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# FOIA MARKER

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**Record Group/Collection:** George H.W. Bush Presidential Records  
**Collection/Office of Origin:** Cabinet Affairs, White House Office of  
**Series:** Korfonta, Paul, Files  
**Subseries:**

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**OA/ID Number:** 03780  
**Folder ID Number:** 03780-002

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**Folder Title:**  
Science and Technology and American Diplomacy [2]

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Stack:	Row:	Section:	Shelf:	Position:
<b>G</b>	<b>10</b>	<b>9</b>	<b>5</b>	<b>1</b>

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## WHITE HOUSE STAFFING MEMORANDUM

DATE: 3/12/90 ACTION/CONCURRENCE/COMMENT DUE BY: 3/20/90 COB

SUBJECT: TITLE V REPORT

	ACTION	FYI		ACTION	FYI
VICE PRESIDENT	<input type="checkbox"/>	<input type="checkbox"/>	MCCLURE	<input type="checkbox"/>	<input type="checkbox"/>
SUNUNU	<input type="checkbox"/>	<input type="checkbox"/>	NEWMAN	<input type="checkbox"/>	<input type="checkbox"/>
SCOWCROFT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	PORTER	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DARMAN	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ROGICH	<input type="checkbox"/>	<input type="checkbox"/>
BATES <span style="font-size: 2em;">→</span>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	UNTERMAYER	<input type="checkbox"/>	<input type="checkbox"/>
CARD	<input type="checkbox"/>	<input type="checkbox"/>	<u>BROMLEY</u>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
CICCONI	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
DEMAREST	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
FITZWATER	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
GRAY	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
HAGIN	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>

**REMARKS:**

Please forward any comments directly to my office no later than COB, Tuesday, March 20. Thank you.

**RESPONSE:**

*Due to the length of the report, I'm only forwarding the attached to you. If you would like a complete copy of it, please let me know. Thanks Todd,*

**James W. Cicconi**  
Assistant to the President  
and Deputy to the Chief of Staff  
Ext. 2702

*Holly*

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

1990 MAR 12 PM 12:16

March 8, 1990

MEMORANDUM FOR JAMES W. CICCONI

FROM:

D. ALLAN BROMLEY *AMB*

SUBJECT:

TRANSMITTAL OF TITLE V REPORT FROM PRESIDENT  
BUSH TO THE CONGRESS

The Administration is required to provide an annual report to the Congress on the international science and technology activities of the U.S. Government, under Title V of the Foreign Relations Authorization Act for FY 1979 (Public Law 95-426). The attached report entitled Science, Technology and American Diplomacy, covers fiscal year 1989.

As in the past, this report was prepared by the Department of State with assistance from technical agencies and our embassies overseas, with oversight from the Office of Science and Technology Policy. It has been thoroughly reviewed by the Office of Management and Budget and the National Security Council, and we find it to be consistent with Administration policy. It is now ready for the President's signature and subsequent transmittal to the Congress. I appreciate your assistance in this matter.

I would be happy to provide your office with additional copies of the report as needed.

Attachment

- DRAFT -

Dear Mr. Chairman: (Dear Mr. Chairman:) (Dear Mr. Speaker:)

In accordance with Title V of the Foreign Relations Authorization Act of Fiscal 1979, as amended (Public Law 95-426; 22 U.S.C. 2656c(b)), I am pleased to transmit the annual report on international activities in science and technology (S&T) for fiscal year 1989.

A characteristic feature of our age is the unprecedented rate of change in science and technology. In 1989, however, the rate of change in foreign affairs, particularly in Eastern Europe, has surpassed even that of science and technology. These remarkable changes in Eastern Europe have provided expanded opportunities for S&T cooperation with countries of the Eastern Bloc.

For example, on July 13, 1989, during my visit to Budapest, Hungary, I committed the United States to work with Hungary to expand bilateral research exchanges between our two peoples. Subsequent negotiations resulted in the signing of an umbrella S&T agreement less than 3 months later. In addition, because of growing concern about the environmental problems that plague the countries of Eastern Europe, I announced the creation of a new, independent Eastern European Environment Center in Budapest, along with initiatives to improve the environmental quality of the historic city of Krakow, Poland. We will continue to look

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THIS DRAFT INCLUDES THE EX. CLERK'S EDITS.

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for opportunities to integrate mutually beneficial science and technology cooperation with our broad foreign policy goals that are aimed at encouraging independence, democratization, and economic growth in emerging market economies of Eastern Europe.

My desire to preserve and improve humanity's common heritage and to address issues of the environment and global change found expression in a number of other activities. During the Paris Economic Summit, I joined other heads of state in calling for decisive action to understand and protect the earth's ecological balance. The United States was instrumental in establishing the Intergovernmental Panel on Climate Change as the primary international forum on this topic. These and other efforts highlighted in this report emphasize the need for nations to work together to understand the interconnected earth system and the ways in which human activity is influencing that system.

Because science and technology are truly international activities, it is frequently the case that scientists and technologists collaborate more closely with colleagues on the other side of the globe than with those at the other end of the hall. This international dimension of science is built on the person-to-person and institution-to-institution bonds that are formed through shared education, collaboration in research and development, and communications.

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We in the United States pride ourselves on open access to our educational institutions, not only for students of this country but for students around the globe. Many foreign students have been eager to take advantage of this access, because it remains a fact that the United States has the best system of graduate education anywhere in the world.

The free flow of students finds a parallel in the free flow of ideas around the world today, particularly in the area of basic scientific knowledge. Much of the international character of science derives from its universality. The United States is firmly committed to the free and open international flow of basic scientific knowledge.

This philosophy also underlies the U.S. approach to a very important subset of our scientific efforts today -- namely, the megaprojects in science, such as the Superconducting Super Collider, the human genome project, and Space Station Freedom. The results of these projects are a global resource adding to the knowledge base of all countries. We are moving toward a day when the responsibility for supporting large basic science projects will be distributed around the world, reflecting the truly international character of modern scientific research and the shared financial and intellectual underpinnings of that research.

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Perhaps the most important element of federally funded international cooperation in S&T is the over 600 bilateral science and technology agreements involving more than 20 U.S. agencies, 120 foreign countries, and numerous multilateral organizations. These agreements -- many of which are highlighted in this report -- differ from one country to another, reflecting the state of that country's development and its past relations with the scientific community in the United States. However, there are several broad principles that apply in all our international science and technology agreements: comparable access, shared responsibilities for both basic and applied research, adequate protection and fair disposition of intellectual property rights, and effective protection of sensitive knowledge.

These agreements provide exciting opportunities for cooperation between the United States and the rest of the world, but we must remain cognizant of the fact that the global marketplace is becoming increasingly competitive. The United States still has the strongest science and technology enterprise that the world has ever seen, but we no longer are in a leading position in all fields. By concentrating resources and focusing efforts, other nations have succeeded in equaling and in some cases surpassing us in specific areas of research and technology.

This is part of the orderly development of nations and is due, at least in part, to the help that we provided to other

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countries since the end of World War II. But the internationalization of the marketplace emphasizes that we can no longer take our leadership for granted. In an increasingly competitive world, only a continuing effort to remain at the forefront of science and technology will ensure our economic and military security.

It has become increasingly clear that science and technology, the economy, and foreign relations are inextricably intertwined. Policy decisions must be made with a clear appreciation of the scientific and technological issues surrounding those decisions. We must find more creative and effective ways to ensure that science and technology are an integral and important part of our foreign policy around the globe. We have begun that process in 1989, and I look forward to continuing that effort in 1990 and beyond.

Sincerely,

The Honorable Thomas S. Foley  
Speaker of the  
House of Representatives  
Washington, D.C. 20515

The Honorable Claiborne Pell  
Chairman  
Committee on Foreign Relations  
United States Senate  
Washington, D.C. 20510

The Honorable John Glenn  
Chairman  
Committee on Governmental Affairs  
United States Senate  
Washington, D.C. 20510

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**OFFICE OF CABINET AFFAIRS STAFFING MEMORANDUM**

Date: 3-20-90

Due by: ----

Subject: Comments on Title V -- Science, Tech., and American Diplomacy

From: Yale/Danzansky

	ACTION	CONCUR	FYI		ACTION	CONCUR	FYI
BATES	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	JACKSON	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DANZANSKY	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	MCBEE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ADAIR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SCHALL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BUCHHOLZ	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	WETHINGTON	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
D'ANDREA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	WILLIAMSON	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DEWITT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	YALE	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DUGGAN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EVANS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FARRAR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HEIMBACH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Comments:**

The attached changes were agreed upon by Steve D. and Ken for the Title V report. This was delivered to Cicconi at 7:30 pm. Thanks.

THE WHITE HOUSE

WASHINGTON

March 20, 1990

MEMORANDUM FOR JAMES CICCONI

FROM: KENNETH P. YALE *Ky*  
SUBJECT: Comments on Science, Technology and American  
Diplomacy

Following are some changes suggested by Cabinet Affairs and the Domestic Policy Council. I must admit that I am not fully aware of the appropriate tone for this document, and therefore found it somewhat difficult to determine appropriate changes. Nevertheless, I have reviewed the document and believe that the following changes would have the approval of OSTP. I would be happy to further discuss these suggested changes with anyone, should there be any questions.

On page 2 or 3, add the following under the environmental section:

The President also announced an international meeting at the White House in 1990, for top scientific, environmental, and economic officials to discuss global change issues. In addition, he signaled the interest of the United States to host a conference to begin the steps towards a framework convention on global climate change, after completion of the reports by the working groups of the United Nations sponsored Intergovernmental Panel on Climate Change.

On page 7, add, after the sentence "...with oversight responsibility for issues related to oceans, science, technology, and environment.", the following:

In response to the increasing importance of the domestic ramifications of the global change issues, a Global Change Working Group was formed under the Domestic Policy Council in October. This group has the lead responsibility to review, formulate, coordinate, and implement all global change policy issues that might have an impact on the United States. The working group has Cabinet and sub-Cabinet level representation and is chaired by the Assistant to the President for Science and Technology Affairs.

On page 25, elaborate on the section inserted in page 2 and 3 (noted, supra) on the activities to host a negotiating session and to convene an international meeting on the science and economics research related to global change.

On page 39, after a reference to the PCC in the left column, add the following:

The Global Change Working Group under the Domestic Policy Council was formed in October to review, formulate, coordinate, and implement all global change policy issues that might have an impact on the United States. The working group has developed policy responses to several international initiatives that could impact the United States.

On page 50, under Recommendations, Environment, please add another recommendation, as follows:

Further our research and understanding of the science and economics related to global change.

On page 58, at the top of the second column, please delete "formulation" from the phrase: "U.S. policy formulation, for the IPCC in general...", add the following before that phrase:

Overall U.S. policy formulation and implementation is coordinated for the President by the Domestic Policy Council Global Change Working Group. This is a Cabinet and sub-Cabinet level group that receives materials from the National Security Council PCC on issues having a domestic impact.

On page 62, at the bottom of the first column, after "... , and Cultural Organization (UNESCO), and UNEP." Please add the following:

The CES also provides technical expertise, advice and information to the Global Change Working Group in the Domestic Policy Council.

**OFFICE OF CABINET AFFAIRS STAFFING MEMORANDUM**

Date: 3-12-90

Due by: 3-19-90

Subject: Transmittal of Title V Report (entitled Science, Technology and American Diplomacy)

From: Holly Williamson

	ACTION	CONCUR	FYI		ACTION	CONCUR	FYI
BATES	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	JACKSON	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DANZANSKY	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MCBEE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ADAIR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SCHALL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BUCHHOLZ	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	WETHINGTON	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<del>_____</del>
D'ANDREA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	WILLIAMSON	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DEWITT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	YALE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<del>_____</del>
DUGGAN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EVANS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FARRAR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HEIMBACH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Comments:**

Due to the length of this report, I am merely staffing the attached. If it looks like something you would like to review and comment on, please come by my office. Thanks.

*Holly,* No comments.  
Thanks. *my*

**OFFICE OF CABINET AFFAIRS STAFFING MEMORANDUM**

Date: 3-12-90

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From: Holly Williamson

	ACTION	CONCUR	FYI		ACTION	CONCUR	FYI
BATES	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	JACKSON <i>N/c</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DANZANSKY	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MCBEE <i>N/c</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ADAIR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SCHALL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BUCHHOLZ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	WETHINGTON	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<del>_____</del>
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DEWITT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	YALE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<del>_____</del>
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EVANS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FARRAR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HEIMBACH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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DATE: 3/12/90 ACTION/CONCURRENCE/COMMENT DUE BY: 3/20/90 COB

SUBJECT: TITLE V REPORT

	ACTION	FYI		ACTION	FYI
VICE PRESIDENT	<input type="checkbox"/>	<input type="checkbox"/>	MCCLURE	<input type="checkbox"/>	<input type="checkbox"/>
SUNUNU	<input type="checkbox"/>	<input type="checkbox"/>	NEWMAN	<input type="checkbox"/>	<input type="checkbox"/>
SCOWCROFT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	PORTER	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DARMAN	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ROGICH	<input type="checkbox"/>	<input type="checkbox"/>
BATES	<input checked="" type="checkbox"/>	<input type="checkbox"/>	UNTERMAYER	<input type="checkbox"/>	<input type="checkbox"/>
CARD	<input type="checkbox"/>	<input type="checkbox"/>	<u>BROMLEY</u>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
CICCONI	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
DEMAREST	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
FITZWATER	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
GRAY	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
HAGIN	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>

REMARKS: Please forward any comments directly to my office no later than COB, Tuesday, March 20. Thank you.

RESPONSE:

James W. Cicconi  
Assistant to the President  
and Deputy to the Chief of Staff  
Ext. 2702

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

1990 MAR 12 PM 12:16

March 8, 1990

MEMORANDUM FOR JAMES W. CICCONI

FROM: D. ALLAN BROMLEY *AW*

SUBJECT: TRANSMITTAL OF TITLE V REPORT FROM PRESIDENT  
BUSH TO THE CONGRESS

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For example, on July 13, 1989, during my visit to Budapest, Hungary, I committed the United States to work with Hungary to expand bilateral research exchanges between our two peoples. Subsequent negotiations resulted in the signing of an umbrella S&T agreement less than 3 months later. In addition, because of growing concern about the environmental problems that plague the countries of Eastern Europe, I announced the creation of a new, independent Eastern European Environment Center in Budapest, along with initiatives to improve the environmental quality of the historic city of Krakow, Poland. We will continue to look

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THIS DRAFT INCLUDES THE EX. CLERK'S EDITS.

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for opportunities to integrate mutually beneficial science and technology cooperation with our broad foreign policy goals that are aimed at encouraging independence, democratization, and economic growth in emerging market economies of Eastern Europe.

My desire to preserve and improve humanity's common heritage and to address issues of the environment and global change found expression in a number of other activities. During the Paris Economic Summit, I joined other heads of state in calling for decisive action to understand and protect the earth's ecological balance. The United States was instrumental in establishing the Intergovernmental Panel on Climate Change as the primary international forum on this topic. These and other efforts highlighted in this report emphasize the need for nations to work together to understand the interconnected earth system and the ways in which human activity is influencing that system.

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This is part of the orderly development of nations and is due, at least in part, to the help that we provided to other

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countries since the end of World War II. But the internationalization of the marketplace emphasizes that we can no longer take our leadership for granted. In an increasingly competitive world, only a continuing effort to remain at the forefront of science and technology will ensure our economic and military security.

It has become increasingly clear that science and technology, the economy, and foreign relations are inextricably intertwined. Policy decisions must be made with a clear appreciation of the scientific and technological issues surrounding those decisions. We must find more creative and effective ways to ensure that science and technology are an integral and important part of our foreign policy around the globe. We have begun that process in 1989, and I look forward to continuing that effort in 1990 and beyond.

Sincerely,

The Honorable Thomas S. Foley  
Speaker of the  
House of Representatives  
Washington, D.C. 20515

The Honorable Claiborne Pell  
Chairman  
Committee on Foreign Relations  
United States Senate  
Washington, D.C. 20510

The Honorable John Glenn  
Chairman  
Committee on Governmental Affairs  
United States Senate  
Washington, D.C. 20510

DRAFT

THE WHITE HOUSE  
WASHINGTON, DC

Date: 3/12

TO: Holly Williamson

FROM: BARRY McBE

	ACTION	CONCUR	FYI		ACTION	CONCUR	FYI
Bates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Jackson	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Danzansky	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	McBee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Schall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buchholz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wethington	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D'Andrea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Williamson	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DeWitt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Yale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Duggan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Farrar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heimbach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

URGENT

BY NOON

C.O.B.

Comments:

**OFFICE OF CABINET AFFAIRS STAFFING MEMORANDUM**

Date: 3-12-90

Due by: 3-19-90

Subject: Transmittal of Title V Report (entitled Science, Technology and American Diplomacy)

From: Holly Williamson

	ACTION	CONCUR	FYI		ACTION	CONCUR	FYI
BATES	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	JACKSON	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DANZANSKY	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MCBEE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ADAIR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SCHALL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BUCHHOLZ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	WETHINGTON	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<del>_____</del>
D'ANDREA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	WILLIAMSON	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DEWITT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	YALE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<del>_____</del>
DUGGAN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EVANS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FARRAR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HEIMBACH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Comments:**

Due to the length of this report, I am merely staffing the attached. If it looks like something you would like to review and comment on, please come by my office. Thanks.

*Holly*

*No COMMENTS*

*BAW*

# WHITE HOUSE STAFFING MEMORANDUM

DATE: 3/12/90 ACTION/CONCURRENCE/COMMENT DUE BY: 3/20/90 COB

SUBJECT: TITLE V REPORT

	ACTION	FYI		ACTION	FYI
VICE PRESIDENT	<input type="checkbox"/>	<input type="checkbox"/>	MCCLURE	<input type="checkbox"/>	<input type="checkbox"/>
SUNUNU	<input type="checkbox"/>	<input type="checkbox"/>	NEWMAN	<input type="checkbox"/>	<input type="checkbox"/>
SCOWCROFT	<input checked="" type="checkbox"/>	<input type="checkbox"/>	PORTER	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DARMAN	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ROGICH	<input type="checkbox"/>	<input type="checkbox"/>
BATES	<input checked="" type="checkbox"/>	<input type="checkbox"/>	UNTERMAYER	<input type="checkbox"/>	<input type="checkbox"/>
CARD	<input type="checkbox"/>	<input type="checkbox"/>	<u>BROMLEY</u>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
CICCONI	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
DEMAREST	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
FITZWATER	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
GRAY	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
HAGIN	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>

**REMARKS:**

Please forward any comments directly to my office no later than COB, Tuesday, March 20. Thank you.

**RESPONSE:**

**James W. Cicconi**  
 Assistant to the President  
 and Deputy to the Chief of Staff  
 Ext. 2702

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

1990 MAR 12 PM 12:16

March 8, 1990

MEMORANDUM FOR JAMES W. CICCONI

FROM:

D. ALLAN BROMLEY *AMB*

SUBJECT:

TRANSMITTAL OF TITLE V REPORT FROM PRESIDENT  
BUSH TO THE CONGRESS

The Administration is required to provide an annual report to the Congress on the international science and technology activities of the U.S. Government, under Title V of the Foreign Relations Authorization Act for FY 1979 (Public Law 95-426). The attached report entitled Science, Technology and American Diplomacy, covers fiscal year 1989.

As in the past, this report was prepared by the Department of State with assistance from technical agencies and our embassies overseas, with oversight from the Office of Science and Technology Policy. It has been thoroughly reviewed by the Office of Management and Budget and the National Security Council, and we find it to be consistent with Administration policy. It is now ready for the President's signature and subsequent transmittal to the Congress. I appreciate your assistance in this matter.

I would be happy to provide your office with additional copies of the report as needed.

Attachment

- DRAFT -

Dear Mr. Chairman: (Dear Mr. Chairman:) (Dear Mr. Speaker:)

In accordance with Title V of the Foreign Relations Authorization Act of Fiscal 1979, as amended (Public Law 95-426; 22 U.S.C. 2656c(b)), I am pleased to transmit the annual report on international activities in science and technology (S&T) for fiscal year 1989.

A characteristic feature of our age is the unprecedented rate of change in science and technology. In 1989, however, the rate of change in foreign affairs, particularly in Eastern Europe, has surpassed even that of science and technology. These remarkable changes in Eastern Europe have provided expanded opportunities for S&T cooperation with countries of the Eastern Bloc.

For example, on July 13, 1989, during my visit to Budapest, Hungary, I committed the United States to work with Hungary to expand bilateral research exchanges between our two peoples. Subsequent negotiations resulted in the signing of an umbrella S&T agreement less than 3 months later. In addition, because of growing concern about the environmental problems that plague the countries of Eastern Europe, I announced the creation of a new, independent Eastern European Environment Center in Budapest, along with initiatives to improve the environmental quality of the historic city of Krakow, Poland. We will continue to look

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THIS DRAFT INCLUDES THE EX. CLERK'S EDITS.

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for opportunities to integrate mutually beneficial science and technology cooperation with our broad foreign policy goals that are aimed at encouraging independence, democratization, and economic growth in emerging market economies of Eastern Europe.

My desire to preserve and improve humanity's common heritage and to address issues of the environment and global change found expression in a number of other activities. During the Paris Economic Summit, I joined other heads of state in calling for decisive action to understand and protect the earth's ecological balance. The United States was instrumental in establishing the Intergovernmental Panel on Climate Change as the primary international forum on this topic. These and other efforts highlighted in this report emphasize the need for nations to work together to understand the interconnected earth system and the ways in which human activity is influencing that system.

Because science and technology are truly international activities, it is frequently the case that scientists and technologists collaborate more closely with colleagues on the other side of the globe than with those at the other end of the hall. This international dimension of science is built on the person-to-person and institution-to-institution bonds that are formed through shared education, collaboration in research and development, and communications.

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We in the United States pride ourselves on open access to our educational institutions, not only for students of this country but for students around the globe. Many foreign students have been eager to take advantage of this access, because it remains a fact that the United States has the best system of graduate education anywhere in the world.

The free flow of students finds a parallel in the free flow of ideas around the world today, particularly in the area of basic scientific knowledge. Much of the international character of science derives from its universality. The United States is firmly committed to the free and open international flow of basic scientific knowledge.

This philosophy also underlies the U.S. approach to a very important subset of our scientific efforts today -- namely, the megaprojects in science, such as the Superconducting Super Collider, the human genome project, and Space Station Freedom. The results of these projects are a global resource adding to the knowledge base of all countries. We are moving toward a day when the responsibility for supporting large basic science projects will be distributed around the world, reflecting the truly international character of modern scientific research and the shared financial and intellectual underpinnings of that research.

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Perhaps the most important element of federally funded international cooperation in S&T is the over 600 bilateral science and technology agreements involving more than 20 U.S. agencies, 120 foreign countries, and numerous multilateral organizations. These agreements -- many of which are highlighted in this report -- differ from one country to another, reflecting the state of that country's development and its past relations with the scientific community in the United States. However, there are several broad principles that apply in all our international science and technology agreements: comparable access, shared responsibilities for both basic and applied research, adequate protection and fair disposition of intellectual property rights, and effective protection of sensitive knowledge.

These agreements provide exciting opportunities for cooperation between the United States and the rest of the world, but we must remain cognizant of the fact that the global marketplace is becoming increasingly competitive. The United States still has the strongest science and technology enterprise that the world has ever seen, but we no longer are in a leading position in all fields. By concentrating resources and focusing efforts, other nations have succeeded in equaling and in some cases surpassing us in specific areas of research and technology.

This is part of the orderly development of nations and is due, at least in part, to the help that we provided to other

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countries since the end of World War II. But the internationalization of the marketplace emphasizes that we can no longer take our leadership for granted. In an increasingly competitive world, only a continuing effort to remain at the forefront of science and technology will ensure our economic and military security.

It has become increasingly clear that science and technology, the economy, and foreign relations are inextricably intertwined. Policy decisions must be made with a clear appreciation of the scientific and technological issues surrounding those decisions. We must find more creative and effective ways to ensure that science and technology are an integral and important part of our foreign policy around the globe. We have begun that process in 1989, and I look forward to continuing that effort in 1990 and beyond.

Sincerely,

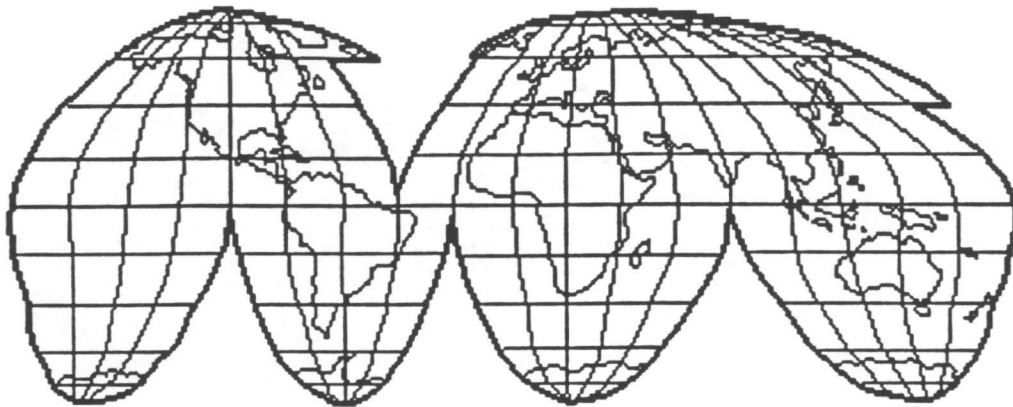
The Honorable Thomas S. Foley  
Speaker of the  
House of Representatives  
Washington, D.C. 20515

The Honorable Claiborne Pell  
Chairman  
Committee on Foreign Relations  
United States Senate  
Washington, D.C. 20510

The Honorable John Glenn  
Chairman  
Committee on Governmental Affairs  
United States Senate  
Washington, D.C. 20510

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# Science, Technology and American Diplomacy



Eleventh Annual Report Submitted to the Congress by the President Pursuant to  
Section 503(b) of Title V of Public Law 95-426

1990

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

*"Scientific and technological achievement have always been at the very heart of our nation's pioneer spirit, pushing the boundaries of our knowledge, creating economic opportunity, and increasing our standard of living."*

President George Bush before the Joint Session of the United States Congress, February 1989

*"We need to develop a longer-range strategic vision of science and technology and of their present and potential contributions to our economic well-being, our national security, and to the health and quality of life of our citizens..."*

*"We need a comprehensive approach to international scientific cooperation that can become an integral part of our foreign relations activities. Further, we should improve our ability, as a government, to utilize science and technology as a tool in attaining the goals of U.S. foreign policy."*

Dr. D. Allan Bromley, Assistant to the President for Science and Technology, before the Committee on Commerce, Science and Transportation, United States Senate, July 1989

*"Science - the pursuit of knowledge - is inherently international and it thrives on cooperation...science and technology agreements have also become indispensable tools of U.S. foreign policy and, occasionally, the diplomatic instrument which allows us to maintain linkages with countries during the most turbulent periods of our relations."*

Dr. Frederick M. Bernthal, Assistant Secretary for the Bureau of Oceans, and International Environmental and Scientific Affairs, Department of State, before the Committee on Science, Space and Technology, United States House of Representatives, September 1989

## Table of Contents

### Science, Technology And American Diplomacy

<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
● Personnel .....	1
● Significant Cooperative Science and Technology Developments: .....	2
● Environment .....	2
● Energy .....	3
● Nuclear Energy, Nuclear and Chemical Weapon Non-Proliferation .....	4
● Space .....	4
● Oceans and Fisheries .....	4
● Polar Affairs and Marine Mammals .....	4
● Health and Quality of Life .....	5
● Selected Large-Scale Basic Science Initiatives: .....	5
● Other S&T Activities .....	5
● Foreign Policy Implications .....	6
●     General Foreign Policy .....	6
●     Economic Benefits .....	6
●     National Security .....	6
● Funding of Science and Technology Cooperation .....	7
● Coordination and Oversight .....	7
● Management of Large-Scale Science Initiatives .....	7
● U.S Initiatives in Response to Additional Legislation and Directives: Executive Order 12591 Reference, Omnibus Trade and Competitiveness Act of 1988, Section 5171, Competitiveness Concerns: .....	8
●     Access .....	8
●     Strategic Technology .....	9
●     Dissemination of S&T Information .....	9
<b>RECOMMENDATIONS .....</b>	<b>10</b>
<b>INTRODUCTION .....</b>	<b>11</b>
<b>Chapter 1: Highlights of Activities</b>	
<b>TITLE V LEGISLATION .....</b>	<b>14</b>
● PERSONNEL, TRAINING AND CAREER DEVELOPMENT .....	14
SCIENCE COUNSELORS, OFFICERS & FISHERIES ATTACHES .....	15
<b>HIGHLIGHTS OF BILATERAL &amp; MULTILATERAL S&amp;T ACTIVITIES .....</b>	<b>19</b>
● Environment .....	20
● Energy .....	25

● Nuclear Energy, Nuclear and Chemical Weapon Non-proliferation .....	25
● Space .....	26
● Oceans and Fisheries .....	27
● Polar Affairs and Marine Mammals .....	28
● Health And Quality Of Life .....	28
● Basic Science .....	29
● Other Multilateral Activities .....	30
● IMPLICATIONS OF S&T ACTIVITIES .....	31
● Foreign Policy Implications .....	31
● Economic Benefits .....	32
● National Security .....	36
● FUNDING OF SCIENCE AND TECHNOLOGY COOPERATION .....	37
● COORDINATION AND OVERSIGHT .....	39
● MANAGEMENT OF LARGE-SCALE SCIENCE INITIATIVES .....	40
<b>INITIATIVES IN RESPONSE TO LEGISLATION &amp; DIRECTIVES ..</b>	<b>42</b>
● Executive Order 12591 .....	42
● Omnibus Trade and Competitiveness Act of 1988, Section 5171 .....	42
● Competitiveness Commitment .....	43
● Access .....	43
● Intellectual Property Rights .....	45
● Strategic Technology .....	47
● Dissemination of S&T Information .....	48
RECOMMENDATIONS .....	50
● Environment .....	50
● Space .....	51
● Science and Technology .....	51
● Nuclear .....	52
● Oceans, Polar and Fisheries .....	52
● Resources .....	52
<b>Chapter 2: Selected Topics</b>	
<b>INTRODUCTION .....</b>	<b>54</b>
<b>ENVIRONMENTAL ISSUES .....</b>	<b>54</b>
● Global Climate Change .....	54
● Biological Diversity .....	64
● Tropical Forests .....	65
● Acid Rain .....	67
● Protection of the Ozone Layer .....	70
<b>OCEANS, POLAR AND FISHERIES ISSUES .....</b>	<b>71</b>

● U.S. - USSR Comprehensive Fisheries Agreement .....	71
● High Seas Driftnet Agreements with Japan, Korea, and Taiwan .....	72
● Antarctic Treaty .....	72
● The Convention on the Regulation of Antarctica Mineral .....	73
● Resource Activities .....	73
● The Convention on the Conservation of Antarctic Marine Living Resources (CAMLR) .....	73
● Convention for the Conservation of Antarctic Seals (CCAS) .....	74
● The Arctic .....	74
● Marine Mammals .....	74
<b>NUCLEAR ISSUES .....</b>	<b>75</b>
● Nuclear Non-Proliferation .....	75
● Nuclear Safety - Post Chernobyl .....	75
● Global Warming and Nuclear Power .....	78
● Current Safety .....	78
● Public Acceptance .....	79
● New Reactor Technologies .....	79
<b>HEALTH AND QUALITY OF LIFE ISSUES .....</b>	<b>79</b>
● Acquired Immune Deficiency Syndrome (AIDS) .....	80
● Population .....	81
<b>SCIENTIFIC &amp; TECHNOLOGICAL ISSUES .....</b>	<b>83</b>
● Cooperation On Large-scale S&T Projects: .....	83
● Space Station .....	83
● Superconducting Super Collider .....	84
● Human Genome Research .....	84
● Advanced Technologies .....	86
● U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) .....	86
● NATO Science Committee .....	87
<b>OTHER SIGNIFICANT MULTILATERAL ACTIVITIES .....</b>	<b>88</b>
● Organization for Economic Cooperation and Development (OECD) .....	88
● U.N. Economic Commission for Europe (ECE) .....	89
● Other U.N.-Related Activities .....	89
● ECOSOC Standing Committees and Subsidiary Bodies .....	90
● Organs and Programs Related to ECOSOC .....	90
● U.N. S&T-Related Bodies reporting to UNDP: .....	91
● Specialized Agencies and Other Autonomous Bodies .....	91
● Other U.N. Bodies .....	92

### **Chapter 3: Bilateral S&T Activities**

<b>ARGENTINA</b> .....	<b>93</b>
● Environment .....	93
● Nuclear Energy .....	94
● Other Technologies .....	94
● Competition and Intellectual Property Rights .....	95
<b>BRAZIL</b> .....	<b>95</b>
● Environment .....	96
● Space .....	97
● Nuclear Energy .....	97
● USGS .....	98
● Competitiveness .....	98
<b>CANADA</b> .....	<b>98</b>
● Intellectual Property Rights .....	99
<b>CHILE</b> .....	<b>100</b>
● NASA - University of Chile .....	100
● AAAS - Chilean Academy of Sciences .....	101
● AID's Advanced Developing Country Program (ADCP) Office in Chile .....	101
● National Science Foundation .....	101
● U.S. Geological Service (USGS) .....	102
● National Oceanic and Atmospheric Agency (NOAA) and Other Related Marine and Geological Research Agencies .....	102
● National Institutes of Health (NIH) .....	102
● Intellectual Property Rights (IPR) .....	102
<b>CHINA</b> .....	<b>103</b>
● The Aftermath of the Summer of 1989 .....	103
● Negotiations on Renewal of the Science and Technology Agreement .....	103
● Intellectual Property Rights and Competitiveness .....	104
● Environmental Issues .....	104
● Advances in Basic Science and New Technology .....	105
<b>EGYPT</b> .....	<b>106</b>
<b>FEDERAL REPUBLIC OF GERMANY</b> .....	<b>107</b>
● U.S. Interests: .....	109
<b>FINLAND</b> .....	<b>109</b>
<b>FRANCE</b> .....	<b>110</b>
<b>HUNGARY</b> .....	<b>112</b>
<b>INDIA</b> .....	<b>113</b>
● Scientific Collaborations .....	113
● Competitiveness and Intellectual Property Rights (IPR) .....	114

● Environment and Ecology .....	114
<b>INDONESIA .....</b>	<b>115</b>
● Aerospace and Aviation .....	116
● Sensitive Technology Controls .....	116
● Intellectual Property Rights .....	116
● Peaceful Nuclear Cooperation .....	117
● Geosciences .....	117
● Disaster Warning and Emergency Preparedness .....	117
● .....	118
● .....	118
● Medical Research and Health Services .....	118
● Joint Ocean Survey Program .....	118
● Environment .....	118
● Research on Climate Change .....	118
● U.S.A.I.D. ....	118
● The U.S. Private Sector .....	119
● Conclusion .....	119
<b>ISRAEL .....</b>	<b>119</b>
● Industrial R and D Cooperation .....	121
● Cooperation in Agricultural Research .....	121
● Energy Research .....	121
● The Environment, Water Resources and Marine Sciences .....	122
● Foreign Policy Perspective .....	122
<b>ITALY .....</b>	<b>123</b>
<b>JAPAN .....</b>	<b>124</b>
● Competitiveness and Intellectual Property Rights Concerns .....	126
<b>KOREA .....</b>	<b>127</b>
<b>MALAYSIA .....</b>	<b>128</b>
<b>MEXICO .....</b>	<b>129</b>
● Nuclear .....	131
● Marine Research .....	132
● Fisheries Trade Promotion .....	132
● Protection of Endangered and Threatened Species and Ecosystems .....	132
● Atmospheric, Oceanic and Meteorological Monitoring and Research .....	132
<b>PAKISTAN .....</b>	<b>133</b>
● Competitiveness and Intellectual Property Rights .....	134
<b>POLAND .....</b>	<b>135</b>
● Environmental Issues at the Round Table .....	135

● Presidential Initiatives .....	136
● Maria Sklodowska-Curie Joint Fund .....	137
<b>SAUDI ARABIA .....</b>	<b>138</b>
● Bilateral S&T Activities .....	139
● Environmental Topics .....	139
● Intellectual Property .....	140
● Atomic Energy .....	140
● Alternative Energy Sources .....	140
<b>UNITED KINGDOM .....</b>	<b>141</b>
● Health .....	142
● Environment .....	142
● Biotechnology .....	143
<b>U.S. MISSION TO THE EUROPEAN COMMUNITIES .....</b>	<b>143</b>
● Environment .....	144
● Research And Development (R&D) .....	145
● Intellectual Property Rights (IPR) .....	146
<b>UNION OF SOVIET SOCIALIST REPUBLICS .....</b>	<b>146</b>
<b>YUGOSLAVIA .....</b>	<b>148</b>
● Intellectual Property Rights Protection .....	150
<b>Chapter 4: International S&amp;T Activities of U.S. Agencies</b>	
<b>DEPARTMENT OF STATE .....</b>	<b>153</b>
● Personnel .....	153
● Highlights Of Science And Technology Activities .....	154
● Coordination And Oversight .....	155
<b>AGENCY FOR INTERNATIONAL DEVELOPMENT .....</b>	<b>155</b>
● Agriculture .....	155
● Biotechnology for Fish Production .....	155
● Biological Nitrogen Fixation Technology Helps Small Farmers .....	156
● Small Ruminant Collaborative Research Support Program (CRSP) .....	156
● Rinderpest Vaccine .....	157
● Anaplasmosis/Babesiosis Vaccines .....	158
● Sorghum/Millet CRSP .....	158
● Bean/Cowpea Collaborative Special Research Program .....	159
● Peanut CRSP .....	159
● Plant Tissue Culture .....	159
● International Agricultural Research Centers .....	160
● Energy and Natural Resources .....	162

● Energy Inefficiency in the Asia/Near East Region and its Environmental Implications .....	163
● Forestry, Environment, and Natural Resources .....	163
● Natural Resource Policy and Training Project .....	164
● Forestry/Fuelwood Research and Development .....	164
● Forestry Resources Management .....	164
● Coastal Resources Management .....	165
● Environmental Planning and Management .....	166
● Biological Diversity .....	167
● Health .....	167
● .....	168
● Nutrition .....	168
● Infant Nutrition and Child Survival .....	168
● Population .....	169
● Biomedical Research .....	169
● Improved Vasectomy Technique .....	169
● Family Planning Business Analysis .....	169
● Research and University Relations .....	169
● Historically Black Colleges and Universities .....	170
● Israel Cooperative Development Research (CDR) Program .....	170
● Research on Policy Options .....	170
● Science Advisor .....	170
● Program in Science and Technology Cooperation (PSTC) .....	170
● Bilateral Science and Technology Cooperation .....	171
● Philippines .....	172
● Costa Rica .....	172
● Thailand .....	173
● Dominican Republic .....	173
● Malawi .....	173
● Education and Communications Technologies .....	173
● Teaching Technologies .....	173
● Management Information Systems for Educational Improvement .....	174
<b>DEPARTMENT OF AGRICULTURE .....</b>	<b>174</b>
● New International Projects - 1989 .....	174
<b>DEPARTMENT OF COMMERCE .....</b>	<b>175</b>
● Export Administration .....	175
● International Trade Administration .....	176
● National Institute of Standards and Technology .....	177
● National Oceanic and Atmospheric Administration (NOAA) .....	178

● Global Environmental Change .....	178
● Earth Observation Satellites .....	180
● Living Marine Resources .....	180
● Emergency Services .....	181
● National Technical Information Service .....	182
● National Telecommunications and Information Agency .....	183
● Technology Administration .....	184
● Office of the Assistant Secretary for Technology Policy (OTP) .....	184
● The United States Patent and Trademark Office .....	186
● U.S. Bureau of the Census .....	187
<b>DEPARTMENT OF DEFENSE .....</b>	<b>188</b>
● Strategic Defense Initiative .....	189
● Armaments Cooperation and Defense Trade .....	190
● Organizations for International Technology Transfer .....	191
● Information Exchange Agreements .....	191
<b>DEPARTMENT OF ENERGY .....</b>	<b>192</b>
● Cooperation with the USSR .....	193
● New Initiatives with Poland and Hungary .....	193
● Incorporation of Standard Intellectual Property Rights Provisions .....	194
● International Thermonuclear Experimental Reactor (ITER) .....	194
● Energy Technologies for Reducing Emissions of Greenhouse Gases .....	195
● Superconducting Supercollider .....	195
<b>DEPARTMENT OF HEALTH AND HUMAN SERVICES, U.S.</b>	
<b>PUBLIC HEALTH SERVICE .....</b>	<b>195</b>
● Bilateral Agreement Highlights .....	197
● Brazil .....	197
● Eastern Europe .....	197
● Egypt .....	198
● France .....	198
● India .....	198
● Israel .....	199
● Italy .....	199
● Japan .....	199
● Pakistan .....	199
● Spain .....	199
● Soviet Union .....	200
<b>DEPARTMENT OF THE INTERIOR .....</b>	<b>200</b>
● National Park Service .....	200
● U.S. Geological Survey .....	201

<b>DEPARTMENT OF TRANSPORTATION .....</b>	<b>205</b>
● Bilateral Programs .....	206
● Canada .....	206
● China .....	207
● Federal Republic of Germany .....	207
● Mexico .....	207
● The Netherlands .....	207
● Poland .....	208
● Soviet Union .....	208
● Yugoslavia .....	209
● Western Europe .....	209
● International Organizations .....	210
● Transport Policy and Trade .....	210
● Maritime .....	211
● Aviation .....	212
● Highway Construction and Highway/Traffic Safety .....	213
● The International Road Federation (IRF) .....	213
● Pan American Highway Congress (PAHC) .....	213
● Permanent International Association of Road Congresses (PIARC) .....	213
● International Commission on Illumination (CIE) .....	213
● Organization for Economic Cooperation and Development .....	214
● Rail .....	215
● Dangerous Goods Transport .....	215
● Special Multilateral Programs .....	215
● Strategic Highway Research Program (SHRP) .....	215
● Experimental Safety Vehicles (ESV) .....	216
● Technical Assistance .....	216
● Training of Foreign Nationals .....	218
● Foreign Visitors .....	218
● Budget and Resources .....	219
● U.S.- Canada Environmental Cooperation .....	219
● U.S.-Mexico City Cooperation .....	220
● Transboundary Movement of Hazardous Waste .....	220
● Organization of Economic Cooperation and Development (OECD) .....	221
● World Health Organization (WHO) .....	221
● Federal Republic of Germany .....	222
● The Netherlands .....	222
● Brazil .....	223
● Japan .....	223

● Korea .....	223
● Soviet Union .....	223
<b>NATIONAL AERONAUTICS AND SPACE ADMINISTRATION .....</b>	<b>224</b>
● International Cooperation on Space Station Freedom .....	224
● Galileo .....	225
● Cooperation with the Soviet Union .....	225
● International Cooperation in Global Change Studies .....	226
● International Space Year .....	227
● New International Agreement .....	227
● German Spacelab Missions .....	227
● Geotail Scientific Satellite .....	227
● Inter-Agency Consultative Group for Space Science (IACG) .....	228
● Orbital Debris .....	228
<b>NATIONAL SCIENCE FOUNDATION .....</b>	<b>228</b>
<b>NUCLEAR REGULATORY COMMISSION .....</b>	<b>234</b>
● Highlights of NRC Fiscal Year 1989 .....	235
● Further Discussion of Key International Cooperation Activities .....	236
● Participation in International Organizations and Conferences .....	240

# Science, Technology And American Diplomacy

## EXECUTIVE SUMMARY

This is the eleventh annual report on Science, Technology and American Diplomacy, in response to Title V of the Foreign Relations Authorization Act of 1979, as Amended.

Chapter 1 of this year's report responds to the legislation with a highlight summary of science and technology personnel issues, significant cooperative science and technology developments, economics, statistics and other foreign policy implications of Fiscal Year 1989 activities, adequacy of funding, and responses to associated directives. Chapter 2 examines in greater detail selected significant topics in international science and technology. Chapter 3 provides details of bilateral science and

technology cooperation for 25 selected countries. Chapter 4 addresses international science and technology activities of 22 U.S. Government agencies, including a detailed summary of S&T activities of U.S.A.I.D.

## Personnel

During Fiscal Year 1989, the Department of State employed 154 full-time Civil Service and Foreign Service employees in the areas of science, technology and environment, including 34 full-time science and technology officers and fisheries attaches at 25 missions worldwide. Additional U.S. agencies have stationed roughly 15 employees in U.S. embassies to support their respective interests. In order to address the

## SCIENCE, TECHNOLOGY, AND AMERICAN DIPLOMACY

increasing impact of science and technology in foreign affairs, the Department of State established within the Foreign Service a separate occupational category for Science and Technology officers. The Department of State also is working with Congress to develop a Science and Environment Resources Package which is intended to project all Departmental resource requirements, both in Washington and in overseas posts, for the conduct of scientific, technological and environmental affairs.

In Fiscal Year 1989, the Department of State made significant progress in support of the objectives of Section 4(b) of Executive Order 12591, entitled "Facilitating Access to Science and Technology." Currently, there are personnel from the public and private sector on limited Foreign Service appointments serving in Korea, Paris, Vienna, Mexico, Tokyo, and New Delhi.

Experts from the public and private sector are also given short-term assignments at embassies overseas to study and report on selected S&T topics, particularly emerging technologies.

Continuing educational and technical training activities for science and technology officers are ongoing areas of emphasis. The third consecutive annual

course entitled "Science, Technology and American Diplomacy" was sponsored by the State Department's Foreign Service Institute (FSI) in June, 1989. In September, 1989, the Department of State held its annual Science and Technology Officers Conference designed to review with current science and technology officers contemporary issues in science and technology and implications for U.S. policy. Science and technology officers also have the opportunity to expand their expertise by serving in exchange assignments outside of the Department of State.

### **Significant Cooperative Science and Technology Developments:**

In Fiscal Year 1989, the United States was engaged in nearly 600 bilateral science and technology agreements involving more than 20 U.S. agencies and 120 foreign countries. The U.S. contributed its support to multilateral organizations across a full range of scientific disciplines. Selected accomplishments include:

#### **Environment**

In the past year, the United States has responded to growing international con-

cern about our global environment. At the Paris Economic Summit, President Bush joined with other heads of state in calling for urgent, decisive action to understand and protect the earth's ecological balance. The U.S. was instrumental in establishing the Intergovernmental Panel on Climate Change (IPCC) and accepted chairmanship of its Response Strategies Working Group. The U.S. was one of the first countries to announce that it would seek a world-wide phase-out of chlorofluorocarbon production and consumption by the year 2000, provided that safe substitutes are available, and we take pride as well, in progress in dealing with problems of transboundary pollution and hazardous waste. President Bush proposed legislation designed to reduce significantly emissions of sulfur dioxide and other acid rain precursors. The President also announced that he will seek legislation to ban exports of hazardous wastes from this country, except where we have an agreement with the receiving country to provide environmentally sound management of such wastes. As part of the President's Eastern European initiatives, he introduced an environmental thrust in July, 1989, consisting of two major activities:

- The U.S. and Poland initiated discussion of a plan for air and water pollution abatement in the historic city of Krakow.
- The U.S. took steps to establish an organizing committee for an independent regional environmental center in Budapest.
- On October 25, 1988, President Reagan signed a resolution designed to exert US leadership in negotiating an international convention to conserve the earth's biological diversity. Environment issues were included for the first time in the agenda of the annual US-EC Ministerial consultations.

### **Energy**

As with environmental research, significant energy research is performed in cooperation with other nations. The Department of Energy currently has 58 bilateral cooperation research and development agreements with 27 nations, most significantly with Japan, U.K., FRG, France, Israel and Canada. In Fiscal Year 1989, an energy research and development memorandum of understanding was established, for example, between the Department of Energy and

the Canadian Department of Energy, Mines and Resources.

### **Nuclear Energy, Nuclear and Chemical Weapon Non-Proliferation**

Since the Chernobyl accident, the U.S. has been working through the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency, as well as bilaterally, to improve nuclear safety practices worldwide. The U.S., USSR, Japan, and the European Community achieved significant progress on a conceptual design for the thermonuclear experimental reactor (ITER). In Fiscal Year 1989, the U.S. and Japan continued activities under a broad program of cooperation in nuclear research. Several countries joined the U.S. in cooperation on fusion energy, radioactive waste management, and nuclear fuel development. In his speech to the U.N. General Assembly in September, 1989, President Bush announced a U.S. initiative to give additional impetus to concluding a worldwide chemical weapons (CW) ban by declaring that in the first eight years of a CW treaty, the U.S. is prepared to destroy nearly all -- 98 percent -- of its CW stockpile, provided the Soviets join the ban.

### **Space**

In Fiscal Year 1989, President Bush asked Vice President Quayle to chair a new Space Council, which is to review and develop U.S. policy. The Space Station Intergovernmental Agreement (signed on September 29, 1988) was implemented in Fiscal Year 1989. Several bilateral programs linked to the Space Shuttle Program provide the framework for payload specialists to fly aboard future shuttle flights. Twenty-nine U.S. experiments also were conducted in connection with the Soviet Cosmos 2044 biosatellite mission.

### **Oceans and Fisheries**

In the last decade, there has been a rapid growth in the use of high seas driftnets in the Pacific Ocean. In 1989, the U.S. completed agreements with Japan, Korea, and Taiwan to control use of driftnets. A US-USSR Intergovernmental Consultative Committee on fisheries (ICC) was established pursuant to the 1988 bilateral Comprehensive Fisheries Agreement.

### **Polar Affairs and Marine Mammals**

In November, 1988, the U.S. Government signed the Convention for the

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Regulation of Antarctic Mineral Resource Activities and oversaw progress toward the creation of a non-governmental organization to coordinate Arctic scientific research and environmental protection. In 1989, the U.S. hosted the 41st annual meeting of the International Whaling Commission (IWC), at which resolutions critical of the scientific whaling of Japan, Iceland and Norway were passed.

### **Health and Quality of Life**

Bilateral research on AIDS (Acquired Immune Deficiency Syndrome) continued between the U.S. and France, Indonesia and Japan. The U.S. Government completed phase I of the development of a model whose purpose is making projections of the international impact of AIDS. The Department of State began a study of existing and potential areas for international drug research collaboration. In Fiscal Year 1989, the U.S. also worked with specific countries on medical problems unique to certain regions of the world. With regard to population issues, United States policy continued to emphasize strong support for voluntary international family planning programs, the integration of population and economic development

policies, the critical role that a market-oriented economy can play in development and in the demographic transition, and the prohibition of U.S. support for coercion or abortion in family planning programs.

### **Selected Large-Scale Basic Science Initiatives:**

- Superconducting Super Collider: The Department of State worked closely with the Department of Energy and other agencies to develop a plan for involving other countries in the SSC initiative.
- The Human Genome Initiative is being managed by the National Center for Human Genome Research of NIH, in close collaboration with the Department of Energy. The importance, complexity, and cost of the effort to map and sequence the human genome makes international cooperation essential.

### **Other S&T Activities**

The US-EC High-Technology Group met twice during Fiscal Year 1989. The 53-member U.N. Committee on the Peaceful Uses of Outer Space (COPOUS) continued to be active

during Fiscal Year 1989. NATO's "Third Dimension," continues to sponsor the Science Fellowships, Collaborative Research Grants, Advanced Study Institute, and Advanced Research Workshop Programs. The OECD focused on cooperative activities to ensure the more effective development and utilization of technology in the promotion of economic growth, energy security, protection of the environment, and international trade. The International Atomic Energy Agency (IAEA) sponsored an international conference on the role of nuclear power in response strategies to global warming.

### **Foreign Policy Implications**

#### **General Foreign Policy**

International science and technology agreements often open channels of communication with important elements of society in countries where contact might otherwise be difficult. Moreover, the talents and resources of U.S. agencies may be applied to resolve crises. Joint science and technology cooperation may also be politically important. Underlying all of our S&T cooperation is the principal that international science and technology agreements are justified and funded by U.S. agencies on the basis of

their individual scientific and technological merits, and the technological or scientific benefit to the funding program.

#### **Economic Benefits**

The Department of State surveyed U.S. agencies to obtain examples of specific benefits to the U.S. taxpayer of collaboration in science and technology activities. The benefits may be characterized in four general ways: 1) cost containment, 2) elimination of duplication of efforts, 3) increased pace of scientific advance, and 4) opportunities for increased trade.

#### **National Security**

U.S. national security and that of its allies can be enhanced through international cooperation on defense science and technology. Cooperative activities improve the effectiveness of U.S. defenses, improve compatibility of military forces (internationally), strengthen alliances, and efficiently utilize scarce research and development resources. The U.S. engaged in a wide variety of cooperative research and development programs funded under the Nunn Amendment. In addition, the U.S. entered into a number of new initiatives with NATO allies for defense science and technology cooperation.

### **Funding of Science and Technology Cooperation**

Most of the U.S. federally-supported international science and technology activities are managed and funded by the individual technical agencies. In Fiscal Year 1989, the Department of State was appropriated specific funding for science and technology cooperation with Poland and Yugoslavia.

### **Coordination and Oversight**

Soon after assuming his position as Assistant to the President for Science and Technology Policy, Dr. D. Allan Bromley endorsed the work of the interagency Committee on International Science, Engineering and Technology (CISSET) of the Federal Coordinating Council on Science, Engineering and Technology (FCCSET), and established a new Working Group on EC92 S&T issues. In addition, a National Security Directive in early May established a Policy Coordinating Committee (PCC) of the National Security Council, chaired by the Department of State, with oversight responsibility for issues related to oceans, science, technology and environment. In compliance with the Case-Zablocki Act of 1972, as amended, the

Secretary of State reported to Congress the successful negotiation of roughly 25 international science and technology agreements during Fiscal Year 1989. Oversight of the Department of State's scientific, technological, and environmental activities is achieved, in part through semi-annual meetings of the Bureau of Oceans and International Environmental and Scientific Affairs (OES) Advisory Committee. In Fiscal Year 1989, the Advisory Committee examined such issues as global climate change, the state of research into chlorofluorocarbons (CFC's) and their substitutes, and other current issues.

### **Management of Large-Scale Science Initiatives**

The Bush Administration, like its predecessors, recognizes that international cooperation is necessary in many areas of research. The U.S. plan to collaborate with other countries to build a superconducting super collider is an outstanding example. The critically important effort to understand the processes involved in global climate change and the need to better understand the existing biological diversity of the earth and conditions for survival of species further emphasize this need. The Space Station

program, on which we have agreements with Europe, Japan, and Canada is clearly such a project. Cooperation is built on extensive communication; successful cooperation requires careful prioritizing before commitments are made. The goal of detailing and understanding the human genome (and perhaps that of other species) will require this approach.

**U.S Initiatives in Response to Additional Legislation and Directives: Executive Order 12591 Reference, Omnibus Trade and Competitiveness Act of 1988, Section 5171, Competitiveness Concerns:**

The U.S. continues its commitment to ensuring that access to government-sponsored or government-supported programs, facilities, and science and technology information is equitable and reciprocal, and that proper consideration is given to protecting U.S. intellectual property generated by cooperative science and technology relationships.

**Access**

The Department of State is committed to ensuring that access to government-sponsored or government-supported programs, facilities, and science and

technology information is practicable, equitable, and reciprocal, as expressed in Section 502 of the Foreign Relations Authorization Act, as amended. Cooperative science and technology agreements negotiated by the Department of State now generally include text stating that the contracting parties shall encourage and facilitate cooperation between government agencies, universities, organizations, institutions and other entities of both countries. The Assistant to the President for Science and Technology Policy established a Task Force on Comparable Access to R&D under the U.S./Japan Science and Technology Agreement.

**Intellectual Property Rights**

In Fiscal Year 1989, the U.S. intensified efforts to negotiate provisions in science and technology agreements that adequately protect and allocate rights to intellectual property furnished or produced in the course of science and technology cooperation. These IPR provisions were included in negotiations for renewal of science and technology agreements with Argentina, India, Korea, Spain, Italy, the Federal Republic of Germany, Israel, Turkey, China, Thailand, USSR, Hungary and Poland; and in proposed agreements with the

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Philippines, New Zealand and Indonesia. Details are provided in Chapters 1 and 3, and in Chapter 4 under activities of specific agencies.

### **Strategic Technology**

Recognizing that the improving climate in East/West relations would result in increased interest in science and technology cooperation, the Department of State developed written procedures for interagency review of science and technology agreements and activities with Warsaw Pact countries. In addition, the Department of State organized, in 1989,

its annual strategic trade officers' conference, alerting the U.S. Government international technology and trade community to the implications for collaboration.

### **Dissemination of S&T Information**

With the successful completion of the Science and Technology Reporting Information Dissemination Enhancement (STRIDE) pilot project early in Fiscal Year 1989, it was decided to expand the project to include all Department of State science reporting officers.

## RECOMMENDATIONS

### (detailed in Chapter 1):

**Environment:** Seek collaboration in advancing an agenda to address international environmental issues of concern to the U.S.

**Space:** Working with the National Space Council, NASA, other government agencies and private groups, promote international cooperation where appropriate to further U.S. national interests in space.

**Science and Technology:** Promote U.S. science and technology interests in multilateral and bilateral fora to maintain U.S. access to foreign research and development programs; to promote the openness of research results; and to secure international support for large scale U.S. science projects, consistent with national security, economic, and other foreign policy interests.

**Nuclear Energy:** Reinforce the U.S. position as a reliable nuclear supplier through timely nuclear export licensing

decisions and the negotiation and implementation of agreements for peaceful nuclear cooperation meeting the requirements of the Nuclear Non-Proliferation Act; attempt to restrain proliferation-sensitive countries from crossing the nuclear threshold and seek international cooperation to this end.

**Oceans, Polar and Fisheries:** Advance U.S. interests in management of international fisheries; promote the further study and appropriate control of high seas driftnet fishing; establish new North Pacific Salmon Organization and further to implement the U.S.-USSR Comprehensive Fisheries Agreement. Support and strengthen the U.S. worldwide navigation and general maritime position as outlined in former President Reagan's Ocean Policy Statement of March 10, 1983.

**Resources:** Continue efforts to incorporate science and technology expertise more effectively into the process of formulating and implementing U.S. foreign policy.

## INTRODUCTION

In recent decades, the world has seen extraordinary advances in science and technology -- advances of pervasive importance to every aspect of our lives. Today, leadership in science and technology can have a profound effect on national destinies.

In many areas, the pace of scientific advancement exceeds our ability to grasp its full implications. It is clear, however, that this progress thrives on international cooperation. Free exchange of information and ideas serves not only the interests of the scientific community; it also reinforces basic principles upon which our nation was founded. Today, the breadth of scientific inquiry worldwide and the cost of these activities further exemplify the need for international collaboration.

Science and technology cannot solve all of our problems, but the potential certainly exists to alleviate wide areas of human suffering and make a better life possible for people around the world. It is, therefore, in our national interest to help developing countries achieve the level of technological progress that will hold promise for improving the quality of life for all of the world's people.

Science and technology are intimately related to the health of our global environment and preservation of our ecological heritage. With strong support of the United States, nations participat-

ing in the Paris Economic Summit in 1989 endorsed an urgent need to comprehend and respond to threats to our planet in these critical areas. At the same time, collaborative efforts during 1989 continued to address efficient use of the world's energy resources, including safe management of nuclear energy.

Improving global standards of human health are also universal aspirations and achievable only through international collaboration. The United States joins other nations in continued efforts to combat AIDS, as well as to address the range of health concerns endemic to developing regions of the world.

Most nations now recognize that science and technology are also two crucial elements of economic competitiveness -- that scientific and technological competence offers an edge in an increasingly competitive global market.

Given the significance of science and technology in the world today, America's international science and technology policy embraces the following principal themes and objectives:

**A. To strengthen America's science and technology capability**

1. Advance U.S. research and development objectives

2. Improve U.S. access to areas of research interest and capability worldwide by the most efficient means

**B. To advance foreign policy goals**

1. Improve international relations; bridge political, ideological and cultural differences

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

2. Advance U.S. economic competitiveness and standard of living
3. Contribute to national security
4. Help developing countries use S&T beneficially

C. Cooperate to understand and deal with global problems; coordinate in the application of technology to issues of global concern

1. Current particular emphasis on global environmental issues
2. Other global and regional concerns -- natural hazard reduction, nuclear safety, health, etc.

To ensure the benefits of international science and technology policy in American foreign policy, the U.S. Congress reflected these themes and objectives in Title V of the Foreign Relations Authorization Act of 1979. It was the finding of the Congress that "many opportunities in diplomacy lie in scientific and technological fields," and that "the mutually beneficial applications of science and technology evidenced by U.S. participation in international agreements should be supported as important elements of U.S. foreign policy."

In order to assure effective implementation and review of international science and technology policy, the Congress established that "the Secretary of State shall have primary responsibility for coordination and oversight with respect to all international scientific and technological activities of the U.S. government...involving foreign

countries, international organizations and international commissions."

The Congress acknowledged that the Secretary of State is responsible for coordination of foreign activities of the United States while the Director of the Office of Science and Technology Policy is responsible for coordination of scientific and technological policy, plans and programs of the U.S. Government under Section 205 of Public Law 94-282. Accordingly, it is the intent of Congress that these officials work in close association in carrying out their respective statutory responsibilities.

Appropriate general knowledge of science and technology and understanding of current issues is critical to the conduct of effective international science and technology diplomacy. Congress noted, therefore, that "employees and officers of the United States should be trained in the application of science and technology to foreign policy and in international implications of science and technology developments." Furthermore, "individuals and organizations concerned with science and technology should be consulted in the formulation, implementation and evaluation of foreign policy."

Therefore, Congress authorized the addition of a small number of skilled professionals and improvement of the technological sophistication of the Foreign Service through education and training activities, and improvement in

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

long-range planning for the application of science and technology to foreign policy problems.

Finally, Congress proposed that technological developments should be anticipated and assessed and appropriate measures implemented in ways beneficial to the United States and other nations. Effective application of science and technology to problems of international relations requires careful planning. U.S. foreign policy should, therefore, be reviewed continually to ensure ap-

propriate and timely application of science and technology to foreign policy.

This eleventh Annual Report to the Congress on Science, Technology and American Diplomacy serves that goal by reviewing the relationship in Fiscal Year 1989 between major issues of science and technology and U.S. foreign policy objectives.

## Chapter 1: Highlights of Activities

### TITLE V LEGISLATION

Title V of the Foreign Relations Authorization Act, Fiscal Year 1979 (PL 95-426) reads, in part, "The President shall study and shall transmit to the Congress a report containing recommendations with respect to:

- (1) personnel requirements, and standards and training for service of officers and employees of the United States Government, with respect to assignments in any Federal agency which involve foreign relations and science or technology; and
- (2) the continuation of existing bilateral and multilateral activities and agreements involving science and technology, including (A) an analysis of the foreign policy implications and the scientific and technological benefits of such activities or agreements for which the United States and other parties, (B) the adequacy of funding for administration of such activities and agreements, and (C) plans for future evaluation of such

activities and agreements on a routine basis."

The Fiscal Year 1989 Title V report, entitled Science, Technology and American Diplomacy, is the eleventh annual report submitted by the President to the Congress.

### PERSONNEL, TRAINING AND CAREER DEVELOPMENT

The Department of State, in conjunction with the White House Office of Science and Technology Policy (OSTP) and other Federal agencies, works to incorporate S&T expertise more effectively into the process of formulating and implementing U.S. foreign policy objectives.

During Fiscal Year 1989, the Department of State employed 154 full-time Civil Service and Foreign Service employees in the areas of science, technology and environment, including 34 full-time science and technology officers and fisheries attaches in 25 missions worldwide.

Officers in many other embassies devote a significant percent of their responsibilities to science and technology and environment issues.

SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

**SCIENCE COUNSELORS, OFFICERS & FISHERIES ATTACHES**

POST	NAME	TITLE	DOS*
BEIJING	WILLIAM THOMAS	SCIENCE COUNSELOR	Y
BEIJING	DARRELL JENKS	SCIENCE OFFICER	Y
BEIJING	SHEREE WILLIS	SCIENCE OFFICER	Y
BELGRADE	ROBERT DAY, JR.	SCIENCE ATTACHE	Y
BONN	EDWARD MALLOY	SCIENCE COUNSELOR	Y
BRASILIA	BARBARA TOBIAS	SCIENCE COUNSELOR	Y
BUDAPEST	THOMAS SCHLENKER	SCIENCE ATTACHE	Y
BUENOS AIRES	ROBERT MORRIS	SCIENCE COUNSELOR	Y
JAKARTA	JEFFREY LUTZ	SCIENCE ATTACHE	Y
LONDON	JAMES DEVINE	SCIENCE COUNSELOR	Y
MADRID	ISHMAEL LARA	SCIENCE ATTACHE	Y
MEXICO	LEROY SIMPKINS	SCIENCE COUNSELOR	Y
MEXICO	ALYCE TIDBALL	SCIENCE OFFICER	Y
MEXICO	HOWARD NESS	FISHERIES ATTACHE	N
MOSCOW	JACK GOSNELL	SCIENCE ATTACHE	Y
MOSCOW	EDWARD SALAZAR	SCIENCE OFFICER	Y
NEW DELHI	PETER HEYDEMANN	SCIENCE COUNSELOR	N
NEW DELHI	KAREN LEVINE	SCIENCE OFFICER	Y
OECD	DANIEL DOLAN	SCIENCE COUNSELOR	Y
OTTAWA	VICTOR COMRAS	SCIENCE COUNSELOR	Y
PARIS	MICHAEL MICHAUD	SCIENCE COUNSELOR	Y
PARIS	GEORGE JOHNSON	SCIENCE ATTACHE	N
PARIS	WILLEM BRAKEL	SCIENCE OFFICER	Y
ROME	RENO HARNISH	SCIENCE COUNSELOR	Y
SEOUL	KENETH W. COHEN	SCIENCE COUNSELOR	Y
TEL AVIV	CHARLES LAWSON	SCIENCE ATTACHE	N
TOKYO	RICHARD GETZINGER	SCIENCE COUNSELOR	Y
TOKYO	MICHAEL MCCABE	SCIENCE OFFICER	Y
TOKYO	JAMES SALISBURY	FISHERIES ATTACHE	N
USEC	PATRICIA HAIGH	SCIENCE OFFICER	Y
VIENNA	FRED MCGOLDRICK	SCIENCE COUNSELOR	Y
VIENNA	MAURICE KATZ	SCIENCE COUNSELOR	N
VIENNA	THEODORE SHERR	SCIENCE COUNSELOR	N

\*In the preceding table, "Y" indicates that an officer is a member of the Depart-

ment of State and "N" indicates that an officer is from another agency.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Senior science officers are now assigned to U.S. embassies in countries that meet the following general criteria:

- Substantial national commitments to science, technology and environment;
- Significant political or economic issues associated with science and technology and environment;
- Science and technology and environmental activities of vital interest to the United States, often including a significant number of cooperative bilateral programs;
- Concerns for the United States in the areas of nuclear non-proliferation, technology transfer, or economic competitiveness.

Responsibilities for science, technology and environment are included in the major goals and objectives of many U.S. missions. Within host countries, the science officers serve as the chief representatives for the United States on science, technology and environment matters. Their responsibilities include:

- Advising the Ambassador and his country team on issues related to science and environment;
- Representing the U.S. Government's interests to the host government;
- Assisting in the negotiation of cooperative agreements and implementation of cooperative programs between U.S. agencies and host country organizations;

- Analyzing and reporting significant scientific and environmental developments in their countries of assignment.

Their host country contacts are numerous and diverse, including, for example, agencies responsible for nuclear energy, environment, scientific and technological research and development, health, agriculture, fisheries, space and foreign affairs.

For many science officers, supervising the implementation of cooperative programs is a central element of their duties. In countries such as Brazil, China, India, Israel, Japan, Poland, Spain, and Yugoslavia, the negotiation of agreements, management of project funds, and assisting visiting U.S. officials accounts for a major portion of time and resources.

Through regular interaction with the governmental, academic, and industrial leadership, science officers obtain information regarding policy and program development in science, technology and environment affairs. Major scientific developments and new programs to promote specific technologies or scientific disciplines can have significant implications for U.S. interests. In analyzing and reporting these developments, science officers play a key role in alerting the U.S. Government to potential cooperative opportunities or economic/national security challenges in fields as diverse as space science,

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## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

biotechnology, advanced materials and processes, etc.

In order to address the increasing impact of science and technology in foreign affairs, the Department of State established within the Foreign Service a separate occupational category for Science and Technology officers. This category, a subfunction of the economic area, combines traditional diplomacy with an understanding in specialized scientific fields and issues.

The Department of State is working with Congress to develop a Science and Environment Resources Package which is intended to project all Departmental resource requirements, both in Washington and in overseas posts, for the conduct of scientific, technological and environmental affairs. The initiative is directed toward expanding the Department's capabilities in these areas in support of U.S. foreign policy objectives. It includes consideration of establishing new senior science positions in additional U.S. embassies, and it is closely tied to Departmental plans for expanded training and career development opportunities in scientific and environmental affairs for the Foreign Service Officers corps.

The Department of State considers foreign policy expertise as well as scientific and technical expertise in credentials of candidates for science positions in U.S. embassies. In response to Executive Order 12591, the Department of

State conducted a review of the work required of officers serving in S&T functions overseas. The conclusions of observers in the government and in the science community, including academia, professional organizations, and private industry, is that individuals who serve in science and technology assignments must possess a balanced competence in scientific disciplines and international relations.

In Fiscal Year 1989, the Department of State made significant progress in support of the objectives of Section 4(b) of Executive Order 12591, entitled "Facilitating Access to Science and Technology," which requires the Secretary of State to develop a recruitment policy that encourages scientists and engineers from other Federal agencies, academic institutions, and industry to apply for assignments at our embassies as Science Attaches or Science Counselors.

Accepted candidates receive a Limited Foreign Service appointment for the duration of the assignment and are granted all rights, protection of Foreign Service Officers and diplomats, as established under the Foreign Service Act of 1980.

Currently, there are personnel from the public and private sector on limited Foreign Service appointments serving in Korea, Paris, Vienna, Mexico, Tokyo, and New Delhi under this program. All positions of each upcoming assignments cycle are reviewed to determine ap-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

appropriate vacancies for the program. Potential candidates are actively recruited from other agencies and from the private sector.

Experts from the public and private sector are also given short-term assignments at embassies overseas to study and report on selected S&T topics, particularly emerging technologies. During Fiscal Year 1989, for example, specialists from National Science Foundation and the National Technical Information Service were stationed in Tokyo. In addition, U.S. agencies such as the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), the National Institute of Standards and Technology (NIST), and the Department of Energy (DOE) have stationed roughly 15 employees in U.S. embassies to support the interests of their respective agencies.

The Office of Naval Research (ONR) maintains branches in Tokyo and London analyzing significant S&T developments in their respective regions. These offices work closely with the science officers based in U.S. embassies throughout their regions.

In Washington, a significant number of officers in the Department of State's Bureau of Oceans and International Environmental and Scientific Affairs (OES) have formal training in scientific disciplines. In addition, the OES Bureau draws on the expertise of scientists to serve on its advisory committee and,

through interagency meetings, the expertise of scientists in other agencies of the government.

The State Department, the Agency for International Development (AID) and the Arms Control and Disarmament Agency (ACDA) also participate in the Science, Engineering and Diplomacy, and the Science, Arms Control and National Security Fellows Programs of the American Association for the Advancement of Science, employing 33 fellows in a number of offices related to science, technology, health, environmental and national security issues.

Continuing educational and technical training activities for science and technology officers are ongoing areas of emphasis. Personnel are encouraged to attend or participate in local, national and international conferences relevant to development of international science and technology policies, and to take advantage of technology review opportunities. These informal educational and training opportunities include activities such as visits to public and private sector laboratories and attendance at trade shows, seminars, conferences, and appropriate professional organizational meetings. In addition, several formal activities and programs have been designed to assist science and technology officers in updating and improving their science and technology expertise as well as expanding their overall viewpoint of international science and technology.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Foreign Service Institute (FSI) Training course in Science, Technology and American Diplomacy - The third consecutive annual course entitled "Science, Technology and American Diplomacy" was sponsored by FSI in June 1989. The course provided perspectives on current key issues in science and technology and their implications for U.S. foreign policy. The one-week course covered issues such as environmental management and global climate change, information technology, the U.S. role in "big" science projects such as mapping the human genome, the superconducting super collider, and the relationship between science and technology and economic competitiveness. The course had a limited enrollment of 26 people from the Department of State and other Federal agencies engaged in international science and technology activities.

Annual S&T Officers Conference - In September, 1989, the Department of State held its annual Science and Technology Officers Conference designed to review with current science and technology officers contemporary issues in science and technology and implications for U.S. policy. Science and technology officers from 20 missions worldwide attended the three-day conference. Senior-level administrators from U.S. Government agencies addressed the conference on a range of subjects including the environment, health, space, energy, economic competitiveness, and U.S.

science and technology funding priorities. Science and technology officers also met in one-on-one discussions with agency personnel relative to bilateral cooperative science and technology issues with their host countries. This annual conference assisted the science and technology officers to perform their duties more efficiently at their missions.

Long-term University Training - This training program emphasizes the relationship between contemporary scientific achievements and American foreign policy. Graduate programs are well established at a number of universities including Princeton, MIT and George Washington Universities. Following training, officers are expected to serve at least two tours in science and technology or non-proliferation related assignments beginning with one in the Bureau of Oceans and International Environmental and Scientific Affairs (OES).

Outside assignments - science and technology officers also have the opportunity to expand their expertise by serving in exchange assignments outside of the Department of State. There have been several details of personnel between the Department of State and the National Science Foundation.

In Fiscal Year 1989, an exchange agreement between OES and the Los Alamos National Laboratories enables a Civil Service or Foreign Service Officer who

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

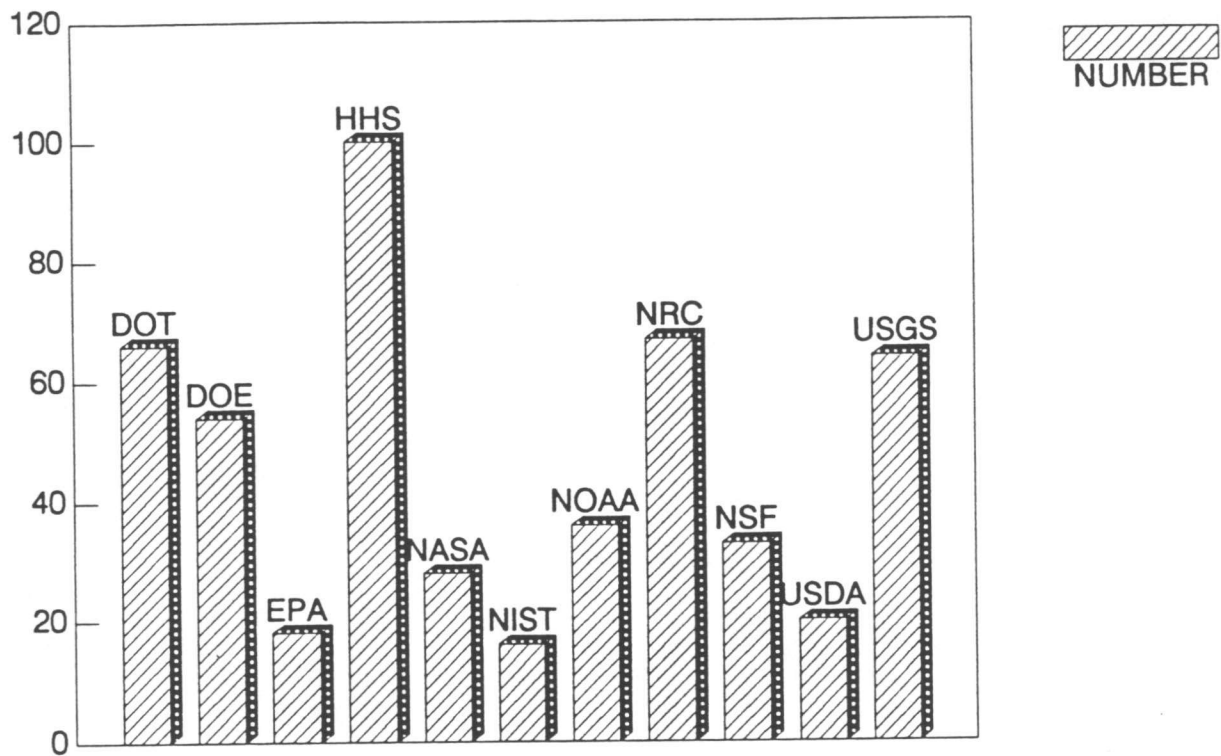
has a strong scientific and technological background to be assigned to a National Laboratory. The tour of duty generally is for two years. An officer assigned to Los Alamos functions in a senior-level capacity that emphasizes the officer's background and training needs. Possible areas of emphasis include 1) analysis of interaction between technological development and national security policy; 2) Nuclear non-proliferation and material accounting technology; 3) Technology transfer, national security, and economic competitiveness. Following assignment, the officer is expected to

serve in a science and technology or non-proliferation related assignment.

### **HIGHLIGHTS OF BILATERAL & MULTILATERAL S&T ACTIVITIES**

In Fiscal Year 1989, the United States was engaged in nearly 600 bilateral science and technology agreements involving more than 20 U.S. agencies and 120 foreign countries. In the following tables are summarized Science and Technology Agreements by Region, Subject, and Agency.

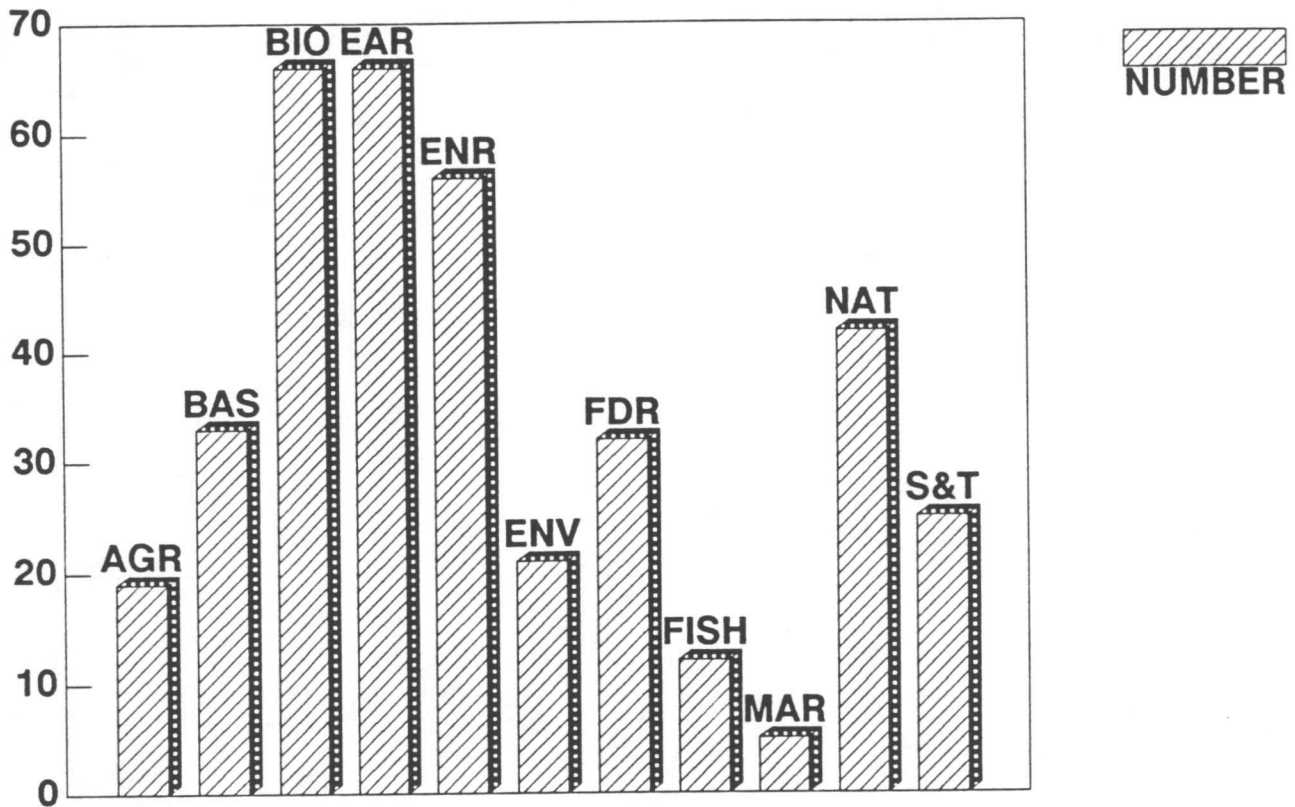
## S&T AGREEMENTS BY AGENCY



Key to Agencies: DOT = Department of Transportation; DOE = Department of Energy ; EPA = Environmental Protection Agency; HHS = Health and Human Services; NASA = National Aeronautical and Space Administration; NIST = National Institutes of Standards

and Technology; NOAA = National Oceanic and Atmospheric Administration; NRC = Nuclear Regulatory Commission; NSF = National Science Foundation; USDA = U.S. Department of Agriculture; USGS = U.S. Geological Survey.

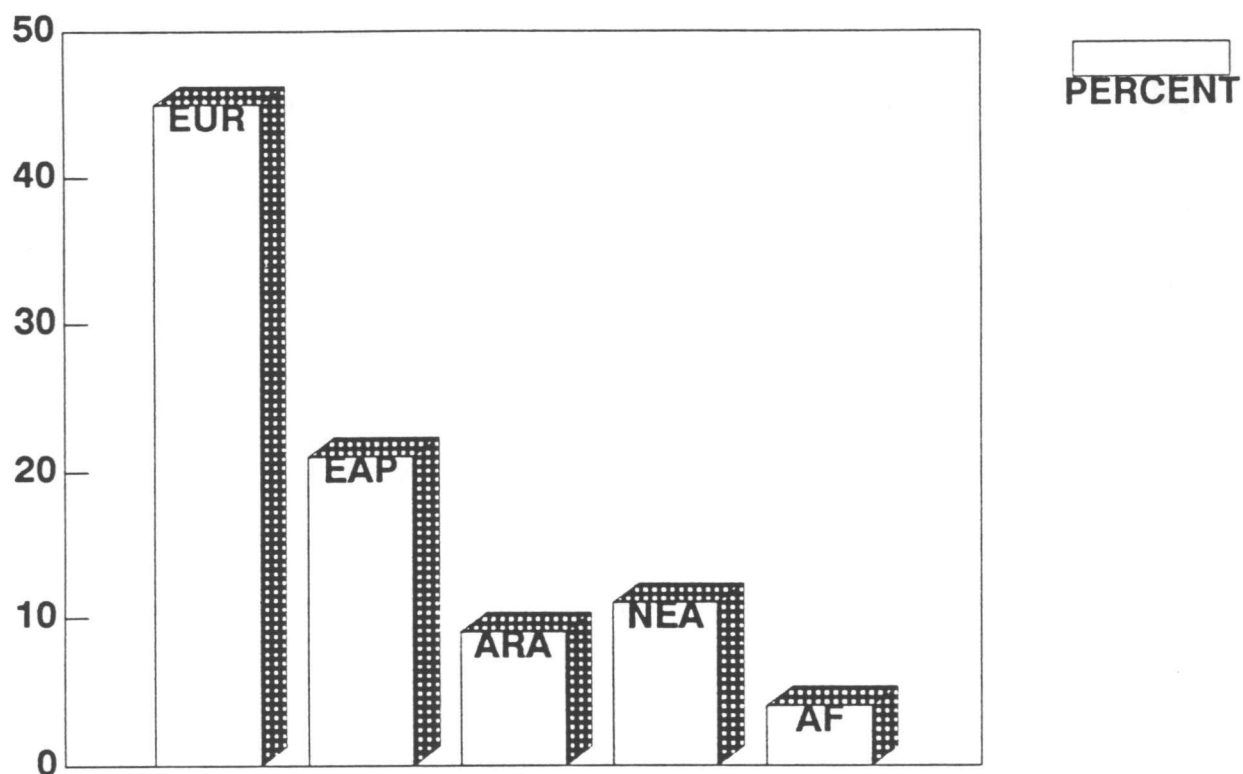
## S&T AGREEMENTS BY SUBJECT



Key to Subjects: AGR = Agriculture; BAS = Basic Sciences; BIO = Biomedical Sciences; EAR = Earth Sciences; ENR = Energy; ENV = Environment; FISH = Fisheries; FDR = Food and

Drug Regulation; FISH = Fisheries; NAT = Natural Resources; NUC = Nuclear Safety; S&T = Science and Technology (Umbrella) Agreements.

## S&T AGREEMENTS BY REGION



Key to Regions: EUR = Europe, EAP = East Asia and the Pacific; ARA = American Republics; NEA = Near East and South Asia; AF = Africa

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

U.S. sensitivity to global concerns and collaborative achievements were particularly noteworthy in the following areas.

### **Environment**

In the past year, the United States has responded to growing U.S. and international concern about our global environment. In this area, the opportunities for science and technology to contribute to human welfare have never been more clear.

Of the environment, President Bush has noted that "We face the prospect of being trapped on a boat which we have irreparably damaged, not by the cataclysm of war, but by the slow neglect of a vessel we believed to be impervious to our abuse."

During Fiscal Year 1989, a number of U.S. government initiatives and international activities have enhanced international cooperation on environmental research. In the Paris Economic Summit, President Bush joined with other heads of state in calling for urgent, decisive action to understand and protect the earth's ecological balance.

The U.S. was instrumental in establishing the Intergovernmental Panel on Climate Change (IPCC) and accepted chairmanship of its Response Strategies Working Group to assess the state of scientific knowledge about global climate change and to develop and evaluate possible policy responses.

Other nations, such as India, Japan and the United Kingdom, have assumed leadership roles in support of this initiative. The Organization of Economic Cooperation and Development (OECD), too, in the context of its work on integrating environment and economic decision-making, is examining, at the Summit leaders' request, how selected environmental indicators can be developed.

A major cooperative interagency effort has resulted in a prioritized and organized U.S. government-wide GCRP (global change research program) which is the basis for extensive international cooperation and coordination on this critical subject. The U.S. was one of the first countries to commit to seek worldwide elimination of chlorofluorocarbon emissions by the year 2000, provided that safe substitutes are available, and we take pride as well in progress in dealing with the problems of transboundary pollution and hazardous waste. President Bush proposed legislation designed to reduce significantly emissions of sulfur dioxide and other acid rain precursors. The President also announced that he will seek legislation to ban exports of hazardous wastes from this country, except where we have an agreement with the receiving country to provide environmentally sound management of such wastes.

During Fiscal Year 1989, special emphasis on environmental cooperation

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

was included in activities under bilateral agreements with a number of countries, among them Japan, Canada, and the United Kingdom. Also, the U.S. initiated new agreements for environmental research cooperation with the Republic of Korea and with Mexico, the latter focusing on transboundary pollution involving border cities, and cooperative research on pollution in Mexico City.

As part of the President's Eastern European Initiatives, he introduced an environmental thrust in July, 1989, consisting of two major activities:

- The U.S. and Poland initiated discussion of a plan for air and water pollution abatement in the historic city of Krakow.
- The U.S. took steps to establish an organizing committee for an independent regional environmental center in Budapest.

On October 25, 1988, President Reagan signed a resolution designed to exert US leadership in negotiating an international convention to conserve the earth's biological diversity. The Department of State organized a symposium in March, 1989 to solicit views on this topic from a broad range of business, government, and conservation organizations. The 15th session of the United Nations Environment Programme Governing Council adopted a U.S. resolution calling upon the UNEP Executive Director to initiate work to negotiate a biological diversity convention. In July, 1989, the

International Union for the Conservation of Nature made public its draft of a proposed biological diversity convention.

U.S. bilateral efforts continue to make major contributions in this area, such as tropical forest conservation and restoration of ecological damage in Argentina.

The U.S. joined other nations in increasing support for multilateral organizations addressing issues such as ozone depletion, climate change, and environmental preservation. Senior environmental leaders, such as the director of the Japanese Environment Agency, also visited the U.S. to discuss with the Environmental Protection Agency Administrator areas of potential cooperation.

Environment issues were included for the first time in the agenda of the annual US-EC Ministerial consultations. Environmental Protection Agency Administrator William Reilly joined Secretary of State Baker, who chaired the meeting, and three other cabinet officials, in discussions with Commission President Delors and other EC commissioners.

The message that the U.S. delivers abroad is that all nations must join in making such commitments if we are to solve these complex environmental problems.

### Energy

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Closely associated with cooperation in environmental research and management are joint efforts to understand and utilize efficiently our energy resources. As with environmental research, significant energy research is performed at the bilateral level. Results of these areas of research can bear directly on consideration of response strategies for climate change policy.

In Fiscal Year 1989, an energy research and development memorandum of understanding was established between the Department of Energy and the Canadian Department of Energy, Mines and Resources. Areas of cooperative effort include gas hydrates, coal heavy oil co-processing high power lasers, alternative transportation fuels, solar technologies, and other fields.

Israel is a world leader in solar energy development. In Fiscal Year 1989, under the DOE/Ministry of Science and Technology cooperative agreement in basic energy sciences, planning began for two workshops on photoconversion, photocatalysis, and energy-related biological sciences. In addition, the American-Israeli LUZ Corp. installed a 194 MW solar electric generating system in southern California which supplies electricity to some 70,000 homes, the result of past support from the U.S.-Israeli Binational Industrial Research and Development Foundation (BIRD).

Through a series of memoranda of understanding and contracts, DOE is work-

ing with Japanese and Chinese counterpart agencies in the fields of clean-coal technology and solar energy.

### **Nuclear Energy, Nuclear and Chemical Weapon Non-proliferation**

On the nuclear front, the U.S. continued efforts to strengthen the international non-proliferation regime, to gain new adherents to the non-proliferation treaty, and to prevent potential proliferant countries from crossing the nuclear explosives threshold. At the same time, it is our goal to reinforce the U.S. reputation as a reliable partner in nuclear cooperation.

In Fiscal Year 1989, the U.S. and Japan continued activities under a broad program of cooperation in nuclear research, including research on safeguards methods and technologies to permit remote monitoring of the fuel cycle. Nuclear cooperation between Korea and the U.S. assists in enhancing public safety and in advancing the development of nuclear technology. Excellent cooperation between the U.S. Nuclear Regulatory Commission (NRC) and its Korean counterpart continues to enhance Korea's capabilities in regulation, inspection, emergency response, and nuclear safety. Joint research has entailed extensive changes of information mutually beneficial to both countries. Exchange programs with DOE have provided training in spent fuel management, fuel fabrication technology and

other areas supporting broad U.S. nuclear policy objectives.

Over the past decade, the world has witnessed an erosion of respect for the international norms against the illegal use of chemical weapons (CW). The U.S. seeks to reverse this trend by concluding a CW ban, working to stem the dangerous proliferation of CW and striving to restore respect for and strengthen the norms against illegal CW use. In his speech to the U.N. General Assembly in September, 1989, President Bush announced a U.S. initiative to give additional impetus to concluding a worldwide ban by declaring that in the first eight years of a CW treaty, the U.S. is prepared to destroy nearly all - 98 percent - of its CW stockpile, provided the Soviets join the ban.

To prevent the production and use of chemical and biological weapons, we will need a strong scientific and technological base for policy decisions. Technologically advanced methods will be required to verify compliance with any international agreements in this frightening new arena. International cooperation in research and enforcement will be critical.

#### Space

In Fiscal Year 1989, President Bush asked Vice President Quayle to chair a new National Space Council, which is to review and develop U.S. policy. National areas of review included commercial space activities and remote sensing. In his July 20 speech on the occasion of the

twentieth anniversary of the Apollo Moon Landing, President Bush asked Vice-President Quayle to lead the National Space Council in determining what is needed to chart a new and continuing course of space exploration to the Moon and Mars.

The Space Station Intergovernmental Agreement (signed on September 29, 1988) began implementation in Fiscal Year 1989. Japan ratified the Space Station Intergovernmental Agreement in June, 1989 and will cooperate with the U.S., Europe and Canada to develop an experimental module for the space station and support the U.S.-developed infrastructure.

On September 5, 1989, representatives of the United States, nine members of the European Space Agency, Japan, and Canada met in Washington for the first government-level review of Space Station cooperation. At the conclusion of the meeting, the partners issued a joint statement emphasizing their commitment "to continue to consult and to work together to preserve the international character of the project and the balance of mutual benefits and responsibilities reflecting the genuine partnership set forth in the agreements."

Several bilateral programs linked to the Space Shuttle Program provide the framework for payload specialists to fly aboard future shuttle flights. In Fiscal Year 1989, three Japanese payload specialists trained with NASA and agree-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

ment was reached to train an Indonesian payload specialist in 1990. NASA and the Federal Republic of Germany also signed an agreement to launch a German Spacelab on the Space Shuttle.

Italy is our most active European partner in space cooperation, dedicating about half of its \$800 million space budget to national projects involving the U.S. and Italian scientists and engineers are working on cooperative projects for the space station, remote sensing, and space launch vehicles and facilities. Twenty-nine U.S. experiments also were conducted in connection with the Soviet Cosmos 2044 biosatellite mission. In August, 1989, the Israeli Space Agency chairman met the Vice President to discuss possible Israeli cooperation in the U.S. Space program.

The Committee on Space Policy of the National Academies of Science and Engineering prepared recommendations for the new Administration concerning the strengthening of our nations' civil aviation program. These recommendations emphasized the need for a core program, balanced and stable enough to ensure U.S. competence in essential space activities. This competence should provide the foundation for special initiatives that meet U.S. scientific, cultural and foreign policy objectives, and for which international partnerships with other spacefaring nations is essential.

### **Oceans and Fisheries**

In the last decade, there has been a rapid growth in the use of high seas driftnets in the Pacific Ocean. This fishing method has been criticized as needlessly harmful to seabirds, marine mammals and other ocean resources not intended to be taken. Congress passed the Driftnet Impact Monitoring Assessment and Control Act in 1987 which mandated that the executive branch negotiate monitoring and enforcement agreements with every country with a high seas driftnet fishery in the North Pacific.

In 1989, the U.S. completed agreements with Japan, Korea, and Taiwan which include time and area fishing restrictions, licensing requirements, marking of nets and vessels, mandatory reporting of fishing vessel location, use of locating transponders, reporting of fishing procedures. The agreements also establish cooperative scientific observer programs or non-target species. The resulting analysis will allow us to establish future policy towards high seas driftnetting and set the stage for later cooperative activities.

A US-USSR Intergovernmental Consultative Committee on fisheries (ICC) was established pursuant to the 1988 bilateral Comprehensive Fisheries Agreement. Issues such as unregulated fisheries in the Bering Sea, and the illegal harvest by third parties of salmon in the high seas areas of the North Pacific were discussed. On the former matter, the

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

ICC established the Bering Sea Fisheries Advisory Body (BSFAB) to advise the Committee on the rational management of fisheries in the Bering Sea including the area beyond the 200 mile limits (the "donut") and on actions which may be taken to reach agreements to control the unregulated fisheries in this "donut" area.

### **Polar Affairs and Marine Mammals**

In Fiscal Year 1989, the U.S. engaged in a number of significant initiatives concerning the polar regions. In November, 1988, the U.S. Government signed the Convention for the Regulation of Antarctic Mineral Resource Activities, a framework regime designed to determine the acceptability of possible mining activities, while protecting the unique Antarctic environment. Additionally, at the 15th Annual Antarctic Treaty Consultative Meeting, the U.S. Government proposed new measures concerning marine pollution, waste management, protected areas, and environmental monitoring, which were endorsed by the Consultative Parties. In the Arctic, the Interagency Arctic Policy Working Group, chaired by the Department of State, oversaw progress toward the creation of a non-governmental organization to coordinate Arctic scientific research, the International Arctic Scientific Committee. The Interagency Arctic Policy Working Group also oversaw U.S. participation in discussions with other Arctic countries over issues related to Arctic environmental protection.

The U.S. firmly supports the conservation of whales, based on the conservation program determined by the International Whaling Commission (IWC). In 1989, the U.S. hosted the 41st annual meeting of the IWC, at which resolutions critical of the scientific whaling of Japan, Iceland and Norway were passed. In addition, U.S. scientists and officials met with representatives of each country in an effort to help bring the scientific whaling programs into compliance with criteria established by the IWC.

### **Health And Quality Of Life**

Health and improved quality of life are universal aspirations. Fiscal Year 1989 saw a continuation of significant international biomedical research cooperation. Bilateral research on AIDS (Acquired Immune Deficiency Syndrome) continued between the U.S. and France, Indonesia and Japan. These programs offer not only significant exchange of research results, but also critical epidemiological data on populations outside of the United States. The impact of AIDS continues as the number of cases increases in virtually all areas of the world. Estimating the demographic, economic, social and political impacts of

the AIDS epidemic is hampered by insufficient data and forecasting techniques. In Fiscal Year 1989, the U.S. Government completed phase I of the development of a model whose purpose

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

is making projections of the international impact of AIDS.

Of similar global concern is the increasingly widespread problem of drug abuse. The President has indicated that reducing the demand for drugs must be at the center of our anti-drug policy. Indeed, one clearly delineated research priority in President Bush's National Drug Strategy is "Increased basic and clinical research on drug use and addiction." The National Drug Strategy also stresses international cooperation in combatting this problem. In support of these objectives, the Department of State began a study of existing and potential areas for international drug research collaboration.

In Fiscal Year 1989, the U.S. also worked with specific countries on medical problems unique to certain regions of the world. For example, the United States and Argentina conducted cooperative research on hemorrhagic fever. The United States and Japan cooperated in the study of a number of tropical disease research programs (e.g. malaria, schistosomiasis), assisting developing nations to reduce the health as well as economic impact of these diseases.

With regard to population issues, the Department of State's Office of the Coordinator for Population Affairs has responsibility for coordinating U.S. international population policy. In Fiscal Year 1989, United States policy con-

tinued to emphasize strong support for voluntary international family planning programs, the integration of population and economic development policies, the critical role that a market-oriented economy can play in development and in the demographic transition, and the prohibition of U.S. support for coercion or abortion in family planning programs.

### **Basic Science**

Details of basic science cooperation are included in subsequent chapters reviewing S&T by themes, countries, and relevant agencies. The following are some examples of significant basic science projects initiated or enhanced during Fiscal Year 1989:

Superconducting Super Collider: A major science and technology project in which international cooperation may have important benefits for the United States is the Superconducting Supercollider (SSC). During 1989 the Department of State worked closely with the Department of Energy and other agencies to develop a plan for involving other countries in the SSC initiative.

Human Genome Research: The Human Genome Initiative is an international research effort with the goal of analyzing the structure of human DNA and determining the location of all human genes, as well as those of additional organisms. The Human Genome Initiative is being managed by the National Center for Human Genome Re-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

search of NIH, in close collaboration with the Department of Energy. The importance, complexity, and cost of the effort to map and sequence the human genome makes international cooperation essential. Most developed countries are already formulating strategies to undertake aspects of this international effort, and some developing countries have expressed interest in participating in the research as well. Cooperation has already begun between the United States and the European Community as well as with the United Kingdom. In addition, in order to strengthen the collaborative effort among nations, an international body of prominent molecular biologists and human geneticists has formed the "Human Genome Organizations" (HUGO).

Bilateral S&T Cooperation (Highlights): A new basic science agreement with the USSR was jointly signed in January, 1989, providing for cooperation in a broad range of common science interests. Similar agreements were initiated or renewed with countries such as Hungary and Poland. (See below - Foreign Policy Implications - for further details.)

This Fiscal Year, the U.S. and Brazil obligated \$2 million each to launch cooperation in six areas of cooperative research under the Presidential initiative. The U.S.-Japan Science and Technology Agreement, signed in 1988, includes an extensive implementation ef-

fort, involving several joint committees. These groups have been established and have started their work. In October, 1988, the President's Science Advisor chaired a ministerial-level meeting for the full agreement.

In Fiscal Year 1989, minister-level officials from countries such as Indonesia, Israel, the Philippines, France and the Federal Republic of Germany also visited the U.S. to discuss basic science cooperation. Subsequent chapters of this document expand on Fiscal Year 1989 developments under bilateral S&T cooperation agreements.

### **Other Multilateral Activities**

President Bush and other Summit leaders devoted unprecedented attention to the environment, dedicating a significant portion of their Paris Declaration to consideration of environmental issues. Calling for "decisive action," they proposed greater international cooperation on environmental problems ranging from the stratosphere to the oceans.

The US-EC High Technology Group met twice during Fiscal Year 1989. The discussions, in which a number of U.S. Government agencies participate, are in-depth exchanges of views and information. This year's agenda included access to publicly funded research and development, clean coal processing technologies, and biotechnology.

The 53-member U.N. Committee on the Peaceful Uses of Outer Space

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

(COPOUS) continued to be active during Fiscal Year 1989. Member states focused on the use of space technology for combatting environmental problems. Members decided to emphasize the use of space technology in terrestrial search and rescue in disaster relief activities.

NATO's "Third Dimension," its civil service Science Programme, complementing the military and the political-economic dimensions, continues to sponsor the Science Fellowships, Collaborative Research Grants, Advanced Study Institute, and Advanced Research Workshop Programs.

During Fiscal Year 1989, the OECD focused on cooperative activities to ensure the more effective development and utilization of technology in the promotion of economic growth, energy security, protection of the environment, and international trade.

Efforts to develop a broad international consensus on climate change issues are focused on Intergovernmental Panel on Climate Change (IPCC), established in Fiscal Year 1989. IPCC's main tasks are to assess scientific information related to the various components of climate change, to review and study evaluate the environmental and socio-economic consequences of climate change and to develop and evaluate possible response strategies.

The International Atomic Energy Agency (IAEA) sponsored an international conference on the role of nuclear

power in response strategies to global warming. The IAEA also reaffirmed the importance of maintaining high levels of activity in the fields of nuclear safety and waste management. The IAEA continues to provide an international forum for scientists to exchange ideas and experience.

### IMPLICATIONS OF S&T ACTIVITIES

#### Foreign Policy Implications

The Department of State has coordination and oversight responsibility for more than 600 science and technology agreements involving more than 20 U.S. agencies and 120 countries.

These agreements often open channels of communication with important elements of society in countries where contact might otherwise be difficult.

We have demonstrated our responsiveness to the very positive signs of "glasnost" in the Soviet Union with invigorated cooperation in basic scientific research, transportation and environment. U.S. science and technology cooperation in countries such as Argentina can play a vital role in support of democracy and democratic institutions.

Chinese students and other intellectuals have been exposed to our culture and values through cooperative science and technology initiatives. Our science and technology program with China celebrates its Tenth Anniversary this year. It is the most extensive joint

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

science and technology effort between the U.S. and any foreign government, covering the environment, space, medicine, terrestrial and marine science, industrial science and technology, and educational exchange. Preparations for the Tenth Anniversary ministerial meeting were interrupted by the events in Tianenmen Square in June, 1989.

Moreover, the talents and resources of U.S. agencies may be applied to resolve crises. Joint science and technology cooperation may also be politically important, and Presidential science and technology initiatives such as those with Brazil and India deepen our bilateral relationships with such countries.

On July 13, 1989, President Bush in his Budapest address announced that the U.S. would initiate science and technology cooperation with Hungary. During Fiscal Year 1989, the U.S. government negotiated a science and technology umbrella agreement with Hungary including projected cooperation in environment, medical science, energy, natural resources, and science and technology management. Separate agency-to-agency activities with Hungary include the areas of biomedical sciences, metrology, basic sciences and earth sciences.

The U.S. Government reactivated the umbrella science and technology agreement with Poland and agency-to-agency activities in areas of environment, biomedical sciences, basic sciences,

fisheries and earth sciences. The U.S./Yugoslavia umbrella science and technology agreement added bilateral activities in areas such as mapping and sequencing the human genome, drug abuse prevention and treatment. Yugoslav scientists are active in U.S. research on climate change.

Underlying all of our S&T cooperation is the principal that international science and technology agreements are justified and funded by U.S. agencies on the basis of their individual scientific and technological merits, and take into account the benefits of each party. While not an underlying objective, federal agencies are also paying closer attention to economic and commercial merit of cooperative agreements.

### **Economic Benefits**

The pace of scientific and technological advance is dependent upon the communication of ideas. The exchange which occurs under science and technology agreements allows the U.S. science and technology establishment to focus on the most promising avenues of endeavor. Indeed, this intellectual exchange can provide a creative stimulus to the U.S. science and technology establishment, and a more efficient allocation of scarce and valuable resources.

Past Title V reports have devoted less attention to detailed economic benefits of science and technology cooperation. Therefore, in Fiscal Year 1989, the Department of State surveyed U.S. agen-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

cies to obtain examples of specific benefits to the U.S. taxpayer of collaboration in science and technology activities. The benefits may be characterized in four general ways: 1) cost containment, 2) elimination of duplication of efforts, 3) increased pace of scientific advance, and 4) opportunities for increased trade.

Cost containment reduces the cost of research by sharing the cost between the U.S. and its collaborating partner. Cost containment can be achieved by shared equipment and personnel, without diminishing the overall quality of the research. Some examples of this type of benefit include:

- Cooperation between Canada and the Environmental Protection Agency on pollution control and management of the Great Lakes has significantly reduced U.S. expenses in this area.
- Cooperation between China and NOAA (National Oceanic and Atmospheric Administration) has led to Chinese research vessels being scheduled for use in two major oceanographic cruises at a savings to the U.S. of approximately \$500,000 per cruise.
- National Institute of Cancer scientists are working with Finnish colleagues to screen plant metabolites for anti-cancer and anti-viral activity. The collaboration allows cost sharing and increases the number of metabolites that can be tested.
- The French currently provide real time data to the U.S. from 2000 expendable bathythermographs deployed each year in the Atlantic, Pacific and Indian Oceans. French deep-water simulators were used in diving physiology studies, saving NOAA substantial costs. Results from a French sampling cruise along the Mid-Atlantic Ridge allowed NOAA to maximize the cost-effectiveness of a subsequent sampling cruise.
- The Poles have a facility for studying models of grain dust explosions which is used by U.S. Department of Agriculture (USDA) researchers.
- The National Institute of Standards and Technology (NIST) and researchers in Sweden collaborated on research in high-temperature superconductors and used a fusion particle accelerator that is not available in the U.S. Operational cost savings have been significant.
- The Department of Transportation is using the Mercedes-Benz driving simulator in Berlin in cooperative studies to determine the effects of certain drugs on driving performance.
- Assistance to the United Arab Emirates on fresh water manage-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

ment allowed the U.S. Geological Survey (USGS) to test, at no cost, techniques and models in an environment similar to the southwestern U.S.

International collaboration can also eliminate duplication of effort which results in indirect economic benefit for the United States. Via international collaboration, information is made known to U.S. researchers, thereby eliminating the need for U.S. researchers to repeat this work. Indeed, this information sharing allows the U.S. science and technology community to take a "leap-frog" approach to research and development. Some examples:

- A cooperative research visit to NIST by an Australian scientist has led to information important to the development of fracture-resistant ceramics.
- A Brazilian researcher visited NIST and provided methodologic and technical contributions to improving the strength of ceramics.
- The U.S. Department of Transportation benefits from information and technical details on the sophisticated French high-speed passenger rail service.
- Indian groundwater studies provided USGS with data that is applicable to similar situations in the U.S.
- From Japan, the United States has gained information and data on emerging technologies that control environmental pollution. These technologies include fusion furnaces for waste disposal, and fine pore aeration methodology for sewage.
- Japan spends approximately three times as much as the U.S. annually on earthquake disaster preparation. Cooperative studies have provided the U.S. valuable information about earthquake resistant building materials.
- The Polish winter triticale breeding program currently is considered the best in the world. Information from the program is provided to USDA researchers.
- A cooperative study allows U.S. agricultural scientists to study Thai techniques of aeration and pond-bottom treatment. U.S. catfish farmers spend \$10 million a year on aeration alone, and improvement of techniques may save considerable sums of money.
- Soviet scientists developed the pulse laser, and Department of Health and Human Services (HHS) scientists perfected and tested it for treating glaucoma. This treatment is now widely used to prevent progression of glaucoma, the second-leading cause of blindness in the U.S.
- Yugoslavia has leading experts in earthquake prediction and re-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

search, providing many opportunities for cooperative projects that benefit the U.S.

International collaboration provides a creative stimulus which increases the pace of scientific advance. New ideas and approaches to scientific experimentation expand the paradigm within which researchers work. The resulting environment is conducive to the full exploitation of new science and technology. Examples:

- USDA and Chinese scientists cooperate in biotechnology to develop biologic pest control agents against agricultural insect pests common to both countries.
- Collaboration between French and HHS researchers has led to development of a device that will prevent the loss of healthy limbs of patients undergoing extensive radiation therapy for cancer.
- Cooperative studies between Irish and NIST researchers have led to development of a new method for analyzing the atomic and electronic band properties of high temperature superconductors.
- Neuroscientists from the U.S. and Italy have located a narrow region of chromosome 21 that appears to be responsible for the familial form of Alzheimer's disease. This is a critical first step in developing a treatment for this form of debilitating disease.
- U.S. and Japanese researchers have developed techniques that have significantly decreased the incidence of post-transfusion hepatitis B in the U.S. and Japan.
- Korean scientists have worked with NIST researchers in developing "maps" of wear characteristics of ceramic materials. This work has definitive application to the industrial development of new ceramic materials.
- A New Zealand researcher collaborating with NIST scientists developed a PC software program that determines the corrosiveness of oil and gas well environments and guides the user in choosing the most suitable materials for use in the well environment. The system currently is being field-tested and it has the potential for significant savings in the petroleum industry.
- New Zealand and USDA cooperative research has led to progress in embryo transfer for the purpose of international movement of disease-free animals. Success in this area will lead to substantial economic benefits in terms of international sales of U.S. livestock and in the importation of strains to improve U.S. stock.
- Joint U.S.-Spain epidemiological studies have been conducted that

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

have implicated soybean dust as the cause of recurrent epidemic asthma attacks, and related adulterated rapeseed oil to human poisoning. These studies provide important health information of benefit to the American public.

Scientific and technological cooperation can benefit U.S. exporters and other U.S. firms. In some cases, the exchanges promote the sale of U.S. research instrumentation, medical equipment and data processing facilities. In addition, as science and technology collaboration leads a less-developed country to more fully utilize its own resources, this can increase sales of U.S. manufacturing technology and goods. For example:

- Department of Transportation (DOT) cooperation in the development of China's highway, rail and aviation systems provided trade opportunities for related U.S. industries.
- DOT cooperation with Canada results in safer, more efficient transportation systems that promote trade.
- USGS assistance to Hungary in petroleum exploration provides an opportunity for U.S. based companies to expand trade.
- USGS assistance and training programs for Indonesia in assessing marine geologic resources and platinum-containing minerals provides markets for U.S. technol-

ogy and equipment, as well as providing potential new sources of strategic minerals.

- USGS assistance in assessing and developing Pakistan's coal reserves provides excellent training opportunities that, for the most part, no longer exist in the substantially developed U.S. coal industry. The cooperation also provides trade opportunities for U.S. industry.
- USGS is assisting Qatar in the development of a remote sensing center that will lead to the sale of several million dollars of U.S.-manufactured equipment.

### National Security

U.S. national security and that of its allies can be enhanced through international cooperation on defense science and technology. Cooperative activities can improve the effectiveness of U.S. defenses, improve compatibility of military forces (internationally), strengthen alliances, and efficiently utilize scarce research and development resources. Section 1103 of Public Law 99-145 (Nunn Amendment to the Fiscal Year 1986 Defense Authorization Act) provides funding for the U.S. Government to engage in a wide variety of cooperative research and development programs with NATO allies.

During Fiscal Year 1989, the U.S. engaged in a wide variety of cooperative research and development programs

funded under the Nunn Amendment. The U.S. Army in conjunction with NATO allies shares responsibility for such projects as: the Airborne Radar Demonstration System, Combat Vehicle Command and Control System, and the Hawk Mobility Enhancement. U.S. Navy Nunn Programs include: The Maritime Patrol Aircraft for the 1990's - Harmonization Phase (MPA-90), the NATO Frigate Replacement of the 1990's, and the Remotely Piloted Vehicle Enhancement Multimission Optronic Stabilized Payload (with Israel). The Air Force also has a number of projects which include: Advanced Avionics Architecture (with France), SOSTAS Interoperability Data Link, and Over-the Horizon Radar Technology (with Australia).

In addition, the U.S. entered into a number of new initiatives with NATO allies for defense science and technology cooperation. Examples include cooperative research and development on 1) non-acoustic anti-submarine warfare with the U.K., 2) maritime patrol aircraft systems standardization with Canada, 3) Joint Stars with France and Italy, and 4) underwater acoustics with the Federal Republic of Germany. Joint defense-related research and development activities did continue in Fiscal Year 1989 with over 80 countries, including, for example, Egypt, Israel, Korea and Australia.

## **FUNDING OF SCIENCE AND TECHNOLOGY COOPERATION**

By far, the majority of the U.S. federally-supported international science and technology activities are managed and funded by the individual technical agencies. Funding is generally allocated from the overall agency research and development budget with stipulation that any international work must support or complement domestic efforts.

The National Science Foundation, for example, was allocated \$1.45 billion for research in Fiscal Year 1989, of which \$11.7 million was allocated to the International Programs Division. Many cooperative activities were also undertaken within other grants. Similar arrangements exist within other technical agencies.

In Fiscal Year 1989, the Department of State was appropriated funding was provided for science and technology cooperation with Poland and Yugoslavia. Each program received approximately \$1 million. Both programs have been extremely fruitful. The current Yugoslavia-U.S. agreement has a five-year term ending in September, 1993. To date, over 750 projects have been administered by 11 U.S. technical agencies under the auspices of this agreement. The Polish program got off to a quick start with over 15 projects in the second half of Fiscal Year 1989.

## COORDINATION AND OVERSIGHT

Soon after assuming his position as Assistant to the President for Science and Technology Affairs, Dr. D. Allan Bromley endorsed the work of the interagency Committee on International Science, Engineering and Technology (CISSET) of the Federal Coordinating Council on Science, Engineering and Technology (FCCSET).

In addition, a National Security Directive in early May established a Policy Coordinating Committee (PCC) of the National Security Council, chaired by the Department of State, with oversight responsibility for issues related to oceans, science, technology and environment. Its interagency subcommittees include the Group on Eastern European Science and Technology (GEESAT) and the Group on Soviet Science and Technology (GOSSAT). Nuclear non-proliferation issues are addressed in a separate PCC. The thrust of this committee's responsibilities is to ensure that the international dimension of these issues are considered in a coordinated interagency process and that interagency differences are resolved on a timely basis.

Additional interagency groups exist to provide coordination of significant programmatic or regional concerns. The National Space Council, for example, is chaired by the Vice President.

The EC High Technology Working Group, chaired by the U.S. Trade Representative, considers some science and technology areas.

In compliance with the Case-Zablocki Act of 1972, as amended, the Secretary of State reported to Congress the successful negotiation of roughly 25 international science and technology agreements during Fiscal Year 1989. Interagency review of the negotiation of multilateral science and technology agreements is coordinated by the Department of State through the "Circular 175" Procedure. This procedure establishes that views of appropriate agencies are taken into account in cooperative agreements. The basic guidelines include:

- making of treaties and other international agreements for the United States is carried out within constitutional and other appropriate limits;
- the objectives to be sought in negotiation of particular treaties and other international agreements are approved by the Secretary or an officer specifically authorized by him for that purpose;
- timely and appropriate consultation is had with Congressional leaders and committees on treaties and other international agreements;
- where, in the opinion of the Secretary of State or his designee,

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

took place within the U.S. high-energy physics community, with openness to and participation from scientists of other countries), and 2) leadership and decision-making by the nation's leaders. Following informal initial discussions with other countries, and our own budgetary decisions, we will be engaging in detailed discussions of collaboration on this exciting project.

Some areas of science inherently require research activity in many worldwide geographical areas, and, therefore, must involve extensive international cooperation. The critically important effort to understand the processes involved in global climate change is a leading example. The magnitude, diversity, and duration of the effort are truly daunting. Success will require major resource commitments, detailed collaboration at many levels, perseverance, and continuity on this common project. The Executive branch has made an unprecedented effort to organize and prioritize global change research components, including the expensive and critical remote sensing program. The U.S. is determined to work actively with other countries on this program. A second example is the need to better understand the existing biological diversity of the earth and conditions for survival of species. This program may be particularly time-sensitive, since we do not know how much of the earth's invaluable genetic diversity is being ir-

retrievably lost due to man-made changes in the environment.

Yet other areas of science, while perhaps composed of results of small-scale science, will increasingly require data collection and organization efforts of such a magnitude as to require a large-scale science approach. The goal of detailing and understanding the human genome (and perhaps that of other species) is such a project. Enormous data systems will be required in other areas, such as compiling information on the characteristics (e.g. toxicity) of chemicals.

There are also projects which combine pure scientific interest, technological opportunities, and factors such as the leadership, the benefit of cooperative effort, and inspiration of younger people to engage in science and technology. The Space Station program, on which we have major agreements with Europe, Japan, and Canada is clearly such a project. A permanent outpost on the moon and manned missions to Mars are examples for the future.

Multinational cooperation can be fruitful, as it has been in many cases such as the International Geophysical Year, the Ocean Drilling Program, and in several European projects (i.e. CERN, the Joint European Torus fusion experiment, and facilities for high magnetic fields, neutron sources, and synchrotron radiation).

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

the circumstances permit, the public be given an opportunity to comment on treaties and other international agreements;

- firm positions departing from authorized positions are not undertaken without the approval of the Legal Adviser and interested assistant secretaries or their deputies;
- the final texts developed are approved by the Legal Adviser and the interested assistant secretaries or their deputies and, when required, brought a reasonable time before signature to the attention of the Secretary or an officer specifically designated by him for that purpose;
- authorization to sign the final text is obtained and appropriate arrangements for signature are made;
- there is compliance with the requirements of Public Law 92-403 on the transmission of the texts of international agreements other than treaties to the Congress; the law on publication of treaties and other international agreements; and treaty provisions on registration.

Coordination of these activities means that the Department of State acts as a central point through which communication and action flow. The Department of State convenes agency meetings, clears

memos and sends cables on program areas.

Oversight of the Department of State's scientific, technological, and environmental activities is achieved, in part through semi-annual meetings of the Bureau of Oceans and International Environmental and Scientific Affairs (OES) Advisory Committee. The Advisory Committee provides expert counsel on all issues for which the OES Bureau is responsible. In Fiscal Year 1989, the Advisory Committee examined such issues as global climate change, the state of research into chlorofluorocarbons (CFC's) and their substitutes, and other current issues.

### **MANAGEMENT OF LARGE-SCALE SCIENCE INITIATIVES**

This Administration, like its predecessors, recognizes that international cooperation is necessary in many areas of research. Large-scale science cooperation can be used to share the expense of large efforts, since the opportunities for research far outweigh the resources of any one country. Some examples for areas benefitting from shared research are elementary particle physics, astronomy, and planetary exploration. The U.S. plan to collaborate with other countries to build a superconducting super collider is an outstanding example. This project illustrates the need for 1) extensive scientific community effort at consensus-building and prioritizing (as

The diverse international efforts mentioned above provide illustrations of some of the key considerations in appropriately choosing, implementing, and benefiting from large-scale science cooperation:

- Cooperation is built on extensive communication, taking into account the resources and desired benefits of all partners. We have much to learn and gain from our cooperating partners.
- Successful cooperation requires careful prioritizing before commitments are made, and continuity of commitment, particularly funding, once joint decisions are made. This in turn will require a very close and positive relationship between the Executive and Legislative branches to provide funding continuity over periods of many years.

The Administration is determined to ensure that the extensive benefits of scientific cooperation be realized, and to work with the Congress and with cooperating countries to that end.

## **U.S INITIATIVES IN RESPONSE TO LEGISLATION AND DIRECTIVES**

### **Executive Order 12591**

Section 4 of Executive Order 12591 pertains most directly to the conduct of U.S. international science and technology

policy. In summary, it indicates that agreements shall insure reciprocal access, intellectual property rights, and national security controls; mandates that U.S. scientists and engineers be assigned to embassies; mandates that science and technology information be circulated widely.

### **Omnibus Trade and Competitiveness Act of 1988, Section 5171**

Section 5171 of the Omnibus Trade and Competitiveness Act of 1988 on symmetrical access to technological research amends Section 502 of the Foreign Relations Authorization Act, Fiscal Year 1979 (22U.S.C. 2656B) to add a new paragraph five. With this paragraph, Congress declares it to be the policy of the United States that "(5) Federally supported international science and technology agreements should be negotiated to ensure that (a) intellectual property rights are protected; and (b) access to research and development opportunities and facilities, and the flow of scientific and technological information are, to the maximum extent practicable, equitable and reciprocal."

The act also amends Section 503(B) of the 1979 Foreign Relations Authorization Act (22 U.S.C. 2656C(B)) by adding a new paragraph three requiring that the President's annual report to the Congress on science, technology and American diplomacy (the Title V report)

contain information and recommendations with respect to "(3) equity of access by United States public and private entities to public (and publicly supported private) research and development opportunities and facilities in each country which is a major trading partner of the United States.

### **Competitiveness Commitment**

The U.S. continues its commitment to ensuring that access to government-sponsored or government-supported programs, facilities, and science and technology information is equitable and reciprocal, and that proper consideration is given to protecting U.S. intellectual property generated by cooperative science and technology relationships.

In testimony before the House Committee on Science, Space and Technology during Fiscal Year 1989, U.S. agencies addressed the competitiveness concerns associated with the formation of a single market in the European Communities (EC) in the early 1990's as well as the trend towards pan-European cooperation in high technology. This issue is particularly important in commercially competitive areas, such as information technology and technology-based industrial development.

In general, as illustrated by examples earlier in this report, all partners benefit from appropriately chosen cooperation. This may convey advantages relative to

nonparticipants. A concern in this connection is that the U.S. sustain its cooperative relations with European partners in this time of rapidly increasing intra-European cooperation. In other areas such as Asia, the U.S. continues to pursue intellectual property rights protection in parallel with expanding science and technology cooperation.

Wherever possible, the U.S. seeks scientific and technological cooperation that supports the economic interests both of the U.S. and its partners. U.S. scientific and technological cooperation with Mexico in Fiscal Year 1989 represents the importance assigned to science and technology by Mexican President Carlos Salinas de Gortari for Mexico's economic development.

### **Access**

In fulfilling the Secretary of State's mandate of primary responsibility for coordination and oversight of international science and technology agreements, the Department of State is committed to ensuring that access to government-sponsored or government-supported programs, facilities, and science and technology information is practicable, equitable, and reciprocal, as expressed in Section 502 of the Foreign Relations Authorization Act, as amended.

The critical issue of access to science and technology in the international arena bears on the potential for scientific

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

benefit and utility of international cooperation for our federal research and development agencies, the U.S. business community, and academia. It bears on the ability of the United States to derive maximum benefit from commercially promising results of federally-funded science and technology. Many governments believe, as we do, that some technological developments have the potential to advance national competitiveness and should be protected. However, it is also evident that most foreign governments share our views that scientific inquiry thrives best on cooperation and open access. It is this spirit that forms the basis for most cooperative agreements between U.S. federal agencies and their foreign counterparts. This administration has maintained a long-standing policy of support for the Nation's basic research infrastructure while encouraging private sector development of commercially viable new technologies.

Cooperative science and technology agreements may be concluded for the purpose of affording U.S. investigators access to foreign research facilities or to environments that are critical to their research efforts. The missions of agencies such as NOAA (National Oceanic and Atmospheric Administration), the U.S. Geological Survey (USGS), and NASA (National Aeronautics and Space Administration) require research worldwide. The National Institutes of

Health (NIH) conduct many biomedical studies, such as tropical disease research and epidemiological studies of AIDS among heterosexual populations, in foreign environments. U.S. Department of Agriculture (USDA) researchers have made significant advances in studying citrus disease and African swine fever without risking bringing the diseases to the United States. Similar concerns exist with studies of hoof-and-mouth disease and gypsy moths, for example.

Cooperative science and technology agreements negotiated by the Department of State now generally include text stating that the contracting parties shall encourage and facilitate cooperation between government agencies, universities, organizations, institutions and other entities of both countries. Such provisions appear in active agreements with, for example, the Soviet Union, Japan and Italy, and in draft agreements currently under negotiation with India, Korea, Indonesia, the PRC, Brazil and Thailand.

The U.S.-Japan Science and Technology Agreement commits both governments to strive for balanced access to government-owned or government-sponsored laboratories and scientific information. The two governments have established task forces to monitor and improve access. In Fiscal Year 1989, the Japanese Government took a number of steps to permit non-Japanese researchers to work in laboratories supported all, or in part, by Government of

Japan funding. National research institutes and university laboratories are now open to non-Japanese scientists (as well as to private sector Japanese researchers.) Under these rules, for example, the Japanese government's National Research Institute of Metals has opened its laboratory to U.S. participation in research on superconductivity.

In India, the 42 institutes of the government-funded Council of Scientific and Industrial Research (CSIR) were established to develop commercial technology for and with Indian industry. All of these institutions are now open to U.S. researchers and many participate in the Indo-U.S. collaborative research program.

Under bilateral science and technology agreements with Europe, U.S. federal agencies have to date identified no impediments to access in the conduct of their joint studies. Between the United States and Italy, for example, reciprocity of access to science and technology research organizations is well entrenched and encouraged by U.S.-Italy science and technology cooperation. The United States and the U.K. share extensive access to science and technology facilities and information in both countries. In major science and technology institutes in the Federal Republic of Germany, U.S. scientists form the single largest contingent of foreign researchers. The U.S. would like to have even better ac-

cess to European Community research and development framework programs, and we are developing a dialogue with the EC along these lines.

Significant numbers of foreign researchers annually work in our national laboratories, contributing to the laboratories' domestic program objectives. The federal laboratories support open exchanges in the areas of basic scientific research. The federal laboratories generally conclude that the United States benefits more by having foreign researchers collaborating in U.S. facilities than do the sending nations. At the same time, laboratory directors are acutely aware of their legislated responsibilities for transfer of new technology to the U.S. private sector, as expressed in the Federal Technology Transfer Act. These laboratories are acting with increased sensitivity to competitive and national security concerns as they consider receiving foreign collaborators.

### **Intellectual Property Rights**

In Fiscal Year 1989, the U.S. intensified efforts to negotiate provisions in science and technology agreements that adequately protect and allocate rights to intellectual property furnished or produced in the course of science and technology cooperation. These IPR provisions were included in negotiations for renewal of science and technology agreements with Argentina, India, Korea, Spain, Italy, the Federal Republic

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

of Germany, China, Thailand, USSR, Hungary and Poland; and in proposed agreements with the Philippines, New Zealand and Indonesia.

Resistance to these provisions by some countries, e.g. India, Korea and China, has resulted in significant reductions or cessation of science and technology cooperation under these agreements.

In Fiscal Year 1989, the Department of State led the U.S. delegation for the second round of negotiations with the Republic of Korea. The U.S.-ROK agreement expired in October, 1988 after the United States refused Korean requests for a further extension in the absence of progress on negotiations for mutually satisfactory IPR provisions. This effort continues and negotiations proceed as well for a new agreement between the U.S. Geological Survey (USGS) and the Korea Ocean Research and Development Institute. This will be the first agreement to be negotiated in the absence of an umbrella science and technology agreement, and therefore will require negotiation of both an IPR and a security obligations annex.

In Fiscal Year 1989, the Department of State supported two visits by the Philippine Assistant Secretary for International Science and Technology Cooperation of the Department of Foreign Affairs. His request for negotiation of an umbrella science and technology agreement is complicated by the inclusion of the

Philippines on an intellectual property rights watch list by the United States.

In Fiscal Year 1989, the Department of State prepared for negotiations to renew the U.S.-Thai umbrella science and technology agreement and its amendment with an intellectual property rights and a security obligations annex. U.S.-Thai disagreements on provisions for intellectual property protection made the preparations particularly complex. We anticipate extensive and complex negotiations with the Thais on an IPR annex to the agreement in Fiscal Year 1990.

During a Fiscal Year 1989 visit, the Malaysian Minister of Science and Technology recommended that we begin negotiations for an umbrella science and technology cooperation agreement. IPR provisions are expected to be an early topic for these discussion.

In Fiscal Year 1989, the U.S. worked to establish a mechanism for science and technology cooperation with Indonesia in the absence of an Indonesian patent law. The Government of Indonesia presented a patent bill to its Parliament in February 1989 and followed with a request to the U.S. to renew negotiations of the umbrella agreement which expired in October 1989. This effort continues with extensive interagency consultation in the U.S. Renewal of the umbrella agreement will pave the way to conclude agreements involving NSF and USGS which have been pending for over a year.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Other subsidiary agency-to-agency agreements are likely to be developed once the umbrella agreement is in place.

Work began in Fiscal Year 1989 to renew the U.S.-New Zealand umbrella agreement and amend it with IPR and security obligations annexes. In order to allow more time for negotiations, the current agreement was extended and negotiations are proceeding.

With India, the lack of an agreement covering IPR in science and technology cooperation has led to the imposition by the U.S. Government of severe restrictions on cooperative work. Absent a waiver of those restrictions, no new or expanded project may be undertaken. A review process to examine waiver requests has been instituted under the Policy Coordinating Committee for International Oceans, Environment and Science, carried out by that body's India Working Group. Negotiations toward an agreement on intellectual property rights in science and technology stalled after the second round in March 1989. The draft agreement presented by India at that time failed to address any of the U.S. concerns which had been raised in the December 1988 round. In May 1989 the U.S. Trade Representative named India to its priority watch list under the Special 301 provisions of the Omnibus Trade and Competitiveness Act of 1988. This, combined with India's unhelpful stance in the GATT Uruguay Round, has

made further dialogue on the subject difficult.

Our umbrella science and technology agreement with Spain expired in May 1989, but active research projects continued to completion and administrative support was maintained until the end of calendar year 1989. A proposal for a new agreement containing detailed provisions for the protection and allocation of intellectual property rights was delivered to the Government of Spain in September 1988. Negotiations are expected in Fiscal Year 1990 but will probably be impacted by Spain's position with regard to its relationship to the European Communities.

The U.S.-Turkey umbrella science and technology agreement expired in mid-October 1988, concurrently with a memorandum of understanding between the National Science Foundation and its Turkish counterpart organization. A proposal for a new umbrella agreement containing detailed provisions was delivered to the Government of Turkey prior to the expiration date.

### **Strategic Technology**

Strategic technology and information transfers are a particular consideration in cooperative science and technology agreements with the USSR and East Bloc countries.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

The export of strategically significant technology to Warsaw Pact and certain other countries is controlled in order to deny them access to technology that would increase the effectiveness of their military establishments. Because modern weapons depend on many advanced supporting technologies that have both civilian and military applications ("dual use"), some commercial technology transfers could undermine U.S. national security.

The value of effective strategic export controls is highlighted by conclusive documentation of the USSR's past and continuing reliance on advanced Western technological know-how to modernize its military and strengthen the industrial base that supports Soviet war-making capacity. Consequently, the U.S. has implemented various statutes pertaining to the transfer of militarily sensitive technology and information. These statutes require export licensing of military significant goods and technologies to ensure that they are destined for appropriate civil applications. The Atomic Energy Act of 1954 also treats all information relating to atomic energy as restricted data. The International Traffic in Arms Regulation Act of 1980 defines restrictions on technical information pertaining to "unclassified information...used...in the maintenance of" any item on the munitions list. This regulation also encompasses "any technology which advances the state-of-the-

art or establishes a new art in an area of significant military applicability in the United States."

The Export Administration Act of 1979 (amended 1985) restricts the export of goods and services. This includes any technical information and technology that can be used or adapted for use in the "design, production, manufacture, utilization, or reconstruction" of any item on the Commodity Control List.

At the initiative of the Office of Science and Technology Policy, the Department of State developed written procedures for interagency review of science and technology agreements and activities with Warsaw Pact countries. These procedures provide a structured approach to assessing the benefits of science and technological cooperation with careful consideration to U.S. policy and national security concerns.

In addition, the Department of State organized, in 1989, its annual strategic trade officers' conference, alerting the U.S. Government international technology and trade community to the implications for export control policy. Joint S&T activities were reviewed.

### **Dissemination of S&T Information**

Project STRIDE (Science and Technology Reporting Information Dissemination Enhancement) was developed in response to the portion of Executive Order 12591 which directed the Depart-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

ments of State, Commerce, and the National Science Foundation to develop a central mechanism to ensure that information on foreign research is made available in a prompt and efficient manner to users in Federal laboratories, academic institutions, and the private sector on a fee-for-service basis. During Fiscal Year 1989 STRIDE moved into Phase Two, with an expanded list of reporters and recipients. The Department of State worked closely with the Department of Commerce National Technical Information Service (NTIS), and National Science Foundation responded fully to the intent of the Executive Order. With the successful completion of the STRIDE pilot project, early in Fiscal Year 1989, it was decided to expand the project to include all Department of State science reporting officers. A list of technical areas of interest was furnished to all Foreign Service posts with full-time science reporting officers. The guidelines included requests for reporting on: advanced technologies, visits to research facilities, scientific and technological developments, biological and medical sciences, energy technology, physical sciences, space activities, host government research and development activities and budgets, scientific and technological infrastructure, scientific, technical and engineering education and scientific and technical conferences. In addition, NASA, USGS, HHS, AID, DOD, DOA and NSF requested report-

ing on more than fifty subjects of their primary interests.

The science officers responded admirably with over 100 reports which were disseminated electronically and in hard copy to over 80 Federal Government addressees, including the Federal laboratories. The private sector is reached through the Department of Commerce's National Technical Information Service (NTIS), which uses these reports extensively in their weekly subscription publication, Foreign Technology Abstract Newsletter (FTAN). In contrast to the other 25 categories of Abstract Newsletters that NTIS publishes (whose subscriptions have decreased by 8 percent), FTAN subscriptions have increased from 173 in January 1989 to 273 by the end of September and are projected to virtually double by the end of calendar year 1989. The STRIDE articles in FTAN are generating requests for additional information primarily from specialized journals and newsletters, thus multiplying the audience for the material. NTIS has received many congratulations from their subscribers about the high quality of the new FTAN. The editor of one of the MIT Press Journals recently said that the material was excellent and that she recommends the FTAN to all the scientists she meets.

The National Science Foundation often uses STRIDE reports as the basis for original analytical articles in its periodical publication for NSF staff, Interna-

tional S&T Insight. The STRIDE reports are also included in the NSF on-line system which is available to NSF staff. As with Insight, plans call for the system, with its reports of foreign science and technology trends, developments, budgets, and policies, to be made more widely available (via electronic network) to the U.S. scientific and engineering community. NSF has found the science officers to be an invaluable resource, not only for their excellent reporting, but as vital links to foreign scientific, engineering and technological communities.

In addition to STRIDE reports, most U.S. Embassies abroad report regularly on environmental, medical, energy, space and other issues. While these reports usually concern specific policy areas, they are highly useful to the offices and agencies targeted. The Department of State is working with science officers to ensure that the reports are made available on the widest possible basis commensurate with policy needs.

### RECOMMENDATIONS

During Fiscal Year 1989, the United States achieved significant progress in international cooperation in science, technology and environment, including initiation of several new activities. Review of these cooperative activities of the past year suggests that continued progress in many of these areas will depend on sustained U.S. commitment. For the new term, some recommended

areas of priority concern and proposed future actions include:

#### Environment

Recommendation: seek collaboration in advancing U.S. interests in international environmental issues, including:

- Continue to work internationally to have the Intergovernmental Panel on Climate Change (IPCC) viewed as the primary international forum for developing a response to climate change and, through IPCC meetings on LDC participation and other means, seek the active participation of developing countries in the IPCC process.
- Strive for the development of an international consensus on climate change, working through the IPCC to ensure the completion of a consensus report on the science and impacts of climate change and on possible response options.
- Encourage international ratification of the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer.
- Further international coordination of research on the environmental risks of internationally traded substances.
- Participate in the negotiation of an agreement on acid rain with Canada, including specific targets

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

and timetables for emissions reductions as provided for by the legislated amendments of the Clean Air Act.

- Work toward conclusion of a Protocol to the Long-Range Transboundary Air Pollution agreement to control the emissions of volatile organic compounds.
- Formulate a U.S. position on the desirability of an international convention to preserve biological diversity.

### Space

**Recommendation:** Working with private groups, promote international cooperation where appropriate to further U.S. national and scientific interests in space.

- Strive for sustained international commitment to development of the Space Station Freedom initiative.
- Ensure that U.S. decisions concerning possible foreign government participation in the Moon/Mars initiative, strengthen this human space exploration initiative and our overall relations with key allies and the Space Station partnership.
- Strengthen U.S. cooperation with other countries in the use of earth observing systems to understand the physical processes and biological diversity of our planet.

### Science and Technology

**Recommendation:** Promote U.S. science and technology interests in multilateral and bilateral fora to maintain U.S. access to foreign research and development programs; to promote the openness of research results; and to secure international support for large U.S. science projects, consistent with national security, economic, and other foreign policy interests.

- Working with the technical agencies and the field, assess foreign technology development programs and their impact on U.S. competitiveness; seek U.S. participation in these programs where appropriate.
- Seek to derive mutual benefit from greater openness, on the part of the Soviet Union and eastern European countries, toward scientific and technological exchanges, particularly regarding access to scientists and scientific data, and support expanded science and technology activity, consistent with national security concerns and foreign policy objectives.
- Seek to maintain, and strengthen where possible, cooperative science and technology relations with Europe as nations move toward a unified European market; review the implications of this trend for U.S. science and technology developments and competitiveness concerns.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

### **Nuclear**

**Recommendation:** Reinforce the U.S. position as a reliable nuclear supplier through timely nuclear export licensing decisions and the negotiation and implementation of agreements for peaceful nuclear cooperation meeting the requirements of the Nuclear Non-Proliferation Act; continue efforts to restrain proliferation-sensitive countries from crossing the nuclear threshold and seek international cooperation to this end.

- Develop, negotiate, and implement mutually beneficial programs of bilateral peaceful nuclear cooperation with other countries, utilizing the resources of DOE, NRC and other agencies as appropriate.
- Work to strengthen the international nuclear export control regime and U.S. efforts to prevent illegal or questionable nuclear or dual-use exports, both from the U.S. and other countries.

### **Oceans, Polar and Fisheries**

**Recommendation:** Advance U.S. interests in management of international fisheries; promote the further study and appropriate control of high seas driftnet fishing; establish new North Pacific Salmon Organization and further implementation of the U.S.-USSR Comprehensive Fisheries Agreement.

**Recommendation:** Support and strengthen the U.S. worldwide naviga-

tion and general maritime position as outlined in former President Reagan's Ocean Policy Statement of March 10, 1983.

**Recommendation:** Develop and implement U.S. oceans and polar policy, including

- Protecting the marine environment and marine mammals;
- Implementing U.S. ocean policy objectives as they apply to ocean resources, e.g. minerals, oil and gas exploration;
- Coordinating U.S. activities and developing and implementing policy relating to marine science and technology, and exploration of the seas;
- Working toward ratification of the Antarctic Minerals Convention;
- Continuing U.S. commitment to protection and conservation of whales internationally.

### **Resources**

**Recommendation:** Continue efforts to incorporate science and technology expertise more effectively into the process of formulating and implementing U.S. foreign policy:

- Develop the Science and Environment Resources Package which is intended to project Department of State resource requirements, both in Washington and overseas, for the conduct of scientific, tech-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

nological, and environmental affairs.

- Continue efforts as required by Executive Order 12591 to identify qualified candidates as needed to apply for assignments at U.S. embassies as science attaches and counselors.

## Chapter 2: Selected Topics

### INTRODUCTION

The realm of science and technology is not limited solely to the advance of knowledge. In addition, the application of scientific and technological knowledge is an integral element in solving many of the world's problems. Environmental, health, space, nuclear, and economic issues are just a few of the broad areas where the utilization of science and technology is an important tool in developing effective solutions to international problems. A review of Fiscal Year 1989 international S&T activities highlights areas of importance and the efficacy of this approach.

### ENVIRONMENTAL ISSUES

#### Global Climate Change

Efforts to develop a broad international consensus on climate change issues are focused on the Intergovernmental Panel on Climate Change. This organization is truly international in scope, involving over 50 nations, hundreds of scientists and policymakers, and many non-governmental and international or-

ganizations. The IPCC is an ad hoc mechanism created jointly by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) in response to the need for an orderly process to ensure that research, monitoring, and impact assessment studies proceed in a rational manner, and that international agreement on the results of these assessments exists before legal or regulatory activities are undertaken.

At the first meeting of the IPCC, in Geneva in November of 1988, the Panel agreed that its main tasks were to assess scientific information related to the various components of the climate change issue, review progress and conduct studies of environmental and socio-economic consequences of climate change and to develop and evaluate possible realistic response strategies. The Panel set up three Working Groups to accomplish this task. To facilitate coordination among the Working Groups, the IPCC established a Bureau consisting of the three Officers of the Panel (the Chairman, the Vice-Chairman and the

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Rapporteur) and the Chairs and Vice-Chairs of the Working Groups. The work of the IPCC has progressed rapidly. Forty-three nations attended the second meeting of the IPCC in June of 1989. The working groups are scheduled to complete draft reports for integration into a single report by early June, 1990, and the IPCC expects to complete the first assessment report in early fall of 1990.

- Working Group I (science), chaired by the UK with Brazil and Senegal as the Vice-Chairs, is reviewing the state of knowledge of the science of climate change. Special emphasis areas are: recent measurements, chemistry, and atmospheric lifetimes of greenhouse gases; a critical review of available climate data; evaluations of existing disagreements on regional climate change; new evaluations of sea level rise; and future requirements for climate research. Thirty international scientists are serving as lead authors of the assessment, aided by the participation of over 200 scientists from nearly 30 developed and developing countries. The final report will summarize the major knowns and unknowns of the science, with policy-relevant scientific conclusions highlighted.

- Working Group II (impacts), chaired by the USSR with Australia and Japan as Vice-Chairs, is focusing its efforts on the social and economic impacts of global climate change. The Working Group has held two plenary meetings and a number of workshops since the IPCC began its work, and a report is now being prepared that covers impacts on permafrost, ecological processes, human settlements, water resources, natural terrestrial ecosystems, world oceans and coastal zones, forests, and agriculture and land use.

- Working Group III (response strategies, RSWG), chaired by the US with Canada, China, Malta, the Netherlands and Zimbabwe as the Vice-Chairs, was asked to develop and evaluate response strategies to global climate change. The working group is concentrating on two classes of broad strategies: limitation and adaptation. To address limitation strategies, two subgroups have been formed. The first, focusing on energy and industry sectors (including transportation), is co-chaired by Japan and China and the second, focusing on agricul-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

ture and forestry, is co-chaired by the Federal Republic of Germany and Zimbabwe. To address adaptation strategies, two more subgroups have been formed. One of these, co-chaired by the Netherlands and New Zealand, is investigating coastal zone management and the other, co-chaired by Canada, France, and India, is focusing on resource use and management.

The Energy and Industry Subgroup (EIS) is preparing papers that describe both country-specific solutions and a global response strategy. In pursuing this objective, it has held several meetings since May of 1989 to elaborate on methodologies for country-specific and global or integrated scenarios on energy demand and supply and greenhouse gas implications. A number of country-specific studies were presented, including Australia, Canada, France, the Federal Republic of Germany, Japan, the Netherlands, the United Kingdom, the United States, the Soviet Union and Eastern Europe. This group is also expected to lead investigations into emission reduction targets, but the nature of this investigation has not yet been determined.

The Agriculture, Forestry, and Other Human Activities Subgroup (AFOS) ar-

anged four workshops in late 1989 and early 1990. Workshops on problems of temperate forests and boreal forests were held in October, 1989 in Bonn and Finland, respectively. One organized by the US Forest Service on tropical forests has been scheduled for January, 1990, in Brazil. A fourth workshop on agricultural problems was held in the United States in December, 1989. The Coastal Zone Management Subgroup (CZM) is preparing six papers on: the extent and timing of sea level rise and associated climate change effects; the impact of sea level rise and climate change; problem identification; available adaptive options and costs for coastal areas at risk; social, economic, legislative, institutional, and environmental implications of adaptive options; and possible funding mechanisms for adaptive options. It is also preparing an inventory of information on technologies and practices for adapting to sea level rise and a regional inventory of existing laws and policies concerning management of development in coastal areas. In addition to these studies, two major workshops were conducted or are planned, one in December, 1989, that concerned coastal zone issues in North and South America, Western Africa, Europe, the Baltic States, and the Nordic Countries, and the other in February, 1990, that will focus on

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

island and tropical countries. The member countries of the Resource Use and Management Subgroup (RUMS) have been drafting papers that address the management of water resources, salinization, desertification, forestry, agriculture, fisheries, animal husbandry, unmanaged ecosystems, and land use in general. "Theme" papers on biodiversity, food security and water resources have also been prepared by UNEP, FAO and the American Association for the Advancement of Science Panel on Climate Change and Water Resources, respectively. A workshop to discuss these papers and solicit additional ideas about the management of these resources took place in November of 1989 in Geneva.

Apart from the activities of the individual subgroups, the Working Group undertook the development of base emissions scenarios to create a basis for the response strategies and the work being undertaken in groups I and II. These scenarios anticipate the conditions necessary for the radiative equivalent of a doubling of the atmospheric concentration of carbon dioxide from its pre-industrial value to occur by the years 2030, 2060, and 2090 and stabilizing thereafter. Another scenario is being developed that will consider the radiation equivalent to a carbon dioxide concentration of less than twice the pre-

industrial value. The RSWG also examined implementation mechanisms that could be incorporated into the separate RSWG subgroup reports. As part of this examination, the RSWG subgroup held a workshop in October, 1989, in Geneva to examine: legal and institution measures, including elements of a framework convention; technology development and transfer measures; financial measures; public education and information; and economic and market mechanisms. The elements contained in the topic papers that were developed are expected to be incorporated into the implementation strategies prepared by the sub-groups. The IPCC Bureau set up a small ad hoc subgroup, chaired by Saudi Arabia, to investigate means to promote the participation of the developing world in the activities of the IPCC. A report was submitted to the IPCC at its June 1989 meeting, which led to the creation of the IPCC Special Committee on the Participation of the Developing Countries, chaired by France. The work of this Special Committee is ongoing.

The United States is by far the largest contributor to research efforts on global change, and these efforts are a key to the success of the IPCC process. U.S. scientists and experts are providing substantial support in virtually every aspect of the work of the science and impacts working

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

groups. Specific contributions in the science working group are in: the investigation of climate forcing trends (with Sweden), climate forcing responses (with France), climate trends (with the UK and the USSR), climate processes (with the FRG and the USSR), model simulations (with Canada, the UK, and the PRC), and model predictions (with the UK and Japan). The primary U.S. contact point for the science working group is the executive secretary of the Committee on Earth Science. This is an interagency committee which is planning and coordinating the United States global change research program, a major focused effort by U.S. agencies to provide a sound scientific basis for addressing national and international policy on global change.

With the Impacts Working Group, the US is investigating water resources (with Algeria) and oceans and sea level rise. The primary contact for this group is the National Climate Program Policy Board, an interagency group that is evaluating the impacts of climate change. As the chair of the Response Strategies Working Group, the U.S., through the State Department, plays the primary coordinating role. As with the other working groups, US experts are involved in all aspects of the work of the subgroups, and the US has agreed to host a number of

workshops to consider measures to limit or adapt to climate change.

U.S. policy formulation, for the IPCC in general and the RSWG in particular, is coordinated by the Department of State through the National Security Council's Policy Coordinating Committee (PCC) on Oceans, Environment, and Science. All interested agencies are represented on the PCC, which has established a Working Group on Climate Change that has the responsibility of preparing draft reports and documents for consideration by the PCC. To facilitate this coordination, the State Department's Bureau of Oceans and International Environmental and Scientific Affairs (OES) has established, pending final approval, an Office of Global Change (EGC). This office is responsible for formulating and coordinating the implementation of U.S. global change policy in the international arena. Since the OES Assistant Secretary chairs the PCC and the RSWG, EGC helps staff both of these and coordinates with U.S. agencies to prepare U.S. delegations for participation in RSWG meetings and other international fora. The United States, through EPA, DOE and USAID, is participating in the Organization for Economic Cooperation and Development (OECD)'s Environment Committee's to evaluate the socio-economic implications for OECD

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

countries of potential global climate change caused by the continuing build-up of carbon dioxide and other greenhouse gases and policy options for mitigating any effects. This will involve cooperation with the International Energy Agency (IEA) in order to evaluate the implications of climate change for energy policy and a comparative analysis of methodologies to analyze socioeconomic impacts of climate change. In addition to the joint IEA/OECD report, the United States is conducting with the IEA several other analyses of energy issues as they pertain to climate change. These include an analysis of emission controls in electricity generation and industry, published in 1988, and a policy overview of the relationships between energy and the environment, to be published in January of 1990. The IEA and the OECD also conducted an expert seminar on energy technologies for reducing greenhouse gas emissions in April, 1989, with the proceedings published in 1989. To investigate the many uncertainties of global climate change, the primary multilateral scientific research programs in which the United States is participating are the World Climate Program, the International Geosphere/Biosphere Programme, and the Joint Global Ocean Flux Study.

The first of the major international research programs is the World Climate Program (WCP), administered by P with active participation by UNEP, ICSU, and the Intergovernmental Oceanographic Commission. Initiated in 1979, the program was formed to coordinate international climate-related activities. The program consists of four components: the World Climate Data Programme (WCDP), the World Climate Applications Programme (WCAP), the World Climate Impact Studies Programme (WCIP), and the World Climate Research Programme (WCRP). WCP has placed increasing emphasis on the decades-to-centuries time scale in its effort to narrow the range of uncertainties regarding climate change and to refine prediction capabilities. ARP is responsible for the data and applications components as well as the overall coordination of the program, while UNEP coordinates the impacts component. The WCRP is managed jointly by ICSU and LP. U.S. involvement in the WCRP is coordinated by the National Weather Service. Major international research efforts in which the U.S. is participating that are part of the World Climate Research Programme are the World Ocean Circulation Experiment (WOCE) and the Tropical Ocean and Global Atmosphere (TOGA). These

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

are international investigations into ocean phenomena and their interactions with atmospheric phenomena. Intensive planning has been taking place on various aspects of the WOCE program, and some research efforts have been initiated. One significant aspect on which planning is still underway is modeling and predicting the circulation of the ocean and its role in climate change. The U.S. has completed an implementation Plan for WOCE; following final review and revision, implementation of the 10-year WOCE plan is expected to commence in 1990, with some aspects continuing into the next century. A more recent international climate-change research effort is the International Geosphere-Biosphere Programme (IGBP). Launched in September of 1986 by the International Council of Scientific Unions (ICSU) and scheduled to begin in 1992 and to last for at least a decade, the IGBP is an ambitious, long-range effort to describe and understand the interactive physical, chemical, and biological processes that regulate the total Earth system, the unique environment it provides for life, the changes occurring in this system, and the manner in which they are influenced by human actions.

A Special Committee to oversee the definition and implementation of the IGBP was formed in February of 1988.

This committee in turn created several coordinating panels to be responsible for developing specific programs in the areas of terrestrial biosphere-atmosphere chemistry interactions, marine biosphere-atmosphere interactions, biospheric aspects of the hydrological cycle, and effects of climate change on terrestrial ecosystems. Because of its all-encompassing focus, the IGBP is designed to interact with other, ongoing international programs of research in each of the areas described above. These programs include:

- components of the World Climate Research Program (WCRP), particularly the International Satellite Land Surface Climatology Project (ISLSCP), the International Satellite Cloud Climatology Project (ISCCP), the Global Energy and Water Balance Experiment (GEWEX), the Tropical Ocean/Global Atmosphere Program (TOGA), and the World Ocean Circulation Experiment (WOCE);
- UNEP programs such as the Global Environment Monitoring System (GEMS) and the Global Resources Information Database (GRID);
- the Global Tropospheric Chemistry Program (GTCP), joint-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

ly coordinated by ICSU and the International Association of Meteorology and Atmospheric Physics (IAMAP); and

- the Joint Ocean Global Flux Study (JOGFS) and the Man and the Biosphere Program (MGP), coordinated by ICSU.

The IGBP is specifically intended to emphasize the study of interactive Earth processes that are not addressed by these programs. Thus far, four areas have been targeted for study:

- the role of oceanic organisms in the global CO<sub>2</sub> cycle;
- the role of biota in the cycles of chemicals in the atmosphere which give rise to the greenhouse gas effect;
- the role of plants in the exchange of energy and moisture between land and atmosphere; and,
- coordinated effort to recover information from natural archives that will illuminate connections among atmospheric composition, global temperature, ice extent, solar history, and the distribution of land and oceanic organisms.

National programs form the foundation of this effort, to be linked by various bilateral and multilateral activities. Some 30 nations have established national committees for the IGBP, and

about 20 nations are providing financial support to the IGBP secretariat.

The U.S. responded to the call for the IGBP by forming, through the National Academy of Sciences/National Research Council (NAS/NRC), a national committee, the Committee for Global Change, for the IGBP. This U.S. committee is being funded by agencies in the CES, and provides advice to the Government and scientific community about national activities related to global change. The U.S. research effort that interacts with the IGBP is the Global Change Research Project, created by the Committee on Earth Sciences (CES). To increase the overall effectiveness and productivity of Federal research and development efforts directed toward an understanding of the Earth as a global system, the Assistant to the President for Science and Technology Policy has established CES under the Federal Coordinating Council for Science, Engineering and Technology (FCCSET). CES is charged with reviewing and coordinating Federal programs and plans dealing with both national and international activities in earth sciences, earth sciences being broadly defined to include the physical, geological, chemical, and biological processes associated with the atmosphere, oceans, and the land. In Fiscal Year 1990, the CES distributed "Our

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Changing Planet: The FY 1990 Research Plan, which reported in detail the science aspects of global change research programs. Another report, "Our Changing Planet: the FY 1991 U.S. global Change Research Program," accompanied the President's 1991 budget and describes the budget aspects of the research plan.

The particular research activities that comprise the Global Change Research Program are grouped into the following 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.

A topic that crosses all seven science elements is data management.

CES is committed to coordinating this program with the many groups currently undertaking global change research. These include the national and international scientific community (both informally and through such groups as NAS and ICSU), government agencies, and intergovernmental science bodies such as the BS, the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and UNEP.

Another international program in which the U.S. participates is the decade-long Joint Global Ocean Flux Study (JGOFS). The main goal of the JGOFS is to determine and understand on a global scale the processes controlling the movement of carbon and associated elements in the ocean, and to evaluate the related exchanges with the atmosphere, sea floor and continental boundaries. JGOFS grew out of similar national studies in the U.S., U.K., France, FRG and Japan, and is planned to interact with several global geoscience and other major oceanographic programs, including the World Ocean Circulation Experiment (WOCE), the Tropical Ocean and Global Atmosphere (TOGA) study, the Global Tropospheric Chemistry Programme, the International Geosphere-Biosphere Programme (IGBP), the Global Investigation of Pollution in the Marine Environment (GIPME), and the ocean aspects of the World Climate Research Programme (WCRP). The first fully international effort under JGOFS will concentrate in the North Atlantic with extensions into the Arctic Ocean. The participants will include the U.K., FRG, Canada and the U.S., with U.S. efforts also underway in the Pacific.

The United States actively participated in several international conferences on

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

global climate change during 1989 that have led to an international consensus on a process for addressing global climate change. The most important of these are the U.N. General Assembly, which passed Resolution 43/53 on the Protection of the Global Climate for Present and Future Generations of Mankind, the G-7 Economic Summit, which issued a communique that emphasized the importance of environmental problems, and the Noordwijk Conference on Atmospheric Pollution and Climate Change, which issued a consensus document that represents the most recent contributions to the development of a consensus among policy makers with respect to global climate change.

In January of 1989, the United Nations General Assembly, in adopting Resolution 43/53 on the Protection of the Global Climate for Present and Future Generations of Mankind, formally recognized the common problem of climate change and gave its support to the emerging process to address it. It also urges governments, intergovernmental and non-governmental organizations and scientific institutions "to treat climate change as a priority issue, to undertake and promote specific, cooperative action oriented programmes and research so as to increase under-

standing on all sources and causes of climate change." The UN called upon "governments and international organizations to collaborate in making every effort to prevent detrimental effects on climate and activities which affect the ecological balance".

At the July 1989 Economic Summit in Paris, the seven most industrialized nations recognized the problem of climate change and the IPCC process to address it. The member nations advocated common efforts to limit emissions of carbon dioxide and other greenhouse gases which threaten to induce climate change and strongly supported the work undertaken by the Intergovernmental Panel on Climate Change on this issue. The member nations also stated that the conclusion of a framework or umbrella convention on climate change to set out general principles or guidelines "is urgently required" to mobilize and rationalize the efforts made by the international community, with specific protocols containing concrete commitments to be fitted into the framework as scientific evidence requires and permits. Specific support was given to the work of the United Nations Environment Program, the BS and the IPCC.

The Noordwijk Declaration on Atmospheric Pollution and Climatic Change was endorsed by 70 Environment Mini-

sters, including the Administrator of the U.S. Environmental Protection Agency, in a conference in November of 1989 in Noordwijk, the Netherlands. This Declaration, which is the most current statement of the international consensus on climate change, urges all countries to take steps individually and collectively to promote better energy conservation and efficiency, recognizes the need to protect forest resources, and urges all countries to become Parties to the Vienna Convention for the Protection of the Ozone Layer and to the Montreal Protocol. It relates a number of specific items to the IPCC for investigation and consideration. The Declaration is also significant in that it represents an endorsement of and a commitment to the IPCC process by many nations that had not previously been active in the IPCC process.

### **Biological Diversity**

H.J. Resolution 648, signed on October 25, 1988, calls upon the President to exert U.S. leadership in negotiating an international convention to conserve the Earth's biological diversity.

A senior-level U.S. delegation led by the Department of State attended the November 1988 meeting of experts of the U.N. Environment Programme (UNEP). The group of experts considered: (a) was a new convention on biological diversity necessary and, if so,

what should its principle elements be; and (b) how can the international community ensure that existing international agreements in the field of biological diversity are melded into a comprehensive, coordinated network?

There was broad agreement, however, as to the measures and obligations which a convention should include, e.g.: networks of protected areas; inventory and classification of species; training of scientific and management personnel; land-use planning and species protection measures that safeguard biological diversity; and a halt to unsustainable exploitation and pollution of the biosphere.

On the question of melding together the administration of the existing international agreements affecting biological diversity, the group recommended that an umbrella convention not be considered. Instead, they urged that participation in the existing agreements be broadened and strengthened, and that the secretariats of the agreements work more closely together.

In the winter of 1988-1989, the Department of State reviewed a provisional draft of the IUCN convention. While sections of the IUCN document will probably be incorporated into any eventual official draft convention, the IUCN draft raised several areas of concern among U.S. government agencies; in par-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

ticular, the mechanism proposed to raise funds for conservation.

The Department of State, recognizing that a biological diversity convention will affect many economic interests, organized a symposium in the spring to solicit views from a broad range of business, government, and conservation organizations. Held in Washington, D.C., March 13, 1989, the symposium served to raise the possibility of a convention with the private sector for the first time. U.S. Representative Claudine Schneider (R-RI) participated in the panel discussion which followed presentations by Assistant Secretary of State Frederick M. Bernthal and IUCN Director General Martin Holdgate.

Congressional staff members were among the audience of the symposium. Though no specific conclusions were reached, the private sector representatives did not indicate opposition to the concept of a biological diversity convention. Future consultations of this nature will be required in the future.

The 15th Session of the UNEP Governing Council, was held in Nairobi May 15-26, 1989. The U.S. delegation introduced a resolution calling upon the UNEP Executive Director to initiate work to negotiate a biological diversity convention. This resolution was adopted unanimously.

In July, 1989, IUCN made its latest draft of a proposed biological diversity convention available to the international community for consideration. This long and complex draft contains a controversial funding mechanism which allocates fees and royalties arising from commercial use of biomaterial to a world conservation fund administered by the parties to the convention.

The relevant agencies of the Executive Branch, coordinated by the Department of State, will be studying this draft with care. In the coming months we will wish to obtain the views of the Congress and Congressional staff, the business community, and the non-governmental organizations concerned with the conservation of biological diversity.

### **Tropical Forests**

In Fiscal Year 1989 the US continued its efforts to promote conservation and sustainable use of tropical forests. The high level attention given to this issue was evidenced by the focus given to tropical forests in the communique issued at the end of the Paris G-7 Economic Summit in July. The US joined the G-7 in recognizing the link between deforestation and global warming, and stated our readiness to assist nations with tropical forests through financial and technical cooperation, and in international organizations. The FAO Tropical Forestry

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Action Plan and the International Tropical Timber Organization (ITTO) were specifically mentioned as deserving of G-7 support.

The US sent strong delegations to the fifth and sixth meetings of the ITTO, in Yokohama and Abidjan, in November 1988 and May 1989, respectively, where we played an active role in the consultations between members of the organization. US views were given considerable weight in decisions on proposed projects designed to identify and promote the use of sustainable management of tropical forest resources. It is the Administration's intention to request funds for Fiscal Year 1991 for the first US contribution to the ITTO Project Account, used to fund such management projects. We remain optimistic that this international commodity agreement, the first to contain environmental provisions, which serves as the principal forum for dialogue among producers and consumers of tropical timber, will play an increasingly significant role in helping to improve global forestry management.

In regard to the Tropical Forestry Action Plan (TFAP), the US attended the ninth session of the FAO Committee on Forest Development in the Tropics in Rome Sept. 11-15, 1989, to discuss progress made on implementing the TFAP. Sixty-three countries have now

requested assistance in drawing up national forestry management plans from the TFAP office. This is the most important kind of assistance given under the TFAP. To give impetus to the preparation of these management plans, the Administration intends to request funds in Fiscal Year 1991 for the first US contribution to the TFAP Trust Fund. The US realizes that the faster these management plans can be prepared, the sooner we will have a firm foundation for preserving the world's tropical forests.

The task force on tropical forestry research sponsored by UNDP, the World Bank, FAO and WRI following the July 1988 Bellagio Conference on Tropical Forests, presented its recommendations at "Bellagio II" which convened in Wiston, England in December 1988. The U.S. participated in both the task force and at Bellagio II, and joined in the conference decision to expand the Consultative Group on International Agricultural Research (CGIAR) to include a forestry research component. The Technical Advisory Committee of the CGIAR is exploring ways of including forestry research within the CGIAR system.

To facilitate a full exchange of views between agencies of the Executive branch, the U.S. Department of State co-chaired with the U.S. Forest Service a

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

meeting in August of the Interagency Task Force on Tropical Forests. These meetings promote discussion of common problems and objectives.

The Department of State continues to support the concept of debt-for-nature swaps, and has worked closely with the Treasury Department in encouraging the World Bank and the private banking sector to direct more resources toward these ends.

In view of the suspension of our diplomatic relations with Panama, there were no activities of the U.S.-Panama Joint Commission on the Environment to report during this period.

### Acid Rain

Acid rain continues to be a significant environmental concern. Emissions which contribute to its formulation cross borders, and measures to reduce such emissions could have considerable economic impacts. This has made it an important international issue -- particularly among European countries and between the U.S. and Canada.

Diplomatic problems related to cross-boundary air pollution, including acid rain, first surfaced in Europe in the 1950s when the Scandinavian countries became concerned about industrial emissions traveling across the North Sea. Since then, acid rain has become a major concern in much of Europe. The Con-

vention on Long-Range Transboundary Air Pollution (LRTAP) was signed in 1979 by 35 countries, including the U.S., Canada and the European Community. Parties to the Convention agreed to "endeavor to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution". The Convention entered into force in 1983.

A protocol to the Convention controlling sulfur dioxide emissions was signed by 21 countries, including Canada, in 1985 and entered into force in 1987. The sulfur dioxide protocol binds signatory governments to reduce their 1980 sulfur dioxide emissions levels by 30 percent by 1993. The U.S., the U.K. and Poland were among a number of parties to LRTAP that did not sign the protocol. The U.S. did not sign because the protocol did not take into account U.S. leadership in instituting extensive control programs in the U.S. U.S. sulfur dioxide emissions declined by 29 percent between the peak year of 1973 and 1983 and by 10 per cent between 1980 and 1983.

Discussions on a protocol under LRTAP to control emissions of nitrogen oxides were begun in 1985 and formal negotiations began in 1987. The nitrogen oxide protocol was signed by the U.S. and other countries in October 1988

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

at Sofia, Bulgaria. The main provisions of the protocol include:

- (1) a freeze on nitrogen oxides emissions at 1987 levels by December 31, 1994;
- (2) the use of best available technologies on new sources when economically feasible;
- (3) a commitment to endeavor to develop a follow-on protocol for nitrogen oxides to meet environmental effects control standards, instead of emissions control standards in the present protocol, for implementation in 1996;
- (4) the exchange of information on control technologies; and
- (5) increased availability of unleaded gasoline in Europe.

Acid rain has been a major item on the U.S./Canadian agenda for more than a decade. Among recent issues between the two countries, it has been one of the most resistant to resolution. The first joint U.S.-Canada effort to deal specifically with this issue was the Bilateral Research Consultation Group established in 1978 to report on the extent and significance of long-range air pollution. Additionally, in 1978 the U.S. Congress called upon the President to "make every effort to negotiate a cooperative agreement with the Government of Canada aimed at preserving the mutual airshed

of the United States and Canada". This led to the Joint Statement on Transboundary Air Quality of July 16, 1979, and the Memorandum of Intent of August 5, 1980 in which the two governments explicitly recognized the seriousness of acid rain and accepted a mutual commitment to work toward a bilateral agreement as soon as possible. However, no bilateral air quality agreement resulted from the Memorandum of Intent due to differences the two sides held concerning our scientific understanding of the nature and effects of acid rain. Negotiations ended in 1983.

In March 1985, then President Reagan and Canadian Prime Minister Mulroney met at Quebec City to discuss a wide range of bilateral issues, including the environment. Acid rain was acknowledged publicly as a serious concern impacting bilateral relations and each leader appointed a Special Envoy to review the issues. The Envoys issued a joint report which was endorsed by the President and Prime Minister in March 1986.

The report contained three sets of recommendations to enable the two countries to resume a fruitful dialogue and take constructive actions to reduce the stress this issue had created without immediately abandoning major policy positions.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

●First, it recommended that the U.S. government "implement a five-year, five-billion dollar control technology commercial demonstration program, with the federal government providing half the funding for projects which industry recommends, and for which industry is prepared to contribute the other half of the funding." The primary purpose of the program is to establish cheaper and more efficient technologies that might support future sulfur dioxide and nitrogen oxides emissions control programs. The Envoys also stated that the program should result in some near-term reductions in U.S. air-borne emissions affecting Canadian ecosystems.

●Second, the report recommended measures to enhance bilateral cooperation and consultation, including establishment of a bilateral advisory and consultative group on transboundary air pollution. Third, they recommended a cooperative program of research in areas of special value to decision makers in guiding the development of environmental policies.

The U.S. has actively implemented these recommendations. Regarding the

innovative control technologies program, the Administration has requested the full \$2.5 billion in federal funding recommended by the Envoys. It has implemented the first phase of the Clean Coal Technology Program and initiated the second phase. Also, the Secretary of DOE has established an advisory panel, with Canadian and U.S. public participation, to advise on the Department's funding and selection of innovative control technology demonstration projects.

Acid rain remains our major unresolved bilateral issue with Canada. In his budget address to the Congress on February 9, 1989 and in conversations the next day with Prime Minister Mulroney, President Bush announced that he would submit a comprehensive proposal to improve air quality which would include acid rain reduction targets and timetables. The President also indicated that, subsequently, discussions on a bilateral accord could begin with Canada. In July, the President submitted to Congress his proposed amendments to the Clean Air Act with provisions for curbing emissions of acid rain precursors.

The U.S. has indicated to Canada that it will be prepared to begin formal negotiations on a U.S./Canada Air Quality Accord when our clean air legislation has made sufficient progress in the Congress-

sional process. Since the President submitted his proposal to the Congress in July, we have been holding a series of meetings with the Canadians for discussions to prepare the ground for such negotiations. The Canadians have already reduced their sulfur emissions by 40% and expect to reach their 50% target of 2.3 million tons by 1995.

### **Protection of the Ozone Layer**

During 1989, substantial progress was made in worldwide cooperation to protect the stratospheric ozone layer. The U.S. government continued to be a leader; both on advancing scientific understanding of ozone depletion and its possible effects; and in promoting worldwide phase-out of chlorofluorocarbons (CFCs) by the year 2000, provided that safe substitutes are available.

The Montreal Protocol on Substances that Deplete the Ozone Layer, which provides for reductions in production and consumption of the principal ozone-depleting chemicals, entered into force on January 1, 1989, having been ratified by the requisite eleven nations representing at least two-thirds of the global consumption of the controlled chemicals. As of December 1, 1989, 49 countries (including 18 developing countries) had ratified the protocol.

The first meeting of the Parties to the Protocol's framework agreement, the

Vienna Convention on the Protection of the Ozone Layer, was held in Helsinki, April 26 - 28, 1989. The Parties:

- adopted rules of procedure;
- arbitration procedures;
- financial rules and a budget;
- and designated UNEP as the secretariat for both the Convention and the Montreal Protocol.

The Parties also agreed on measures to implement the research, monitoring and information exchange provisions of the Convention.

The first meeting of the Parties to the Montreal Protocol was in Helsinki, May 2 - 5, 1989. A precedent-setting aspect of the Protocol is its provision for periodic review of new scientific, environmental, technical and economic developments. The Parties endorsed the establishment of four panels under Article 6 of the Protocol to assess the control measures on the basis of scientific, environmental, technical, and economic information. They also established an open-ended working group to make recommendations regarding further control measures, based on the panels' conclusions, for consideration by the Parties at their second meeting in June, 1990. At this time, the working group will also make recommendations relative to financial and other mechanisms to implement the Protocol's provisions concerning infor-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

mation exchange and technical assistance to developing countries. Recognizing the limited information available, the working group has agreed on the initiation of a series of representative developing countries, to serve as the basis for estimating overall developing country needs.

The U.S. Environmental Protection Agency (EPA) is assisting Egypt, Mexico, and Brazil in carrying out studies. Other studies are either underway or planned for India, China, Venezuela, Kenya, Malaysia and Singapore. In addition, UNEP has commissioned a series of studies on methodologies for estimating overall developing country needs, and an evaluation of new and existing financing mechanisms.

In October 1989, nine major electronics firms in the United States announced the formation of an "Industry Cooperative for Ozone Layer Protection" to work with the EPA in eliminating the worldwide use of CFCs. The members of the cooperative will work through their foreign operations, suppliers, and customers to encourage the use of substitute chemicals, products and technologies in developing countries. In addition, under the Program for Alternative Toxicity Testing and the Alternative Fluorocarbon Environmental Acceptability Study,

a large number of chemical manufacturers worldwide are conducting joint toxicity and environmental acceptability studies for substitute chemicals. Pending the results of these and other environmental acceptability studies, industry is now working under an accelerated schedule to bring new chemical substitutes to the market within the next three to five years.

Cooperative international action to protect stratospheric ozone is a foreign policy priority because unilateral U.S. action would not be effective in protecting a global resource which is essential to the health and welfare of the citizens of the U.S. In addition, cooperative action minimizes trade distortions which would result from uneven application of controls on the production and use of ozone-depleting chemicals.

## **OCEANS, POLAR AND FISHERIES ISSUES**

### **U.S. - USSR Comprehensive Fisheries Agreement**

A US-USSR Intergovernmental Consultative Committee on fisheries (ICC) was established pursuant to the 1988 bilateral Comprehensive Fisheries Agreement. The ICC met twice during 1989 to discuss a broad range of fisheries issues, including unregulated fisheries in the Bering Sea and the illegal harvest by

third parties of salmon in the high seas areas of the North Pacific. On the former matter, the ICC established the Bering Sea Fisheries advisory Body (BSFAB) to advise the Committee on the rational management of fisheries in the Bering Sea including the area beyond the 200 mile limits (the "donut") and on actions which may be taken to reach agreements to control the unregulated fisheries in the "donut" area.

### **High Seas Driftnet Agreements with Japan, Korea, and Taiwan**

In the last decade, there has been a rapid growth in the use of high seas driftnets in the Pacific Ocean. This fishing method has been criticized as needlessly harmful to seabirds, marine mammals and other ocean resources not intended to be taken. Congress passed the Driftnet Impact Monitoring, Assessment and Control Act in 1987 which mandated that the executive branch negotiate monitoring and enforcement agreements with every country with a high seas driftnet fishery in the North Pacific. In 1989, we completed agreements with Japan, Korea, and Taiwan which include time and area fishing restrictions, licensing requirements, marking of nets and vessels, mandatory reporting of fishing vessel location, use of locating transponders, reporting of fish-

ing effort and catch, and tighter at sea and in port enforcement procedures. The agreements also establish cooperative scientific observer programs for non-target species. The resulting analysis will allow us to establish future policy towards high seas driftnetting and sets the stage for later cooperative activities.

### **Antarctic Treaty**

The Antarctic Treaty, which grew out of the International Geophysical Year of 1957-58, is the cornerstone of the Antarctic Treaty system. It establishes the basis for international cooperation in Antarctica; reserves use of the continent solely for peaceful purposes, prohibits military activities and nuclear weapons and wastes, and guarantees freedom of scientific research. The U.S. Antarctic Program of The National Science Foundation supports national goals to maintain the Antarctic Treaty, including ensuring the continent will continue to be used for peaceful purposes, to foster cooperative research in the region, to protect the environment, and to ensure equitable and wise use of living and non-living resources. The number of countries party to the treaty continues to grow. During the past year Colombia acceded to the treaty, bringing the number of treaty parties up to 39. In 1988 and 1989, five signatories: Finland, The

Republic of Korea, Peru, Spain and Sweden, became Antarctic Treaty Consultative Parties, bringing that total number to 25.

The treaty provides for regular consultative meetings, now held biennially. The Fifteenth Consultative Meeting was held at Paris in October 1989. At that meeting, a number of specific US proposals were approved by the Treaty parties. These included a new Code of Conduct on waste disposal, marine pollution measures, new types of protected areas, stronger action on environmental impact assessments, and agreement to develop coordinate environmental monitoring and data systems. It was also decided to hold a Special Consultative Meeting in 1990 on comprehensive environmental measures, as well as one on the liability protocol called for by the Convention on the Regulation of Antarctic Mineral Resources Activities. Special Consultative Meetings were held in 1988 and 1989.

### **The Convention on the Regulation of Antarctica Mineral**

#### **Resource Activities**

On November 30, 1989, the United States signed the Convention on the Regulation of Antarctic Mineral Resource Activities (The Wellington Convention) in Wellington, New

Zealand. To date, seventeen Consultative Parties have signed the agreement. The convention establishes the necessary legal and institutional framework for determination of the acceptability of mineral resource activities in Antarctica, should interest in them emerge in the future, and for regulating any activities determined to be acceptable.

It sets forth strict environmental standards and requires that no activity be permitted unless there is adequate information to assess possible environmental impacts. The impact assessment must be undertaken in light of these environmental standards. The convention provides the framework necessary to foster the major investment which would be required for any Antarctic mineral exploration and development meeting these environmental standards.

The convention is designed to ensure that issues relating to mineral resources do not become a source of discord or conflict in Antarctica. Its conclusion thus represents an extension and reinforcement of the Antarctic Treaty system which has maintained Antarctica as a zone of peace, free of military activity or conflict, for the past quarter century.

### **The Convention on the Conservation of Antarctic Marine Living Resources (CAMLR)**

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Another element of the Antarctic Treaty System is the Convention on the Conservation of Antarctic Marine Living Resources. It held its eighth annual meeting in Hobart, Tasmania, and passed stricter conservation measures for fish populations, including area and seasonal closures, and timely reporting requirements. A system of inspection was implemented, which will allow countries to board and inspect fishery vessels of CAMLR countries, which are operating in Antarctic waters. There are presently 24 signatories to the Convention.

### **Convention for the Conservation of Antarctic Seals (CCAS)**

The Convention for the Conservation of Antarctic Seals held its first meeting since the Convention came into force in 1978 in London September 12-16, 1988, to review its operations to date. The meeting featured country reports on sealing and research. The Soviet Union described its experimental 1985-86 sealing expedition, which took 4800 seals (mostly crabeater seals). It was agreed that commercial sealing was unlikely for the foreseeable future. Highlights of the meeting included: 1) agreement to new requirements for scientific reporting, 2) prohibition of the taking of Weddell seal pups, 3) new steps to protect against the introduction of canine distemper and

other viruses into the Antarctic environment.

### **The Arctic**

During the past year scientists and government officials from the US, Canada, Scandinavian countries and the Soviet Union have explored the possible formation of a non-governmental International Arctic Science Committee. The goal of the committee, would be the promotion and coordination of international scientific cooperation in the Arctic.

The United States also participated in consultations with other Arctic countries on Arctic environmental protection. At Finland's initiative, countries met in Rovaniemi, Finland, in September 1989, and agreed to meet again in April 1990, in Yellowknife, Canada.

### **Marine Mammals**

The U.S. firmly supports the conservation of whales, based on the program determined by the International Whaling Commission (IWC). In 1989, the U.S. hosted the 41st annual meeting of the IWC in San Diego, at which resolutions critical of the scientific whaling of Japan, Iceland, and Norway were passed. In addition, U.S. scientists and officials met with representatives of each country in an effort to help bring the scientific whaling programs into compliance with criteria established by the IWC.

## NUCLEAR ISSUES

### Nuclear Non-Proliferation

A fundamental policy underlying all United States nuclear cooperation with other nations is that such cooperation may take place only under arrangements which assure that it does not, in any way, assist the spread of nuclear explosives capabilities. A detailed report of United States actions to implement this policy is submitted by the President annually to the Congress pursuant to Section 601 of the Nuclear Non-Proliferation Act of 1978 (Public Law 95-242, 92 Stat. 120). In summary, United States non-proliferation is grounded in three basic elements:

- First, cooperating parties must make firm and legally binding non-proliferation commitments. The Nuclear Non-Proliferation Treaty and the Treaty for the Prohibition of Nuclear Weapons in Latin America (Tlatelolco) represent the best way for other nations to make such peaceful use pledges.
- Second, we rely for verification of these commitments on the international safeguards system implemented by the International Atomic Energy Agency. Under United States law, significant nuclear exports may only be con-

ducted to nations which accept such safeguards over their entire nuclear programs.

- Third, we cooperate closely with other nuclear suppliers in implementing a system of nuclear export controls, to prevent countries of proliferation risk from obtaining commodities and technology which could assist a nuclear weapons program.

These basic elements represent only the framework for a very complex and active program of non-proliferation. The President's 601 Report should be consulted for further details on the implementation of United States non-proliferation during the past year.

### Nuclear Safety - Post Chernobyl

Since the April 1986 accident at the Chernobyl nuclear power plant, the U.S. has been working through the International Atomic Energy Agency and the Nuclear Energy Agency, as well as bilaterally with other countries, to improve nuclear safety practices worldwide. Highlights of the 1989 activities include (1) commencement of substantive cooperation with the USSR on a wide range of nuclear safety topics; (2) initiation of nuclear safety cooperation with Czechoslovakia; (3) a visit by a

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

U.S. team to the Juragua nuclear power plant in Cuba at the invitation of the Cubans to discuss nuclear safety, (4) progress on the development of a conceptual design for the international thermonuclear experimental reactor (ITER) by the four parties of the ITER project, the U.S., USSR, Japan, and the European Community; and (5) formal establishment of the World Association of Nuclear Power Plant Operators (WANO) with full support of the USG.

Cooperation under the U.S.-USSR Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety (MOC) was successfully initiated during 1989. All ten working groups met; the meetings alternating between the U.S. and the USSR. These included an exchange in July of U.S. and USSR nuclear power plant safety inspectors for seven weeks at the Zaporozhe and the Catawba nuclear power plants, respectively, to observe each others safety inspection programs. Also, in September 1989, a large team of U.S. officials and scientists visited the USSR to initiate cooperation on the topic of the health and environmental effects of the Chernobyl accident. This is a topic of utmost import to the USG, as we hope to advance our understanding of the effects of exposure to prolonged, low level radiation on both man and the environment through access

to the USSR research in these areas. The second meeting of the Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS) was held on October 30-31 in Washington. Both sides agreed that cooperation had progressed well during the year. In September, DOE proposed a new item for cooperation on improving operational safety practices which is designed to increase contacts between the U.S. nuclear industry and the Soviet nuclear industry.

On April 14, 1989, the U.S. Nuclear Regulatory Commission and the Czechoslovakian Atomic Energy Commission signed an Agreement for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters. The first NRC delegation visited Czechoslovakia in October. Discussions focussed on nuclear safety inspections activities and materials performance issues such as pipe and vessel fracture. Further exchanges are scheduled for 1990.

A U.S. team, including a NRC official, visited Havana, at Cuban invitation, for nuclear safety discussions and a site visit to the Juragua nuclear power plant which is under construction in Cienfuegos. Cuban commitment to nuclear safety was noted. Follow-on discussions are anticipated.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Several nuclear safety Information Exchange Agreements were renewed or consummated by the NRC and its counterparts in other countries in 1989. Successes included conclusion of a new agreement with the Canadians after several years of negotiation; agreement renewals with Brazil, Sweden, and Spain; and substantial information exchange and research cooperation activities with the U.K., France, the FRG, Japan, Korea, Taiwan, and Mexico.

The U.S., USSR, Japan and the European Community achieved significant progress on a conceptual design for the thermonuclear experimental reactor (ITER) in 1989. A final report on this phase is anticipated in 1990. If the parties agree and the results of the conceptual design effort warrant, their work would commence on a detailed engineering design for the reactor.

Although not an official USG activity, we note the formal establishment of the World Association of Nuclear Power Plant Operators (WANO) at a meeting in Moscow in February 1990. WANO's mission is to maximize the safety and reliability of the operation of nuclear power plants by exchanging information, encouraging comparison, emulation and communication among the power plant operators on their operational safety practices and problems. The U.S. hosts

one of the regional centers of WANO in Atlanta. All U.S. utilities are members of WANO. The USG endorses the mission of WANO and facilitates its activities as appropriate.

Fiscal Year 1989 witnessed continued US participation in the nuclear safety activities of the IAEA. State, DOE, ACDA, and NRC officials participated extensively in IAEA meetings, symposia, and technical assistance activities devised to improve nuclear safety.

The U.S. participated in several IAEA sponsored Operational Safety Review Team (OSART) visits to review safety practices at specific nuclear power plant facilities at the request of their governments. Indeed, the US requested an OSART review of the Byron Nuclear plant in Illinois which yielded positive review results. Subsequently, the NRC sponsored a meeting in April for U.S. OSART participants to evaluate their experience(s). The NRC then provided recommendations to the IAEA on possible improvements for OSART.

U.S. participants also assisted in the IAEA response to a nuclear incident in El Salvador in February, involving the exposure of three workers to a cobalt-60 source while conducting maintenance activities at a pool irradiator. The US Radiation Emergency Assistance Team (REACTS) from Oak Ridge National

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Lab was sent to El Salvador and later to Mexico City to treat the victims. As a follow-on, with IAEA assistance, the U.S. sponsored an interregional training course at Argonne National Laboratory on Safety and Regulation of Sealed Sources of Radioactive Material in April.

The Nuclear Energy Agency of the OECD carried out a number of safety activities, focussing especially on the human factor in nuclear plant operations. NEA revamped its Incident Reporting System Data Bank, intended to collect for wide dissemination, detailed information on safety-related plant incidents. The U.S. Nuclear Regulatory Commission, through Oak Ridge National Laboratories, took over administration of the Data Bank late in 1989 as an in-kind NEA contribution. NEA published a report on "The Role of Human Intervention in the Prevention and Mitigation of Severe Accidents"; and held two international meetings that drew wide attendance: a conference on Man-Machine Interface in the Nuclear Industry, and a symposium on Feedback of Operational Safety Experience from Nuclear Power Plants.

Fiscal Year 1989 also saw the termination of the LOFT project, a highly successful 10-year experimental program in which NEA supported continued operation of an Idaho research reactor

originally built by the U.S. Atomic Energy Commission that otherwise would have been retired prematurely due to lack of funding. The last test series run, which involved substantial meltdown of the core test bundle, provided information essential to U.S. understanding of the Three Mile Island nuclear accident.

A final two-day international conference on LOFT will be held in May 1990.

### **Global Warming and Nuclear Power**

As concerns about climate change increased, the international nuclear community accelerated efforts to examine the potential role of nuclear power in alleviating the greenhouse effect. Nuclear energy produces little of the greenhouse gases believed likely to cause climate change, and thus might continue to serve as an effective energy source in the 21st century. However, problems such as waste management and public acceptance must continue to be addressed and resolved. U.S. foreign policy efforts this past year have focussed in three areas:

#### **Current Safety**

In order for nuclear power to remain and expand as an alternative energy source, the current generation of reactors must establish a safe operating

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

record, and progress on waste management must be demonstrated. The U.S. has become one of the leading advocates of this approach to help preserve the important contributions of this technology to international energy security and more environmentally benign energy production in the future.

### **Public Acceptance**

What fears occur in the general public regarding nuclear power? How might these fears of the technology be overcome? What must national regulatory bodies do in order to gain the public trust?

### **New Reactor Technologies**

Smaller, "modular" reactors such as advanced pressurized-water reactors (APWR's) and high-temperature gas-cooled reactors (HGTR's) with passive safety features eventually may prove more cost effective, efficient and publicly acceptable than the light-water or graphite-moderated reactors currently favored by most nations. Although promising, these new designs will require additional development and demonstration on a commercial scale. Multilateral efforts to review the role of nuclear power in the energy mix have focussed in two international agencies, the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA) of the OECD. IAEA Director General

Hans Blix in particular has become a strong advocate for nuclear power as an important energy source with distinct environmental advantages, speaking to this issue at both the United Nations and in response to the Brundtland report on sustainable development. In August 1989, the IAEA sponsored an international conference in Chicago to examine the general role of nuclear power in response to global warming. The NEA is working closely with the Environmental Directorate of the OECD and the International Energy Agency in a common effort to identify the best, most environmentally benign energy technologies for both the short and long terms.

In response to the challenges presented by global climate change, both the IAEA and the NEA recently held high-level brainstorming sessions to revise the long-term orientations of their respective work programs. Both agencies reaffirmed the importance of maintaining high levels of activity in the fields of nuclear safety and waste management. Both agencies also regularly bring research scientists together to exchange ideas and experience from work with innovative reactor technologies such as those described above.

## **HEALTH AND QUALITY OF LIFE ISSUES**

### **Acquired Immune Deficiency Syndrome (AIDS)**

HIV/AIDS impact continues to accelerate in virtually all areas of the world. To date approximately 520,000 people have become clinically ill with the disease, while five million persons are estimated to be infected worldwide. Time from infection to illness averages 9-10 years. Essentially all who are infected will develop AIDS. There remains, therefore, an extremely large inevitable impact of disease from those already infected. Treatment remains only moderately effective, at best only slowing the inevitable fatal course of the illness. Prevention of infection remains the only effective approach to controlling this epidemic. Prevention means education and motivation of behavioral changes among those at risk for transmitting or acquiring the infection.

The virus responsible for Acquired Immunology Deficiency Syndrome is included in a group of viruses referred to as Human Immunodeficiency Viruses. Their unique ability to infect and destroy the immune system is now under intense study.

Within the past year, medications and vaccines have begun to look more promising. Research sponsored by the National Institutes of Health has

demonstrated the usefulness of several medications. Fifty-four other compounds are under study and may prove useful as therapeutic agents in years to come. Recent primate trials of killed virus vaccines offer encouragement for vaccine development but further breakthroughs are necessary before candidate vaccines will be ready for human efficiency trials.

The U.S. continues to support the World Health Organization's Global Programme on AIDS (GPA). The U.S., through the Agency for International Development (USAID), contributed \$25.5 million to the GPA in Fiscal Year 1989. An additional \$14.5 million was allocated with congressional mandate for HIV/AIDS program activities. An additional \$16 million of general development funds were also committed by USAID for HIV/AIDS related assistance.

USAID has compiled a data base for tracking international AIDS activities. The United States Government is the single largest contributor to international efforts to control the HIV/AIDS epidemic. In Fiscal Year 1989 the overall budget for all agencies was \$69 million. The largest share (38%) of the international AIDS budget was for the WHO/GPA. Of the remaining funds,

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

there are six agencies which engage in international AIDS activities. Four of these agencies are within the Department of Health and Human Services and account for 63% of the Fiscal Year 1989 international AIDS budget. USAID represents 34% and the Department of Defense represents 3%. Expressed geographically, roughly 40% of the activities have a worldwide or regional focus and the remainder are distributed between Africa (32%), Asia and the Near East (9%) and Latin America (19%). Prevention and prevention-related research account for 35% of the Fiscal Year 1989 budget; epidemiology and surveillance represent another 34%. The remaining funds were divided among vaccine development, clinical research and therapeutic development.

In addition, the U.S. Government is developing a model to facilitate and rationalize the process of developing demographic projections of the international impacts of AIDS. The Defense Department maintains a continuous sero-surveillance of all military personnel. Those testing positive for HIV are not assigned overseas. The U.S. Government does test those visa applicants seeking permanent residence (e.g., immigrants and refugees). Current policy does not require testing of short-term visitors. The World Health As-

sembly strongly opposes travel restrictions on the basis of HIV/AIDS status.

During Fiscal Year 1989, the U.S. Government spent almost as much on international aspects of AIDS as it has spent in the previous three years combined. These efforts include agencies with a domestic focus as well as those with a foreign policy focus.

### Population

The Department of State's Office of the Coordinator of Population Affairs has responsibility for coordinating U.S. international population policy, thereby enhancing the effectiveness of U.S. programs, the programs of other nations and the activities of international organizations. U.S. international population assistance programs are implemented by USAID. Cooperation between the Department of State and USAID is close and continuous. The primary U.S. objective is to encourage developing countries to adopt sound economic and population policies consistent with respect for human dignity and family. Population assistance is an ingredient of a comprehensive program that focuses on treating the root causes of development failures.

United States policy emphasizes continued strong support for voluntary international family planning programs, the integration of population and economic

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

development policies, the critical role a market-oriented economy can play in achieving population goals, and the prohibiting of any U.S. support for coercion or abortion in family planning programs. The implementation of this policy has resulted in a cut-off of U.S. funding of the International Planned Parenthood Federation (IPPF) and of the United Nations Population Fund (UNFPA). Funds programmed annually for UNFPA continue to be reprogrammed to other USAID-supported population activities.

In Fiscal Year 1989, the U.S. provided \$252 million for population assistance programs, which includes \$38 million from the Africa Development Fund and \$12.5 million from the Economic Support Fund. The U.S. contribution accounts for over 40 percent of the total amount of direct or bilateral assistance provided by developed countries. Other donors have pledged to increase the level of their assistance in coming years. About 40 percent of total resources allocated to population programs each year worldwide come from developed countries, while developing countries spend another 40 percent of total resources, and international organizations and non-governmental organizations contribute 20 percent.

There have been some successful examples of international cooperation in population programs. High rates of fertility have dropped significantly in some countries, but very little in other countries. The number of people seeking voluntary family planning services is growing, both in absolute numbers and as a percentage of total population. However, reductions in the birth rate in recent years have been matched by reductions in the death rate, and the rate of increase of the world's population has remained unchanged during the past decade at 1.8 percent per year. (The rate of growth has remained at 0.6 percent annually in industrialized countries, and at about 2.4 percent annually in all LDC's, excepting China.) With this rate of growth, the population of the earth will continue to double every 40 years. Last year 106 million people were added to the world's population. With no reduction in the rate of population growth, global population can be expected to increase from today's 5.2 billion to 6.3 billion by the year 2000, and to some 10.5 billion people by the year 2030. The political, economic, social and environmental implications of rapidly expanding human populations in the coming century remain largely unexplored.

## SCIENTIFIC & TECHNOLOGICAL ISSUES

### Cooperation On Large-scale S&T Projects:

#### Space Station

On September 5, 1989, representatives of the United States, nine members of the European Space Agency, Japan, and Canada met in Washington for the first government-level review of Space Station cooperation. The Intergovernmental Agreement on Space Station Cooperation, which was signed by participating governments in 1988 together with implementing memoranda of understanding, calls for such a meeting to be held every three years to deal with matters involved in their cooperation and to review and promote Space Station cooperation. The principal topic of discussion was the impact of an anticipated cut in the Administration's Fiscal Year 1990 budget request for NASA's Space Station activities. The European, Japanese, and Canadian delegations expressed deep concern that the budget cut might force NASA to change the program in ways that would adversely affect their interests. At the conclusion of the meeting, the partners agreed on a joint statement emphasizing their commitment "to continue to consult and to work together to preserve the international

character of the project and the balance of mutual benefits and responsibilities reflecting the genuine partnership set forth in the agreements."

Successful cooperation on Space Station Freedom will be a durable and highly visible symbol of the determination of the U.S. and its friends to work together for mutual benefit. The level and scope of international cooperation involved are in many respects unprecedented. Europe, Japan, and Canada are contributing laboratory modules and other hardware valued at more than \$7 billion. (The total initial U.S. investment in Space Station Freedom is expected to total \$16 billion.) Each partner will be allocated a proportion of the Space Station's physical space and resources roughly commensurate with its investment. Each partner will also provide crew members, participate in managing the facility, and share operational costs.

Space Station cooperation could also lay the groundwork for working together with our friends and allies in the next century to expand human presence beyond the near-Earth orbit. In his July 20 speech commemorating the twentieth anniversary of the Apollo Moon Landing, President Bush asked Vice President Quayle to lead the National Space Council in determining what is needed to chart a new and continuing course of

space exploration. One important question being examined in the Space Council-led review process is the feasibility of international cooperation in carrying out manned missions to the Moon and Mars.

### **Superconducting Super Collider**

Another major science and technology project in which international cooperation may have important benefits for the United States is the Superconducting Super Collider (SSC). Congress has appropriated funding for the beginning of construction of the SSC (the world's largest particle accelerator) in Fiscal Year 1990, at a site in Texas. The SSC will collide two beams of protons together by accelerating them through 10,000 superconducting magnets in a tunnel 53 miles in circumference. It will give scientists unprecedented capability to study the basic building blocks of matter. During 1989 the State Department worked closely with the Department of Energy and other agencies to develop a plan for involving other countries in the SSC.

A number of other attractive large-scale science and technology projects--including Mission to Planet Earth and Human Genome Mapping--are on the drawing board for the 1990s and may be appropriate candidates for international

cooperation. Sharing the costs and benefits of such projects with other interested countries could enable the United States to pursue a more ambitious science and technology agenda over the next decade.

### **Human Genome Research**

At the National Institutes of Health, (NIH), the Human Genome Initiative is being managed by the National Center for Human Genome Research. The program is managed in close collaboration with a similar program at the Department of Energy. The Human Genome Initiative is an international research effort with the goal of analyzing the structure of human DNA and determining the location of all human genes. The Initiative will encompass examination of genomes of a number of animal and plant model systems in order to gain insight into evolutionary processes such as the conservation of key generic elements. Gene mapping and analysis will be key biological research tools in the 21st century. The ability to determine the location and structure of specific genes on the 23 pairs of human chromosomes is a major step toward discovering new methods to prevent or treat the 4,000 inherited diseases that are caused by single-gene defects, or the many more genetic defects that involve an inherited susceptibility to disease. The technology

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

and data produced by the Human Genome Initiative will be of great benefit to the biotechnology industry and will be used in the development of many applications in fields as diverse as agriculture, waste management, and environmental studies.

The importance, complexity, and cost of the effort to map and sequence the human genome makes international cooperation essential. Most developed countries are already formulating strategies to undertake aspects of this international effort, and some developing countries are interested in participating in the research as well. The Human Genome Project will require a number of years, substantial resources, and the development of increasingly sophisticated technology. Storage, comparison and retrieval of the information produced will require a high level of international cooperation to ensure that basic scientific information is freely accessible to all.

Cooperation already exists between the United States and the Commission of the European Community and the U.S. and the United Kingdom. Representatives of the Commission of the European Community, the United Kingdom and Canada have participated in meetings of the NIH Program Advisory Committee on the Human Genome. Similarly, staff

from the National Center for Human Genome Research have attended meetings of the European Community's Human Genome Initiative Working Group. In the past year, Dr. James Watson, Director of the National Center for Human Genome Research, has travelled to England, Italy, France and the Soviet Union to confer with scientists working on human genome research. In addition to representatives of these countries officials from Japan, Belgium, Denmark, Norway, and the Federal Republic of Germany have visited the National Center for Human Genome Research, to obtain information about its programs. These interactions illustrate the depth and breadth of interest in this program across the world.

Open communication, information exchange, and collaborative efforts are probably the most effective methods for preventing duplication of research efforts and costly international competition. NIH has been active in promoting international scientific collaboration for projects with similar objectives and has sponsored a number of workshops to facilitate this. In order to provide a more formal forum for international collaborations, a number of prominent international molecular biologists and human geneticists have banded together to form the "Human Genome Organiza-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

tion" (HUGO). This organization has been incorporated in Switzerland and in the United States. The National Center for Human Genome Research, supports the role of HUGO as the principal international coordinating group for human genome research and for the international exchange of data.

### **Advanced Technologies**

The State Department's Office of Advanced Technology is charged with following advanced technology developments abroad, including supercomputers, nuclear physics, advanced materials, hypersonic flight technology, robotics, advanced manufacturing technology, remote sensing, and others. Receipt of cables from science officers overseas keeps the office up-to-date concerning foreign advances in these fields.

In Fiscal Year 1989, the office started a series of "reverse reporting" cables. These cables go from Washington to field officers to inform them of current developments and interests in the U.S. This information enables officers to concentrate reporting on subjects of topical interest. Subjects covered in this series of cables have included: hypersonic flight, supercomputers, robotics and industry, superconductivity, and the forwarding of the Department of Defense's list of 22 Critical Technologies.

### **U.N. Committee on the Peaceful Uses of Outer Space (COPUOS)**

The 53-member COPUOS, its Scientific and Technical Subcommittee, and its Legal Subcommittee all met during 1989. For several decades after its inception in 1958, the Committee worked successfully in the exchange of scientific information and negotiated four widely accepted conventions that form the basis of international space law. However, the scientific and legal work of the Committee has suffered in recent years as debates became increasingly political. There has been a tendency to seek to involve the Committee in disarmament and other matters that the U.S. and other Western nations believe are fundamentally at odds with the Committee's mandate and with the consensus procedure that governs its work.

At the February 1989 Scientific and Technical Subcommittee, member states focused on the use of space technology for combating environmental problems. The Subcommittee decided to pay particular attention in 1990 to the use of space technology in terrestrial search and rescue and in disaster relief activities. The Legal Subcommittee met in March 1989, to consider questions relating to the use of nuclear power sources in space, utilization of the geostationary orbit and the delimitation of outer space.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

The subcommittee considered for the first time the new agenda item on dealing with the application of the principle that space exploration should be carried out for the benefit of all countries, taking particular account of the needs of developing countries. The U.S., with the support of other Western countries, in 1988 continued efforts to make the work of COPUOS and the Subcommittees more relevant to the present state of space exploration. To this end, at its June 1989 meeting, member states exchanged views on an item concerning the secondary applications of space technology for addressing problems on Earth. This topic was first proposed by the U.S. at the 1988 session of COPUOS. On the basis of a joint resolution of Congress in 1986, which was endorsed by President Reagan, International Scientific organizations and national space agencies will celebrate 1992 as the International Space Year. COPUOS agreed it could play a meaningful role in ISY without any impact on the regular budget of the U.N. through the training and education capabilities of the U.N. Programme on Space Applications.

### **NATO Science Committee**

NATO's "Third Dimension", its civil Science Programme, complementing the military and the political-economic dimensions, has developed substantially

since its inception in 1958. The Science Programme emerged in recognition of the importance of strong capabilities in Science and Technology in all member countries and of the need for broad cooperation to

achieve such capabilities. The Science Committee has implemented the programme by focussing on scientific and technological exchanges, emphasizing the international mobility of scientists throughout the Alliance. In 1980 this scientific cooperation was supplemented by a special programme, Science for Stability (SFS), to assist Greece, Portugal and Turkey in enhancing their individual scientific and technological capabilities and their management experience in these areas.

A key feature of the administration of the Science Programme, is the heavy, voluntary involvement of the international scientific community in the peer review process accompanying each grant recommendation. At any time, more than 100 individual scientists from the Alliance nations, chosen on the basis of their scientific qualifications, serve without recompense on the several advisory and selection bodies established by the Committee. In addition they were assisted by well over 2,000 written reviews prepared by eminent specialists on individual grant applications.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

The original main sub-programmes developed to achieve the Science Committee's objectives have continued to demonstrate their validity and still form the framework for the NATO Science Programme. They are:

- The Science Fellowships Programme which increases the quality and quantity of trained scientists by stimulating the exchange of post-graduate and post-doctoral students between member countries.
- The Collaborative Research Grants Programme which increases the effectiveness of national scientific efforts by promoting the sharing of expertise and scientific facilities;
- The Advanced Study Institute Programme which fosters high-level education in space and technology and encourages international linkages; and
- The Advanced Research Workshop Programme which brings together small groups of advanced researchers for exchange of information and planning purposes.

### **OTHER SIGNIFICANT MULTILATERAL ACTIVITIES**

### **Organization for Economic Cooperation and Development (OECD)**

Economic growth in the OECD member countries is strongly dependent upon technological change and the consequent generation of new products and processes. Far-sighted government policies can stimulate innovation and entrepreneurial activities, improve structural conditions, and generate market-led economic development. The Committee for Scientific and Technology Policy (CSTP) of the OECD engages in a variety of activities which reflect this fact - ranging from promoting common safety standards in biotechnology among OECD countries to pioneering the development of analytic frameworks for evaluating trade in high technology. The CSTP continues to focus on technology and its impact on economic growth by identifying opportunities that can assist member countries to better utilize technology to stimulate their industry and economy. The OECD affords a receptive multilateral forum for the U.S. to discuss broad policy issues with our major free world trading partners.

The U.S. is also actively involved in the work of the OECD's Committee on Information, Computers and Communications Policy, Environment Committee,

Chemicals Group, Nuclear Energy Agency, and the International Energy Agency's R&D Committee. In 1989, the work of all of these bodies focused on cooperative activities to ensure more effective development and utilization of technology in the promotion of economic growth, energy security, protection of the environment, and international trade.

### **U.N. Economic Commission for Europe (ECE)**

The Senior Advisers on Science and Technology (SAST), formed in 1972, is a principal subsidiary body of the ECE. It is designed to promote East-West cooperation and exchange in S&T. The work of the SAST has been of limited value to the U.S., however, we remain interested in the potential role the Senior Advisers could play as an effective multilateral forum in Europe for cooperation in S&T.

The U.S. and other Western countries initiated an effort several years ago to make SAST more effective, and to restore a sense of balance to its work program. The U.S. has made a number of proposals that have been developed further. Above, all the U.S. has urged the Senior Advisers to undertake a critical examination of the work in order to purge the program of projects that have

outlived their usefulness, are of only marginal value, or never were useful. The member states of the European Community (EC) strongly support these efforts. In contrast, the East European delegations have sought to justify maintaining virtually every area of the work program, and to expand it in high technology areas.

In 1989, the Senior Advisers held a debate on the policy aspects of the transition from an industrial based society to an information society and agreed to have an exchange of views at its next session on the economic and social impacts of biotechnology, taking into particular account government policies to facilitate public involvement.

### **Other U.N.-Related Activities**

In Fiscal Year 1989, the United States monitored, and in many instances, participated substantially in the scientific, technological and environmental activities of a range of U.N.-related organizations. They are: - United Nations Environment Program (UNEP): Focuses on international coordination of S&T in the field of the human environment - assessment, management and support - Global Environmental Monitoring System (GEMS); Regional Seas Program, International Convention on Protection of the Ozone Layer; Traffic in Toxic Waste. - Intergovernmental

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Committee for S&T for Development: Provides policy guidance for organizing the activities of the U.N. system in the areas of science and technology for development; established in response to the U.N. Conference on S&T for Development, held in Vienna in 1979; receives guidance from the Advisory Committee on Science and Technology for Development; Center for S&T for Development - Established to assist the Director-General to translate recommendations of the intergovernmental committee into specific national and regional programs. - U.N. Scientific Committee on Effects of Atomic Radiation (UNSCEAR): Assesses radiation levels and radiation effects on man and the environment, report on exposure effects from explosions, nuclear power and occupational or medical sources, hereditary effects, and biological effects in combination with other physical, chemical or biological agents; prepares comprehensive report on the effects of the Chernobyl nuclear accident.

### **ECOSOC Standing Committees and Subsidiary Bodies**

- ECOSOC Committee on Natural Resources: Planning, implementation, and coordination of activities in the U.N. system for development of natural resources.
- U.N. Population Commission: advises ECOSOC on issues which affect population change, including migration; responsible for review and update of population statistics relevant to the activities of other U.N. organizations.
- ECOSOC Regional Economic Commissions - Economic Commission for Europe (see above); Economic and Social Commission for Asia and the Pacific (ESCAP): Committees and subsidiary bodies address energy and natural resources, technology and human settlement, agriculture, transport and communication, environment, and industry.

### **Organs and Programs Related to ECOSOC**

- UNICEF: Focuses on "Child Survival and Development Revolution," maternal and child health care; water supply and sanitation, child nutrition, and education
- United Nations Development Program (UNDP): Focuses on technical assistance in formulation of national development plans, with emphasis on agriculture and industrial products, health, power, transportation, natural resource exploration, communications, etc.;

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

recent projects emphasizes in Latin America and Caribbean.

### **U.N. S&T-Related Bodies reporting to UNDP:**

- U.N. Capital Development Fund: industrial development using light-capital technologies. - U.N. Fund for Population Activities: since 1985, U.S.A.I.D. has withheld Congressionally-earmarked funds from UNFPA on the basis of the U.S. determination that the fund supports China's policy of controlled abortion and involuntary sterilization. U.S.A.I.D. is responding to the Kemp-Inouye Amendment which forbids U.S.A.I.D. support under these circumstances.
- U.N. Revolving Fund for Natural Resources Exploration
- U.N. Fund for S&T for Development
- UNDP Energy Account

### **Specialized Agencies and Other Autonomous Bodies**

- Food and Agricultural Organization (FAO): Focuses on sustained global improvement in food security, nutrition and rural productivity. FAO is the leading international organization in agriculture, fisheries and forestry.
- International Fund for Agricultural Development (IFAD): Mobilizes financial resources for food development and nutrition in the poorest regions of the world.
- International Atomic Energy Agency (IAEA): Focuses on the contribution of atomic energy to peace, health and world prosperity; supports research and development, and safeguards.
- International Civil Aviation Organization (ICAO): Plans and develops international aviation navigation and transport systems.
- International Maritime Organization (IMO): Supports maritime safety and protection of the marine environment through prevention of marine pollution by sea-going vessels.
- U.N. International Development Organization (UNIDO): Accelerates industrialization and fisheries in developing countries through joint venture opportunities.
- International Telecommunications Union (ITU): Focuses on improvement and national use of worldwide telecommunications equipment and networks, including technical assistance to LDC's.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

- **U.N. Educational, Scientific and Cultural Organization (UNESCO):** The U.S. continues to hold observer status with UNESCO; the U.S. does still participate in several UNESCO bodies which conduct scientific activities including the Intergovernmental Oceanographic Commission (IOC), the International Geological Correlation Program (IGCP) and the Man and the Biosphere Program (MAB). The IOC includes global and regional research and information exchange in marine science, with programs such as the World Ocean Circulation Experiment (WOCE), the Tropical Oceans and Global Atmosphere (TOGA) Experiment, and the International Oceanographic Data Exchange (IODE).
  - **World Health Organization (WHO):** Coordinating authority on international public health - endemic diseases, nutrition, environmental sanitation, maternal and child care, international standards in food, biologics, and pharmaceuticals, mental health, gerontology, population, smoking, and health care financing.
  - **World Meteorological Organization (WMO):** Coordinates, standardizes, and improves world meteorological activities, and encourages efficient information exchange; global network of stations for meteorological, hydrological and geophysical data; application to aviation, shipping, water resource management, agriculture and tourism. Major program activities include the World Weather Watch, the World Climate Program (with UNEP), the Hydro and Water Resources Program, the Commission on Atmospheric Sciences, and the Voluntary Cooperation Program.
- Other U.N. Bodies**
- **The Office of the U.N. Disaster Relief Coordinator** is the focal point in the U.N. system for disaster relief, preparedness, and prevention. Some specific activities receive U.S. support in the form of contribution from U.S.A.I.D. programs.
  - **U.N. Institute for Training and Research** offers courses and seminars for diplomats and staff members of U.N. missions on topics of current concern, including resources and the environment.

## Chapter 3: Bilateral S&T Activities

### ARGENTINA

In Fiscal Year 89, a deteriorating economy, a change of administration, the May 1989 election and a hastily-advanced transition of power all overshadowed science and technology (S&T) progress and planning in Argentina.

US-Argentine nuclear cooperation remains restricted by US law because Argentina is not a party to a non-proliferation treaty. Some allowed cooperation goes on, while a search for other areas continues: besides nuclear safety these might include medicine, agriculture, waste management and physical security of facilities. Efforts to continue and bolster this cooperation directly support US nonproliferation goals by keeping our nuclear dialogue open and objective, with regular examination of both countries' nuclear and proliferation policies.

US-Argentine S and T cooperation at all levels, formal and informal, continues playing a vital role in US support for democracy and democratic institutions in Argentina. Despite the severity of

some of Argentina's recent problems, this democracy appears to have made its first successful transition from one elected civilian president to another in more than 50 years.

### Environment

Public awareness, of environmental problems however is increasing; 150 organizations have begun to monitor the environment since 1983. Water pollution is the key national problem. Recent cooperation with USG agencies has led to progress in some areas. Under the umbrella S and T agreement, NSF installed an ultraviolet radiation measurement station in Tierra del Fuego to measure changes in transmission through the ozone layer. Argentine scientists participate in the station's operation and, with the US team are assessing the ecological impact of the January 1989 sinking of the Bahia Paraiso near US palmer research station in Antarctica.

Extinction threatens tropical forests in the North; their area has decreased because of logging and clearing from 87

percent of the Province of Misiones to 35 percent since 1920. US bilateral efforts have, however, made a contribution to forest conservation through fire suppression in southern forests. An intensive US Forest Service/AID course in California was attended by 16 Argentines. Another US team with NSF and US Forest Service support is working in the South on the ecological damage (mainly to trees) caused by introduced animal species.

Legislative efforts to tighten technology transfer laws to "protect" national technology development are stalled. A new intellectual property rights appendix is under negotiation in conjunction with Memorandum Of Understanding between the National Atomic Energy Commission and the US Nuclear Regulatory Commission.

### **Nuclear Energy**

A low-power nuclear reactor dubbed CAREM is in the design stage and has received a lot of publicity as a safe, modular power unit for small, isolated applications requiring up to 50 megawatts. Argentina opened its unsafeguarded spent-uranium-fuel reprocessing facility at Ezeiza to international visitors for the first time. Much progress was evident. Argentines claim it is 80 percent complete, but also say it will not be fully operational until 1995.

### **Other Technologies**

A proposed US-Argentine solar satellite project was not selected in an international competition sponsored by NASA, but further joint studies on a satellite to measure gamma and ultraviolet radiation are underway. In the industrial field, IBM and the National Institute of Industrial Technology (INTI) signed an accord to cooperate on research and development in manufacturing engineering; the results will be available for transfer to Argentine industry.

Interchange, studies and consideration of possible civilian space research and development cooperation emphasize the advantages and fruits of such an Argentine national program consistent with US government policy toward unwarranted spread of missile technology.

Well-developed Argentine seismic capabilities have led to increased cooperation with the US Geological Survey. Joint work both in the US and Argentina produced a vaccine against hemorrhagic fever undergoing extensive clinical tests with the population of the Argentine district where the disease is endemic.

Several Argentine laboratories immediately entered the international cold fusion contest. After initial confused reports, the consensus now tracks that in

other countries some unexplained phenomenon is occurring, but not the fusion originally claimed.

### **Competition and Intellectual Property Rights**

Legislative efforts to tighten technology transfer laws to

'protect' national technology development are stalled. A new intellectual property rights appendix is under negotiation in conjunction with a Memorandum of Understanding between the National Atomic Energy Commission and the US Nuclear Regulatory Commission. Access to certain nuclear facilities is limited, partly on proprietary grounds but mainly for political reasons; the US controls access to its facilities by nationals of countries not participating in international nonproliferation regimes. Argentina may also reason that improved access could be the first step to international inspection. Strict reciprocal access on oceanographic voyages in national waters is also an Argentine concern, again probably more politically motivated than technologically.

### **BRAZIL**

Brazil is larger than the continental United States and the fifth largest country in the world. It is, by far, the largest country in South America and currently is the acknowledged leader in

promoting South American integration in economic and other areas, including science and technology. It has the largest number of trained scientists and technicians in the region, over 500 research institutes and over 100 organizations involved in S&T policy-related activities. Most of the S&T talent and facilities are in the states of Rio de Janeiro and Sao Paulo, but other states are beginning to carve out their own niches.

The basic problems in the relationship include 1) Brazil's failure to sign the Non-Proliferation Treaty (NPT), thus precluding most cooperation in the nuclear energy sector, and causing great difficulty in allowing any technology covered by the Missile Technology Control Regime (MTCR) to be passed to Brazil; and 2) Brazil has been the object of retaliations under Section 301 of the Omnibus Trade Act, focussing on the pharmaceutical sector and long disputes under the same provisions for the informatics sector. Intellectual property rights practices are of particular concern in that context. The four areas which gave rise to this listing are inadequate patent protection of pharmaceuticals and fine chemicals, lack of enforcement of anti-piracy laws (particularly the videocassettes), requirement that theatrical and television films be printed locally, and the lack of responsiveness in multilateral fora such

as the Uruguay Round on intellectual property rights negotiations. Brazil and the U.S. have now set up a formal working group to discuss these IPR problems. There is also formal periodic communication between the Secretary General of the Ministry of External Relations and Deputy Secretary Eagleburger on them.

The Government of Brazil spent 0.7 percent of GNP on S&T this past year, and supports about 70 percent of R&D done in the country. Some 70 percent of 3000 foreign scholarships awarded by the National Science Council (CNPQ) this year were for study in the U.S. CNPQ also awarded 13,000 scholarships for local study. The NSF maintains a bilateral program with Brazil through an MOU with CNPQ. The two agencies are executors of the bilateral S&T initiative, a broad bilateral cooperative research program.

### **Environment**

Brazil contains 30 percent of the world's tropical forests and the world's largest wetland. The Amazon River basin has 18 percent of the world's fresh water supply. Brazil has more species of primates, spiders, amphibians, flowering plants, and psittacine birds (such as parrots and macaws) than any other country. In numbers, it has more terrestrial vertebrate animals. Brazil also has more en-

dangered and threatened species than any other country. The high birthrate of the 1960's and 1970's means 1.7 million new jobs must be created each year, a burden the urban centers such as Rio de Janeiro and Sao Paulo cannot sustain. One response has been to provide fiscal incentives for people to move onto unsettled land, especially into that 58 percent of the country designated as the legal Amazon. Deforestation followed by low agricultural yield on cleared lands has now brought the policy into question and the incentives have been stopped while a reassessment of potential economic use of the area is made.

It has also long had a comprehensive body of domestic law, including the forestry code, the protection of fauna law, the fish code, and the national plan of coastal management. Critics pointed out, however, that environmental law was poorly enforced, and the subject received no attention at the highest levels of government. Private environmental groups were small and largely ineffective. International press attention and pressure brought to bear by the multinational banks in 1988 changed this in a dramatically short period of time. The president launched a program entitled "our nature," combined four separate federal agencies concerned with the environment into one, and backed a cam-

paigned of public education on environmental issues conducted by that organization. This attention and support spawned broader public interest, brought tougher national and state laws and more rigorous enforcement, and doubled the number of environmental organizations in a period of eight months.

U.S. Brazil environmental cooperation includes a small exchange program between EPA and CETESB (the Environmental Protection Agency in Sao Paulo), meteorology projects between NOAA and the National Institute of Space Research (INPE), atmospheric testing studies between NASA and INPE, and use of LANDSAT and NOAA satellites in detecting burning and deforestation. NOAA and NASA are both expanding their cooperative programs with INPE, including climate change and atmospheric testing over the Amazon.

### **Space**

Atmospheric testing studies between NASA and INPE, and use of LANDSAT and NOAA satellites in detecting burning and deforestation. EPA is now discussing a memorandum of understanding with IBAMA, the newly-created National Institute of Environment. NOAA and NASA are both expanding their cooperative programs

with INPE, including climate change and atmospheric testing over the Amazon.

INPE maintains ground facilities for receiving and processing images from LANDSAT, NOAA satellites and SPOT. Brazil is the second largest user of such images in the world and sells some 10,000 images annually. INPE also maintains a highly sophisticated meteorological center involved in both research and operations. It has a cooperative program with NOAA and with the University of Maryland.

NASA and NOAA have a long relationship with INPE, which became practically moribund after the Challenger accident and implementation by missile-producing countries of the MTCR, which has prevented cooperation on the air force's launch vehicle and affected other projects involving potentially sensitive equipment. The NASA relationship revived this year with agreement on five specific projects in atmospheric testing.

### **Nuclear Energy**

Although Brazil's constitution states that nuclear energy can be used only for peaceful purposes, the country is not a signatory of the NPT nor has it put Tlatelolco into effect. This has prevented cooperation between our countries in several sensitive technology areas, and has precluded nuclear cooperation except for information exchange on safety

between the NRC and the national Nuclear Energy Commission (CNEN).

Brazil has the fifth largest reserve of uranium in the world. It has mastered the entire fuel cycle, although some technology has been carried out only at the research level. It has also mastered much of the engineering needed in the nuclear field and several applications to medicine and agriculture. CNEN and the Navy inaugurated a locally-developed critical unit research reactor in December 1988 which will be used for research on a nuclear propulsion unit.

### **USGS**

In Fiscal Year 1989, GOB coordinated with USGS in developing a global telemetered seismic network to strengthen real-time seismic recording in the southern hemisphere.

Brazil's most outstanding tropical medicine research has been done at the Oswaldo Cruz Foundation (FIOCRUZ) in Rio de Janeiro, established at the turn of the century. NIH has a cooperative arrangement with FIOCRUZ which includes collaboration through Cornell on leishmaniasis and chagas disease, through PAHO on HIV and related retrovirus infections, consultation on a demonstration project for a cataract-free zone, and collaboration with Johns Hopkins on a study of antibodies against endemic pemphigus.

### **Competitiveness**

The agricultural applications area of biotechnology is moving toward a critical mass, in terms of Brazilian interest in patent protection. The lack of such protection has been the basis of USG retaliations under Section 301 of the Trade Act in the pharmaceutical sector. The U.S. Department of Agriculture is presently increasing its cooperation with EMBRAPA under the STI.

Brazil has a highly protected informatics industry, both for hardware and software. Within this context it has developed the capability to produce personal and medium-size computers which are somewhat less than state-of-art products. It is working with parallel processing, applying technology incidentally gained in a project in high energy physics with Fermilab of Chicago, and also developing it indigenously. There are unclassified nascent research projects in artificial intelligence and some work in robotics, particularly as it is applied to the petroleum industry.

### **CANADA**

The Government of Canada has established a national S&T policy designed to promote applied science and technology research and to foster technology transfer. A key strategy in this program is the creation of "centers of excellence" to in-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

tegrate government, university and private sector research activities into project specific research networks. Recently approved projects include applied research in advanced electronics and communications, biotechnology, advanced industrial materials, advanced ceramics, and fusion materials development.

Canada and the United States enjoy a very active science and technology relationship. Broad cooperation exists between various Canadian and American governmental and academic institutions and between industrial R&D programs. U.S. Public and private research institutes as well as individual researchers enjoy equitable access to public research facilities and private facilities receiving public support. Energy-related R&D has received particular attention. A new energy R&D MOU has been established between DOE and Canada's Department of Energy, Mines, and Resources. Cooperative projects have included gas hydrates, coal heavy oil co-processing, high power lasers, alternative transportation fuels, solar technologies and other fields. DOE is also working closely with the atomic energy of Canada LTD (AECL) on fusion energy research and high energy nuclear waste management.

### **Intellectual Property Rights**

Canadian law provides general protection for intellectual property rights. Legislation was enacted in November 1987 fully protecting pharmaceutical research discoveries, and encouraging such activities in Canada. The U.S. has also encouraged Canada to put into place legislation to improve the protection of topography software used in the design of semiconductors. New MOU'S and other accords between U.S. And Canadian government research organizations also provide additional protection for intellectual property rights flowing from cooperative research.

The Canadian government is paying considerable attention to various global climate and environmental issues. These include, inter alia, air and water quality issues, global warming and hazardous waste management. Recent new programs have included a \$150 million Great Lakes clean-up and related health program, a \$225 million hazardous waste clean-up program, and enactment of stringent anti-pollution regulations. These include reducing acid rain forming pollutants by 50 percent by 1994, and establishing California-like restrictions on automobile emissions by 1995. The GOC has complied fully with the Montreal Ozone Protocol. They are also undertaking an active reforestation program to help compensate for expected

increases in CO<sub>2</sub> and other greenhouse gas emissions. The Canadians are active participants in the IPCC process and other international environmental conferences.

Acid rain remains the number one air quality issue in Canada. They look to the United States to act quickly on a package of amendments to the U.S. Clean Air Act which would reduce U.S. sulfur dioxide emissions by 10 million tons by 2000. For their part, the Canadians have already reduced their own sulfur dioxide emissions by 40 per cent and expect to meet their 50 per cent target of 2.3 million tons by 1994. Formal negotiations on a Canada - U.S. acid rain accord are expected to begin shortly.

The Canadian government is beginning to focus on Arctic issues, including environment pollution and the effects of climate change. The GOC has sponsored a series of international conferences on the Arctic seeking to foster cooperation to address Arctic pollution questions including depletion of atmospheric ozone, acidification and the impact of radioactive substances.

The Canadian space program encompasses three key areas of activities: development of a mobile servicing system (MSS) for the Space Station Freedom program, design and construction of an advanced remote sensing satel-

lite known as radarsat, and design and construction of a new mobile telecommunications satellite (MSAT).

## **CHILE**

### **NASA - University of Chile**

The most relevant bilateral cooperative event between the U.S. and Chile was the transfer of NASA's oldest earth tracking station--31 years of operation--to the University of Chile's center of space studies (CEE) in September 1989. The "Peldehue" tracking station--sited near Santiago--became unnecessary and relatively too expensive for NASA to maintain once NASA put in place the last of a series of three space tracking satellites (TDRS) that could do the same job. NASA transferred all of its Peldehue tracking station assets, worth some 15 million dollars in machinery and equipment to the CEE (a branch of the Engineering Faculty of the University of Chile). CEE will continue operating the satellite tracking facility, offering services both to NASA--who still needs its services for satellites using bands that the TDRS system does not handle--and other countries. NASA has already contracted CEE's services to track some satellites and permitted CEE to continue pulling down signal information generated by remote sensors installed on-board of NASA, NOAA and other

U.S. satellites. This information, which ranges from the fishing industry to water management for hydroelectric generation, is put to effective use by Chilean industry. NASA helped Chile's academic community gain access to the U.S. Bitnet computer network by offering the use of its telephone link from Santiago to the Goddard Space Center (and then to University of Maryland) during off-hours. More than 2000 academic users from all over Chile have joined the network.

### **AAAS - Chilean Academy of Sciences**

In 1987, responding to an initiative of the U.S. Embassy in Santiago, a group of distinguished U.S. scientists traveled to Chile under the umbrella of the American Association for the Advancement of Sciences (AAAS), to meet their Chilean colleagues of the Chilean academy of sciences (CAS). The purpose of this first meeting was to identify ways of improving and strengthening scientific bilateral ties. Since then, this informal working group, AAAS and CAS, have met on a number of occasions in Chile and in the U.S. In 1988, the MacArthur foundation (U.S.) granted AAAS with funds to allow the AAAS-CAS working group to promote encounters between U.S. and Chilean scientists to develop

joint research ideas and pre-proposals. Further activities are expected as a result of the improvement of the bilateral ties under a more democratic political environment.

### **AID's Advanced Developing Country Program (ADCP) Office in Chile**

The opening of an AID ADCP office in Chile--with 5 people in total--has brought new resources to the Chilean S & T community. Currently, AID is disseminating information about its Program on Science and Technology Cooperation (PSTC). PSTC has granted funds--close to one million dollars over a four year period--to eight research projects ranging from biotechnology, to food sciences and engineering. The AID ADCP office also has financially supported other areas such as environmental and health research issues.

### **National Science Foundation**

In August of 1988 an NSF team of three professionals from the International Relations Office visited Brazil, Argentina and Chile. Their findings, published this year, concluded that in spite of the resource shortage endemic to Chilean scientists, there are many potential research areas for future bilateral cooperation through NSF's current programs. NSF's division of polar programs

(NSF/DPP) continues to maintain close ties with the Chilean antarctic research community and agencies. The ozone hole phenomena and the ultraviolet radiation problem--resulting from the thinning of the ozone layer--are topics being discussed with Chilean scientists for future bilateral cooperation.

### **U.S. Geological Service (USGS)**

The USGS continued its involvement with Chilean seismologists and geologists through its cooperation with the Geophysics Department of the University of Chile.

### **National Oceanic and Atmospheric Agency (NOAA) and Other Related Marine and Geological Research Agencies**

U.S. research vessels are continuing research to support the U.S. S & T needs, whether operated by NOAA or other research agencies. They provide an active source for bilateral cooperation. While doing research in Chilean waters, U.S. research cruises often carry Chilean scientists providing them with an opportunity to learn from U.S. scientific findings. up to two Chilean researchers are present on each cruise.

### **National Institutes of Health (NIH)**

Chilean biomedical and medical researchers have strong and long lasting ties with NIH, directly through U.S. support or through the World or Pan-American Health Organizations. Chile is tied to U.S. and world scientists through the academic Bitnet computer network. Most of the spectacular growth experienced in the usage of Bitnet (from 500 to 2000 users in one year) is explained by the interconnection, through Bitnet, with Medline--the NIH on-line medical library. Currently, any authorized user can access the NIH library from almost any medical facility in Chile. This research resource provides, on a continuing basis, a highly valuable information source for M.D.'s and other bioscientists.

### **Intellectual Property Rights (IPR)**

Chilean authorities in consultation with U.S. trade officials have agreed to pass legislation ensuring protection of intellectual property rights (IPR) for goods currently without full protection. Already Chile has promulgated new laws to acknowledge proprietary rights on software produced abroad, mostly in the U.S. Along the same lines, IPR protection have been adequately given to

protect other areas such as video and audio production. current conversations are centered around protecting pharmaceutical products.

## **CHINA**

Advancement in science and technology continues to be a top priority in China's thrust to modernize. It is clearly in the U.S. interest to be a part of this modernization, both in terms of our commercial priorities and our geopolitical requirements. Notwithstanding shifts in our political relationship, China has consistently looked to the U.S. for both advanced technology and top-quality basic research. During the past ten years, a network of relationships among U.S. and Chinese scientists has grown which supports this tilt toward the U.S. in science. This network now expands far beyond the intergovernmental program and includes many forms of scientific cooperation.

### **The Aftermath of the Summer of 1989**

The Beijing events of June, 1989, have had a serious impact on the bilateral cooperation. The U.S. Government decision regarding high-level exchanges was a factor in the decision to postpone the Joint Commission meeting. Travel restrictions during the summer also delayed several U.S. science and technol-

ogy delegations to China, some of which have yet to be rescheduled. Communications between U.S. and Chinese counterpart organizations in some cases fell off after the summer events. Despite these hindrances, however, working-level cooperation continues. The aftermath of the summer events does not seem to have displaced or otherwise significantly affected the majority of Chinese participants in our bilateral cooperation. Chinese counterparts continue to express support for ongoing cooperation.

### **Negotiations on Renewal of the Science and Technology Agreement**

Fiscal Year 1989 marked the end of the first decade of cooperation under the bilateral science and technology agreement. Preparations were begun for a fifth Joint Commission Meeting, originally scheduled for October 1989 (and later postponed). The dominant issue in bilateral cooperation during Fiscal Year 1989 was the U.S. requirement for an intellectual property rights annex to the agreement, as stipulated by the Omnibus Trade Act of 1988. Negotiations on this annex were held in the fall of 1988 and in January 1989. Because the intellectual property rights negotiations were not completed by the expiration date of the umbrella agreement in January 1989, the

agreement was not formally renewed at that time, but temporarily extended to October 1989, and again to April 1990. Negotiations on the intellectual property rights annex are still in process. The Chinese made a counter-proposal in May 1989, and both sides hope to schedule a third round of negotiations in early 1990.

Several of the approximately 30 science and technology protocols have been affected by the slow negotiations on intellectual property rights. Many of the protocols have or will soon reach expiration dates. In general, the U.S. has only agreed to extend protocols for a period coterminous with the temporary extension of the umbrella agreement. This has adversely affected scientific cooperation in that participating Chinese organizations have been hesitant to plan and budget for new projects during a short temporary extension. After the U.S. determined that no intellectual property rights concerns were involved, the Marine and Fisheries Protocol and the Atmospheric Sciences Protocol were extended for five years, and both continue to yield definite benefits for the U.S.

### **Intellectual Property Rights and Competitiveness**

Protection of intellectual property rights has been a prominent theme in China during the past year. In May 1989,

the PRC and the U.S. signed a Memorandum of Understanding on intellectual property rights. The PRC agreed to draft a new copyright law and make revisions to the 1984 patent law. Consistent with the commitments in the MOU, a draft copyright law, including copyright protection for computer software, was submitted to the National People's Congress in December 1989. Revisions to the patent law are also being drafted. In October 1989, the PRC joined the Madrid Agreement on the International Registration of Marks. The U.S.-PRC Joint Commission on Commerce and Trade Working Group on Intellectual Property Rights is working to resolve specific U.S.-PRC intellectual property rights conflicts in the commercial arena.

### **Environmental Issues**

Another major science theme in China during Fiscal Year 1989 was the environment. China has started a new thrust to gain control over a severe pollution problem created by many years of lax supervision. For example, Shanghai is currently preparing to construct a large waste-water treatment plant to help clean up Suzhou Creek. The National People's Congress recently passed a new law on environmental protection. Several hundred small factories, mainly in paper-making and metallurgy, were closed this year for environmental

reasons. However, enforcement of regulations needs further strengthening. China is paying increasing attention to the problems of deforestation. China claims to have replanted trees destroyed by the devastating forest fires in Heilongjiang two years ago, and thirty-one million hectares of trees have been planted since 1981, but excessive cutting, pests, poor management, and fires continue to threaten China's forest resources. China also passed a new law on wildlife protection in November 1988, and established a number of new wildlife preserves. However, habitat encroachment, pollution and poaching remain serious problems for endangered species in China. The U.S.-PRC Protocol on Nature Conservation includes research on endangered species in China and the U.S.

On the international front, China participated in (but did not join) the Basel Convention on the Transport of Hazardous Waste in March 1989. China joined the Vienna Convention on the Protection of the Ozone Layer. China has not yet acceded to the Montreal Protocol on Substances Hazardous to the Ozone Layer but has begun working with the U.S. Environmental Protection Agency on collaborative research on substitutes for ozone-depleting chemicals, and is working with the United Nations

Development Program to study means for China to meet the goals of the Montreal Protocol.

China is fully engaged in the worldwide movement to understand global climate change. During 1989, China participated actively in the Intergovernmental Panel on Climate Change (IPCC) and other international organizations related to global change. The Chinese government has established a committee on climate change and is funding a number of research projects related to climate change. Several U.S.-PRC protocols, including fossil energy, environmental protection, atmospheric sciences, marine and fishery sciences, and basic sciences include collaborative research projects related to climate change.

### **Advances in Basic Science and New Technology**

One major milestone in scientific research during Fiscal Year 1989 was the inauguration of an electron-positron collider at the Beijing Institute of High-Energy Physics in the fall of 1988. The collider was built partly on the basis of cooperative research with the U.S. under the protocol on high-energy physics. A breakthrough in superconductivity was announced recently by Chinese researchers in Shanghai who claimed to

have developed a yttrium compound superconductive membrane with near zero resistance and a maximum superconducting temperature of 90.5 Kelvin.

In the realm of new technology, the Chinese continue to emphasize applications to current problems. For example, in the area of information technology, several Chinese institutions are building large databases, in many cases using U.S. equipment, to address such problems as mapping, disaster control and the 1990 census.

## EGYPT

U.S.-Egyptian S&T cooperation is conducted under a bilateral agreement signed in 1981 and renewed in 1986. Ongoing activities include bilateral, USAID-funded projects, archeological research, and the programs of the U.S. Naval Medical Research Unit (NAMRU) in Cairo.

The seven currently active USAID-funded S&T projects, begun in 1981, cover a range of scientific fields. USAID is planning to obligate almost \$500 million for these projects. The largest project is the National Agricultural Research Project (NARP), with planned funding of \$300 million. NARP includes research, technology transfer, seed technology, and policy analysis. Five projects (\$120 million) focus on transfer of modern energy technologies related to

petroleum exploration, renewable energy, industrial/commercial energy conservation, energy planning, and manpower development in energy agencies. While the energy projects do not have an explicit environmental component, their objective of more efficient utilization of energy resources will have positive environmental consequences. The schistosomiasis research project (\$40 million) focuses on vaccine development and includes collaboration of Egyptian scientists with NAMRU. The S&T cooperation project's (\$36 million) objective is to focus Egyptian scientific expertise on predefined, high priority development problem areas, which include biotechnology and microelectronics.

In addition, in the multilateral arena, the regional cooperation program was authorized by the U.S. Congress in Fiscal Year 1979 to promote cooperation between Israel and its Arab neighbors, with particular attention to the development of the technological and scientific needs of those countries. Thus far, the only Arab country to participate has been Egypt. Five million U.S. Dollars of ESF has been earmarked annually for this program for the past several years. Egypt currently participates in six approved sub-projects--four in agriculture, one in marine technology, and one in health--in

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

a trilateral arrangement involving Egypt, Israel and the United States.

The U.S. leadership position in information systems software and hardware and its special know-how in petroleum exploration and production technology will be brought to bear on Egypt's crucial needs. The management information tools and experience developed at the U.S. Elk Hills Naval Petroleum Reserve in California are serving as a wellspring for a USAID effort to transfer appropriate technology and training to the Egyptian General Petroleum Company of the GOE. This technical assistance reflects the increasing need in developing country energy sectors for information systems and services that use proven techniques, are practical for the local environment, and offer potential near-term improvements in productivity and efficiency.

Petroleum production in high gas-oil ratio fields in Egypt is currently leading to substantial flaring. This wasting of an important and limited energy resource exacerbates air pollution and deprives the country of a needed energy resource as the country's energy requirements grow. USAID is assisting the GOE in conducting a natural gas utilization study that will find ways to economically store and utilize the gas, help the country sup-

plement existing energy resources, and mitigate global warming impacts.

A.I.D. and the Government of Egypt are sponsoring a project to improve the energy efficiency of Egyptian industrial plants and commercial buildings in the public and private sectors. The project provides grants to companies to finance the importation of equipment for application in projects demonstrating energy conservation technology and promotes technology investments. The project also expands Egyptian institutional capabilities to identify, evaluate, finance, procure, install, operate, monitor, and maintain efficient technologies in industrial and commercial facilities.

The A.I.D.-sponsored Regional Cooperative Initiative funds joint research among Egypt, Israel, and the United States. The program supports joint collaborative research in agriculture, marine sciences, and vector-borne diseases.

### **FEDERAL REPUBLIC OF GERMANY**

In the 1980's, Germany has been the predominant European power in science and industrial technology, a situation likely to prevail well beyond the proposed advent of the integrated

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

market in the European Community after 1992. There is no magic to this preeminence. Building on strong traditions, Germany spends over one-third more on research and development (R and D) than either the U.K. or France. While lagging in the glamour areas of aerospace and computers, Germany has scored by integrating old and new technologies to modernize the means of production and to produce a wide range of top quality goods.

The technological prowess of Germany is demonstrated in its success in becoming the world's largest trader. Exports of research-intensive products account for over half (54 percent) of Germany's exports, a share that is rising rapidly. Relative to other European countries, Germany exports 90 percent more high technology products than France and 60 percent more than the United Kingdom. Another indicator of technological competitiveness is the number of patents received in the U.S., the most important testing ground. German inventors were granted 30 percent more U.S. patents that were received by all French and British inventors together.

Even if the U.S. and Japan are included in the comparison, Germany's investment in R and D, particularly in non-defense R and D, ranks high in proportion to the size of its economy. Of

the major western countries, only Japan invests a larger share of its GNP in R and D. Moreover, both these countries direct their R and D funds almost entirely at non-defense programs. For example, Germany spends about 60 percent more of its GNP on non-defense R and D than does the U.S. (2.7 versus 1.7 percent). A major reason for this is the willingness of German industry to invest in R and D. In Germany, industry is expected to account for 64 percent of all R and D expenditures in 1989, versus 80 percent in Japan and less than half in the U.S., the U.K., and France.

State and federal governments play an important role in directly and indirectly supporting industrial R and D. The federal government spends about \$2 billion a year in project support, personnel development, and tax write-offs for industrial R and D. Furthermore, the technological capabilities of German industry are grounded in a superb basic research system, largely government supported, which provides new scientific knowledge for industrial application. Germany devotes an unusually large share (20 percent) of its R and D budget to basic research. As a result of strong and stable funding from federal and state governments, Germany probably ranks second only to the United States in basic research. Finally, state and federal

governments provide cost-free higher education and technical training. Germany has probably the best trained technicians in the world. By most accounts the university system produces a large and steady stream of well-trained and highly motivated scientists and engineers, able to find jobs in industry.

### **U.S. Interests:**

It is obviously in the interest of the United States to maintain the high level of bilateral scientific cooperation that we enjoy with Germany. An estimated 5000 to 6000 American scientists go to Germany each year, with a similar number of German scientists coming to the United States. Germany is our best science and technology partner in space. Our two countries have also long cooperated in energy technologies, in nuclear safety and in environmental protection. Moreover, with our shared concern over the affects of man's activities on atmospheric ozone and on global warming, there is enormous potential for increasing cooperation in research and technology, both to better understand the nature of these global atmospheric problems and to develop alternate technologies that would not contribute to worsening them.

However, U.S.-German cooperation has met some difficulties recently over access of German scientists to certain

U.S.-origin classified scientific information and on the inclusion of language on protection of intellectual property in two draft agreements for cooperation, one in geosciences, the other in clean coal technology. The two sides are working to resolve these issues.

### **FINLAND**

In 1989, Finland and the U.S. conducted a review of our bilateral S and T Agreement during a one-day official meeting in Helsinki. This was the first formal review since our countries signed the umbrella, government-to-government agreement in 1985. In addition there are eight inter-agency agreements which have been signed in this decade. One which has received international notice is the joint cancer research conducted by the National Institutes of Health and the Finnish National Public Health Institute. The USGS and the Finnish geological survey intend to sign a cooperation agreement during the October meeting. Already, the Finnish survey has agreements with a few individual U.S. institutes and universities.

Finns and Americans also engage in joint research projects on a less formal basis. This past year, the Ministry of Trade and Industry and the State of Colorado signed a co-operation agreement, "Colorado Partnership," to assist Finnish companies in entering the US

market. Also this year, the Lappeenranta University of Technology concluded an agreement with the Michigan University of Technology on student and researcher exchanges. Last year, the University of Wisconsin-Madison and the Helsinki Technical University signed an agreement for S and T cooperation. Overall, the degree of S and T cooperation is modest, but at an acceptable level for both sides. The main thrust of Finnish technology cooperation is directed to the EC.

As a small country, Finland has concentrated its technological efforts into a few, specific and highly sophisticated areas, such as electronics and advanced communications.

The level of concern for the environment is very high in Finland and is reflected in Finland's leading role in international environmental activities. Over the past few years, the GOF has paid particular attention to the control of long range transboundary air pollution. Last May, Finland hosted the first meetings of the Vienna and the Montreal Protocols on protection of the ozone, and in the latter, promoted an accelerated deadline for the termination of chlorofluorocarbon use. Finland has also used its considerable experience and expertise in forest management in assistance to efforts to combat deforestation.

A new area of interest and activity is Finland's cooperation with nearby East Bloc countries in environmental control.

## FRANCE

The U.S. and France regard S&T cooperation and competition as integral to their economic, political and security relations. These relations are typified by major negotiations such as those for the international space station; such current projects as fusion energy; health issues such as aids and environmental issues such as ozone depletion and global climate change. Discussions about the strategic defense initiative and the EUREKA program are of continuing mutual interest. Benefits accrue to both countries because of the advanced nature of the work done by their scientific and technological establishments.

Joint S&T activities in areas of French strength include space, high-energy physics, biomedicine, nuclear energy and environmental science.

A large number of U.S. agencies cooperate directly and indirectly with French scientists through interagency and program agreements: NSF conducts joint research, staff exchanges and seminars. NASA and NOAA cooperate in large scale activities that yield complex, essential data from space-based atmospheric, terrestrial and oceanographic research.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

There is particular interest in France in environmental issues. France has become a strong advocate of global environmental protection measures. France organized and sponsored a ministerial-level meeting on global climate change earlier this year. France, along with the U.S., is a major player in multi-lateral environmental fora such as the UNEP and IPCC. A much closer working relationship is developing between the U.S. and French environmental communities which is leading to shared data, technologies and the development of a common approach to this highly complex issue.

There continues to be extensive cooperation in research on AIDS. Joint projects have been sponsored through the U.S./French AIDS Foundation with particular emphasis on the problems faced by developing countries. France hosted a meeting of the International Committee on Ethics in AIDS earlier this year. Exchanges of data between the Pasteur Institute and the National Institute of Health as well as other U.S. and French experts continue to evolve.

France remains confident in its ability to safely generate electricity from nuclear energy. Light water reactors will remain the major components of French electricity generation well into the next century. France's concerns about en-

vironmental problems, particularly global warming, reinforces their commitment to nuclear power generation. Having noted that breeder reactors will not contribute significantly to electricity generation until well into the next century, the French civilian nuclear R&D is concentrating on the increased safety of, and improved designs for, its light water reactors. This preoccupation with safety of the French nuclear community has resulted in a regularized exchange of information between U.S. and French nuclear safety experts.

While there is a strong bilateral relationship in space, much of the space cooperation between the U.S. and France is channeled through the European Space Agency. The focus of this cooperation, and one in which France plays a critical role is the Space Station Freedom. A major milestone towards achieving this goal was reached in September 1988 with the signing, by all the partners, of the intergovernmental agreement which sets the terms for this cooperative effort. France, for its part, will lead the efforts in developing, building and deploying the European elements of the station which include the attached pressurized module for the station and the polar platform for earth observation. The successful conclusion of the Space Station Agreement will not

only increase U.S./French but U.S./European space cooperation and provide both the U.S. and its partners with a fully capable, manned space station.

There is an awareness in France that the nation's economic, political and social future depends upon France's being technologically competitive. France's priority S&T projects include telecommunications, computers and electronics, space and aviation systems, biotechnology and nuclear energy. Each of these contributes significantly to France's economic prosperity.

## HUNGARY

The science and technology initiatives announced during President Bush's July 13 Budapest address have set the stage for a substantial expansion of bilateral research exchanges between the Hungarian People's Republic and the United States. In addition, the President also announced the creation of a new, independent eastern European Environment Center in Budapest with funding of five million dollars.

The new bilateral S&T agreement was successfully negotiated in August, 1989 and will provide joint government budget financing of one million dollars by each party. It will expand research in

basic science, environment protection, medical science and health, agriculture, engineering research, energy, natural resources, transportation, science and technology policy and management.

The standard intellectual property clauses were negotiated in the new S&T agreement. It is a concern that Hungarian patent laws afford greater protection to indirect product processes, particularly in the pharmaceutical field. Hungarian officials have indicated that such legal changes are already being considered.

The independently constituted, eastern European Environment Center announced by President Bush is being formulated. It is foreseen as an information and research center that would concentrate on regional environment concerns, as well as build contacts with environment groups worldwide and help disseminate information.

During the past year separate environmental exchange programs with EPA and a non-governmental organization have been discussed. The expansion of S&T cooperation between the United States and Hungary is increasing in tandem with the remarkable movement toward a more open, western-oriented society in Hungary. Expansion and deepening of western ties in this area of

the world is a basic tenet of U.S. foreign policy.

## **INDIA**

India is a democracy with an economy slowly moving from state capitalism to a more liberal market oriented economy. Its growing, educated middle class shares western values with U.S. This is particularly true for the professionals connected with the large Indian science and technology establishment. Many of the leaders of the Indian science and technology establishment were educated in the West. Since independence in 1947 they have tried to catch up with the scientific establishments and with progress in the rest of the world. They naturally turned to the United States, but also to Great Britain, France, Germany and other western countries, as well as the USSR, for access to first class science and scientists, and for collaboration and technical assistance. Out of these beginnings has developed the largest set of scientific collaborations between any two countries and this trend is continuing.

### **Scientific Collaborations**

Since the 1960's, collaborations were supported with U.S. owned non-convertible rupee funds generated from grain sales under PL 480. In the mid-1970s the Subcommittee for Science and Technology was established to promote, guide

and organize scientific collaborations between the two countries. In 1987 the United States India Fund (USIF) was established with the remaining U.S. owned rupees. The USIF currently provides the rupee equivalent of 10 million dollars per year to support collaborations in science and technology. Today there are about 250 collaborative projects between Indian and U.S. Scientists organized under the auspices of the Indo - U.S. Subcommittee for Science and Technology, 50 under the Gandhi Reagan Science and Technology Initiative (STI), about 100 under the Indo - U.S. Subcommittee for Agriculture, and 12 sponsored by USAID. In addition there is a large number of quite informal collaborations between scientists from both sides. On the U.S. Side about 20 federal agencies and many universities participate. Their main purpose is to support agency objectives by making use of the large number of highly trained scientific professionals, special environment, experience and facilities.

The large number of collaborations that have taken place over the past 25 years have certainly led to closer contacts between the two countries. Many prominent Indian scientists have collaborated under one or the other of our programs, e.g. the chairman of the Prime Minister's Advisory Board and the mem-

ber (science) of the Planning Commission, were and still are closely connected with the programs of collaboration. The wide range of contacts makes access easier in both directions.

### **Competitiveness and Intellectual Property Rights (IPR)**

Due to U.S. concerns about India's failure to provide adequate and effective protection of IPR, U.S. S&T negotiators held IPR discussions with India in December, 1988, and in March, 1989.

### **Environment and Ecology**

Environmental pollution and abuse of natural resources are serious problems in India. The government and the technical community are aware of the threats of global climate change, lack of drinking water, pollution of the environment, rapid deforestation etc. Increasing population pressure makes countermeasures extremely difficult to enact. India actively participates in the Intergovernmental Panel on Climate Change (IPCC) and co-chairs, with the U.S., the Response Strategies Working Group.

India has not yet signed the Montreal Protocol for the Protection of the Ozone Layer, seeking specific assurances in the protocol of available new CFC technologies at reasonable cost. Indian CFC manufacturing capacity is still well below the maximum permitted in the protocol,

but it is increasing through the purchase by Indian industry of obsolete U.S. and European plants. However, the Indian government, but not industry, is interested in developing the scientific and technical skills to deal with the production and use of replacement CFC's. In November 1986 India enacted the Environment Act, but norms and standards are still being formulated and an authority akin to EPA is still to be set up.

One of the major tasks will be the clean up of the Ganges. But problems of similar magnitude are faced almost everywhere in the country. Tens of thousands of villages are still without safe drinking water. Air pollution is a problem in most industrial areas. Delhi is among the most polluted cities in the world. Forest cover in India was reduced by 23 percent in seven years. The awareness of these problems and their consequences is slowly rising, and a great deal of collaboration with U.S. scientists will be needed to develop the scientific base from which to develop sound, technical solutions.

A.I.D. recently completed a preliminary study that indicates there would be significant environmental benefits in using integrated gasification combined cycle (IGCC) technology in India to generate power from its low-quality,

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

high-ash indigenous coal. The GOI has been seriously following the research, development, and demonstration of IGCC technologies worldwide since the early 1980s. GOI has recently shown an interest in designing and constructing a 100 MW (megawatt) IGCC power plant as an alternative to conventional coal burning technologies. As a world leader in clean coal IGCC technologies, the United States is in a position to provide India with important environmental expertise and IGCC operating experience. The results of this technical assistance will be used as inputs to GOI's Eighth 5-year Plan.

To foster partnerships with the private sector in developing biomass energy systems, A.I.D. supports the creation of in-country joint ventures. In India, an Arkansas-based rice-residue energy system company has joined with the Punjab Agro Industrial Corporation to produce 3-5 MW power systems throughout the Punjab. Available rice straw can support a total of 1000 MW of electricity which the joint venture will sell to the State Electricity Board.

A new A.I.D. initiative is the Program for the Acceleration of Commercial Energy Research (PACER), which promotes the development of energy technology and demonstrates how private enterprise participation is neces-

sary to move new technology from research and development to the Indian marketplace. The program offers financial and organizational assistance to a qualifying consortium working on specific market-driven technology development problems. The consortium must have a significant financial stake in the venture.

Currently funded consortium projects under PACER involving conventional energy resources include developing an optimization operation, continuous fluidized-bed furnaces for heat treatment, a low-cost combustion control system based on oxygen sensing, and an energy-efficient regenerative burner. The PACER program is also funding a number of renewable energy technology development projects, including cogeneration using rice residues, the development of commercially viable gasification technology, and electric power generation from solar and wind sources.

### INDONESIA

As a developing industrializing country, Indonesia depends on science and technology across the board for its industrial and economic development. In addition to the numerous U.S. Government collaborative projects with Indonesia (including the U.S.A.I.D. program), the

U.S. private sector has been very active in a wide range of science and technology developments. In particular, the U.S. private sector has ongoing ventures in aerospace and avionics, telecommunications, energy and natural resources development, computers, electronics, and other fields. The companies have established close relations with the Indonesian private sector and have successfully retained or expanded market shares in several key areas. The companies have also provided technology transfer and training for significant number of Indonesian technicians and specialists.

### **Aerospace and Aviation**

Aerospace is a key element of our bilateral S&T cooperation with Indonesia and continues to have a major impact on overall U.S.-Indonesian relations. The future participation of an Indonesian space flight participant on a U.S. shuttle flight is an extremely important source of pride to many Indonesians. The United States continues to work closely with Indonesia in the field of aviation. The U.S. trade and Development program offered a grant to the Government of Indonesian to fund a National Airspace plan, with a focus on traffic routes, air traffic control and navigation equipment.

### **Sensitive Technology Controls**

The U.S. works closely with officials at the Indonesian aircraft industry (IPTN) in Bandung to assure that safeguards are properly implemented for the first super-computer in southeast Asia and the developing world. The ongoing discussions on strategic trade controls took place in Washington in October 1988 and Jakarta in March 1989. U.S.A.I.D. has identified and allocated funds for a two-pronged training program for Indonesian officials involved in strategic trade controls.

### **Intellectual Property Rights**

The effective protection of intellectual property rights will be important to Indonesia as it seeks to encourage foreign investment in key sectors where higher technology is employed, such as biotechnology in agriculture and computer software design.

On September 8, 1987, the parliament passed Indonesia's new copyright law. In March 1989, the Government of Indonesia signed a bilateral copyright agreement with the United States which became effective on August 1, 1989.

The effective enforcement of these laws will be important to Indonesia's national economic development and, if successfully carried out over the next decade,

will undoubtedly increase Indonesia's attractiveness to foreign and U.S. investors in high technology industries.

For Indonesia, adequate patent protection should encourage wider dissemination of technology, particularly in pharmaceuticals and agriculture; promote research and development; increase the skilled labor force and employment opportunities; and, most importantly, provide a viable basis for further technology transfer from abroad, which is of great interest to Indonesia.

With copyrights, for example, adequate protection of computer software could help Indonesia in the coming decade to become a regional center for computer software design.

### **Peaceful Nuclear Cooperation**

Indonesia-U.S. peaceful nuclear cooperation is highlighted by the successful Nuclear Joint Steering Committee (JSC) arrangement which was created for the purpose of enhancing cooperation in several key nuclear fields, including radioisotope production and application, instrumentation, nuclear safety, and nuclear training.

Nuclear safety and regulatory issues are paramount concerns for the Government of Indonesia, and the Indonesian National Atomic Energy agency (BATAN) is interested in continuing to strengthen ties with the United States in

both of these fields. Under the auspices of the International Atomic Energy Agency, a U.S. scientist was assigned to work with BATAN officials regarding the underground disposal of radioactive waste materials.

### **Geosciences**

Geoscience cooperation is a significant element in the bilateral science and technology relations between the United States and Indonesia, with extensive programs between the U.S. Geological Survey (USGS) and the Indonesian Directorate General of Geology and Mineral Resources (DGGMR).

### **Disaster Warning and Emergency Preparedness**

Scientists from Scripps Institution of Oceanography and Rensselaer Polytechnic Institute are working with the National Coordinating Agency for Surveys and Mapping (BAKUSURTANAL) in an NSF-funded project on "Geodetic investigations of oblique plate convergence in Sumatra." Scientists from NASA's Goddard Space Flight Center and Louisiana State University (LSU) have worked closely with representatives of the Agency for the Assessment and Application of Technology (BPPT) in developing a joint proposal titled "Program to Develop an Integrated Disaster Warning and Emer-

gency Preparedness System in Indonesia."

### **Medical Research and Health Services**

The U.S. Naval Medical Research Unit No. 2 Detachment (NAMRU-2-DET) is located in Jakarta to conduct medical research in the Indonesian archipelago on diseases of military relevance which are of mutual interest to the host country and the U.S. Department of Defense. Major programs include tropical medicine (e.g. oral typhoid, oral rehydration, severe diarrhea), entomology (e.g. malaria), virology, microbiology, immunology and parasitology.

### **Joint Ocean Survey Program**

The waters of the Indonesian archipelago are among the most important areas of required accessibility for the U.S. in the Pacific Ocean region. An extensive joint ocean survey programs serves the interests of both countries.

### **Environment**

Indonesia has been a leader of the region in recognizing the importance of wise management of environmental and natural resources. Indonesia signed the Montreal Protocol on Substances that

Deplete the Ozone Layer and participates in the Intergovernmental Panel on Climate Change. Cooperation with agencies of the U.S. Government has played a prominent role in efforts to improve environmental management in the country, and this continues to be an area of major interest and concern. This cooperation focuses on the following topics: pollution and hazardous wastes management, biological diversity conservation, tropical forest management, sustainable agriculture, energy, coastal and marine resources, water resources management, natural disasters and environmental management.

### **Research on Climate Change**

In March, 1989, representatives of the U.S. National Oceanographic and Atmospheric Administration (NOAA) participated in an International Symposium on Indonesia and Global Weather (climate). As a result of the symposium, NOAA scientists prepared a proposal for collaborative work with Indonesia in two general areas: (1) study of interannual climate variables and (2) study of interdecadal climate change.

### **U.S.A.I.D.**

A.I.D. provides a range of support relating to science and technology focusing on environment and natural resources management. Current activities amount

to approximately 80 million dollars in project support. See Chapter 4 for further details of A.I.D. programs in Indonesia.

### **The U.S. Private Sector**

The U.S. private sector, which is well represented by the American Chamber of Commerce (AMCHAM), has been active in a wide range of science and technology developments in aerospace and avionics, telecommunications, energy and natural resources development, computers, electronics, and other fields. The companies have established close relations with the Government of Indonesia and the private sector, and have successfully retained or expanded market shares in several key areas. The companies have also provided technology transfer and training for significant numbers of Indonesian technicians and specialists.

Following A.I.D.-organized workshops to examine private sector views and key financial, institutional, legal, operational, and technical issues for development of an Indonesian energy and power program, the Government of Indonesia passed legislation to encourage private power generation. A.I.D. is providing technical assistance in evaluating private power proposals to use state-of-the-art combined cycle gas turbine technology for a 900 megawatt Build-Operate-

Transfer (BOT) power plant. Additional assistance is also being offered in preparing a policy framework for implementing the private power law.

USAID/Jakarta's science and technology program funds medical research, health sciences, and agriculture. Projects include the Expanded Program on Immunization, the Health Training and Research Development Project, and the Applied Agricultural Research Project.

### **Conclusion**

Science and technology is likely to play an increasingly important role in Indonesian economic development. As stated by Minister Habibie, "The ability of a country to make use of and develop science and technology is the key to a country's economic success, today and in the future." As Indonesia looks to science and technology to provide solutions for many national development problems, prospects are enhanced for mutually beneficial science and technology cooperation with the United States.

### **ISRAEL**

The U.S. and Israel have a long history of cooperation in science and technology. This bilateral cooperation spans the entire range of scientific and technological disciplines, and benefits to the U.S. accrue in all the fields in which cooperative activities take place.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

- Direct scientific benefits - Israeli scientists and engineers are recognized leaders in R and D in many fields. As a result of cooperative activities, U.S. scientists get direct access to Israeli expertise, thus expanding the base of scientific knowledge available to the U.S.
- Direct social and economic benefits - many cooperative activities generate results that have direct social and economic benefits to the U.S. Social benefits include improvement of the quality of life and improvement of the environment. Economic benefits include increased production of crops and sales of products developed as a result of cooperative activities.

Normal S and T cooperative activities between the U.S. and Israel take place within several different contexts. There are three U.S.-Israel binational foundations - the Binational Science Foundation (BSF), the Binational Industrial Research and Development Foundation (BIRD), and the Binational Agricultural Research and Development Fund (BARD). Each foundation has an endowment contributed by both governments, the interest from which is used to fund cooperative projects. A number of USG technical agencies have formal in-

ternational bilateral agreements for cooperation with counterpart Israeli agencies.

Activities performed within the context of these agreements are funded by the cooperating U.S. and Israeli agencies. The percent of Israel's GOP denoted in civilian research and development (roughly 3%) is competitive with other industrialized nations in terms of percentage but small in terms of absolute amount of dollars invested. The breakdown of civilian R and D spending (also for 1985-86) by sector is:

industrial, 50.4 percent; universities, 35.1 percent; and government laboratories and private institutions, 14.5 percent.

Israel continues to depend heavily on cooperative S and T agreements with the U.S. To support its basic research activities. In Fiscal Year 1989, the Binational Science Foundation (BSF) awarded 154 new grants for cooperative research projects between Israeli and U.S. Scientists, with first year funding for those grants totalling 4.9 million dollars. This brings the total number of active BSF projects to over 400. Almost all fields of science are supported by BSF, with life and health sciences, physics, chemistry and mathematics being the most active areas of cooperation. BSF sponsored three joint workshops this

year in the fields of biochemistry, mathematics, and number theory. The BSF board of governors in 1989 recommended that the foundation encourage Israeli and U.S. Scientists to submit proposals in the field of global climate research.

### **Industrial R and D Cooperation**

Technology development in Israel is heavily export-oriented. In Fiscal Year 1989, industrial exports exceeded 9 billion dollars, out of a total 15.2 billion dollars of exports in goods and services. Industrial exports continue to grow (and have been for the last decade) by over 14 percent. More than 650 local firms are engaged in some 1500 R and D projects. Joint industrial research activities with the United States are an important component of the industrial R and D effort.

In Fiscal Year 1989, the Binational Industrial Research and Development Foundation (BIRD) approved 40 full scale projects for cooperative R and D projects between U.S and Israeli companies. To date, BIRD has supported 235 projects, involving 192 U.S. Companies. The distribution of intellectual property arising from bird projects is agreed to by the participating U.S. And Israeli companies prior to initiation of a project.

### **Cooperation in Agricultural Research**

Agriculture is one of the most highly planned sectors of the Israeli economy. In Fiscal Year 1989, the Binational Agricultural Research and Development Fund (BARD) awarded 41 new grants having a total funding of 7.45 million dollars for joint projects between U.S. And Israeli agricultural scientists. In its first ten years of operation, BARD has supported over 450 projects involving 72 U.S. and 21 Israeli research institutions. In addition, exchange visits between U.S. Soil Conservation Service scientists and their counterpart in the Israeli Ministry of Agriculture continued this year.

### **Energy Research**

Israel imports approximately 97 percent of its energy needs. It has undertaken a major effort to lessen its dependence on imports by diversifying energy sources and emphasizing energy conservation. Israel is a world leader in the use of solar energy. In Fiscal Year 1989, the Institute for the Energies and Applied Research opened at the Weizmann Institute of Science, including a 64 heliostat solar research tower capable of producing 3 megawatts of power.

In Fiscal Year 1989, planning began for two workshops that will be held under the auspices of the DOE/Ministry of Science and Technology Cooperative Agreement in Basic Energy Sciences. The workshops will be in the areas of

photoconversion and photocatalysis, and energy-related biological sciences.

### **The Environment, Water Resources and Marine Sciences**

Over 50 percent of Israeli environmental expenses are devoted to pollution prevention, with another 30 percent to nature protection. Israeli's water supply is seriously threatened by overuse, pollution, and saline infiltration. Joint U.S.-Israeli activities, through formal agreements and informal exchanges, are helping to address many of these problems.

After the November 1988 elections, the government established a new Ministry of the Environment. Minister of the Environment Ronni Milo and EPA administrator William Reilly met in May 1989, at which time they agreed to establish a formal agreement between EPA and the Ministry for Scientific and Technological Cooperation on environmental matters of mutual interest.

In August 1989, Israel Space Agency Chairman Yuval Ne'eman met with Vice President Dan Quayle, Chairman of the National Space Council, to discuss possible U.S.-Israel cooperation in the U.S. Space program. Dr. Ne'eman presented Vice-President Quayle with a proposal for an R and d project for the exploitation

of solar energy as a power source in space.

### **Foreign Policy Perspective**

The U.S. has a long-standing interest in the viability of Israel as an independent state. One factor that helps Israel to maintain its viability is the strength of the R and D efforts of its science and technology community.

The U.S. assist Israel in its attempts to normalize relations with neighboring countries and The rest of the world community. Several USAID-funded programs are designed to provide Israeli scientists with the opportunity to work with scientists from Arab countries (in the Middle East Regional Cooperation program - MERC) and less developed countries (the Cooperative Development Research Program - CDR). The MERC program has received 5 million dollars per year from A.I.D. For the last several years. In Fiscal Year 1989, one new MERC health program was initiated, bringing the total number of programs to 7 (4 programs in agriculture, 2 in health, and 1 in marine sciences). In Fiscal Year 1989, after a lapse of almost two years, the CDR program restarted with a budget of 2.5 million dollars. Approximately 12 projects will be initiated in Fiscal Year 1989, bringing the total number of active projects to approximately 100.

## ITALY

The United States and Italy have had a close cooperative relationship in science and technology since the end of World War II. Italy sees that relationship as an essential element to continued economic growth. From the U.S. perspective, S and T cooperation contributes to our political and defense relationships, as well as to a continued strong U.S. commercial presence as the European Community moves toward a single market.

Under the joint umbrella accord for scientific and technological cooperation, there are over twenty agreements in force between U.S. and Italian technical agencies. They

provide, inter alia, for research and development activities in space, the environment, high energy physics, health, nuclear safety, agriculture and energy.

Italy is a close partner in space cooperation, dedicating about half of its 800 million dollar space budget to national projects involving the United States. U.S. and Italian scientists and engineers are working in cooperative projects for space station, remote sensing, and space launch vehicles and facilities.

Cooperation in the environment is conducted under a 1987 Memorandum of Understanding between the Italian Ministry of Environment and the U.S. Environmental Protection Agency (EPA).

With serious pollution problems in the Adriatic and the Po river, a growing pile of industrial and toxic wastes, and increasing public concern about air quality, the Italians are proposing joint projects with EPA in automobile emissions control, advanced environmental monitoring systems, and the development of new technologies for the management of urban wastes.

Italy is active in global climate change issues, initiating studies on sea level rise in the Adriatic and projects in the Antarctic and in space to measure the decrease in the ozone layer. The Italians are among the leaders in Europe in voluntarily restricting CFC production and in developing cfc substitutes. The Italian parliament has already ratified the Vienna Convention on the Ozone Layer and the Montreal Protocol governing CFC production.

The U.S. - Italian umbrella S and T agreement contains provisions for the protection of intellectual property rights. IPR provisions are also being incorporated into the new memorandum of understanding currently being negotiated by the National Science Foundation and the Italian National Research Council (CNR).

In the new technologies, Italian industry and laboratories excel in the development of numerically controlled machine

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

tools and robotics, this year surpassing the United States in both production and exports. Under CNR's "strategic projects" program, there are R and D efforts in telecommunications, robotics, superconductive and cryogenic technologies, advanced materials, electro-optics, and biotechnologies.

### JAPAN

Science and technology cooperation between the U.S. and Japan was formally initiated in the early 1960's and has been actively pursued for over 25 years. At the present time, over a dozen bilateral S and T agreements are in force, covering such diverse fields as space, medical research, the environment, energy, basic sciences, transportation, and natural resources. Regular bilateral interactions held in connection with these agreements have resulted in numerous mutually-beneficial technology exchanges and the creation of lasting friendships between researchers and science administrators in both countries.

During this same period, the level of Japan's science and technology has risen steadily, and now equals or exceeds world-class standards in many fields. Japan now spends 2.8 percent of its GNP, or about \$62 billion in Japanese fiscal year (JFY) 1987, on research and development. Comparable figures for the U.S. are 2.7 percent of GNP and \$119

billion. In Japan, the private sector provides the largest component of total R and D funding, approximately 69 percent. While in the U.S. the private sector and the government each provide approximately 50 percent of the funding.

The umbrella U.S.-Japan Science and Technology (UJST) Agreement, signed by the two heads of government in June, 1988, commits both governments to strive for a more equal balance in access to each other's laboratories and scientific information. In addition, the agreement targets priority areas for future joint research efforts, and provides for protection of both intellectual property rights and national security-related information. Under the agreement, within the past year: a ministerial-level meeting was held in October, 1988; a Joint-High-Level Advisory panel meeting was held in January, 1989; and a Joint Working-Level Committee Meeting was held in April, 1989. Thus far, significant initiatives have been undertaken (details follow below) in the areas of research fellowships and cooperation in fields such as superconductivity, computer science, biotechnology and the environment. In addition, the two governments have established task forces to monitor access to each other's laboratories and scientific information.

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

This year has been a particularly opportune time for American scientists and engineers desiring to conduct research in Japanese laboratories. In response to negotiations that led to the new UJST agreement, both the Japanese Ministry of Education, Science and Culture (Monbusho) and the Science and Technology Agency (STA) have created new fellowship programs which yearly are able to support fifty postdoctoral level U.S. investigators. The STA program also provides funding for ten additional fellowships for researchers coming from U.S. Government agency laboratories. To date participants in this category have come from USDA, FDA, NIST, NOAA, NASA and NIH. The Japanese Ministry of Foreign Affairs has provided funding to NSF which in the past year has resulted in tripling the number of senior U.S. investigators able to conduct collaborative research in Japan for periods of from six months to two years.

In another significant and related development, the Japanese government has also taken steps to open its cooperative government-industry research programs to non-Japanese scientists. Specific examples of such programs are MITI "NEDO" (New Energy and Industrial Technology Development Organization) programs in support of private research. "NEDO" now includes

the two premier MITI R and D projects, Large-scale Projects and Next-generation Projects. In addition, the International Superconductivity Center (ISTEC) now hosts foreign researchers. An STA program, ERATO (Exploratory Research in Advanced Technologies), also hosts foreign researchers.

In addition to these programs for increasing foreign researchers' access to Japanese science and technology in Japanese laboratories, the GOJ is expanding the availability of Japanese science and technology literature, again in response to U.S. requests during negotiation of the new UJST agreement. A particularly significant development in this respect has been the translation and expansion of the JICST (Japan Information Center for Science and Technology) database to make it accessible in the U.S. in English. Japan has also begun to collate information on science and technology at university libraries to make it available online.

Other important areas of U.S.-Japan science and technology cooperation are in space, nuclear, and energy fields. Japan ratified the Space Station Intergovernmental Agreement in 1989. Japan will cooperate with the U.S., Europe and Canada to develop an experimental module for the space station and support the U.S.-developed infrastructure. In

July, 1988, the U.S.-Japan Agreement on Peaceful Uses of Nuclear Energy went into effect. Under this agreement Japanese use of U.S.-origin nuclear fuel is controlled to comply with U.S. laws and international safeguards through cooperative administrative arrangements.

Energy cooperation between the United States and Japan continued across a wide spectrum, ranging from studying the human response to radiation at the Radiation Effects Research Foundation at Hiroshima and Nagasaki, to high-energy physics and fusion research. Negotiations have been initiated on the renewal of the "umbrella" energy research agreement, an important United States/Japan cooperation document under which most energy-related research is conducted.

The meeting of former Japanese Environment Agency Director General Aoki with EPA Administrator Reilly in Washington, May 3 and 4, 1989, was an effort to direct existing cooperation under the U.S.-Japan Environmental Agreement toward research on the global environment. Aoki proposed that the U.S. and Japan explore cooperation in the field of global atmospheric protection, exchange information on the effects of acid rain, and exchange information and views on the economic aspects of

measures described in the EPA report on global climate.

Japan chairs the Energy and Industry Subgroup of the International Panel on Climate Change's (IPCC's) Response Strategies Working Group. Three meetings have been held by this working group during 1989. Japan hosted a major international meeting of experts on climate change in September, 1989.

The Japanese Diet has ratified the Montreal Protocol restricting the production of chlorofluorocarbon (CFC) compounds. MITI in June, 1989, began to restrict production and use so as to totally phase out CFCs in Japan by the year 2000.

### **Competitiveness and Intellectual Property Rights Concerns**

Inclusion of detailed provisions relating to intellectual property rights in the 1988 UJST agreement marked a significant step forward in recognizing the need for a new relationship between S and T cooperation and competitiveness. Follow-up UJST-related meetings described above have carried forward the process of assuring that intellectual property rights considerations will be a key factor in all future U.S.-Japan S and T cooperation. U.S. proposals for a revision of the U.S.-Japan Energy Agree-

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

ment (see above) included similar intellectual property rights language.

Cooperation between the U.S. and Japan in information technology centers on two programs initiated in April, 1989, by the Joint Working Level Committee under UJST:

- The task force on access to science and technology information has agreed to improve access through use of surveys and study teams, sharing findings, observing progress in machine-aided translation, encouraging establishment of a Japanese reproduction right organization, the flow of grey literature.
- Also in April, 1989, the Joint Working Level Committee under UJST agreed to cooperate on development of a high field magnet for characterization of superconductors; discussion continues on ceramics and electronic materials.

### KOREA

Cooperation in science and technology between the U.S. and Korea continues to reflect the close ties that exist with this important ally. Based on mutual benefit, science and technology activities spread across the entire spectrum of our bilateral relations. A government-to-government umbrella agreement

provided the policy framework for this cooperation until its expiration in late 1988. The agreement was originally developed in the mid-1970s when Korea had very little technological capacity. In view of the rapid development of Korea and, importantly, looking ahead to expected progress over the next 10 years, the U.S. initiated negotiations to amend that agreement so that it would properly represent the technological level of the anticipated cooperation. Policy aspects of the ever-growing industrial linkages, invention rights from shared research, and defense-industrial cooperation are to be included in the new agreement. While some important issues, mainly dealing with intellectual property rights, remain to be resolved, both sides are working to achieve renewal before a significant effect on S and T cooperative activities develops.

During Fiscal Year 1989, Korea made significant progress in establishing an export control system to protect advanced strategic technology and assure mutual security. Korea's National Assembly approved the government-to-government agreement that was concluded in September 1987 and close cooperation between Korean and U.S. officials to develop implementation measures has been under way since the agreement was signed. Nuclear cooperation between the

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

two countries assists in enhancing public safety and in advancing the development of nuclear technology. With over 50 percent of its electrical power coming from nuclear plants, Korea continues to support its commitment to nuclear power. The majority of its nuclear infrastructure is of U.S. origin. Excellent, well-established cooperation between the U.S. Nuclear Regulatory Commission (NRC) and its Korean counterpart continues to enhance Korea's capabilities in regulation, inspection, emergency response, nuclear safety and joint research, and has entailed extensive exchanges of information mutually beneficial to both countries. Exchange programs with the Department of Energy (DOE) have provided training in spent fuel management, fuel fabrication technology and other areas supporting broad U.S. nuclear policy objectives. Regular bilateral discussions on peaceful applications of nuclear energy offer a forum for consideration of nuclear policy matters, including issues arising in the International Atomic Energy Agency.

The Foundation for Cooperation in Environmental Matters was enhanced with the signing of a Memorandum for Cooperation between the U.S. Environmental Protection Agency and its Korean counterpart. In addition to joint studies of mutual benefit, the formal

cooperative mechanism will facilitate discussions of broad environmental issues, including proper environmental standards to be applied to U.S. industrial investments in Korea. Very importantly, the environmental cooperation presents a vehicle for soliciting Korean support of U.S. positions on such crucial issues as the problem of stratospheric ozone.

The Korean government also recently announced a war on pollution and has focused high level attention on environmental issues. It is expected that this will be an important area of cooperation in the future once the US-Korea S&T Umbrella Agreement is concluded.

### **MALAYSIA**

Malaysia is putting greater resources into the enhancement of its science and technology capabilities. Research and development traditionally has supported growth in the commodities sector. Malaysian science and technology policy, however, is increasingly focusing on support for its growing industrialization through a mix of research and development on the one hand and technology transfer on the other.

U.S. agencies which were involved in limited cooperative activities in Malaysia in Fiscal Year 1989 included AID's ASEAN Mission, the National Science Foundation, UADA's Office of International Cooperation and Development,

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

the Smithsonian Institution, and the Bureau of Reclamation. U.S. multinationals such as IBM and Intel support science and technology in Malaysia by donating equipment and through training activities. Other private sector cooperation includes technology licensing agreements and efforts by U.S. professional organizations, such as the Institute of Electrical and Electronics Engineers, to form linkages with their Malaysian counterparts.

Malaysia is a key country on the issues of biodiversity and deforestation of tropical rainforests. The government strongly asserts its right to make use of its forest resources for economic development while expressing a commitment to sustainable forestry practices. Various forestry projects have received support from the world bank and the asian development bank. Malaysia has stated its intention to sign the Vienna Convention and Montreal Protocol on ozone depletion and has formed a working group to look into global climate change.

Malaysia sees the United States as dominant or among the leaders in most technologies and gives the United States high marks for its openness in scientific collaboration. Scientific collaboration remains very limited, however, in comparison to Malaysia's activities with

Japan, the U.K., Australia and Canada. A great deal of U.S.-Malaysian cooperation to date has been fully or partially funded by the Malaysian government. A large Malaysian student presence in the United States during the 1980's has increased mutual awareness in the scientific community and could lead to increased cooperation.

### MEXICO

U.S.-Mexican scientific cooperation is overseen by a Joint Mixed Commission which is chaired on the U.S. side by the Department of State's Bureau for Oceans and International Environmental and Scientific Affairs (OES) and on the Mexican side by the Mexican Secretariat of Foreign Relations (SRE) and includes approximately 24 memoranda of understanding (MOUs) between U.S. and Mexican agencies under the Joint Mixed Commission's auspices.

One of the best examples of the close cooperation between the U.S. and Mexico has been in the area of environmental affairs. The 1983 U.S.-Mexico Border Environment Agreement is the mechanism by which the two work together in resolving a wide range of transboundary pollution issues. Fiscal Year 89 saw the successful negotiation of a Fifth Annex dealing with transboundary air pollution in border cities. In the

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

fall of 1989, the governments of the U.S. and Mexico concluded an agreement to work together on protecting and improving the environment of the Mexico City metropolitan area.

Throughout the year the U.S. Environmental Protection Agency (EPA) provided Mexican technical experts with training in several areas of air pollution management. In the spring of 1989, the Department of the Federal District (DDF) sent a 7-member team to Denver, Los Angeles, Ann Arbor, and Washington, D.C. to study alternative fuels programs in those U.S. cities. Follow-up plans are underway for 20 environmental technicians from the Secretariat for Urban Development and Ecology (SEDUE), DDF, the state of Mexico, and several universities to travel in 1990 on AID and local parent agency funds to EPA's North Carolina facilities in Research Triangle Park for an ozone control training course.

U.S.-Mexican cooperation in environmental issues is not limited to air quality matters, however. In August, 1989, the two countries came closer to resolving the Laredo/Nuevo Laredo border sanitation problem with the signing of a Minute for a joint international sewage treatment plant and outfall.

The signing of the Laredo/Nuevo Laredo Minute was but another excellent

example of the outstanding work being done jointly by the U.S. and Mexico under the direction of the International Boundary and Water Commission (IBWC). In fact, at the IBWC's centennial anniversary celebrations in 1989, both U.S. and Mexican officials lauded the organization as being one of the most successful bilateral organizations between any two countries in the world. The successful negotiation of the Laredo/Nuevo Laredo Minute is giving impetus to a similar resolution for the San Diego/Tijuana border sanitation issue. Joint U.S.-Mexico programs in conservation and ecology are also progressing extremely well. Senior SEDUE officials have expressed a strong interest in working more closely with public and private U.S. organizations in managing and preserving Mexico's natural resources.

Other noteworthy Fiscal Year 89 achievements in U.S.-Mexican S & T cooperative efforts include the following; 1) MOU between the U.S. Food and Drug Administration (FDA) and the Mexican Secretariat of Health (SSA) for cooperation in ensuring the safety and wholesomeness of Mexican shellfish exports to the U.S.; 2) MOU between FDA and the Mexican Secretariat of Agriculture and Hydraulic Resources (SARH) for cooperation in the regulation of raw

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

agricultural products involved in U.S.-Mexico commerce; 3) MOU between the U.S. National Park Service and SEDUE for cooperative projects and U.S. Training for SEDUE personnel; 4) MOU between the U.S.

Geological Survey (USGS) and the Mexican Institute for Geological Research (IIE) for cooperation in geothermal and related volcanic research (April 1989); and 5) MOU between the U.S. National Aeronautic and Space Administration (NASA) and SSA for malaria research.

Mexican officials are well aware of the importance which the U.S. Government places on intellectual property rights at all levels of S & T agreements. To date, the USG has not had any problems with the GOM over intellectual property rights in S & T cooperative projects. Moreover, senior Foreign Ministry officials have even suggested the formation of intellectual property rights and nuclear subgroups under the guidance of the MQQD Commission.

While a substantial amount of U.S.-Mexico S & T cooperation is conducted through official agency-to-agency channels, more cooperation is carried out informally between researchers and scientists in industries, universities, and private institutions. Mexico's geographic proximity and the 2,000 mile border it

shares with the U.S. Makes it only natural for the U.S. to have the greatest number of requests for permits to conduct research on Mexican territory.

In the last few years, American researchers have encountered some difficulties with the lengthy permit application process required for all foreign scientists wishing to conduct research in Mexico. Nevertheless, U.S. scientists and researchers have generally enjoyed open access to Mexican facilities. Furthermore, Mexico has taken steps toward implementing a permit system that will simplify the issuance of all land, sea, and air scientific research permits.

Other fields in which bilateral cooperative programs have played an important role are nuclear safety; marine research; fisheries promotion; protection of endangered and threatened species and ecosystems; atmospheric, oceanic and meteorological monitoring and research.

### **Nuclear**

The one and only nuclear plant in Mexico is operational. Testing has been going on for almost six months and full power operation should start in early 1990. U.S. Government cooperation to improve safety at the plant has been ongoing for many years. Technical assistance and cooperation between the Mexican Nuclear Research Institute

(ININ) and Los Alamos National Laboratory has also been conducted for a number of years.

### **Marine Research**

The three current memorandums of understanding between the National Marine Fisheries Service (NMFS) and the Secretariat of Fisheries (SEPESCA) to conduct marine research in the Gulf and Pacific coast and exchange of fisheries information are now being reviewed by SEPESCAS' newly-arrived officials. It is expected that early next year the three bilateral agreements will be renewed once improvements and corrections to the agreements are fully completed.

### **Fisheries Trade Promotion**

Technical assistance and cooperation projects with the private sector were developed in 1987 under the auspices of USAID-Mexico. These projects have encouraged joint ventures between private sector entities in Mexico and the U.S. Projects this year have focused on aquaculture development in Mexico. This coming year, the cooperative agreement between USAID and the Chamber of the National Fishing Industry (Canainpes) will probably be renewed and expanded.

### **Protection of Endangered and Threatened Species and Ecosystems**

For more than ten years, the U.S. Fish and Wildlife Service (USFWS) has sponsored bilateral projects in Mexico, under the umbrella agreement of the Joint Committee Meeting on Wildlife. Projects and funding have increased in recent years. Cooperation between the Secretariat of Urban Development and Ecology (SEDUE) and USFWS has also increased. Law enforcement information exchange between Mexico and the U.S. To limit and reduce illegal trade of wildlife across the 2000 mile border has information exchange, research, and bilateral cooperation are expected to grow this year as a result of better environmental bilateral understanding.

### **Atmospheric, Oceanic and Meteorological Monitoring and Research**

The office of the representative of the National Oceanic and Atmospheric Administration (NOAA), working through the Science and Technology Office, assists the Mexican government with information, satellite imagery and other weather services. NOAA weather stations are kept and maintained in Mexico. NOAA conducts hurricane observation

flights in Mexican air space with participating Mexican meteorologists and technicians.

## PAKISTAN

Our collaborative and productive S and T relationship with Pakistan continues to contribute to our efforts to create a more stable and secure ally able to seek peaceful and cooperative relations with its neighbors. It also helps us promote a Pakistan more able and willing to play a helpful role in matters of bilateral concern such as suppression of narcotics production and trafficking, and the furtherance of our nuclear non-proliferation policies.

Pakistan has a sizeable trained body of scientists and researchers covering nearly every field of science and technology. However, many of these people are engaged in teaching and/or basic research with little practical relevance to the solution of critical national development problems. Many of the obstacles to a more direct application of science and technology are deeply rooted in institutional and attitudinal factors and cannot be easily overcome. The GOP is encouraging the Pakistani S and T community to address development problems by emphasizing applied research and by encouraging private sector involvement in S and T. Our collaborative programs, especially commitments

by the national science foundation and USAID's manpower development program have supported this effort. Next year USAID is due to begin a \$80 million institutional excellence program which will support research and institutional development at Pakistan's nine centers of excellence in S and T.

Although our bilateral S and T programs are winding down with the end of our special foreign currency funds, collaborative efforts in several areas will continue through 1992. The Fish and Wildlife Service is working with the Smithsonian on plans for a national zoo. The National Park Service, in collaboration with the National Council for the Conservation of Wildlife, recently completed a workshop designed to assist the GOP with expanding and developing one of Pakistan's greatest natural resources, the Khunjerab National Park. The Office of Naval Research is finalizing plans for joint research in marine science and oceanography. The Public Health Service is assisting the Pakistan Medical Research Council with the first comprehensive health examination survey project in the country. The Smithsonian and USIS are planning training for Pakistani museum specialists in conservation techniques and exhibit design. In addition, USAID is funding extensive

research in agriculture, energy and environmental matters.

The Memorandum of Understanding between NSF and Pakistan's Ministry of Science and Technology, originally signed in 1981, was allowed to lapse on May 31, 1989. Without additional funding from either side, NSF could find no justification to renew the existing agreement. However, the GOP and Pakistan's scientific community and U.S. scientific organizations have expressed interest in continued collaboration. Areas of particular interest to both sides include medical research, renewable energy, geology, oceanography, environmental research, and natural resource management. The institutional excellence program's \$20 million small grants will go a long way toward bolstering our bilateral S and T relationship as the special foreign currency program ends.

### **Competitiveness and Intellectual Property Rights**

Pakistan is working to enact new legislation for copyrights, trademarks and patent protection, and the embassy is making efforts satisfy U.S. concerns. In addition, Pakistan's evolving investment policy seeks to encourage foreign private investment in many industrial and trade sectors. The foreign investment benefits to be derived from adequate and effec-

tive intellectual property rights protection are increasingly self-evident. The U.S. will seek consultations with Pakistan on intellectual property rights and hopes to see improvements in the course of the year.

Our S and T programs contribute to some extent to creating opportunities for U.S. goods and services in Pakistan. Scientists trained in the U.S., and collaborating with U.S. counterparts, naturally look first to U.S. equipment and materials. Finally, our S and T programs with their emphasis on the sharing of scientific and technical advances relevant to the solution of development related problems enhance U.S. influence and prestige with Pakistan's leaders and people.

A.I.D. is helping the Government of Pakistan establish the National Energy Conservation Center (ENERCON) to meet the goals of saving energy, improving productivity and profitability, reducing load shedding, and minimizing dependence on imported oil. The ENERCON project includes energy analyses of selected industries, buildings, and other energy consuming facilities to identify energy saving recommendations. Benefits obtained to date include average efficiency improvements of 10 percent per combustor in a boiler tune-up program and average fuel savings of

11 percent from tune-ups of 260 automobiles. In addition, savings of \$10.5 million from energy audits have been identified and \$4 million achieved in the industrial and buildings sectors. A.I.D. and the Government of Pakistan signed an agreement for a major USAID/Islamabad activity, Institutional Excellence Project (IEP), in June 1989. The IEP funds the strengthening of S&T institutions and also supports a research grants program. The IEP project is to be funded by A.I.D. at a level of \$80 million over a ten-year period.

### **POLAND**

In 1989, Poland continued to suffer severe environmental degradation. For example, total sulfur dioxide emissions rose by more than 10 percent over the previous year. As a statistical average, 14 metric tons of sulfur dioxide are deposited in each square kilometer of Polish soil per year. This is more than double the average for all of Europe, and six times greater than for the U.S. Krakow alone receives 80-100 tons of sulfur dioxide per square kilometer yearly. (the threshold beyond which sulfur dioxide concentrations are harmful to human health is estimated at 20 tons per square kilometer). The deterioration of water quality also continued unabated with hundreds of miles of Poland's main rivers unfit for any use, even industrial.

Only ten percent of total water resources met the standard for drinking water. The human health implications of the progressive contamination of the country's natural environment are disturbing. In some areas of Poland, which combined contain approximately 12 million people or about one third of the total population of the country, the level of toxic substances exceed permissible levels and present an immediate health threat. In the workplace, twenty percent of all employed, work in conditions of an immediate health hazard. In most industrial areas, there is increased incidence of respiratory diseases among children. This gloomy picture notwithstanding, there were a number of positive developments in 1989. The dramatically changed political atmosphere in Poland allowed a genuine dialogue on the country's environmental condition to flourish, and an ecological program emerged from the round table negotiations. Initiatives tabled by President Bush with regard to Krakow offered hope that its deterioration could be reversed. Finally, during the year the Maria Sklodowska-Curie Joint Fund II became operational.

### **Environmental Issues at the Round Table**

## SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

The deepening ecological crisis in Poland led to a Sub-commission on ecology being formed within the framework of the round table discussions. Following weeks of negotiations, in March 1989 the participants came to agreement on a 28 point comprehensive program for changing the environmental direction of the country. Among the most urgent tasks foreseen by the Sub-commission: the lowering of sulfur dioxide and nitrous oxide emissions by at least 50 per cent; the improvement of water quality of the rivers of Poland, particularly the Vistula; and the systematic integration of environmental considerations into the economic planning. The 28 postulates agreed to by the Sub-commission for implementation in 1989-90 included:

- Development by June, 1990, of a comprehensive environmental protection program which will incorporate environmental safeguards in economic policies, require environmental impact studies on all major projects, and begin a gradual shift toward production technologies safe for the environment.
- Ensuring access by citizens and private organizations to information about the state of the environment, and their rights to initiate

legal action to stop environmental damage.

- The prohibition of imports of waste materials into Poland.
- The closing of specific industrial plants considered to be dangerous (for example, the Siechnice Steelworks, by the end of 1989, and the zinc and lead works in Miasteczko Slaskie, by the end of 1990).
- Protest of the construction of power plants in Czechoslovakia and east Germany near the Polish border.

The only major area on which consensus was not reached in the Sub-commission was on the role of nuclear energy in Poland's future.

The opposition-solidarity side insisted the development of nuclear power be halted forthwith, while the government took the position that there was no rational basis for eliminating a role for nuclear power in view of the need to limit the burning of coal because of the threat which CO<sub>2</sub> poses to the biosphere.

### **Presidential Initiatives**

In his historic visit to eastern Europe in July 1989, President Bush stressed the importance of East and West working together to preserve and improve the environment, humanity's common heritage. Following up on his Mainz speech in which he said the U.S. could

offer the east new technologies in pursuing this goal, the President proposed three environmental initiatives for Poland totalling \$15 million. The initiatives are concentrated on Krakow, the magnificent medieval city, designated by UNESCO as a world monument but suffering from severe pollution. Initiatives include:

- Retrofit an existing coal-fired plant, a \$10 million initiative to retrofit an existing coal-fired plant in the Krakow area with advanced clean coal technology. This retrofit will reduce sulphur dioxide emissions from a 100 MW plant by 60-65 percent. Nitrogen oxide emissions will also be reduced.
- Air quality monitoring network, a \$1 million project for an air quality monitoring network in the Krakow metropolitan area as part of Poland's national air monitoring network.
- Water quality and availability, a \$4 million initiative to improve water quality and availability in Krakow, emphasizing recycling, pollution prevention, and low-cost approaches such as land treatment of effluents.

### **Maria Sklodowska-Curie Joint Fund**

In April 1989, the Maria Sklodowska-Curie Joint Fund (MSC II) became operational when its first eight projects were approved for funding by the second meeting of the U.S.-Polish Joint Commission. This followed the deposit by the United States of \$600,000 to the MSC II joint fund and counterpart contribution by Poland. The Joint Fund, established as a result of an agreement signed by President Bush in September, 1987, presents opportunities for Polish scientists to collaborate with U.S. scientists in a broad range of research activities. In its second session the Commission endorsed a three-tiered approach to research priorities and funding allocations for MSC II cooperative activities as follows:

- High priority areas: agriculture, environmental protection, medical science and health protection, and basic research.
- Mid-level areas: geoscience research and exploitation of mineral resources, energy research, and engineering research.
- Third level areas: transportation, construction research, oceans and atmospheric sciences and limnological research, park management and historical preservation,