Paul
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people on
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re EC

FROM
THE WHITE HOUSE
WASHINGTON, D.C.

MEMORANDUM FOR ALL EPC, DPC AND CABINET
LIAISON STAFF

FROM: Gary Blumenthal

SUBJECT: FYI

THE WHITE HOUSE

WASHINGTON

October 31, 1989

MEMORANDUM FOR HEADS OF DEPARTMENTS AND AGENCIES

SUBJECT: Assistant to the President for Science and Technology and
Director of the Office of Science and Technology Policy

On October 13, 1989, in the Oval Office, Dr. D. Allan Bromley was formally sworn in as Assistant to the President for Science and Technology. Dr. Bromley also serves as Director of the Office of Science and Technology Policy (OSTP).

The elevation of the Science Advisor to the status of Assistant to the President reflects the President's keen awareness of the importance of science and technology to U.S. competitiveness, national security, and economic health. Dr. Bromley is an important source of scientific and technical counsel for the President.

Dr. Bromley serves on the Economic Policy Council, the Domestic Policy Council, and the Space Council and will work closely with the National Security Council and the Competitiveness Council on matters relating to science and technology.

Dr. Bromley looks forward to working with the departments and agencies on a wide range of scientific, technological and educational issues.

John H. Sununu
Chief of Staff to the President

[redacted]

THE WHITE HOUSE
The Office of Cabinet Affairs
Routing Slip

From: Fitzhenry Date: 3-21

	Sequence To	Has Seen	Disposition
Williamson	1	DW	D
Jackson			
Wethington			
Porter			
Danzansky	2		R
Holiday	3		A
Skelly	4		original back to Holly

A=Action I=Information R=Review D=Dispatch

[redacted]

cc: Adair Buchholz Casse Danzansky Farrar
Fitzhenry Gunn Holiday Jackson
McMunn Porter Sechler Schall Wethington Williamson

side: Bob Crosby + Allen Brantley have approved this -

back to Paul

THE WHITE HOUSE

WASHINGTON

March 22, 1991

MEMORANDUM FOR GOVERNOR SUNUNU

FROM: D. ALLAN BROMLEY

EDE HOLIDAY

SUBJECT: Preparation for the 1992 U.N. Conference on Environment and Development

Planning is underway for the 1992 U.N. Conference on Environment and Development (UNCED), which will be held in June, 1992 in Rio de Janiero. UNCED will mark the twentieth anniversary of the Stockholm Conference, at which a declaration of principles was issued that continues to guide the international approach to environmental issues. The Stockholm Conference also established the UN Environmental Programme to coordinate international work on the environment. The U.S. was primary sponsor of the Stockholm Conference and played a major role in its success.

The UNCED in Rio will address a wide range of environmental issues including climate change, land resources, toxic wastes, oceans and coastal areas, and biological diversity. The 1992 Conference will also consider how to integrate environmental objectives with economic development. The developing countries are expected to focus on the need for additional U.S. funding of international environmental projects and technology transfer.

There is a greater need for White House supervision of the planning process because, five months prior to the U.S. election, UNCED will be addressing many controversial environmental issues that have a political impact. You should also know that, in connection with the UNCED planning process, CEQ is preparing a U.S. National Report which will both review U.S. domestic actions on the environment during the last 20 years and identify current issues. In that connection, CEQ has planned a series of five roundtable meetings throughout the country at which representatives from nongovernmental organizations will publicly comment on the draft report. It is important that the CEQ report, and the process for its formulation, are consistent with the overall policy guidance for the 1992 Conference.

Consequently, as planning for the conference continues, an EPRG Steering Group will be formed to regularly review material and provide guidance to the State Department. OSTP will be involved to monitor climate change issues, should any arise. The Steering Group will be staffed by OMB. We will keep you informed when any significant issues arise that require your attention, or that of the full DPC.

THE WHITE HOUSE
WASHINGTON

February 19, 1991

TO: Daniel Casse

FROM: **EDE HOLIDAY**

- [x] FYI
- [ ] Action
- [ ] Comment

CC: MPJ
Steve D.
Richard

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20500

February 14, 1991

Ede Holiday:

The meeting with the HHS people this morning was very interesting, I do appreciate the opportunity to participate.

On the matter of the rural hospitals, I do believe this is a real time-bomb. As a former member of the Steering Committee for the Senate Rural Health Caucus, I witnessed the barrage of negative comments from constituents regularly faced by Senators with even slight changes to the Medicare or Medicaid laws. In fact, we were successful in eliminating the "rural-urban differential" that was the source of discriminatory reimbursement practices towards rural hospitals.

On the other hand, OMB is fiscally and managerially correct in that the current system is very flawed -- we are keeping many hospitals open for the wrong reasons and in the wrong way. I just shudder to think of the bad publicity if this is not handled well. Alternatives and options should be shown to rural communities, so they do not have the perception of being arbitrarily affected.

Please do not hesitate to contact me if you believe I can be of appropriate assistance.

Again, thank you for the opportunity to participate.

Ken Yale

Ken Yale

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

Ltr/ Michael Clarke

November 27, 1990

Dear Michael:

I wanted to write to express my apologies for the misunderstandings between OSTP and Commerce the past few weeks during the Medals of Science and Technology events.

I am new to this event and it was a good learning experience, on what to do -- and what not to do. To assist in ensuring proper coordination and better cooperation in the future, I requested Bill Wells of our office to follow up with Technology Administration staff. Dr. Wells is an OSTP consultant and my predecessor in the Chief of Staff position. I trust his evaluation will assist us in making appropriate improvements. Preliminary discussions with your staff have been most useful and I can assure you we will take steps to correct any problems identified.

You should also know that the Office of Cabinet Affairs was very instrumental in correcting some of our misunderstanding and bringing us to a better understanding of the issues involved in this matter. They deserve much credit for improving our perspective. I look forward to more productive interactions with your office.

good work!

Again, I apologize for the problems created by this event and thank you for your patience. Do feel free to contact me at any time should you believe we can be of assistance.

Best regards.

Sincerely,

Kenneth P. Yale
Chief of Staff

Michael Skarzynski
Chief of Staff
Department of Commerce
Herbert C. Hoover Building
14th Street and Constitution Avenue, N.W.
Washington, D.C. 20230

bcc: Ede Holiday

Paul - Call Bromley's office + ask if this is the final - If not could we get a copy of the final. Thx

(It says final draft.)

OFFICE OF CABINET AFFAIRS STAFFING MEMORANDUM

Date: 9-14 **Due by:** FYI

Subject: The Making of a Greenhouse Policy -- By Allan Bromley

From: H. Williamson

	ACTION	CONCUR	FYI		ACTION	CONCUR	FYI
HOLIDAY	☐	☐	☑	MCBEE	☐	☐	☑
DANZANSKY	☐	☐	☑	MCMUNN	☐	☐	☐
ADAIR	☐	☐	☐	PORTER	☐	☐	☑
BUCHHOLZ	☐	☐	☐	SCHALL	☐	☐	☐
CASSE	☐	☐	☐	SECHLER	☐	☐	☐
EVANS	☐	☐	☐	WETHINGTON	☐	☐	☐
FARRAR	☐	☐	☐	WILLIAMSON	☐	☐	☐
GUNN	☐	☐	☐	_____	☐	☐	☐
HEIMBACH	☐	☐	☐	_____	☐	☐	☐
JACKSON	☐	☐	☐	_____	☐	☐	☐

Comments:

Please ask for copy of final when complete Pat

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

September 11, 1990

MEMORANDUM TO: **PAUL KORFONTA**
BOB CORELL
ROBERTA MILLER
GORDON BINDER
DALLAS PECK

FROM: **D. ALLAN BROMLEY** Allan

SUBJECT: **ARTICLE ON GLOBAL CHANGE FOR ISSUES IN SCIENCE AND TECHNOLOGY**

Attached is a final draft of my article on global change scheduled for publication in the Fall issue of Issues in Science and Technology. Thank you very much for your comments on the piece. Your expertise and good judgment have improved the article considerably.

cc: Steve Olson
Ken Yale

DRAFT: DO NOT QUOTE OR DISTRIBUTE

[September 10, 1990]

THE MAKING OF A GREENHOUSE POLICY

by D. Allan Bromley

Within the past several years, global change has become the archetypal science policy issue. It combines almost all the elements of public policy debates that have a substantial scientific component: questions about scientific data and conclusions, the difficulty of translating scientific analysis into politically relevant terms, competing interests with multiple agendas, differing international perspectives on common problems, and decision-making based on less-than-complete information. It has received an enormous amount of attention from politicians, from environmentalists, from the media, and from the public. Since I became Assistant to the President for

Science and Technology last August, no issue has consumed more of my time than has global change.

Given the broad slate of science policy issues that demand attention, it can sometimes be frustrating to dwell so predominantly on a phenomenon -- anthropogenic climate change on a global scale -- that has yet to be conclusively demonstrated. Not that the global environment has never changed. At the height of the last ice age about 20,000 years ago -- not long, in geological terms, before humans are widely believed to have first crossed the Bering land bridge into North America -- glaciers over two kilometers high covered much of the northern United States and Europe, and sea level was 100 meters lower than at present. These natural changes in the Earth's climate have occurred throughout its history, and they will continue to occur in the future.

It is also true that, during the past century, human society has entered into a new and momentous relationship with the global environment. For the first time in history, our species has become an agent capable of influencing the entire planet. We have altered the face of the Earth by clearing forests, building cities, and converting wild lands to agriculture. We have changed the composition of the Earth's atmosphere by burning fossil fuels, expanding agriculture, and producing and releasing industrial compounds. As Roger Revelle and Hans E. Suess wrote as early as 1957, "human beings are now carrying out a large-scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future."

It may be, as many have suggested, that global climate change will become a problem of very serious consequence. Certainly, the possibility of such change is being taken seriously by all governments, and appropriate actions are being considered to deal with the possible effects of climate change.

It may also be that the other issues usually subsumed under the term "global change" -- such as ozone depletion, the adequacy of food and water supplies, deforestation, desertification, levels of biodiversity, and soil erosion -- turn out to be more serious in terms of human impact than global climate change. The only reasonable course is to move forward on all these issues simultaneously.

Scientific knowns and unknowns

Bertrand Russell once wrote, "The most savage controversies are those about matters as to which there is no good evidence either way." Certainly if more were known about global change, the policy disputes would not be nearly so acrimonious. If it were possible, for example, to unequivocally associate the warmer-than-average years of the 1980s with the greenhouse effect, multibillion-dollar decisions affecting life-styles and the quality of life would appear less open to question. If computer models of the earth system could precisely mimic the observed temperatures changes of the past century, they would provide a more solid foundation for policymaking.

For that matter, the policy debate will be quite different in the year 2000 if temperatures rise sharply in the 1990s.

For now, though, it is important for policymakers clearly to keep in mind what is known and what is not known about the Earth system. Based on exacting measurements of atmospheric gases and the bubbles trapped in ice sheets, researchers know that the level of carbon dioxide in the atmosphere has increased by about 25 percent since preindustrial times. Atmospheric levels of methane, another potent greenhouse gas, have doubled over the same period. Chlorofluorocarbons (CFC's) released into the atmosphere, which are almost certainly responsible for the ozone hole over Antarctica, also act as greenhouse gases, as do several other atmospheric constituents with increasing concentration levels, including tropospheric ozone and nitrous oxide.

Computer models of the atmosphere reproduce the current global climate and changes of seasons with a fair degree of accuracy. When these models are run with twice as much carbon dioxide in their atmospheres, global average surface temperature is somewhere between 1.5 and 4.5 degrees Celsius higher than at present. However, the treatment in these models of such fundamental and important features of the Earth system as clouds, oceans, and ice remain suspect. It may be that the models inadequately simulate some fundamental aspect of the Earth system that drastically reduces the predicted climate effects of greenhouse gas emissions -- or makes them worse.

Thus, computer models have been unable to specify with any certainty the magnitude, rate, or timing of future climate change. Nor do models give much indication of how potentially-important climate variables -- including mean annual temperatures, seasonal and daily maximums and minimums in temperature, seasonal and annual precipitation, the degree and frequency of variations in precipitation, and the degree and frequency of extreme events such as storms -- might change. Furthermore, present models are totally unable to make reliable climate predictions on regional and local scales, yet these are essential if we are to be able to quantify the detailed impacts of global change.

The geological record also offers incomplete clues to the effects of greenhouse forcing. Earth scientists have found that global temperatures and atmospheric carbon dioxide levels have risen and fallen naturally and largely in parallel for the past 160,000 years. However, it is difficult to tell whether temperatures lead carbon dioxide or vice versa, and the mechanisms connecting these natural fluctuations remain obscure.

The same pattern of concrete observations paired with uncertain implications marks the record of global temperatures. Scientists now generally agree that the planet has warmed up by 0.3 to 0.6 degrees Celsius during the past century. But very few scientists would claim that they are yet able to determine whether any of that warming can be attributed to an enhanced greenhouse effect or whether it represents a natural fluctuation. Of particular interest in this regard have been recent precise temperature measurements by satellite of the global atmosphere. They show that,

even though surface measurements in some regions indicate that the 1980s were one of the warmest decades on record, average global temperatures did not increase from 1979 to 1989. Yet the magnitude and rate of increase of anthropogenic loading of the atmosphere with greenhouse gases were at unprecedented levels during the 1980s.

Based on climatic modeling and paleoclimatic research, scientists now generally agree that continued loading of the atmosphere with greenhouse gases will lead to global climate change. But without further research, the nature and dimensions of that change will remain elusive. Furthermore, we are only beginning to understand what the impacts of potential changes might be on agricultural productivity, sea level changes, biological productivity in the oceans, shifting vegetation patterns, storm patterns and severity, droughts, and the like. The various components of our planet are bound up in a fantastically intricate and mutually counterbalancing system, and it will be many years before we can reliably predict how changes in one part of the system affect every other part.

Numerous uncertainties

Many of the observations made above also appear in the report of Working Group I of the Intergovernmental Panel on Climate Change (IPCC), an international body of hundreds of scientists and government officials set up by the United Nations Environment Program and World Meteorological Program to establish a global

consensus on the likely causes and consequences of climate change. The charge to Working Group I, which was chaired by the United Kingdom, was to assess the current scientific understanding of climate change. The second working group, chaired by the Soviet Union, assessed the possible environmental and socioeconomic effects of a changing climate. The third, chaired by the United States, sought to identify potential responses to climatic changes.

The three working groups presented their reports at the end of the summer as input to the Second World Climate Conference in Geneva on October 29 - November 7, 1990. These reports are an important resource for policymakers grappling with issues of global change. They will be among the most authoritative statements on the causes and consequences of climate change well into the future.

Nevertheless, to read the reports of the IPCC is to be struck again by the formidable difficulties that still surround this subject. Working Group I devoted considerable attention to scientific uncertainties in its report (although they tend to be minimized in the Executive Summary), concluding that "much uncertainty exists in the prediction of global climate properties such as temperatures and rainfall" and that "even greater uncertainty exists in predictions of regional climate change, and the subsequent consequences for sea level and ecosystems."

Working Group II's study of potential impacts also cited the uncertainties hampering their task, pointing out that "confidence in regional estimates of critical climate factors is low, [particularly] of precipitation and soil moisture, where there is considerable disagreement between various general-circulation-model and paleoanalog

results." The working group also found many scientific questions surrounding the relationships between climate change and biological effects and between biological effects and socioeconomic impacts. Uncertainties about the lengths of time lags at each step from emissions to climate change to socioeconomic impacts are particularly troublesome, because the severity of impacts depends on the ability to adjust and hence partially on the length of the lags.

Finally, Working Group III concluded that the existing uncertainties make it very difficult to determine which responses to potential climate change make sense. It wrote: "The consideration of climate change response strategies . . . presents formidable difficulties for policymakers. On the one hand, the information available to make sound policy analyses is inadequate because of: (a) remaining scientific uncertainties regarding the magnitude, timing, rate, and regional consequences of potential climate change; (b) uncertainty with respect to how effective specific response options or groups of options would be in actually averting potential climate change; and (c) uncertainty with respect to the costs, effects on economic growth, and other economic and social implications of specific response options or groups of options."

These many uncertainties do not argue for inaction (a point to which I shall return later). But they do make it exceedingly difficult to impose policies that may have large additional costs on specific sectors of society or on specific countries, because the affected sectors or countries can legitimately point to the uncertainties in arguing against the policies. The wrangling involved in getting a Clean Air Act

through Congress gives some indication, on a much smaller scale, of what will be involved in negotiations over global change.

At the same time, any discussion of uncertainties must acknowledge the fact that the unknowns cut both ways: climate models could understate as well as overstate the extent of the problem. For example, there is growing suspicion from the paleoecological data -- as yet unconfirmed -- that atmosphere-ocean interactions may harbor the possibility of surprises. If it should turn out, for example, that relatively small, and not as yet understood, mechanisms could shift ocean circulation patterns from one stable configuration to another, the potential impacts could be large.

A better known example of a climatic surprise was the development of the ozone hole over Antarctica. The ozone hole was not predicted or originally understood, although its detailed chemical mechanisms have now been explained at the molecular level. Nevertheless, the ozone hole has demonstrated that, contrary to long-held assumptions, our atmosphere is not so large, nor its inertia so great, that human activities cannot affect it under certain circumstances on human time scales. Human release of CFCs, combined with unique meteorological conditions, created the ozone hole in only a few decades at most.

The need for research

In the absence of a clearly identifiable signal of greenhouse warming -- which the IPCC deems unlikely for a decade or more -- there is only one way to reduce the uncertainties associated with global change: through concerted national and international research programs. In the United States, such a program has been organized by the Working Group on Global Change of the federal interagency Committee on Earth and Environmental Sciences. This U.S. Global Change Research Program -- a government-wide effort to monitor and understand the Earth system and predict global change -- is designed to significantly expand data gathering, research, and modeling activities. A significant component of the program is environmental observations and measurements from space.

The budget that President Bush sent to Capitol Hill last January -- reflecting the compelling case made by the Committee on Earth and Environmental Sciences for a comprehensive, national program -- called for a 57 percent increase in funding for the program, to a total of over $1 billion. This is far more than any other nation is spending on global change research and in my view is a clear indication of this Administration's commitment to what President Bush has termed "global stewardship."

The committee has focused on three classes of key scientific questions: What global change has occurred in the past and is occurring now? What physical, chemical, biological, geological, and social processes are involved in global change? And how well can global change be predicted globally and regionally? To address

these questions, the committee has divided the research program into seven interdisciplinary scientific elements: climate and hydrologic systems, biogeochemical dynamics, ecological systems and dynamics, earth system history, human interactions, solid earth processes, and solar influences.

To take one important research area as an example, the committee has emphasized the need to better understand both natural and anthropogenic flows of greenhouse gases. According to the IPCC, a reduction of over 60 percent in carbon dioxide emissions would be needed to stabilize the concentration of the gas at current levels -- a restriction that would sharply reduce living standards around the world and cause widespread suffering in poorer nations. But the natural fluxes of carbon dioxide are approximately 20 times the anthropogenic ones, so the same net effect can be obtained through only a 2 to 3 percent increase in the gas's natural sinks. Innovative ideas on ways to draw carbon dioxide from the air -- such as macroalgal ocean farming and fertilizing microalgal blooms -- are now being proposed. Much more study of natural sources and sinks is needed, of course, to determine if proposals such as these are viable.

The economic factor

This scientific research will be an indispensable part of our response to the possibility of global change. But it is important to keep in mind that even if all of

the physical, chemical, and biological questions surrounding global change were answered tomorrow, appropriate policies would still be far from obvious. Global change is an inherently interdisciplinary problem, drawing not only on the natural sciences but on economics, sociology, and (especially in the last few years) politics. The full range of questions surrounding global change cannot be answered without input from the social sciences.

The most obvious intersection of global change with the social sciences involves future emissions. It is certainly possible to conceive of a world that supports an even larger population while releasing fewer greenhouse gases into the atmosphere (although the costs required to achieve such a world are likely to be very great). It is also possible to conceive of a world with global greenhouse emissions at least several times today's level, particularly if CFC's are not fully controlled and if countries begin to rely much more extensively on coal for increased energy needs.

The major social uncertainties revolve around population growth rates, the pace and nature of economic development, and the availability of new technologies. These uncertainties are particularly acute for the developing world. According to the World Resources Institute, developing countries already account for a substantial portion of total greenhouse emissions when all greenhouse gases are included; in fact, the top five greenhouse contributors in 1987 were the United States, the Soviet Union, Brazil, China, and India. Furthermore, the relative contribution of the developing countries is going to continue to increase as their industrialization proceeds.

Economics research will also be crucial in estimating the costs of either mitigating climate change by reducing greenhouse-gas emissions now or adapting to climate change after it occurs. Such research will enable sound comparisons of the costs of various policies aimed at mitigation with the benefits, in terms of reduced adaptation costs, that those policies would yield. Such comparisons, using discounting to reflect the earlier occurrence of mitigation costs, must be the basis for sound policymaking.

Several promising estimates of costs are already being developed, but no one doubts that these estimates will inevitably rest on numerous simplifying assumptions. One problem is that the nature of costs varies from place to place. In the developed countries, costs of lowering energy usage can be measured in terms of reduced economic growth, which causes economic hardships to substantial numbers of people. But in the developing world, reduced economic growth must be measured in more stark terms: lives lost, hunger increased, social instability heightened. Similarly, the costs of climate change in the developing world are likely to be higher and more disruptive than in the developed nations, where it is more likely that the resources to adapt to changing climates will be available.

The central role of economics research in global change was a major consideration in the White House Conference on Science and Economics Research Related to Global Change, which was held in Washington, D.C., on April 17-18, 1990. Hosted by Michael Deland, Chairman of the Council on Environmental Quality, Michael Boskin, Chairman of the Council of Economic Advisors, and myself, the

conference brought together delegations from 17 countries and from the European Community and the Organization for Economic Cooperation and Development to explore what we know and do not know about the scientific, economic, and policy questions surrounding global change.

The conference was organized around a straightforward but surprisingly unexplored question: How best can the results of both scientific and economic research into global change be integrated into the policymaking process? Although the format of the conference received some criticism, it achieved much of what it set out to achieve. In particular, several promising proposals on international cooperation emerged from the conference, including one to establish a series of research institutes devoted to the scientific, economic, and policy issues surrounding the global environment. The transnational and multidisciplinary nature of such institutes would provide an added dimension to national and international discussions of global change.

An insurance policy against climate change

After a year of intense involvement with this issue, I am convinced that, at present, no justification exists for imposing substantial new costs on society solely to lower greenhouse-gas emissions. But the climate models and paleoclimatic data cannot be ignored, and the United States and other countries cannot wait until all of

the facts are known to take action. Enhanced levels of research -- in many areas -- are one form of action, but they are not, by themselves, enough.

Thus, the Bush Administration has instituted a number of policies that will reduce greenhouse-gas emissions and that are justified for other reasons as well. I think of them as an "insurance policy" that will delay any possible adverse effects of climate change while research and technology development proceed. Among these policies are the following:

o The United States is committed to phasing out the manufacture of CFC's by the year 2000 to protect the stratospheric ozone layer. Based on their greenhouse properties, CFC's accounted for 14 percent of all greenhouse-gas emissions in the 1980s, and if not controlled they could account for as much as 25 percent of the additional emissions over the next century.

o The Clean Air Act being debated in Congress would substantially reduce emissions of greenhouse gases by fostering more efficient use of energy. The Environmental Defense Fund has estimated that the acid rain provisions of this legislation alone, if implemented, will have an effect comparable to that of removing fully one fifth of the U.S. automotive fleet (22 million automobiles) from our highways for a period of 10 years.

o The U.S. Department of Energy is developing a National Energy Strategy that will include an aggressive commitment to energy conservation and energy security. Energy conservation is the quickest and most effective way to reduce

greenhouse-gas emissions and can have a number of other benefits, including improved economic efficiency, reduced emissions of other pollutants, and less U.S. dependence on imported oil. In addition, technology development is a crucial hedge against the possibility of future warming, because it will ease the transition from processes that produce greenhouse gases (if substantial emission reductions prove necessary). Research and development on non-fossil-fuel technologies -- including nuclear energy and solar energy -- will be an important component of any national or international strategy to address global change.

These initiatives address the source component of the greenhouse gas question. Turning to the sink component, this country is again taking concrete steps.

o The President has proposed a combined public and private sector initiative to plant a billion trees per year for five years on private land across America, trees that will eventually absorb 13 million tons of carbon annually. This is just part of the United States' current carbon emissions -- about 5 percent if such a program were continued for 20 years -- but these trees will provide additional benefits, such as recreational areas and heightened public awareness of environmental issues.

o At the Houston Summit Conference in July, the President proposed that a global forestry convention be negotiated as soon as possible to curb deforestation, protect biodiversity, address threats to the world's forests, and promote actions that expand and strengthen forests.

All of these actions are justified for other reasons, yet together they can have a substantial impact on greenhouse-gas emissions. Preliminary estimates by the Environmental Protection Agency indicate that, using a measure of global warming potential that accounts for residence times in the atmosphere, these actions would hold U.S. greenhouse-gas emissions at 1987 levels until at least the year 2000. This would provide a ten-year window of opportunity to determine what future actions are necessary.

Insurance policies against the possibility of climate change are not limited to our own country. As in the case of deforestation, the United States can also influence the actions of other countries in ways that are mutually beneficial. I believe that this country now has a unique window of opportunity in which to provide Third World and Eastern European nations with technology, know-how, and financial assistance to permit them sustained economic growth with minimal damage to the global environment. If we do this on our own initiative, we will not only act to preserve the quality of the environment but will gain access for American industry to what will inevitably be a very large global market. If, on the other hand, we are pressured or are perceived to be pressured into taking such action, we will gain the first benefit but stand to lose much of the second.

A Framework Convention

These considerations will be very much a part of the next major step in the making of a greenhouse policy: the establishment of a Framework Convention on climate change. At the Malta summit last December, President Bush proposed that the United States host the first negotiating sessions leading to such an international agreement, an offer that he has repeated several times since.

In considering the outlines of a Framework Convention, it may be useful to refer to the Vienna Convention for the Protection of the Ozone Layer, which was established by the United States and 20 other countries in 1985. The Vienna Convention established a framework for international scientific and technical cooperation on ozone destruction. It did not, however, set limits on CFC emissions. Rather, it included provisions to establish protocols as further research demonstrated the need for additional action. The 1987 Montreal Protocol on Substances that deplete the Ozone Layer was the result of this process.

A Framework Convention on global change could serve the same function, although CFC emissions and greenhouse-gas emissions are quite different phenomena. Such a convention would establish general principles and obligations, based on a negotiated international consensus, by which future steps can be taken. It would be designed to gain the adherence of the largest possible number of countries while permitting timely action to be taken. The United States is now in the process of

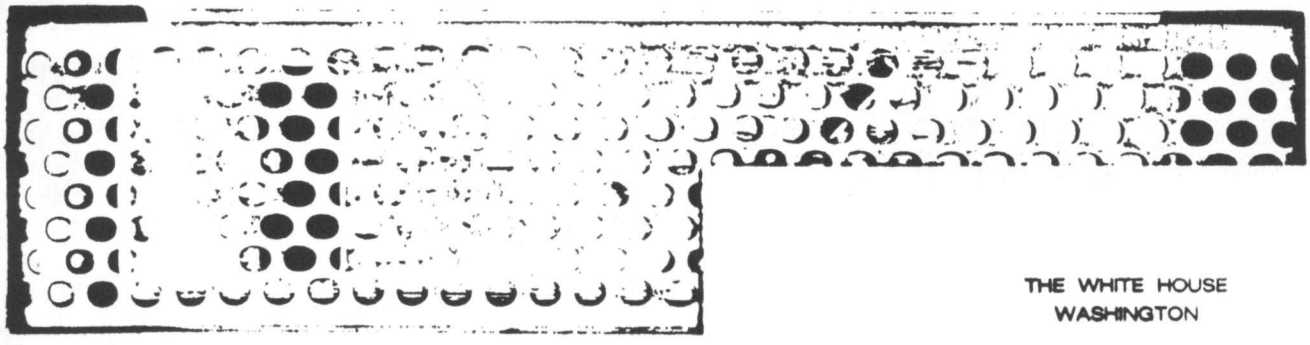
formulating its position for the negotiations, with coordination being provided by a White House Working Group on Global Change that I chair.

This negotiating position will reflect the extensive discussions that have been taking place within the U.S. government on environmental issues. As one example of these discussions, I might cite the Administration's work on emissions trading. If future restrictions on greenhouse emissions prove necessary, market-based approaches to implement those restrictions would be far preferable to command-and-control approaches. One such market-based approach involves a comprehensive system in which all sources and sinks of all greenhouse gases are treated on a common footing in terms of an appropriate greenhouse warming potential. Such a measure would include established scientific knowledge regarding the greenhouse effectiveness of individual chemicals and their average lifetime in the atmosphere.

With such a comprehensive approach in place, it would be easier to use market forces to achieve reductions in greenhouse gas emissions at minimum costs. This could well encompass bilateral and multilateral arrangements in which a given country might find it economically attractive to help another country achieve net global benefits at lower total cost than if each country were to act independently. This process of emissions trading has been successfully implemented in a number of situations, and it bears much promise for dealing with emissions of greenhouse gases.

Such innovative approaches are going to be essential to meet the main challenge presented by international agreements on climate change: establishing mechanisms that are both effective and workable. The negotiations leading to a

Framework Convention and any subsequent protocols will encompass an unprecedented range of national and international policies, and no country is likely to be coerced into actions that are not in its long-term interests. But ensuring a stable and predictable environment is in everyone's interest, and actions that genuinely help to achieve that end will carry great force.



THE WHITE HOUSE
WASHINGTON

August 22, 1990

TO: Justine

FROM: **EDE HOLIDAY**

☐ FYI

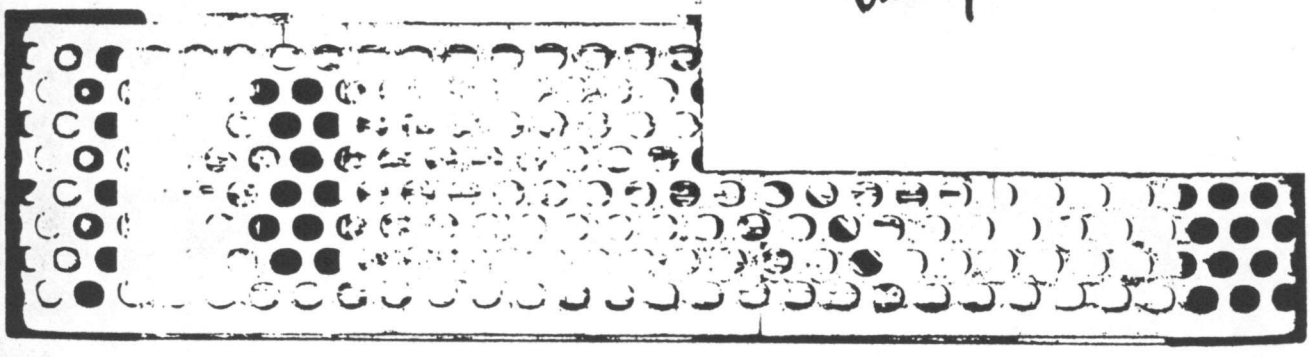
☐ Action

☐ Comment

I am not sure who is supposed to get this. Would you take a look and get back to me?

Laura

cc: Ken
Richard
Barry



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

August 21, 1990

MEMORANDUM FOR DISTRIBUTION

FROM: FCCSET SECRETARIAT

SUBJECT: WEEKLY FCCSET CALENDAR

Attached for your information is the latest edition of the schedule of events for the Federal Coordinating Council for Science, Engineering, and Technology.

Attachment

Distribution:

FCCSET Council Members
FCCSET Committee Members
FCCSET Executive Secretaries
PCAST Members
OSTP Staff
Jack Fellows, OMB, NEOB, Rm. 8001
Joe Hezier, OMB, NEOB, Rm. 8001
David Kleinberg, OMB, NEOB, Rm. 7025
Norine Noonan, OMB, NEOB, Rm. 8001
Susan Offutt, OMB, NEOB, Rm. 8025
Daniel Taft, OMB, NEOB, Rm. 10007
Stephen Danzansky, OEOB, Rm. 231
Brad Mitchell, OEDP, 2 FL, WW, WH
Ede Holiday, OCA, 2ND FL WW
Ken Yale, OCA, OEOB, Rm. 231
Allan B. Hubbard, OVP, OEOB, Rm. 286

as of August 21, 1990

FCCSET MEETINGS TO END OF SEPTEMBER 1990

AUGUST

21	9:00 am	Physical, Mathematical and Engineering Sciences Structure of Science Support Working Group, NSF, 1800 G Street, NW, Rm. 1243
23	10:30 am	Education and Human Resources Working Group on FY 1992 Federal Program Plan, NSF, 1800 G Street, NW, Room 540 (until 12:30)
	1:15 pm	Physical, Mathematical and Engineering Sciences Structure of Science Support in the U.S., NSF, 1800 G Street, NW, Room 1243 (until 3:15)
29	10:00 am	Education and Human Resources, DOE Headquarters, Forrestal Building, Room 8E-089, 1000 Independence Ave., SW (until 12:00)
	time TBA*	Committee on Food, Agricultural and Forestry Research Meeting, Agriculture, Room TBA*
30	9:30 am	Education and Human Resources, Working Group on the FY 1992 Federal Program Plan, NSF, 1800 G Street, NW, Room 540 (until 12:30)

SEPTEMBER

6	10:00 am	Executive Secretaries Meeting, NEOB, Room 5026 (until 11:00 am)
11	3:15 pm	Chairmen and Vice Chairmen Meeting [tentative] (until 4:30)
18	3:15 pm	Full Council Members Meeting [tentative] (until 4:30)
19	1:00 pm	Physical, Mathematical and Engineering Sciences Committee Meeting, NSF, 1800 G Street, NW, [tentative] Room TBA*
20	11:00 am	Committee on Technology and Industry Meeting, Commerce, Secretary's Dining Room, Room 5843 (until 1:00)
	1:15 pm	Physical, Mathematical and Engineering Sciences Structure of Science Support in the U.S., NSF, 1800 G Street, NW, Room 536 (until 3:15)
26	10:00 am	Life Sciences and Health Subcommittee Meeting on Earth Science Behavior, OEOB, Room 248 (until 12:00)

* TBA = TO BE ANNOUNCED

[redacted]

THE WHITE HOUSE
WASHINGTON
August 23, 1990

TO: Richard Porter

FROM: **EDE HOLIDAY**

☐ FYI

☒ Action

☐ Comment

cc: Olin
Todd
Dan
John

[redacted]

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

August 21, 1990

MEMORANDUM FOR DISTRIBUTION

FROM: **FCCSET SECRETARIAT**

SUBJECT: **WEEKLY FCCSET CALENDAR**

Attached for your information is the latest edition of the schedule of events for the Federal Coordinating Council for Science, Engineering, and Technology.

Attachment

Distribution:

FCCSET Council Members
FCCSET Committee Members
FCCSET Executive Secretaries
PCAST Members
OSTP Staff
Jack Fellows, OMB, NEOB, Rm. 8001
Joe Hezier, OMB, NEOB, Rm. 8001
David Kleinberg, OMB, NEOB, Rm. 7025
Norine Noonan, OMB, NEOB, Rm. 8001
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as of August 21, 1990

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* TBA = TO BE ANNOUNCED

THE WHITE HOUSE
WASHINGTON

August 10, 1990

TO: Richard Porter

FROM: **EDE HOLIDAY**

☒ FYI

☐ Action

☐ Comment

cc: steve Danzansky

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

August 9, 1990

Ede,

It was a pleasure to meet you and Richard today!

Attached is a page on the 1976 enactment of FCCSET. If you desire additional information, we will be pleased to provide it.

We have added your office to the FCCSET calendar distribution list and Dr Bromley will be inviting you to attend FCCSET Council meetings.

We look forward to supporting your office and working with you!

Tom Welch

BACKGROUND ON FUNCTIONS OF THE FCCSET

The Federal Coordinating Council for Science, Engineering, and Technology was established in 1976 by Public Law 94-282 with primary functions as follows:

> **"The Council shall consider problems and developments in the fields of science, engineering and technology and related areas affecting more than one Federal agency, and shall recommend policies and other measures designed to:**
>
> **(1) provide more effective planning and administration of Federal scientific and technological problems;**
>
> **(2) identify research needs including areas of research requiring additional emphasis;**
>
> **(3) achieve more effective utilization of the scientific and technological resources and facility of Federal agencies, including the elimination of unnecessary duplication; and**
>
> **(4) further international cooperation in science and technology."**

This mandate provides the FCCSET with two major objectives.

- First, the FCCSET will serve as the clearly recognized source of authoritative scientific and technological expertise in the U.S. Government for the purpose of providing input for policy discussions and decisions to Cabinet-level councils, including the Domestic Policy Council, the Competitiveness Council, the Economic Policy Council, The National Security Council, and the Space Council, and to the President.

- Second, the FCCSET will serve as the principal body for coordinating science and technology efforts of Federal agencies in support of administration policies--be they economic, national security, foreign, or domestic--and for surfacing and resolving S&T policy issues.

In support of these efforts, the Director of OSTP, as chairman of both the FCCSET and PCAST*, will seek to ensure that the FCCSET receives the benefits of PCAST advice as appropriate.

The FCCSET should meet on a regular basis, perhaps twice a year, and at the discretion of the chairman, to provide a continuing forum for discussion of science and technology strategies, issues, budgets and joint programs that extend beyond the interests of a single agency or department as well as matters concerning the functions of the FCCSET committees, the need for new subcommittees and review of committee reports, studies, papers, and issues.

* President's Council of Advisors on Science and Technology

FCCSET MEETINGS TO END OF AUGUST 1990

AUGUST

6	10:30 am	Education and Human Resources Working Group Meeting, NSF, 1800 G Street, NW, (until 12:30)
7	9:00 am	Physical, Mathematical and Engineering Sciences Structure of Science Support (S3) Working Group, NSF, 1800 G Street, NW, Rm. 536, (until 11:00 am)
	1:00 pm	Committee on Earth and Environmental Sciences Mitigation and Adaptation Research Strategies Meeting, Dept. of Commerce, Rm. 5230 (until 5:00 pm)
	1:00 pm	Committee on Earth and Environmental Sciences Subcommittee on National Disaster Reduction, Dept. of Commerce, Room to be Announced, (until 5:00 pm)
9	9:00 am	Committee on Earth and Environmental Sciences Landsat Task Group, NSF, 1800 G Street, NW, Rm. 536 (until 12:00 n)
10	2:00 pm	Committee on Life Sciences and Health, Humphrey Building, 200 Independence Ave., SW, Rm. 729-G (until 3:30 pm)
13	10:30 am	Edcucation and Human Resources Committee Working Group, NSF, 1800 G Street, NW, Rm. 543
	12:00 n	Committee on Earth and Environmental Sciences Working Group, NSF, 1800 G Street, NW, Rm. 536 (until 5:00 pm)
14	1:00 pm	Committee on Earth and Environmental Sciences Landsat Task Group, NSF, 1800 G Street, NW, Rm. 536 (until 5:00 pm)
15	9:00 am	Committee on Earth and Environmental Sciences Working Group, Place NASA, 600 Independence Ave, Rm. 5212 (until 5:00 pm)
	3:00 pm	Physical, Mathematical and Engineering Sciences Meeting, NSF, 1800 G Street, NW, RM. 540 (until 5:00 pm)
16	9:00 am	Mitigation and Adaptation Research Strategies Subcommittee of the Committee on Earth and Environmental Sciences, Place to be Announced, (until 5:00 pm)
21	9:00 am	Physical, Mathematical and Engineering Structure of Science Support (S3) Working Group, NSF, 1800 G Street, NW, Rm. 1243

OSTP

R&D IN THE FEDERAL BUDGET: 1991 AND BEYOND

D. ALLAN BROMLEY
Assistant to the President for Science and Technology
Executive Office of the President

AAAS Science and Technology Policy Colloquium
Washington, D.C.
April 12, 1990

When the President's FY 1991 budget was released on January 29, I held a press conference at which I called it an excellent budget for R&D in what is otherwise a very difficult budget year. I continue to believe this budget to be an excellent one for R&D. The overall increases in the budget -- 7 percent total for federal R&D, with a 12 percent increase in nondefense R&D and an 8 percent increase in basic research -- reflect President Bush's strong belief that research and development are a vital investment in our nation's future.

I am not going to describe in detail the components of the budget, because I know that will be done during much of this colloquium. Rather, I thought I would describe some of the thinking that went in to the formulation of the President's 1991 budget, and that will go into the formulation of future budgets. I will mention some of the problems that this budget tries to address -- and some that will have to be addressed in future budgets. And I will cover some of the long-term priorities for the Office of Science and Technology Policy.

FCCSET AND PCAST

But before that, I thought I would describe some of the institutional changes associated with OSTP that have been going on during the last several months, changes that may have a substantial effect on future R&D budgets. First, and most important, for the first time in the history of OSTP I now have the four Presidentially appointed, Senate-confirmed Associate Directors called for in OSTP's founding legislation.

One of the next most important developments, in my view, is the reorganization and revitalization of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), which was established by that same legislation. FCCSET is the interagency group within the Executive Office that is charged with reviewing, integrating, and coordinating the R&D activities of the federal government that cut

across the missions of more than one federal agency. As such, FCCSET has the potential to play a substantial role in shaping federal R&D efforts and guiding budget decisions.

There have been two meetings of FCCSET since I came to Washington last summer, and at both meetings we had excellent representation from the agencies, with Cabinet secretaries and heads of independent agencies constituting the majority of those in attendance. In general, we foresee a substantially altered and enhanced role for FCCSET within the White House. For the first time since it was created, FCCSET should be functioning as it was designed to function.

Much of the impetus for FCCSET's revitalization has come from the recent success that several FCCSET committees have had in coordinating cross-cutting areas of science and technology. For example, the Committee on Earth Sciences has taken all of the formerly disparate research being done by federal agencies on the global environment and has organized it into the U.S. Global Change Research Program -- a coherent, government-wide approach to the scientific understanding of global change. This is the kind of coordination I expect FCCSET to bring to many other important areas of science and technology.

FCCSET has recently formed seven new umbrella committees, each chaired by a high-level official of a Federal agency or department, to oversee broad areas of science and technology. Subcommittees and working groups will be active within each of these umbrella committees to examine, coordinate, and integrate federal activities in selected areas of science and technology. The seven umbrella committees are in (1) earth and environmental sciences (chaired by Dallas Peck, Director of the U.S. Geological Survey), (2) education and human resources (chaired by James Watkins, Secretary of the Department of Energy), (3) food, agriculture, and forest research (chaired by Charles Hess, Assistant Secretary for Science and Education of the Department of Agriculture), (4) international science and engineering (chaired by Reginald Bartholomew, Under Secretary for Security Assistance, Science and Technology of the Department of State), (5) life sciences and health (chaired by James Mason, Assistant Secretary of the Department of Health and Human Services), (6) physical, mathematical, and engineering sciences (chaired by Erich Bloch, Director

of the National Science Foundation), and (7) technology and industry (chaired by Thomas Murrin, Deputy Secretary of the Department of Commerce).

I expect FCCSET to be a powerful influence in helping to shape and implement federal science and technology policy. The planning and coordination provided by FCCSET will allow for more effective use of the scientific and technological resources of federal agencies. FCCSET will also help to develop and review, in close cooperation with the Office of Management and Budget, annual and long-range federal budget plans in selected cross-cutting areas of science and technology.

Policy matters internal to science and technology will be resolved within FCCSET. Policy input involving science and technology to broader issues with strong political and economic components -- such as global change -- will be channeled to the Domestic Policy Council or the Economic Policy Council for Cabinet-level consideration and eventual presentation to the President through a new Working Group that will report to both Councils and that I chair.

One problem with FCCSET in the past has been that it has had very little input from the private sector. In the future, much greater input will come from the President's Council of Advisors on Science and Technology, a group of 12 distinguished scientists and engineers that the President established in February. PCAST has held two meetings thus far -- the first at Camp David in February, and the second in the White House complex last month. The President and several of his top advisers participated in all or part of both those meetings and were involved in very candid discussions with the PCAST members.

Because I chair both FCCSET and PCAST, I have the opportunity to coordinate their actions so that each benefits from the other's activities. For example, much of the work of PCAST will be carried out through panels chaired by PCAST members and with extensive private sector representation. These panels will in many cases parallel the committee and subcommittee structure of FCCSET, so that the concerns and activities of the private sector can be taken into account in the deliberations of FCCSET committees and so that PCAST can be aware, in detail, of relevant governmental plans and activities.

SETTING PRIORITIES IN THE FEDERAL BUDGET

As in the case of the Committee on Earth Sciences, FCCSET committees can have a very substantial effect on federal R&D budgets. Working through OSTP and through the Office of Management and Budget, FCCSET committees can scrub the components of cross-cutting programs, making it possible to consider the program as a whole, as a coherent national activity rather than a collection of agency programs.

Regarding the interactions between OSTP and OMB, our two offices have established an excellent working relationship. Our respective staffs work together at all levels to review the distribution of federal funds and to ensure that the Administration's proposals to Congress represent the most efficient and effective allocation of those funds. This interaction is also extremely important in the priority-setting process that goes into the development of the Presidential budget requests.

It may be helpful to describe how this priority-setting process worked last fall, because some variant of it will be applied in the future. Last fall Dick Darman and his senior staff reviewed all R&D programs to determine an optimum allocation of funds across the R&D agency budgets. I participated in virtually all of the reviews dealing with science and technology and will continue to do so in future years. It was a very difficult process, since almost all of the agency budget proposals were excellent and worthy of support. Unfortunately, in the reviews that were completed this past fall, the available budget resources would not stretch to cover all agency efforts -- nor, I suspect, will there ever be enough resources to cover all of the proposals.

As a result, this last fall, OMB, with substantial input from OSTP, applied three quite simple guiding principles in prioritizing the agency requests.

1. The first principle is that support is required for certain programs that address national needs and national security concerns. Examples would be scientific research to address global change, a preeminence in space, and adequate support for the defense technology base. Out of these considerations, I might add, comes the division between civilian and defense needs.

2. The second principle is the adequacy of support for basic research. In my view, basic research--and particularly university-based, individual-investigator and small group research--constitutes the heart of our science and technology enterprise. Funding for "small science" must be guaranteed if American science, as a whole, is to flourish. Thus, in evaluating agency programs, a concerted effort was made to ensure that small science received high priority in the agencies' final programs.

3. The third principle is to ensure an adequate level of funding for the scientific infrastructure and facilities in this country, including large facilities. Large facilities, such as the superconducting supercollider, Space Station Freedom, and, in a more distributed sense, the human genome project, are essential if American scientists are have, in future, the facilities and the infrastructure necessary to take them to the research frontiers of their fields. Once these facilities are built, they serve thousands of scientists and make possible a scientific understanding of the world and universe in which we live.

The final step in preparing the Administration's budget was a series of meetings with the President. Dick Darman and I, in each case with the affected Cabinet secretary or R&D agency head, sat down on a case-by-case basis with the President to resolve the budget priorities within the constraints of the available budget resources. The President made the final priority decisions -- as indeed he should. The budget that was presented to the Congress this January was the end result of this process, and the same basic process--with a substantially enhanced FCCSET role--is expected to apply to the R&D component of federal budgets in the future.

PROBLEM AREAS IN THE BUDGET

That process resulted in a good budget for science and technology this year, but there remain several areas of concern.

One very serious problem involves the funding rate for grants at the National Institutes of Health and the National Science Foundation. Despite nearly a decade of funding increases at those two agencies, the money available for new, young investigators is very tight. During fiscal year 1989, for the first time ever, the fraction of excellent, peer-reviewed, new proposals that were actually funded by these two agencies fell below 30 percent. The discouragement caused by a lack of funding is particularly unfortunate at a time when the nation has a very serious need to recruit more young people into scientific careers.

There are several reasons for this state of affairs. One is that the rate of inflation for research in the physical and life sciences is higher than the consumer price index (sophistication inflation), and the nonearmarked dollars available to NIH and NSF have not kept pace.

Members of the scientific community also built part of this problem for ourselves. For years, we argued for multiyear grants and contracts to cut down on the amount of paperwork required to do research. Both NSF and NIH have responded to those requests, and in the process they have built substantial "outyear mortgages" for themselves.

Simple demographics are yet another contributing factor. About 87 percent of all the scientists and engineers who have ever lived and worked are active today, whereas only 4 percent of all the human beings to have lived on this planet are alive today.

Finally, we must also recognize that, to some extent, we are the victims of our own success. It has been a remarkable decade in science. The increased funds devoted to research during the 1980s have produced a wealth of advances, which in turn have created an exponentially increasing number of exciting opportunities throughout the scientific disciplines. The number of high-quality applications is growing steadily. We must find some way of dealing with the remarkable progress that we have made.

Another area of concern for the budget involves how Congress will treat the President's proposals. As you well know, the President proposes, but the Congress disposes. There is a strong base of support on Capitol Hill for science and

technology, but the next few years will not necessarily be easy ones for science and technology on Capitol Hill; nor are substantial increases for R&D guaranteed. There are a variety of pressures on the federal budget that will continue to increase, and support for R&D is eminently vulnerable.

First and foremost are the pressures of the deficit. The Gramm-Rudman-Hollings deficit reduction act calls for a deficit target in fiscal year 1991 of $64 billion. In fiscal year 1992 the deficit target drops to $28 billion, and the year after that to zero. Barring a very great reduction in defense spending--and I do not believe that we can count on that at this time--savings will have to be found in current programs.

Science and technology in the federal budget are also in direct competition with programs that have very active and vocal constituencies. For example, funding for the National Science Foundation and for NASA falls under the same Appropriations Subcommittee that supports Veteran Affairs, Housing and Urban Development, and a number of other independent agencies.

A useful way to consider the problem such Subcommittees face is to reflect on the types of programs funded by the federal government. These can be divided into three categories: (1) outlays for obligations made in the past, such as commitments to Veterans or to Social Security (2) current needs, such as health care, the homeless, or the war on drugs, and (3) investments in the future. Thus, in the case of the National Science Foundation and other scientific agencies, the future is in direct competition with current needs and past obligations. In such a situation, it is always tempting to defer investments in the future and to respond to the much more demanding needs of the past and present.

Given these pressures, Congress does remarkably well at supporting science and technology. But Congress cannot do it alone. Research and development must have a constituency that is more commensurate with the importance of science and technology to our nation. I have talked a great deal this spring about developing a constituency for science -- a constituency for the future -- that would support the federal government's efforts to invest our future. Partially, this will depend on developing a level of scientific literacy in the country that enables people to

understand, at least in outline, the importance of science and technology in almost every aspect of modern life. But it will also rely on your efforts, as the individuals who are at the interface between science and technology, the federal government, and the public.

Those of you here this morning bear a very special responsibility in helping the Congress to respond to the President's budget requests. It is essential that you make known your concerns about the importance of continuing -- and increasing -- the nation's investment in research and development to your Representatives and Senators. I have been asked repeatedly by members of Congress why, if the problems of funding are as serious as I maintain them to be, these members have not heard directly from their scientist and engineer constituents. This is a fair question.

It is simply no longer possible for the scientific and technology communities of this nation to expect someone else to make the case for science and technology. We need your help so that we can better help you and the nation.

FUTURE INITIATIVES

This problem of funding is, of course, one with which OSTP is continually involved. But there are other areas in which our office has begun to focus, and let me conclude today by mentioning a few of them. They include science and technology for economic growth, global change, science and mathematics education, high performance computing, materials science and engineering, and biotechnology.

SCIENCE, TECHNOLOGY, AND THE ECONOMY In the area of science and technology for economic growth, much has been written about the proper role of the federal government in promoting commercially important technologies. Some people have pointed to the loss of market share in key industries and have advocated that the U.S. government should move to bolster those industries through favorable tax treatment or direct subsidies. But the Bush Administration believes that private industry, not the federal government, knows what is best for private industry. The

Administration will not adopt a policy that has the effect of picking winners and losers in the marketplace.

Nevertheless, the Bush Administration does acknowledge the very important role for the federal government in supporting the development of generic, enabling technologies. These are technologies that are important in a wide variety of commercial applications and to our national security; however, no single company can capture enough of the benefits to justify investing an adequate amount of R&D in them. The rationale for investing in these enabling technologies is essentially the same as that for investing in basic research: individual companies cannot bear the cost and risk of such investments alone given the diffuse nature of the benefits.

In a speech to the American Electronics Association on March 7, President Bush pointed specifically to the importance of these enabling technologies. He said, "This Administration is committed to working with you in the critical precompetitive development stage where the basic discoveries are converted into generic technologies that support both our economic competitiveness and our national security. Here again we can help to level the international playing field on which you compete."

Later in the speech, the President noted that he would charge the Competitiveness Council, which is chaired by the Vice-President, with a new task: "to find ways that American industry can better translate new ideas and technologies into marketable products."

At OSTP, we believe that this is an important function for the Administration. OSTP's Associate Director for Industrial Technology William Phillips, who was confirmed last week, will be working with the President, with the Competitiveness Council, and with the other parts of the Administration to further this work on leveraging technologies.

The FY 1990 Defense Authorization Act requires OSTP to establish a panel to merge the lists of critical technologies prepared by the Departments of Defense and Commerce as of importance to the long-term national security and economic prosperity of the United States. We are now in the process of setting up that panel and beginning the examination of candidate technologies. The panel's first report will be submitted to the President on October 1 of this year and transmitted to Congress

30 days later. This will be an important process within OSTP, and we will devote a considerable amount of time to it this spring and summer.

GLOBAL CHANGE Another area that has occupied much of our time in the last few months has been global change. Next week I will be cochairing, together with Michael Deland of the Council on Environmental Quality and Michael Boskin of the Council of Economic Advisers, an international White House Conference on Science and Economics Research Related to Global Change. The conference will bring together delegations from 18 countries, the Organization for Economic Cooperation and Development, and the European Community for two days of discussions on the key scientific and economic questions surrounding global change. The conference will look at what is known about global change, what is not known, and how long will it be before the remaining uncertainties are reduced. In this way, the conference will complement other ongoing national and international activities that are contributing to the formation of policies on this issue.

A primary function of the conference, which is complementary and supporting the work of the U.N.-sponsored Intergovernmental Panel on Climate Change (IPCC), will be that of emphasizing the importance of economics as the glue that binds scientific understanding of global change phenomena with rational policy making -- both national and international -- in this area. Economic analyses have been conspicuous by their absence in most discussions to date of national and international policies concerning global change.

HIGH PERFORMANCE COMPUTING A third area of emphasis for our office will be high performance computing -- an important example of an enabling technology for industrial, research, and national security applications. Last fall I sent to the Congress a report entitled The Federal High Performance Computing Program, produced by the Computer Research and Applications committee of FCCSET. The program laid out by the report had four distinct parts. The first concerns developing the hardware that will, both with enhanced mainframes and through the use of

parallelism, make possible TERAOP computers operating at trillions of operations per second. The second is developing the user friendly software technology and algorithms that will permit full and efficient use of the hardware capabilities that are now and will soon be available. The third is building a national fiber optic network that will increase the accessibility of geographically dispersed users to these supercomputers and reduce the incompatibility that now characterizes many computer networks. One of the major new areas that I see as a target here is that of education --- an area that has been more resistant to technological change than any other in our society. Another is the small business that up to now simply has been denied access to the power of major computer facilities. And the fourth is training the personnel who will extend the tremendous advances that have been made in the past.

To further coordinate and increase high-level attention for high performance computing, and to explore where there exists a basis for extending the Federal program into a national program, I convened a meeting earlier this year of agency heads and their deputy directors for R&D agencies that support high performance computing. A second meeting of this group was held last month and further meetings will be held as necessary. I expect that the result of this effort will be a far more coordinated program and budget submission for FY 1992.

SCIENCE AND MATHEMATICS EDUCATION A fourth area of emphasis within our office is that of science and mathematics education. I do not have time to discuss education in detail, but I want to outline our overall approach. During his State of the Union message, President Bush set down six goals for education, including making American students the best in the world in science and mathematics education. The Administration takes this set of national goals and objectives very seriously. The President and the Governors have agreed to work with Congress, with education groups, and with business to institutionalize a process to oversee the development of ways to measure progress against these goals and report regularly to the nation on whether they are being achieved.

We need to pursue a number of detailed steps to achieve the goals and objectives that the President and Governors have established. We need more magnet

schools for science and mathematics that can inspire our most gifted young people. We must focus on the "forgotten middle"--the technicians who will be running the high-technology factories of the future. And we need to encourage more women and minorities to study science and engineering and to pursue technical careers.

MATERIALS SCIENCE AND TECHNOLOGY A fifth area is that of materials science and technology -- in my opinion an orphan area in the federal government because it does not fall neatly into any given agencies or, indeed, into any of the traditional scientific or engineering disciplines. Yet this area is of enormous importance to almost every aspect of our increasingly technological society.

BIOTECHNOLOGY Finally, biotechnology may hold the promise in the coming decades that electronics and other products of the physical sciences did in the postwar decades. While we still hold a commanding lead in the related basic research areas, we are falling behind on international competitiveness in the critical scale-up of laboratory to industrial production facilities.

CONCLUSION

We are committed in OSTP, and indeed throughout the Administration, to strengthening, to the greatest extent possible, the science and technology base on which so much of our national future depends. But hard choices lie ahead: how best to balance large projects in science against funding for individual investigators and small groups, how to produce the steady stream of trained scientists and engineers that industry and universities will require in the 21st century, how to increase cooperation among universities, government, and the private sector.

The federal budget will reflect the decisions that are made in these and other areas. But the decisions themselves will come from our vision for the future of science and technology, from our deeper ideas of where we are and where we should be going. The first rule of the budget examiner is that God is in the details, and if I

might apply that analogy to science, I would hope that as you delve into the numbers that we have presented this year, you might also spend some time reflecting on the broader import of those numbers.

And let me reiterate my plea for your individual help in building a national constituency for science and technology. In a very real sense, those of you in this morning's audience hold the future of American science and technology in your hands. Working together, we can maintain it as a central part of our national future -- and as perhaps the great adventure that is available to members of our species.

R&D IN THE FEDERAL BUDGET: 1991 AND BEYOND

D. ALLAN BROMLEY
Assistant to the President for Science and Technology
Executive Office of the President

AAAS Science and Technology Policy Colloquium
Washington, D.C.
April 12, 1990

When the President's FY 1991 budget was released on January 29, I held a press conference at which I called it an excellent budget for R&D in what is otherwise a very difficult budget year. I continue to believe this budget to be an excellent one for R&D. The overall increases in the budget -- 7 percent total for federal R&D, with a 12 percent increase in nondefense R&D and an 8 percent increase in basic research -- reflect President Bush's strong belief that research and development are a vital investment in our nation's future.

I am not going to describe in detail the components of the budget, because I know that will be done during much of this colloquium. Rather, I thought I would describe some of the thinking that went in to the formulation of the President's 1991 budget, and that will go into the formulation of future budgets. I will mention some of the problems that this budget tries to address -- and some that will have to be addressed in future budgets. And I will cover some of the long-term priorities for the Office of Science and Technology Policy.

FCCSET AND PCAST

But before that, I thought I would describe some of the institutional changes associated with OSTP that have been going on during the last several months, changes that may have a substantial effect on future R&D budgets. First, and most important, for the first time in the history of OSTP I now have the four Presidentially appointed, Senate-confirmed Associate Directors called for in OSTP's founding legislation.

One of the next most important developments, in my view, is the reorganization and revitalization of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), which was established by that same legislation. FCCSET is the interagency group within the Executive Office that is charged with reviewing, integrating, and coordinating the R&D activities of the federal government that cut

across the missions of more than one federal agency. As such, FCCSET has the potential to play a substantial role in shaping federal R&D efforts and guiding budget decisions.

There have been two meetings of FCCSET since I came to Washington last summer, and at both meetings we had excellent representation from the agencies, with Cabinet secretaries and heads of independent agencies constituting the majority of those in attendance. In general, we foresee a substantially altered and enhanced role for FCCSET within the White House. For the first time since it was created, FCCSET should be functioning as it was designed to function.

Much of the impetus for FCCSET's revitalization has come from the recent success that several FCCSET committees have had in coordinating cross-cutting areas of science and technology. For example, the Committee on Earth Sciences has taken all of the formerly disparate research being done by federal agencies on the global environment and has organized it into the U.S. Global Change Research Program -- a coherent, government-wide approach to the scientific understanding of global change. This is the kind of coordination I expect FCCSET to bring to many other important areas of science and technology.

FCCSET has recently formed seven new umbrella committees, each chaired by a high-level official of a Federal agency or department, to oversee broad areas of science and technology. Subcommittees and working groups will be active within each of these umbrella committees to examine, coordinate, and integrate federal activities in selected areas of science and technology. The seven umbrella committees are in (1) earth and environmental sciences (chaired by Dallas Peck, Director of the U.S. Geological Survey), (2) education and human resources (chaired by James Watkins, Secretary of the Department of Energy), (3) food, agriculture, and forest research (chaired by Charles Hess, Assistant Secretary for Science and Education of the Department of Agriculture), (4) international science and engineering (chaired by Reginald Bartholomew, Under Secretary for Security Assistance, Science and Technology of the Department of State), (5) life sciences and health (chaired by James Mason, Assistant Secretary of the Department of Health and Human Services), (6) physical, mathematical, and engineering sciences (chaired by Erich Bloch, Director

of the National Science Foundation), and (7) technology and industry (chaired by Thomas Murrin, Deputy Secretary of the Department of Commerce).

I expect FCCSET to be a powerful influence in helping to shape and implement federal science and technology policy. The planning and coordination provided by FCCSET will allow for more effective use of the scientific and technological resources of federal agencies. FCCSET will also help to develop and review, in close cooperation with the Office of Management and Budget, annual and long-range federal budget plans in selected cross-cutting areas of science and technology.

Policy matters internal to science and technology will be resolved within FCCSET. Policy input involving science and technology to broader issues with strong political and economic components -- such as global change -- will be channeled to the Domestic Policy Council or the Economic Policy Council for Cabinet-level consideration and eventual presentation to the President through a new Working Group that will report to both Councils and that I chair.

One problem with FCCSET in the past has been that it has had very little input from the private sector. In the future, much greater input will come from the President's Council of Advisors on Science and Technology, a group of 12 distinguished scientists and engineers that the President established in February. PCAST has held two meetings thus far -- the first at Camp David in February, and the second in the White House complex last month. The President and several of his top advisers participated in all or part of both those meetings and were involved in very candid discussions with the PCAST members.

Because I chair both FCCSET and PCAST, I have the opportunity to coordinate their actions so that each benefits from the other's activities. For example, much of the work of PCAST will be carried out through panels chaired by PCAST members and with extensive private sector representation. These panels will in many cases parallel the committee and subcommittee structure of FCCSET, so that the concerns and activities of the private sector can be taken into account in the deliberations of FCCSET committees and so that PCAST can be aware, in detail, of relevant governmental plans and activities.

SETTING PRIORITIES IN THE FEDERAL BUDGET

As in the case of the Committee on Earth Sciences, FCCSET committees can have a very substantial effect on federal R&D budgets. Working through OSTP and through the Office of Management and Budget, FCCSET committees can scrub the components of cross-cutting programs, making it possible to consider the program as a whole, as a coherent national activity rather than a collection of agency programs.

Regarding the interactions between OSTP and OMB, our two offices have established an excellent working relationship. Our respective staffs work together at all levels to review the distribution of federal funds and to ensure that the Administration's proposals to Congress represent the most efficient and effective allocation of those funds. This interaction is also extremely important in the priority-setting process that goes into the development of the Presidential budget requests.

It may be helpful to describe how this priority-setting process worked last fall, because some variant of it will be applied in the future. Last fall Dick Darman and his senior staff reviewed all R&D programs to determine an optimum allocation of funds across the R&D agency budgets. I participated in virtually all of the reviews dealing with science and technology and will continue to do so in future years. It was a very difficult process, since almost all of the agency budget proposals were excellent and worthy of support. Unfortunately, in the reviews that were completed this past fall, the available budget resources would not stretch to cover all agency efforts -- nor, I suspect, will there ever be enough resources to cover all of the proposals.

As a result, this last fall, OMB, with substantial input from OSTP, applied three quite simple guiding principles in prioritizing the agency requests.

1. The first principle is that support is required for certain programs that address national needs and national security concerns. Examples would be scientific research to address global change, a preeminence in space, and adequate support for the defense technology base. Out of these considerations, I might add, comes the division between civilian and defense needs.

2. The second principle is the adequacy of support for basic research. In my view, basic research--and particularly university-based, individual-investigator and small group research--constitutes the heart of our science and technology enterprise. Funding for "small science" must be guaranteed if American science, as a whole, is to flourish. Thus, in evaluating agency programs, a concerted effort was made to ensure that small science received high priority in the agencies' final programs.

3. The third principle is to ensure an adequate level of funding for the scientific infrastructure and facilities in this country, including large facilities. Large facilities, such as the superconducting supercollider, Space Station Freedom, and, in a more distributed sense, the human genome project, are essential if American scientists are have, in future, the facilities and the infrastructure necessary to take them to the research frontiers of their fields. Once these facilities are built, they serve thousands of scientists and make possible a scientific understanding of the world and universe in which we live.

The final step in preparing the Administration's budget was a series of meetings with the President. Dick Darman and I, in each case with the affected Cabinet secretary or R&D agency head, sat down on a case-by-case basis with the President to resolve the budget priorities within the constraints of the available budget resources. The President made the final priority decisions -- as indeed he should. The budget that was presented to the Congress this January was the end result of this process, and the same basic process--with a substantially enhanced FCCSET role--is expected to apply to the R&D component of federal budgets in the future.

PROBLEM AREAS IN THE BUDGET

That process resulted in a good budget for science and technology this year, but there remain several areas of concern.

One very serious problem involves the funding rate for grants at the National Institutes of Health and the National Science Foundation. Despite nearly a decade of funding increases at those two agencies, the money available for new, young investigators is very tight. During fiscal year 1989, for the first time ever, the fraction of excellent, peer-reviewed, new proposals that were actually funded by these two agencies fell below 30 percent. The discouragement caused by a lack of funding is particularly unfortunate at a time when the nation has a very serious need to recruit more young people into scientific careers.

There are several reasons for this state of affairs. One is that the rate of inflation for research in the physical and life sciences is higher than the consumer price index (sophistication inflation), and the nonearmarked dollars available to NIH and NSF have not kept pace.

Members of the scientific community also built part of this problem for ourselves. For years, we argued for multiyear grants and contracts to cut down on the amount of paperwork required to do research. Both NSF and NIH have responded to those requests, and in the process they have built substantial "outyear mortgages" for themselves.

Simple demographics are yet another contributing factor. About 87 percent of all the scientists and engineers who have ever lived and worked are active today, whereas only 4 percent of all the human beings to have lived on this planet are alive today.

Finally, we must also recognize that, to some extent, we are the victims of our own success. It has been a remarkable decade in science. The increased funds devoted to research during the 1980s have produced a wealth of advances, which in turn have created an exponentially increasing number of exciting opportunities throughout the scientific disciplines. The number of high-quality applications is growing steadily. We must find some way of dealing with the remarkable progress that we have made.

Another area of concern for the budget involves how Congress will treat the President's proposals. As you well know, the President proposes, but the Congress disposes. There is a strong base of support on Capitol Hill for science and

technology, but the next few years will not necessarily be easy ones for science and technology on Capitol Hill; nor are substantial increases for R&D guaranteed. There are a variety of pressures on the federal budget that will continue to increase, and support for R&D is eminently vulnerable.

First and foremost are the pressures of the deficit. The Gramm-Rudman-Hollings deficit reduction act calls for a deficit target in fiscal year 1991 of $64 billion. In fiscal year 1992 the deficit target drops to $28 billion, and the year after that to zero. Barring a very great reduction in defense spending--and I do not believe that we can count on that at this time--savings will have to be found in current programs.

Science and technology in the federal budget are also in direct competition with programs that have very active and vocal constituencies. For example, funding for the National Science Foundation and for NASA falls under the same Appropriations Subcommittee that supports Veteran Affairs, Housing and Urban Development, and a number of other independent agencies.

A useful way to consider the problem such Subcommittees face is to reflect on the types of programs funded by the federal government. These can be divided into three categories: (1) outlays for obligations made in the past, such as commitments to Veterans or to Social Security (2) current needs, such as health care, the homeless, or the war on drugs, and (3) investments in the future. Thus, in the case of the National Science Foundation and other scientific agencies, the future is in direct competition with current needs and past obligations. In such a situation, it is always tempting to defer investments in the future and to respond to the much more demanding needs of the past and present.

Given these pressures, Congress does remarkably well at supporting science and technology. But Congress cannot do it alone. Research and development must have a constituency that is more commensurate with the importance of science and technology to our nation. I have talked a great deal this spring about developing a constituency for science -- a constituency for the future -- that would support the federal government's efforts to invest our future. Partially, this will depend on developing a level of scientific literacy in the country that enables people to

understand, at least in outline, the importance of science and technology in almost every aspect of modern life. But it will also rely on your efforts, as the individuals who are at the interface between science and technology, the federal government, and the public.

Those of you here this morning bear a very special responsibility in helping the Congress to respond to the President's budget requests. It is essential that you make known your concerns about the importance of continuing -- and increasing -- the nation's investment in research and development to your Representatives and Senators. I have been asked repeatedly by members of Congress why, if the problems of funding are as serious as I maintain them to be, these members have not heard directly from their scientist and engineer constituents. This is a fair question.

It is simply no longer possible for the scientific and technology communities of this nation to expect someone else to make the case for science and technology. We need your help so that we can better help you and the nation.

FUTURE INITIATIVES

This problem of funding is, of course, one with which OSTP is continually involved. But there are other areas in which our office has begun to focus, and let me conclude today by mentioning a few of them. They include science and technology for economic growth, global change, science and mathematics education, high performance computing, materials science and engineering, and biotechnology.

SCIENCE, TECHNOLOGY, AND THE ECONOMY In the area of science and technology for economic growth, much has been written about the proper role of the federal government in promoting commercially important technologies. Some people have pointed to the loss of market share in key industries and have advocated that the U.S. government should move to bolster those industries through favorable tax treatment or direct subsidies. But the Bush Administration believes that private industry, not the federal government, knows what is best for private industry. The

Administration will not adopt a policy that has the effect of picking winners and losers in the marketplace.

Nevertheless, the Bush Administration does acknowledge the very important role for the federal government in supporting the development of generic, enabling technologies. These are technologies that are important in a wide variety of commercial applications and to our national security; however, no single company can capture enough of the benefits to justify investing an adequate amount of R&D in them. The rationale for investing in these enabling technologies is essentially the same as that for investing in basic research: individual companies cannot bear the cost and risk of such investments alone given the diffuse nature of the benefits.

In a speech to the American Electronics Association on March 7, President Bush pointed specifically to the importance of these enabling technologies. He said, "This Administration is committed to working with you in the critical precompetitive development stage where the basic discoveries are converted into generic technologies that support both our economic competitiveness and our national security. Here again we can help to level the international playing field on which you compete."

Later in the speech, the President noted that he would charge the Competitiveness Council, which is chaired by the Vice-President, with a new task: "to find ways that American industry can better translate new ideas and technologies into marketable products."

At OSTP, we believe that this is an important function for the Administration. OSTP's Associate Director for Industrial Technology William Phillips, who was confirmed last week, will be working with the President, with the Competitiveness Council, and with the other parts of the Administration to further this work on leveraging technologies.

The FY 1990 Defense Authorization Act requires OSTP to establish a panel to merge the lists of critical technologies prepared by the Departments of Defense and Commerce as of importance to the long-term national security and economic prosperity of the United States. We are now in the process of setting up that panel and beginning the examination of candidate technologies. The panel's first report will be submitted to the President on October 1 of this year and transmitted to Congress

30 days later. This will be an important process within OSTP, and we will devote a considerable amount of time to it this spring and summer.

GLOBAL CHANGE Another area that has occupied much of our time in the last few months has been global change. Next week I will be cochairing, together with Michael Deland of the Council on Environmental Quality and Michael Boskin of the Council of Economic Advisers, an international White House Conference on Science and Economics Research Related to Global Change. The conference will bring together delegations from 18 countries, the Organization for Economic Cooperation and Development, and the European Community for two days of discussions on the key scientific and economic questions surrounding global change. The conference will look at what is known about global change, what is not known, and how long will it be before the remaining uncertainties are reduced. In this way, the conference will complement other ongoing national and international activities that are contributing to the formation of policies on this issue.

A primary function of the conference, which is complementary and supporting the work of the U.N.-sponsored Intergovernmental Panel on Climate Change (IPCC), will be that of emphasizing the importance of economics as the glue that binds scientific understanding of global change phenomena with rational policy making -- both national and international -- in this area. Economic analyses have been conspicuous by their absence in most discussions to date of national and international policies concerning global change.

HIGH PERFORMANCE COMPUTING A third area of emphasis for our office will be high performance computing -- an important example of an enabling technology for industrial, research, and national security applications. Last fall I sent to the Congress a report entitled The Federal High Performance Computing Program, produced by the Computer Research and Applications committee of FCCSET. The program laid out by the report had four distinct parts. The first concerns developing the hardware that will, both with enhanced mainframes and through the use of

parallelism, make possible TERAOP computers operating at trillions of operations per second. The second is developing the user friendly software technology and algorithms that will permit full and efficient use of the hardware capabilities that are now and will soon be available. The third is building a national fiber optic network that will increase the accessibility of geographically dispersed users to these supercomputers and reduce the incompatibility that now characterizes many computer networks. One of the major new areas that I see as a target here is that of education --- an area that has been more resistant to technological change than any other in our society. Another is the small business that up to now simply has been denied access to the power of major computer facilities. And the fourth is training the personnel who will extend the tremendous advances that have been made in the past.

To further coordinate and increase high-level attention for high performance computing, and to explore where there exists a basis for extending the Federal program into a national program, I convened a meeting earlier this year of agency heads and their deputy directors for R&D agencies that support high performance computing. A second meeting of this group was held last month and further meetings will be held as necessary. I expect that the result of this effort will be a far more coordinated program and budget submission for FY 1992.

SCIENCE AND MATHEMATICS EDUCATION A fourth area of emphasis within our office is that of science and mathematics education. I do not have time to discuss education in detail, but I want to outline our overall approach. During his State of the Union message, President Bush set down six goals for education, including making American students the best in the world in science and mathematics education. The Administration takes this set of national goals and objectives very seriously. The President and the Governors have agreed to work with Congress, with education groups, and with business to institutionalize a process to oversee the development of ways to measure progress against these goals and report regularly to the nation on whether they are being achieved.

We need to pursue a number of detailed steps to achieve the goals and objectives that the President and Governors have established. We need more magnet

schools for science and mathematics that can inspire our most gifted young people. We must focus on the "forgotten middle"--the technicians who will be running the high-technology factories of the future. And we need to encourage more women and minorities to study science and engineering and to pursue technical careers.

MATERIALS SCIENCE AND TECHNOLOGY A fifth area is that of materials science and technology -- in my opinion an orphan area in the federal government because it does not fall neatly into any given agencies or, indeed, into any of the traditional scientific or engineering disciplines. Yet this area is of enormous importance to almost every aspect of our increasingly technological society.

BIOTECHNOLOGY Finally, biotechnology may hold the promise in the coming decades that electronics and other products of the physical sciences did in the postwar decades. While we still hold a commanding lead in the related basic research areas, we are falling behind on international competitiveness in the critical scale-up of laboratory to industrial production facilities.

CONCLUSION

We are committed in OSTP, and indeed throughout the Administration, to strengthening, to the greatest extent possible, the science and technology base on which so much of our national future depends. But hard choices lie ahead: how best to balance large projects in science against funding for individual investigators and small groups, how to produce the steady stream of trained scientists and engineers that industry and universities will require in the 21st century, how to increase cooperation among universities, government, and the private sector.

The federal budget will reflect the decisions that are made in these and other areas. But the decisions themselves will come from our vision for the future of science and technology, from our deeper ideas of where we are and where we should be going. The first rule of the budget examiner is that God is in the details, and if I

might apply that analogy to science, I would hope that as you delve into the numbers that we have presented this year, you might also spend some time reflecting on the broader import of those numbers.

And let me reiterate my plea for your individual help in building a national constituency for science and technology. In a very real sense, those of you in this morning's audience hold the future of American science and technology in your hands. Working together, we can maintain it as a central part of our national future -- and as perhaps the great adventure that is available to members of our species.

Holly

Greenhouse Policy
Bromley
(OSTP)

THE WHITE HOUSE
WASHINGTON

4-9-90

Steve:

Attached is a DRAFT of Bromley's National Press Club speech, scheduled Wed. of this week. OMB and the WH Conference will be commenting on it and the speechwriter, Steve Olson, said he would get a more final draft to me sometime tomorrow.

Thanks.

Holly

PS--Steve Olson said he thought the speech could change quite a bit once comments have been incorporated.

DRAFT--DO NOT QUOTE OR CITE

THE MAKING OF A GREENHOUSE POLICY

D. ALLAN BROMLEY

Assistant to the President for Science and Technology

and Director, Office of Science and Technology Policy

Executive Office of the President

National Press Club

Washington, D.C.

April 11, 1990

When the media describe a scientific advance, they often focus on a particular individual or event, as if the advance derived entirely from that source. Scientists working in the field typically know the situation to be much different. Many steps are needed before a particular advance can occur, and much needs to be done for an insight to be integrated into an existing body of knowledge.

Similarly, in describing the formation of policy, it is often easy to overemphasize a particular incident: a clash of personalities, a pivotal document, the meeting at everything becomes clear. I wish it were so simple. In fact, I have often found policymaking to be somewhat similar to scientific research, both in its rewards and its frustrations. Thomas Jefferson described science this way: "A patient pursuit of the facts, and cautious combination and comparison of them, is the drudgery to which man is subjected by his Maker if he wishes to attain sure knowledge." He might as well have been describing how you put together the fifth draft of a policy statement.

What I would like to do today is describe the process by which the Bush Administration has been forming a national policy -- and contributing to an international policy -- on global environmental change. You will be hearing much about that policy over the next few weeks, largely because of an international White House Conference on Scientific and Economic Research Related to Global Change that I will be cochairing next Tuesday and Wednesday.

But that conference is just one step in the much larger process of trying to understand and respond to the threat of global change. I have spent a great deal of my time since coming to Washington last summer on this subject. And I believe that the actions the Bush Administration has taken -- and will be taking -- in this area amply demonstrate the President's commitment to dealing responsibly with this problem.

A POLITICAL AWAKENING

The term "global change" encompasses such diverse but interrelated issues as ozone depletion, greenhouse gases, climate change and warming, food security, water supply, sea level changes, wetlands, deforestation, biodiversity, population changes, and energy demands. But much of the public's attention has focused on global warming. And I don't think you can look at the possibility of global warming without being struck by an immediate paradox.

The enhancement of the greenhouse effect is one of the most long-term and fundamental problems that we face. As such, it will require a long-term response -- not what I have heard described as slam dunk solutions.

Yet the political atmosphere surrounding global warming resembles nothing so much as a crisis. Dozens of bills have been introduced on Capitol Hill, and the latest research results make the front pages of newspapers.

There are several good reasons for this widespread concern, including the fact that six of the warmest years on record have occurred in the 1980s. But I believe that much of the current ferment still derives from the summer of 1988. In that single season, a severe drought struck the Midwest, much of the nation sweltered under very hot temperatures, forest fires scorched large areas of the West, and a particularly strong hurricane devastated the Caribbean. The greenhouse effect made the covers of Time and Newsweek -- even though scientists cannot yet connect these events of that summer to global warming. And Time even made the Earth its planet of the year.

I don't mean to belittle the potential seriousness of this problem. It should be recognized, however, that scientists have been speculating about enhancements of the greenhouse effect for decades. The Swedish chemist Svante Arrhenius predicted in 1896 that the temperature of the Earth would go up 4 to 6 degrees Celsius if levels of atmospheric carbon dioxide doubled -- a remarkably prescient prediction given that global circulation models now predict temperature increases of just a little less. As early as 1957, Roger Revelle and Hans Suess wrote that "human beings are now carrying out a large-scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future."

Scientists know much more about the Earth and its components now than they did when these early predictions were made. General circulation models mimic climate with a fair amount of accuracy. And we can observe the Earth from space, which has made a deep impression not only on our understanding of the Earth but on our sense of the planet as a unified and somewhat fragile home.

But what we do know about the Earth is still dwarfed by what we do not know. I know that journalists are expected to answer the four W's in the first paragraphs of their stories: who, what, where, and when. Suffice it to say that it would be very difficult to write a first paragraph describing the greenhouse effect.

Although general circulation models predict a warming of several degrees Celsius if carbon dioxide levels double, we still do not know when this warming will occur, what its effects will be on a regional scale, or even the exact likelihood of its occurrence. Furthermore, we are only beginning to understand what the impacts of such warming might be on agricultural productivity, sea level changes, biological productivity in the oceans, shifting vegetation patterns, storm patterns and severity, droughts, and the like. We are even further from any quantitative understanding of the corresponding economic impacts, as I shall discuss in a moment.

In fact, those working in this area might be excused for sympathizing with the remark of King Alphonso X of Castile, a medieval patron of astronomy, who, after much study, is reported to have said, "If the Lord Almighty had consulted me before embarking on the Creation, I would have recommended something simpler."

Two of the most severe difficulties involve the treatment of clouds and oceans in general circulation models. Until recently, geoscientists did not even know if clouds warm or cool the Earth. We still do not know if the increased cloudiness expected with a warmer Earth will augment or counteract a greenhouse effect.

Regarding the oceans, we know that only about half of the carbon dioxide released through fossil fuel combustion and deforestation remains in the atmosphere. For years, researchers assumed that the rest was being sequestered in the oceans, but

recent studies indicate that no more than a quarter probably ends up there. Where does the rest go? We still are not sure.

Furthermore, we must remain aware of the potential for surprises. The development of the ozone hole over Antarctica was such a surprise. The hole develops through a mechanism that was not included in earlier models of ozone destruction, and as a result was found almost by accident. We need a careful program of observing and monitoring the Earth to detect any such surprises caused by our emission of greenhouse gases.

Lewis Thomas, among others, has compared the Earth to a living organism, and in particular to a single cell. The conclusion is certainly apt in this regard: as much as we still have to learn about the nature of life, about how it developed and where it is going, we have as much to learn about the nature of the Earth.

THE COMMITTEE ON EARTH SCIENCES

Bertrand Russell once wrote: "The most savage controversies are those about matters as to which there is no good evidence either way." The greenhouse effect can come dangerously close to falling into this category. As research reveals more about how human activities are influencing climate, we will have a much less controversial basis on which to take actions.

The U.S. government is now engaged in a large-scale, integrated program to develop the understanding that will guide future policy decisions. Much of the credit

for developing this program must go to the interagency Committee on Earth Sciences, which was established in 1987 by my predecessor William Graham. The Committee consists of directors of independent agencies and of assistant secretaries of cabinet departments doing research on the global environment. Working groups organized under the committee consist of the senior program managers working in a particular area.

Through its Working Group on Global Change, chaired by Robert Corell of the National Science Foundation, the Committee on Earth Sciences first identified and analyzed all of the research related to global change going on in various federal agencies. Working closely with the Office of Management and Budget, it then organized and coordinated this research to form the U.S. Global Change Research Program.

The FY 1991 budget that President Bush sent to the Hill at the end of January called for a 57 percent increase in funding for this program, to a total of over $1 billion. The proposed funding would significantly expand research, data gathering, and modeling activities through a carefully balanced mix of ground-based and space-based research.

The U.S. Global Change Research Program is a larger effort than that of all other countries combined. Other nations will be looking to the United States for information on global change, and I believe that we should be proud of our forefront position in this area.

I might say, by the way, that the success of the Committee on Earth Sciences has acted as a model for similar efforts by the Office of Science and Technology

Policy. We have recently reorganized and revitalized the Federal Coordinating Council for Science, Engineering, and Technology -- the parent body of the Committee on Earth Sciences -- and have established a number of new interagency committees in such areas as education, the life sciences, and technology and industry. In this way, we hope to bring a much greater coherence and visibility within the federal government to other important areas of science and technology.

THE WORKING GROUP ON GLOBAL CHANGE

The Committee on Earth Sciences considers the research aspects of global change. The policy analog to the CES is the Working Group on Global Change, which President Bush established last fall under the Domestic Policy Council, one of several policy councils within the White House. The Working Group, which I chair, provides Cabinet-level coordination on global change issues and is an important source of advice for the President.

Shortly after it was established, the Working Group called for three specific studies of global change. The first looked at the economic costs of both global change and responses to possible change. The second considered private sector concerns and activities. The third reviewed the legal precedents for international agreements and conventions on the environment. The Working Group has also been briefed by top experts in the scientific, economic, environmental, and industrial

aspects of global change. At this point, we have consulted with some of the best scientific and economic minds in the country.

The Working Group on Global Change will continue to be the focal point within the White House in considering Administration policies toward the global environment. But at this point I would like to break my promise about sticking to process and discuss some of the policies themselves. The Bush Administration does not believe that further research is a substitute for action. On the contrary, this administration has already instituted a number of policies that will reduce greenhouse emissions while being fully justified for other reasons. The President refers to these as "no regrets" policies, because even if our concerns about the greenhouse effect turn out to be unfounded, these policies will have other benefits.

o The United States is committed to phasing out the manufacturing and use of CFC's by the year 2000 to protect the ozone layer -- ahead of the requirements of the Montreal Protocol -- provided safe substitutes are available. If not controlled, CFC's would account for as much as 25 percent of the greenhouse effect's increase in the next century.

o The Clean Air Act now being debated in Congress will provide for substantial reductions in the emission of other greenhouse gases.

o The Department of Energy is developing a National Energy Strategy that will include an aggressive commitment to energy conservation and to the development of non-fossil-fuel sources of energy. As an initial step in this strategy, the

Department of Energy has already announced a series of conservation and renewable energy initiatives that are included in the President's FY 1991 budget request.

o Finally, the Department of Agriculture is proposing to plant a billion trees on private land across America, trees that will eventually absorb 13 million tons of carbon annually. Furthermore, we are continuing diplomatic discussions with countries such as Brazil aimed at protecting the remaining tropical forests through such mechanisms as debt-for-nature swaps.

An underlying theme in all of the Administration's global change policies is that they be based on the best possible science and that they be technically and economically sound. These are criteria that we will continue to apply as we consider policies in the future.

THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

So far I have been discussing our national research and policymaking toward global change. But the greenhouse effect is no respecter of national or political boundaries, and its understanding demands information and analyses that span the globe. International cooperation will therefore be essential to continued progress.

The primary international forum through which these issues are being addressed is the Intergovernmental Panel on Climate Change, which has been organized under the auspices of the United Nations Environment Program and World

Meteorological Organization. The IPCC involves hundreds of scientists and government officials from a number of countries who are seeking to establish an international consensus on the likely causes and consequences of climate change.

By the way, someone in my office recently told me -- I hope facetiously -- that if you take every possible four-letter combination of the 26 letters in our alphabet -- a total of 456,976 -- we have now used up over half of the acronyms that result. Within a very short time, he calculated, we will use up all of them, at which point the Soviets, with their 32-letter alphabet, will have a clear advantage. Although this is one advantage I wouldn't mind losing.

The IPCC is conducting its activities through three working groups. The first, which is chaired by the United Kingdom, is seeking to develop a better scientific understanding of climate change. The second, chaired by the Soviet Union, is assessing the possible environmental and socioeconomic effects of climate change. And the third, chaired by the United States, is seeking to identify potential responses to global change.

These three working groups will produce reports by the end of the summer. Policymakers around the world will then be able to draw upon these reports in formulating national and international policies.

The three working groups of the IPCC met here in Washington in February, and President Bush addressed their opening plenary session. He told them, "The United States is strongly committed to the IPCC process of international cooperation on global climate change. We consider it vital that the community of nations be drawn together in an orderly, disciplined, rational way to review the history of our

global environment, to assess the potential for future climate change, and to develop effective programs."

President Bush has also expressed his support for the next logical international step: a Framework Convention on Global Change to be negotiated among the countries of the world. At the Malta Summit, President Bush proposed that the United States host the first negotiating session of the Framework Convention, and he reiterated that offer to the IPCC.

In thinking about the goals of a Framework Convention, the Vienna Convention offers a useful analogy. In 1985, the United States and 20 other countries signed the Vienna Convention for the Protection of the Ozone Layer, which established a framework for international scientific and technical cooperation. However, the Vienna Convention did not set limits on emissions. Rather, it included provisions to establish protocols as further research developed. Following the discovery of the ozone hole and other findings demonstrating the need to limit emissions, the Montreal Protocol was signed in 1987 that called for a phased reduction of CFC manufacturing and use.

A Framework Convention on Global Change would serve the same function. It would build cooperation among nations and establish the mechanisms by which future steps are taken. Specific agreements to limit or adapt to climate change would then be addressed in subsequent protocols to the convention as our scientific and economic understanding grows.

THE WHITE HOUSE CONFERENCE ON SCIENTIFIC AND ECONOMIC RESEARCH RELATED TO GLOBAL CHANGE

The reports of the IPCC working groups will be an important input to the Framework Convention, but another important influence will be the White House Conference being held here in Washington next week. I am one of the cochairs of the conference, along with Michael Deland of the Council on Environmental Quality and Michael Boskin of the Council of Economic Advisors. President Bush will open and close the conference.

The conference will bring together the three senior officials in science, economics, and the environment from 18 countries, the Organization for Economic Cooperation and Development, and the European Community. The theme of the conference is global stewardship, our shared responsibility to manage the Earth's finite natural resources in a sustainable manner. Global stewardship is the continuing process of political, economic, and social decision-making that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

The conference is designed to more fully integrate the results of scientific and economic research into the policymaking process. In addition, the conference will focus on the scientific and economic uncertainties that now limit our understanding and on ways to reduce those uncertainties.

I have already mentioned some of the scientific challenges, so let me focus here on the economic ones, since in many cases they are even greater than the scientific

ones. For example, one recent analysis was able to conclude only that emissions of carbon dioxide in the year 2050 are likely to be between 1.5 times what they are today and 12 times what they are today.

We also need much better measures of the potential costs of limiting or adapting to global change. Preliminary studies show that these costs could be very high, but information with which to make such estimates is scarce.

In general, the social sciences will be as important as the natural sciences in improving our understanding of global change. Even when the physical and biological aspects of a problem are understood, all too often agreement is lacking on the underlying social, behavioral, and economic consequences of an action. The conference next week will be focused at least as much on these aspects of the problem as on the purely scientific aspects. We hope in this way to add a new dimension to the international dialogue on global change.

CONCLUSION

More broadly, we hope that it will be possible at the conference to explore a number of new areas in which science and economics intersect with policy. And in that regard, I would like to conclude with a bit of history that I plan to relate at the conference, because I believe that it summarizes our current situation very well.

Next year we will be celebrating the 500th anniversary of Columbus's discovery of the new world, an event of unsurpassed importance in the course of world history.

As might be expected, Columbus was an astute observer of the natural world. After his death, his son noted that Columbus, while he was anchored off the coast of Jamaica, observed that it rained for about an hour every afternoon. Columbus also pointed out that the same thing used to occur in the Canary and Azores Islands, but that the rain had stopped since the trees on those islands were cut down. In other words, Columbus was one of the first people to observe the effects of human beings on climate.

I think it very appropriate that Columbus should have done so, because he was engaged on a great voyage of discovery, and today we find ourselves engaged on a similar voyage. We are changing the world in ways that it has never been changed before. And yet human beings, by their very nature, cannot help but change the world.

We have no reason to fear such changes. But we must keep our eyes open, and try to understand where we are going, and change course when we have good reasons to do so. We need not sail blindly into our future. But if we are to reach a new world of economic prosperity and environmental well-being, we must keep moving forward.