Chantilly Meeting May Portend Arduous Negotiations But Progress is Evident

The second meeting of the International Negotiating Committee for a Framework Convention on Climate Change has now been scheduled for Geneva, to start on June 17 and end on either June 26 or 28. This is the follow-on of the meeting held at the Westfields Conference Center in Chantilly, Virginia, on February 4-14 where representatives of 101 countries began to hammer out procedures as a first step on the road to the United Nations Conference on the Environment and Development in Rio de Janeiro in June 1992.

At the Chantilly meeting, Jean Ripert of France, Chairman of the IPCC Special Committee on Developing Countries, who has also served as U.N. Director General for Development and International Economic Cooperation, was elected chairman of the newly formed Intergovernmental Negotiating Committee for a Framework Convention on Climate Change. The conference agreed to set up two working groups, one to draft specific recommendations for reducing the threat of global warming and the other to cover legal and financial mechanisms.

The meeting was unable to reach a consensus among five competing re-

Climate Change Would Damage Great Lakes Forests, Mexican Agriculture

Projections of the effects of global warming on the forests of the Great Lakes area show startling alterations, according to Daniel Botkin, prize winner at the Woodlands Conference in March. In the transition from boreal to northern hardwoods, massive die-offs of mature trees would occur. Open forest would become thickets of shrubs, seedlings and saplings. Canopy trees damaged by too much heat and water would suffer from insect attack and disease outbreaks. What might look like mismanagement could be merely secondary responses to global warming.

The Conference, "The Regions and Global Warming: Impacts and Response Strategies," was held from March 3-6 at The Woodlands, north of Houston, Texas. In conjunction with the conference, Houston oilman George P. Mitchell and his wife Cynthia announced the winners of the Fifth Mitchell International Prize for Sustainable Development. Dr. Botkin, a professor of biology and environmental studies at the University of California, Santa Barbara, received the $50,000 first prize and delivered the keynote address at the awards banquet.

Taking the Great Lakes Region as an example of the dilemmas we face, Botkin argues that the consequences of global warming for the area would be so severe that, even though the possibility of warming remains controversial, it is only prudent to plan now, projecting the impacts as accurately as possible and developing responses while there is still time to plan.

(Continued on page 4)
Mexico Presidential Meeting Initiates Institute Series

Sir Crispin Tickell, Chairman of the Climate Institute and a former British Ambassador to Mexico, led a five-person team to Mexico in mid-March for discussions on climate change with senior government officials. This visit was carried out in collaboration with the United Nations Environment Programme (UNEP) and culminated in a meeting Wednesday, March 13 at Los Pinos, the Presidential Palace, with President Carlos Salinas de Gortari.

During the meeting which lasted nearly an hour, three team members, Sir Crispin Tickell, Dr. Noel Brown, North American Regional Director for UNEP, and Laura Tlaiye, Senior Associate of ICF Incorporated, made presentations on various aspects of climate change. President Salinas responded stressing the high priority his government places on limiting climate change and the need to act in the face of uncertainty.

Also participating in the Presidential meeting were John Topping, President of the Climate Institute, and Dr. Hind Sadek, a Senior Fellow of the Institute. Luis Manuel Guerra, Director General of Instituto Autonomo de Investigaciones Ecologicas and a new member of the Climate Institute Board of Directors, arranged the visit which included not only meetings with ministers and other senior officials but also a speech to a luncheon meeting of COCAI, a Mexican manufacturing association. Manuel Guerra was the principal speaker but two other team members, Sir Crispin Tickell and Laura Tlaiye, also addressed the COCAI meeting in Spanish.

Also attending the Presidential meeting were Patricio Chirinos, Ecology Secretary, and Sergio Reyes Lujan, Undersecretary for Ecology.

Institute Team Participates in Honduran Seminar

Honduras is subject to frequent droughts, hurricanes and floods which are partly a result of erosion triggered by deforested hillside streams. Concern about these phenomena led the Honduras Ministry of Communications, Public Works and Transport to set up a weeklong seminar on climatology and hydrology in late March in Tegucigalpa attended by more than 80 ministers, policymakers and officials of various government departments.

For two days during the week, a team led by Dr. Ata Qureshi, Climate Institute Director of Global Environment Programs, conducted briefings on climate change. Dr. Gordon MacDonald of the University of California at San Diego made a presentation on the science of climate change, and Karen O'Brien of Pennsylvania State University, along with Dr. Qureshi, discussed global climate change impacts on agriculture, water resources, forestry and biodiversity. Dr. Qureshi presented an overview of climate change according to IPCC conclusions and also outlined a possible national climate program for Honduras, with enthusiastic participants continuing discussions late into the evening, identifying a number of priorities for follow-up, future research and interagency, regional and international cooperation.

The next day the visiting briefing team met with the Secretario de Estado, Communications Minister Mauro Membreño Tosta. The seminar was organized by Vice-Minister Matute Tte. Cnel. Cordova and Nabil Kawas, chief of the Meteorology Department.

Lichens Reappear on Paris Trees

When Parisians replaced wood-burning stoves with sulphur-rich coal in the mid-19th century, the lichens on trees were wiped out. As air quality has improved, botanists have now discovered nine lichen species have recently returned.

Argentine IPCC Seminar

Sr. Raul Estrada-Oyuela, vice-chairman of the UN Intergovernmental Negotiating Committee preparing for UNCED, as well as the Minister for Foreign Affairs, the Minister for Science and Technology and three local scientists participated in another of IPCC's information exchange seminars in Argentina in March, attended by a large, well-informed audience.

Members of the seminar team included Dr. Bob Watson of NASA and Dr. Tom Downing of Birmingham University, with Jonathan Tillson representing the IPCC Secretariat, joined by Dr. Ata Qureshi of the Climate Institute.
Climate News Around the World

Australia

The Senate Committee on Industry, Science and Technology has drawn up a 10-year action plan to cut greenhouse gas emissions by improved energy efficiency and development of alternative energy technology.

The plan, called "Rescue the Future," proposes a national integrated electricity grid by the year 2000, transportation fuel efficiency standards and incentives, industrial and domestic energy use targets, appliance labelling and standards, and increased support for renewable energy and the development of very efficient new energy technology.

The committee has proposed tax incentives and low-interest loans to further the introduction of new energy technologies and has recommended the prolonging of the nation's existing research and development tax concession. The initiatives will be discussed at a meeting of state premiers later this year.

In January a Climactic Impacts Centre was established at Macquarie University, funded by the Commonwealth and State governments. The Centre's objective is to develop a better understanding of climate and society in Australia and the Asia-Pacific region through education and both policy and interdisciplinary research. The Centre's director is Dr. Ann Henderson-Sellers who told the OUTLOOK 91 Conference in Canberra that Australia may be better prepared than many countries to deal with future climate change because of its large land mass, highly variable rainfall and runoff, and frequent droughts.

Brazil

Satellite data from the National Space Research Institute show a marked decline in annual rate of forest clearing. Farmers and ranchers burned 27 percent less forest in 1990 than 1989, with the annual rate of forest clearing falling from 7,300 square miles in 1989 to 5,300 last year. Twenty thousand illegally cut logs were seized and $9 million in fines were levied on 5,500 violators. But four of the state environmental agency's rangers were shot to death and two of its six helicopters were struck by gunfire, an indication of the intense reaction to the new campaign.

Next year's budget for a more intensive "Operation Amazonia" has been quadrupled to $4 million, although a sharp contraction in the economy has left budget officials worried whether the total will actually be released. Low interest loans and gifts have been offered for Amazon research and park preservation projects but very few resources for control.

Horn of Africa

Drought and crop failure in Sudan and Ethiopia has put 15 million people in danger of famine and needing emergency assistance. In fact the United Nations estimates that 27 million people in 25 countries in Africa will need nearly four million tons of emergency food relief this year, the highest requirement ever forecast.

The northern part of Sudan is suffering the worst drought and one ship loaded with food arrived in Port Sudan on the Red Sea in mid-March. Approximately eight million Sudanese are at risk of starvation.

Donor countries are bringing about 15,000 tons of food a month through the Red Sea port of Massawa to help feed an estimated four million Ethiopians in the northern provinces of Eritrea and Tigre. A total of seven million Ethiopians are thought to be threatened with famine this year.

About 1.9 million people in Angola could face starvation as a result of four years of drought plus 15 years of civil war.

Sahara

A group of scientists from universities and research institutes in Virginia, New Hampshire, Sweden and Brazil, using ground observations as well as data from weather satellites and NASA aircraft, have traced dust clouds from the Sahara to the Amazon basin. They estimate that as much as 12 million tons of dirt reaches the Amazon every year, possibly providing 100 pounds per acre of forest per year in some regions.

Huge dust storms scour the desert floor in the Sahara and Sahel, especially in the spring, and toss a huge volume of particles into the air. By the time the dust reaches South America, the clouds are diffuse and for the most part invisible. However, the fallout, drawn over the continent by powerful rainstorms, could contain up to one pound of phosphate per acre per year, although probably somewhat less.

The phosphate rain may be a clue to the productivity and survival of the rain forests, enriching the extremely poor soil in many parts of the Amazon. Scientists have puzzled over the sudden appearance of strange pulses of nutrients in the forests. Without the nutrient rich African dust, the Amazon might be a grassland instead of a jungle, the scientists suspect.

Vietnam

To restore the 2.2 million hectares of forest and large areas of farmland devastated during the Vietnam War by defoliation, bombing, land clearing and napalm, the country has planted 500 million trees each year.

Students and children have planted more than a million trees in the last six years on the former border between north and south Vietnam, and many of the seedlings have grown vigorously. Early attempts to plant indigenous species failed because of grass fires in the dry season. More resilient acacias and eucalyptus trees were then planted to shelter the indigenous trees. Now four kinds of native diptocarpus which grows up to 40 meters with a trunk two meters in diameter, are flourishing under the canopy.

However, Vietnam's population, currently 56 million, is expanding and clearing the existing forests as the deforested areas are replanted. The eight million tribal people of the forests, who practice slash and burn agriculture, are being squeezed into ever smaller areas.

The use of charcoal-burning buns and the transplanting of saplings to villages for firewood is putting the replanting program in jeopardy.
Mexico
(continued from page 1)

Whatever model is used, potential evaporation will increase and soil moisture decrease, even in cases where the model projects an increase in precipitation. In one region, Puebla in central Mexico, an important supplier of food to Mexico City, under current conditions potential evaporation is about double precipitation each year. Global warming could increase this deficit by 17 to 45 percent.

In the Tehuacan valley southeast of Mexico City, on land cultivated for 2000 years, drought occurs three years out of ten. Some reforms have reallocated land without accompanying water rights to springs and farmers have been unable to buy or obtain water and therefore could not work their farms.

Liverman agrees that Mexico has many urgent problems but argues that the possible impact of climate change merits increased attention. Any decline in water supplies from major rivers threatens hydroelectric generation and limited urban supplies. Sea level rise would threaten coastal agriculture, industry and tourist developments. Higher temperatures would make people more uncomfortable and lower their productivity. Tides of refugees might swirl across the land, fleeing heat and drought. Repercussions might include changes in agricultural comparative advantage versus other nations.

While Mexico has to date made only small contributions to increases in carbon dioxide and methane emissions, future expansion of population, industry and agriculture could raise these totals significantly. The Mexican government, which was the first in the world to ratify the Montreal Protocol is already attempting to link air pollution control programs and greater energy efficiency to efforts to restrain growth of greenhouse emissions.

Building on its leadership in the Montreal Protocol process, Mexico has endorsed the precautionary principle supporting action to control emissions in the face of scientific uncertainty concerning the rate of climate change. With per capita emissions of greenhouse gases only about a fifth those of the U.S. and

Inadequate Rainfall in California Shows Harm Drought Can Inflict

The drought that has seared California for five years conceivably could be a foretaste of water shortage impacts that California or other states — and other nations — may face if global warming becomes a reality. Farmers are being put out of business, major industries are threatened and there is a fear of devastating fires this summer.

Average temperatures during this five-year drought have been modestly above the 56-year average (1931-87) of 59 F, the standard deviation is 0.9. The record of recent statewide average Fahrenheit temperatures is:

1990 (preliminary) 59.5
1989 59.6
1988 59.4
1987 60.0
1986 60.6

The March rains that eased the state's water crisis have been considered a mixed blessing by state decisionmakers, weakening the will to overhaul inefficient water policies. When reservoirs were bone dry, Canada, Mexico is entering the North American free trade negotiations with an increasingly strong environmental position. Although it appears driven more by local pollution concerns and a desire to continue playing a leadership role on global environmental issues, Mexico may disarm many critics of a free trade zone by its environmental actions.

Chantilly Meeting
(continued from page 1)

Regional groups on choice of the chairmen and make-up of the two proposed working groups. Selection of working group chairmen and procedural questions were put off until the June meeting.

Perhaps the single most coherent force at the conference was the Alliance of Small Island States (AOSIS), a spanning group. Robert V. Van Lierop of Vanuatu, Chairman of AOSIS, declared that it was difficult to overstate the sense of urgency all low-lying and coastal countries felt about accelerated climate change. Sea level rise would flood their already limited lands; in a warmer ocean coral reefs would bleach and die. Valuable and life-sustaining ecosystems would perish.

Jose Goldemberg, Secretary for Science and Technology of the Presidency of Brazil, was among senior officials present. He made a strong case for much greater emphasis on energy efficiency strategies by both developing and developed nations, much on the lines advanced in Energy for a Sustainable World, the widely acclaimed book of which he is a co-author.

The U.S. submitted an "action agenda," a plan to stabilize overall production of gases contributing to global warming by the year 2000. This would shift the focus from carbon dioxide to other warming gases and would include CFCs. It would entail holding U.S. greenhouse gas emissions to 2.3 billion tons annually, the same amount produced in 1987. It does not set targets and timetables for control of carbon dioxide emissions, which would increase by 15 percent by 2000 under the plan.
Climate Institute News

Board Chairman Sir Crispin Tickell presided at the Ditchley Conference on Global Climate Change and Its Implications in January at Ditchley House, Oxfordshire, England. Among those attending from the Climate Institute were President John Topping, Board Members Shuzo Nishioka and Pier Vellinga, and Advisory Board Members Andre Berger and Norman Myers. About fifty scientific and policy experts from Europe, North America and Japan participated in this three day meeting.

At the end of January, President Topping gave a talk in Tokyo to 30 senior level executives, members of the Environmental Subcommittee of Keidanren, the Japanese manufacturing association. The talk was arranged by Dr. Hiroya Ichikawa whom Topping had met at the Ditchley Conference.

Several days earlier Topping had spoken to 200 people in Nagoya at a forum arranged by the Tokai Bank Foundation.

The increased international focus of the Institute was underscored at its annual meeting March 11 when two non-U.S. nationals, Dr. Noel Brown and Quim. Luis Manuel Guerra, were elected to the Board of Directors. They moved into vacancies created when two American members, who have played key roles in past Institute activities, indicated that because of personal and professional commitments, they would prefer to serve on the Board of Advisors which would entail fewer demands on their time.

Dr. Brown of Jamaica is Director of the New York Office of the United Nations Environment Programme (UNEP). He has maintained close liaison with nongovernmental organizations around the globe, spearheaded UNEP climate research in the Caribbean, and worked closely with the Alliance of Small Island States. He has been connected with many Institute events, a symposium for UN agencies and permanent missions in New York, the Second North American Conference on Climate Change, and the Workshop on a Framework Convention. He will be attending a series of meetings in Victoria, Australia, with John Topping in April.

Quim. Guerra is Director General of Instituto Autonomo de Investigaciones Ecologicas (INAIEN), a Mexico City based environmental research organization which has sparked improved water and air quality in the Mexico City area. He helped the Institute organize its very successful Presidential briefing in Mexico. He was a speaker at the Institute-sponsored Cairo conference in 1989.

Guerra monitors pollution levels at specific sites around Mexico City and broadcasts the results from his mobile testing laboratory nine times a day on the leading Spanish and English radio stations in the city.

The Institute’s Board of Advisors has added three distinguished members, Dr. Andre Berger of Belgium, the Rt. Hon. Sir Ninian Stephen of Australia and Dr. Toufiq A. Siddiqi of Hawaii.

Besides being a professor with great interest in training young scientists in geophysics and climate, Dr. Berger is an outstanding research scientist, particularly in the fields of air pollution modelling, data analysis, and climate variations on the astronomical time scale. His main contribution has been to extend the Milankovitch theory by making more accurate astronomical calculations, particularly the transient response of climate to astronomical and trace gas forcings over the last 150,000 years. The Milankovitch theory seeks to explain the ice ages by taking into account changes in the earth’s orbit caused by gravitational tugs of other planets.

At present, Dr. Berger is a professor at the Catholic University of Louvain (where he received his doctorate degree) and Head of the Institute of Astronomy and Geophysics George Lemaître. He also holds an M.S. degree in Meteorology from MIT and has published more than 80 papers, and in his role as chairman of many committees and symposia he has followed his interests in contributing to a closer collaboration between modellers and field scientists, pioneering an interdisciplinary approach to the study of climate dynamics and past climate history.

After serving for nearly seven years as Governor-General of Australia, Sir Ninian Stephen was appointed Ambassador for the Environment, to ensure Australia’s active participation in international efforts to tackle urgent and pressing environmental problems. He completed his law degree at Melbourne University and had a long career in Victoria, principally in the fields of constitutional, commercial and company law, equity and taxation, culminating in his appointment as justice of the High Court where he served for 10 years before becoming Governor-General.

Sir Ninian attended the Institute’s 1989 conference in Cairo on Preparing for Climate Change.

Dr. Toufiq Siddiqi, whose recent research has been on the relationship between climate change and energy policies, and on issues of technology transfer, initiated and served as Coordinator of a multi-country project on “The Environmental Dimensions of Energy Policies.”

He has been a member of the research staff of the East-West Center in Hawaii since 1977 and is also a member of the faculty of the Geography Department of the University of Hawaii at Manoa. He is President of the Hawaiian Academy of Science and an editor of Energy-The International Journal. Educated first in India and Pakistan, he received his B.A. in Mathematics and Physics from Trinity College, Cambridge, and his Ph.D. in nuclear physics from the Johann Wolfgang Goethe University at Frankfurt/Main.
International Conference on Cities and Global Change
June 12-14, 1991
Royal York Hotel
Toronto, Ontario, Canada
Convened by the Climate Institute

In partnership with:
City of Toronto
Municipality of Metropolitan Toronto
Province of Ontario

With support of:
Environment Canada
Consumer Gas Company
McCarthy Tétrault, Barristers and Solicitors
Netherlands Climate Program
Japan Environment Agency
UNEP
U.S. Dept. of Energy
Cray Research

WEDNESDAY, June 12

Welcome and Introductory Remarks

9:30  For the Climate Institute, J. McCulloch, Conference Director
For the City of Toronto, Mayor Art Eggleton
For the Province, Hon. Jenny Carter, Minister of Energy

10:45  Keynote Address, Planning in a Climate of Uncertainty,
sponsored by Environment Canada
Chair, Dr. D.K. Dawson, Director General, Canadian Climate Centre
Prof. Barry Smil, University of Guelph

12:15  LUNCHON - Chair, Dr. J. P. Bruce, Canadian Climate Planning Board
Potential Legal Implications of the Impacts of Climate Change for Local Governments, Dennis Wood, McCarthy Tétrault, Barristers and Solicitors
An Introduction to the Urban Heat Island Session, Linda Delacroix, U.S. Dept. of Energy

14:00  Urban Heat Island Reduction: U.S. Research Results, sponsored by U.S. DOE.
Chair, Linda Delacroix
Dr. Hashem Akbari, Lawrence Berkeley Laboratories
Dr. Greg McPherson, Univ. of Arizona

15:45  Megalopolis and Climate Change: The Case of Tokyo
Dr. Shuzo Nishioka, Center for Global Environmental Research, National Institute for Environmental Studies
Dr. Yuichi Moriguchi, National Institute for Environmental Studies, Japan Environment Agency

18:00  DINNER, sponsored by Municipality of Metropolitan Toronto
Chair, Alan Tonks, Metro Council
Dr. Noel Brown, United Nations Environment Programme

THURSDAY, June 13

9:00  Istanbul
Dr. Nuzhet Dalıes, Institute for Environmental Sciences, Bogazici University, Istanbul, Turkey

10:45  Municipal Policy Responses to Global Change
Chair, Councillor Tony O’Donohue, City of Toronto
Richard Gilbert, President, Canadian Urban Institute
An official from a European city, involved in the International

FRIDAY, June 14

9:00  Impact of Climate Change on the Urban Environment of the UK
Prof. John Page, Cambridge University

10:45  Urban and Regional Transportation
Chair, Michael Colle, Vice Chair, Toronto Transit Commission
Councillor Dale Martin, Metro Toronto

12:15  LUNCHON
Prof. F. Kenneth Hare, Honorary President of the conference

14:00  Jakarta
Dr. Aca Suhandy, Population and Environment Ministry, Indonesia

15:45  Urban Redevelopment
Chair, Councillor Jack Layton, Toronto

The Program includes those speakers who have confirmed. Conference Director: James McCulloch. For further information or a copy of a conference reservation form, please contact him at 15 Elmasy Drive, Richmond Hill, Ontario, Canada, L4C 8V2, telephone and FAX: 416-737-2064 or the Climate Institute, 202/547-0104, FAX 202/547-0111
Great Lakes (continued from page 1)

Projections of effects of global warming on the southern part of the Superior National Forest of northern Minnesota show surprisingly large changes. Depending on soil moisture conditions, between 2010 and 2040 the present dominant species would decline to about one-fifth of their current abundance. On shallow dry upland soil, sugar maple would replace trembling aspen as a dominant species. On deep, fertile moist soil, two-thirds of the dominant balsam fir would give way to sugar maple. Formerly soil too wet for optimal tree growth would be warmed and dried, and biomass would triple.

The change from conifers, useful for timber, pulp and paper, might require major forest industry retooling because hardwoods presently cannot be used for pulp and paper. If CO2 concentration continued to foster an even warmer climate after 2070, large treeless areas might appear, as seedlings could not become established and reach maturity before the climate changed to one hostile for their development.

Botkin outlines development of three kinds of natural areas, one for recreation, one for biological conservation, and one for baseline measurement and monitoring. He suggests allocating to biological conservation a fraction of the land, possibly 10 percent in the case of the Great Lakes States. A program of tree planting could be started to introduce species better adapted to warmer and drier conditions, and they could be watched carefully. A new computer simulation Botkin has developed with two colleagues could assist in managing timber production, reducing change in forests to natural rates and employing logging techniques that impose natural kinds of alterations.

Second prizes of $20,000 each at the Woodlands Conference went to Dr. Jose Goldemberg, Secretary of Science and Technology in Brazil, for a paper entitled "Global Climate Change: What Can Developing Countries Do," and to Dr. Diana Lerman of Pennsylvania State University, whose paper is also reported in this issue of Climate Alert. There were five third prizes and 10 prizes for Young Scholars.

Meeting Tackles Climate Change Threat to Cities

Mexico and Los Angeles wonder how they could cope with more frequent temperature inversions. London is troubled by the possibility of more frequent Thames River flooding. Toronto is worried about the health effects of rising greenhouse gas emissions. The cities of the world are showing increasing concern about the special burden climate change may place on them.

Experts from three continents will meet in Toronto, June 12-14 to discuss the cities' mutual problems and measures to ameliorate them. The International Conference on Cities and Global Change is being held on the third anniversary and in the same city as the historic forum chaired by Mrs. Gross Harland Brundtland, "The Changing Atmosphere: Implications for Global Security," which put this issue at the forefront of the public agenda.

Speakers from Tokyo, Jakarta, Istanbul, Hannover and Stockholm, as well as Mexico City, London, Los Angeles and Toronto will discuss such topics as urban air quality and health, urban and regional transportation, and the urban heat island. Agenda for the conference is on page 6.
Scientists Research Whether Global Warming Could Feed on Itself

Among the concerns and controversies about global warming is the fear that as the warming intensifies, a feedback effect might set in, aggravating the rising temperatures. When the oceans and atmosphere warm up, evaporation increases. Most scientists have agreed that the additional water vapor would trap more infrared radiation. A multiplier effect might ensue, adding to global warming.

MIT meteorologist Richard Lindzen, however, has suggested that increased convection might actually dry and cool the upper troposphere, offsetting the warming effect from increases in water vapor closer to the ground.

David Rind of the NASA Goddard Institute for Space Studies and colleagues from NASA and NOAA used satellite water vapor data to investigate this issue. Comparing summer and winter moisture values they find increased convection leads to increased water vapor above 500 millibars in agreement with current climate models. Further confirmation came in comparing data from tropical western Pacific where convection is stronger with the eastern Pacific where it is weaker. Convection moistens the middle and upper troposphere more over the western Pacific, strengthening the argument for a positive feedback mechanism.

Another possible feedback effect has been suggested in a study by Cornell University and the Environmental Defense Fund. Global temperatures and naturally occurring concentrations of carbon dioxide rose and fell together between 1958 and 1988, with changes in temperature preceding changes in carbon dioxide by several months. Warmer temperatures trigger the release of carbon dioxide from forests, grasslands and wetlands. This process could build on itself, stimulating more warming and more release of carbon dioxide.

Three Foundations Unite to Promote Energy Research

In an unusual collaboration, three large U.S. foundations have banded together to form the Energy Foundation which will disburse $20 million over three years to non-profit organizations to research, analyze, and promote conservation and renewable energy.

The participating organizations are the Rockefeller Foundation, the John D. and Catherine T. MacArthur Foundation and the Pew Charitable Trusts. Hal Harvey, an energy engineer, will be executive director of the Energy Foundation, which will be based in San Francisco.

The foundation will focus first on fields where there is a high potential for energy savings, such as electrical utilities, building construction and transportation, identifying innovations and promoting their use nationally.