice land were inundated, and 43,000 miles of roads were damaged. Floods in 1987 were considered at that time the worst in modern times and reduced economic growth by 50 percent.

A month later heavy floods hit four states in northwest India. Punjab was most severely affected in more than a week of flooding with many acres of farmland inundated and at least 400 dead. Tens of thousands of farm animals perished and food stocks were destroyed. Other Indian states reported hundreds more casualties as rivers swollen by record monsoon rains poured into the plains and valleys. There has also been recent heavy flooding in northeastern India.

A severe storm struck the Bay of Bengal along the coast of Bangladesh on October 19, about six weeks after the country's earlier floods, with 75-mph winds and 15-foot waves. At least 400 fishermen were missing and presumed drowned and 1,000 people were injured.

Deforestation in the Himalayas and their foothills is allowing the rush of water from the barren, eroded hills along the mountainous roof of India and Nepal into Bangladesh and India's northern states.

Continued sea level rise and further deforestation would subject Bangladesh

and India to repeat performances of such disasters, underlying the urgency of a cooperative approach to problems resulting from climate change.

After the floods in Bangladesh, the President, Lieut. Gen. H. M. Ershad, reached individual agreements with India and other neighboring countries for cooperation. General Ershad and Prime Minister Rajiv Gandhi of India agreed to set up a joint task force to study the flood management and water flow of the Ganges and Brahmaputra Rivers. Nepal has agreed to set up a joint study team on the problem. Bhutan and China are also being approached on the issue.

Bangladeshi Foreign Minister Humayun Rasheed Choudhury appealed to the United Nations General Assembly on October 10 for regional cooperation with international support for a solution to the country's annual flood disasters. But the Bangladeshi president has not yet won sufficient support for a regional response. Mr. Choudhury has suggested a regional water authority, including the five concerned countries, to regulate and harness water resources for the benefit of all. He said a regional agency would need international assistance both in technology and financing because the problem is so huge. He has cited as an example technological help from the Netherlands and West Germany which coop-



President Hussain Muhammed Ershad of Bangladesh.

erated in ameliorating Rhine River floods.

Indian Prime Minister Rajiv Gandhi has ordered restrictions on tree-cutting for industrial purposes in an attempt to reduce the devastation to India's environment. He hopes to enforce a ban in five years.

Because most Indians, even in cities, cannot afford cooking gas connections, they use firewood. More than 2.5 million acres of rich forests are destroyed every year, increasing erosion and worsening annual floods. India's National Remote Sensing Agency reports forest cover in the nation has been reduced from 17 percent in 1972-75 to 14.1 percent. The Government is planning to reforest five million acres, at a cost of more than \$400 million, by 1990. Around the country, local volunteer groups are organizing villagers to protect trees and wildlife.

Montreal Protocol

Continued from page 5

If methyl chloroform emissions grow at recent rates, chlorine concentrations would rise from 2.7 ppb to 8 ppb by the year 2075, according to the report. Even with a methyl chloroform freeze, chlorine levels would hit 6 ppb by 2075, it predicted. To stabilize chlorine and bromine levels in the next 100 years will require an immediate 100 percent reduction in the use of CFCs and halons and a freeze on methyl chloroform, said John Hoffman, co-author of the report. The report, *Future Concentrations of Stratospheric Chlorine and Bromine*, may be obtained from EPA by calling 202/382-4036.

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New Membership Rates

To insure broader participation, Climate Institute membership, including subscription to *Climate Alert*, has been reduced to \$35, with a special student rate of \$15. See page 7 for tear-out Membership Form.

The Climate Institute is a private, nonprofit organization formed to advance public understanding of global warming produced by the greenhouse effect and of strategies to avert stratospheric ozone depletion.