NASA

Science Communications Strategy

Final Report

of the

NASA Science Communications

Working Group

(SCWG)

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National Aeronautics and
Space Administration

Office of the Administrator
Washington, DC 20546-0001

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TO: Officials-in-Charge of Headquarters Offices
Directors, NASA Field Installations
Director, Jet Propulsion Laboratory

FROM: A/Administrator

SUBJECT: Recommendations of the Science Communications Working Group

In June of this year, a team, chartered by NASA's Chief Scientist, completed a major review of NASA's science communications activities. The effort was initiated with a January 1994 conference in which senior NASA management met with experts from the scientific, communications, and education communities to discuss their ideas on NASA's science communications activities. As a result of this dialogue, several NASA science communications goals and plans were developed. In addition, a comprehensive Agencywide evaluation of our science communications activities was conducted. The review team's findings and recommendations, many of which have already been implemented, are documented in the enclosed report.

Officials-in-Charge must take action, as appropriate, to implement the recommendations contained in this report. In addition, I urge each of you to reconfirm your support for employees to participate in science communications activities. The NASA team is immensely proud of the work they do. We must work together to find the most effective and innovative ways to share their accomplishments with the American people. The enclosed report promises to serve as an excellent guide to accomplishing our science communications objectives.

We plan to publish the report on the Internet to inform the public of NASA's science communications activities.

Daniel S. Goldin

Enclosure

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Executive Summary

Change is sweeping the landscape of federal science communications. The demand for information regarding the effective expenditure of taxpayer dollars continues to increase as available resources continue to decline. The responsibility to not only increase scientific knowledge, but to share it broadly with the American public has become one of the Administration's highest priorities. As such, an increased emphasis has been placed on proactive science information distribution by Federal agencies.

In 1994, the Administration issued a report, *Science in the National Interest,* which identified new national science goals. Two of the five goals are related to science communications:

- Produce the finest scientists and engineers for the 21st century
- Raise scientific and technological literacy of all Americans

In addition to the guidance and goals set forth by the Administration, NASA has been mandated by Congress under the 1958 Space Act to "provide for the widest practicable and appropriate dissemination concerning its activities and the results thereof."

The environment in which NASA conducts its communications activities is also undergoing change. As information demands grow among members of the science community, media and general public, so do the technologies for disseminating such information. Perceptions have evolved among some segments of the public that NASA is not meeting the information demands of its customer base. Although NASA's current science communications activities are aggressive and well diversified, the agency is challenged with improving its ability to meet increasing demands for information in an era of decreasing resources.

In addition to addressing eight Goals and Plans which resulted from a January, 1994 meeting between NASA and members of the broader scientific, education and communications community on the Public Communication of NASA's Science (Appendix D), the Science Communications Working Group (SCWG) took a comprehensive look at the way the Agency communicates its science to ensure that any changes the Agency made were long-term improvements. In all, 23 separate studies were conducted by the SCWG across a wide spectrum of NASA activities. The SCWG developed a Science Communications Strategy for NASA and a plan to implement the Strategy.

The Agency's commitment to long-term reform is demonstrated by the adoption of a new goal in the NASA Strategic Plan which specifies the importance of science communication. To provide continued coordination across NASA offices, a communications roundtable will be established and chaired by the Office of Public Affairs. NASA's Science Council will assess the effectiveness of the roundtable and review the Science Communications Strategy on an annual basis.

As a result of a full year of studies and analysis, the SCWG finds that NASA has the opportunity to become a national leader for new standards in communicating science to the public. Because of its unique agency role, NASA can provide leadership and assistance in the definition of appropriate government roles in science communication. By shifting its communications emphasis from the "what" to the "why," by focusing on upfront coordination in the development and use of communications products and services, and through more effective and efficient use of NASA's as well as others resources (financial, technological and expertise), NASA can become a national model for the effective communication of valuable and informative science.

SCWG Findings

I. Introduction

The Government has made the communication of science information a high priority, an effort to which NASA brings unique information, programs, and capabilities. This national effort requires that NASA develop a strategy to coordinate its science communications efforts. The primary issue that must be addressed in this strategy is expanding access to NASA scientific results and information. NASA must recognize that attempting to do this will result in greater demand at a time when the agency is faced with reduced resources. Thus, NASA must continually seek the means to do more with less.

An effective NASA science communications strategy should encompass both centralized planning and coordination, coupled with decentralized custom tailoring to meet individual program and project needs. As such, NASA Centers should assume greater responsibility for implementation of science communications efforts. Further, an effective science communications strategy requires a continuing mechanism or process capable of developing broad plans and policies for NASA science communications. Upfront and continuing coordination is required across Codes and Centers on all NASA science communications products and activities.

This report outlines a Science Communications Strategy from which effective science communications programs can be developed and implemented across the agency. Guiding Principles and Strategic Themes for the Strategy are provided, with numerous recommendations for improvement discussed within the respective Themes.

II. SCWG Vision, Mission Statement

The SCWG developed the following science communications Vision and Mission Statement for the NASA Science Communications Strategy.

SCWG Vision Statement:

NASA contributes to America's future by communicating unique scientific information. This endeavor increases the public's knowledge, understanding and application of science and technology which inspires and servesAmerica and benefits the quality of life on Earth.

SCWG Mission Statement:

Our challenge is to use NASA's resources to best communicate the excitement of our missions and discoveries to our diverse customer community in a way that is understandable, promotes scientific literacy, and demonstrates application to their lives.

-We involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds.

-We provide the widest practicable and appropriate dissemination of information to the news media and general public concerning the objectives, methods and results of NASA programs.

-We work closely with the research community to provide ready access to data and analysis and we assist them in clearly communicating these results and their significance to the broader public.

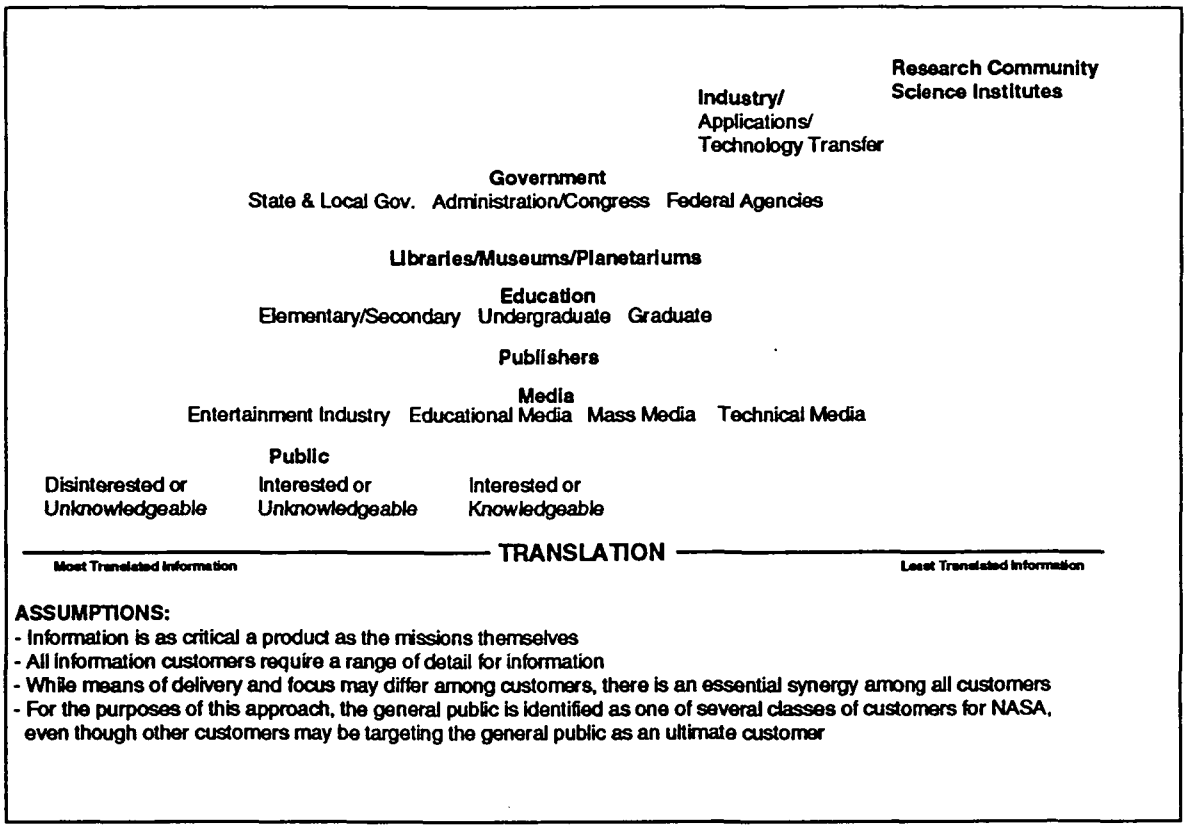
-We join with our industrial partners to facilitate the commercial development and innovative application of NASA-developed technologies to the benefit of all Americans.

-We cooperate with external groups to leverage their unique skills, expertise and resources to significantly assist in the interpretation and dissemination of information.

Further, as a result of a SCWG recommendation, science communications has been incorporated into the NASA Strategic Plan as an Agency goal.

The SCWG chose to depict its science information customers along a continuum which is defined by the amount of translation required to successfully convey the information (Chart 1). While the means of delivery and focus may differ among customers, the SCWG found that an essential synergy existed among all customers.

Chart 1: NASA's Continuum of Customers for Science Information



ASSUMPTIONS:
- Information is as critical a product as the missions themselves
- All information customers require a range of detail for information
- While means of delivery and focus may differ among customers, there is an essential synergy among all customers
- For the purposes of this approach, the general public is identified as one of several classes of customers for NASA, even though other customers may be targeting the general public as an ultimate customer

III. Guiding Principles

To maximize the effectiveness of its efforts, NASA's science communications strategy should be guided by certain basic principles. In summary, NASA must demonstrate its relevance, focus its messages, identify its unique contributions, incorporate technology, emphasize diversity, and explore how its efforts could flexibly serve multiple audiences.

Relevance

NASA's science communications efforts should clearly establish why science results and investigations are important and of benefit to society. This principle entails a shift in communications emphasis from the "what" to the "why."

Focus

As the quantity and quality of information available to the public increases, NASA must focus its science communications to clearly convey its results and message in a manner consistent with changing national standards and priorities.

Uniqueness
NASA's efforts in science communications should center on those activities and products to which it can most effectively bring to bear its unique capabilities and resources.

Technology
To the extent possible and appropriate, technological innovation and advances should be incorporated into our science communications efforts. This will not only extend the reach of these efforts, but will also increase the range of services NASA is able to offer. However, NASA must be mindful that a "two-track" communications approach will be required for several years in order to meet the needs of both high and low-tech audiences.

Diversity
Our efforts should seek to include all segments and areas of society, both through program message and execution.

Flexibility
NASA communicates science to a broad continuum of customers and must consider how approaches could synergistically serve multiple audiences.

IV. Strategic Themes

The SCWG recommended that a Science Communications strategy encompasses the following themes: leadership, coordination, integration, participation, leveraging, and evaluation. Each Theme is discussed in some detail below. Specific recommendations of the SCWG are summarized under each of the Themes. An Implementation Plan, which lists the respective actions and office of responsibility for each of the recommendations is attached as Appendix C.

Theme 1 LEADERSHIP

NASA must provide interagency leadership and assistance in the definition of an appropriate federal government role for Science Communications.

Recommendation: **Provide Leadership/Assistance in the Definition of an Appropriate Federal Role**

To this end, NASA's Chief Scientist has been designated as chair of the National Science and Technology Committee's Subcommittee on Communicating Science to the Public. This subcommittee has already begun working to:

--define appropriate Federal role
--define appropriate level of interagency resources (personnel, and funding), relative to other agency priorities, to effectively communicate science
--explore partnering arrangements with federal and non-federal participants

Recommendation: **Definition of NASA's Role**

In addition to providing leadership and assistance at the federal level, NASA must also define its unique role in the communication of its science. NASA should undertake this effort once the appropriate Federal role has been defined.

Theme 2 COORDINATION

NASA's science communications efforts must be fully coordinated to focus a broad range of views and capabilities to most effectively communicate science to the public, and to extend limited resources.

Recommendation: **Integrated Communications Teams**

One of the major findings which was validated through several of the SCWG studies was the need for upfront coordination in the development and use of communications products and services. Upon reviewing the common characteristics of several successful science communications activities (Hubble Space Telescope First Servicing Mission and Compton Gamma Ray Observatory are but two examples), the SCWG discovered that by convening teams of experts from different functional areas, a high level of coordination is

achieved. Thus, the SCWG recommends the establishment of Integrated Communications Teams (ICT's). Associate Administrators or their designees should be responsible for managing, in coordination with appropriate offices, science communications activities for major science themes as they relate to major missions and programs. The ICT's should be composed of program, project, public affairs and education representatives. It is important that the ICT approach be implemented early on in the life of a mission, and that it be continued for the life of the science communications effort.

Recommendation: **Communications Roundtable**

As a means of ensuring that NASA communications across the board are well coordinated, a NASA Communications Roundtable should be established and chaired by the Office of Public Affairs. The Roundtable should be comprised of working-level representatives appointed by each Associate Administrator. Participation should include all program and staff offices with substantial involvement in NASA communications. The Roundtable should meet on a quarterly basis for approximately two hours to discuss current coordination, agency policy direction, and outstanding issues. Electronic mail would be the primary means of communications between meetings. An assessment of the Roundtable's effectiveness should be conducted by the NASA Science Council in one year.

Recommendation: **NASA Exhibits Program**

The Office of Public Affairs, the Science Codes and NASA Centers should review NASA's inventory of exhibits that feature science subjects, assess their responsiveness to the new national science goals of communicating science to the public, and use this as a foundation when developing new exhibits.

Before an exhibit is initiated, the NASA Headquarters science Codes and /or Center project offices should coordinate with the Office of Public Affairs to consider: message (responsiveness to new national science goals), audience, budget, duplication, and long-term usefulness. Also, the use of interactive multi-media should be considered when designing exhibits.

Finally, the Office of Public Affairs should initiate a study of creating on-line exhibits.

Other COORDINATION Recommendations:

- Efforts should be made to standardize certain communications product development and service processes with an aim towards providing better products and services and eliminating duplication and overlap. This recommendation is targeted to any NASA program or staff office responsible for the development of science related publications or exhibits, or which is responsible for responding to science related public inquiries.

- NASA should create a mechanism to consolidate message development across the agency. This would alleviate some of the variances in responses coming from different parts of NASA.

- The science program offices should work with Codes AIC, F, L and P to prepare draft responses to frequently asked questions, reducing the time required to address certain inquires.

Theme 3 **INTEGRATION**

Science communications must be embedded in everything that NASA does, as an essential component of the agency's mission.

Recommendation: **Modify the NASA Strategic Plan**

NASA's Mission Statement should be modified to reflect the importance to the agency of science communications. The SCWG has developed proposed changes to the NASA Mission Statement which, if adopted, would add a fourth mission that reflects the importance the agency places in the communication of its science. The proposed changes are indicated by underlined text below.

Proposed NASA Mission Statement:

It is NASA's mission to:

- Explore, use, and enable the development of space for human
- Advance scientific knowledge and understanding of the Earth, the Solar System, and Universe and use the environment of space for research
- Research, develop, verify, and transfer advanced aeronautics, space, and related
- **Communicate our unique scientific information to increase the public's knowledge, understanding and application of science and technology.**

The SCWG recommends that the science Codes and Codes P and F pursue the above Mission Statement modifications during the next formal Strategic Plan review cycle.

Recommendation: **Communications Strategies for Major Science Themes**

The SCWG recommends that science communications strategies be developed early on in the lifetime of science themes as they relate to missions and programs. These strategies should be coordinated with Public Affairs and Human Resources and Education, and they should be part of a checklist of requirements for New Starts. A summary of the strategies should also be incorporated into Program Commitment Agreements. Finally, existing NASA Management Instructions should be revised to reflect these requirements.

Recommendation: **Integrate Strategies into Strategic, Program and Project Plans**

The SCWG recommends that plans and strategies for communicating science to the public be mandatory elements of strategic, program and project plans. Public Affairs and Education representatives should be included in the development of these plans.

Science communications strategies should be reviewed at non-advocate and other mandatory Program and Project reviews.

Recommendation: **Integration of Emerging Technologies**

Automated and electronic distribution of materials is fast becoming the most efficient means to reach large numbers of people. NASA needs to explore how it could better integrate emerging technologies into its dissemination of scientific information and materials. It appears that these emerging technologies offer substantial cost/benefit ratios over the long run, while providing reliable and timely dissemination of information. Specifically:

- NASA should establish a coordination policy, including roles, responsibilities and format for the electronic dissemination of scientific information.

- NASA should conduct a one-year pilot program using emerging technology to enable members of the public without modern communications equipment toll-free access to NASA information.

- NASA should perform a cost/benefit analysis of providing electronic instead of hardcopy publications. Such a capacity would transition the NASA publications facility into a virtual warehouse which could provide electronic access and print on demand.

- A feasibility study should be conducted into the development of automated systems that help customers rapidly locate relevant NASA information and tools, without having to know where the resources are located. Such a system could be located on the NASA home page.

- When developing publications, the NASA science program offices should "build into" their publications the capacity for electronic distribution of information.

- NASA should conduct a feasibility study on the establishment of a national "Post Haste" -style interactive information system, accessible through a toll free 1-800 number.

- NASA should explore enlarging the number of educators having access to toll free 1-800 service offered by Spacelink/Quest.

- NASA should expand the use of automated list servers to effectively and efficiently disseminate science information.

- NASA should develop a 1-page document that captures the basics about how to get information from NASA (phone numbers, TRC's CORE, etc.). This would be an especially useful tool for NASA speakers.

Other INTEGRATION Recommendations:

- Continuity of message/materials must be provided across all agency science communications functions (education, legislative, public affairs, public mail, etc.)

- All science communications efforts should include or support Administration, NASA, enterprise, programmatic/thematic, local objectives (in order of priority).

Theme 4 **PARTICIPATION**

Full participation by every member of the NASA team is essential if NASA is to meet its potential in communicating its results. Science communications should be established as a legitimate and achievable responsibility to be supported by every NASA employee and by every scientist that is conducting NASA research.

Recommendation: **Announcement of Opportunity Outreach "Tools"**

In *Science in the National Interest*, the Administration calls for Federal Agencies to encourage research scientists to use their research experience in support of public understanding and appreciation of science.

The science community should be required or encouraged to take a more active role in communicating their results to the broader public. To strengthen the translation of scientific research into science communications, the SCWG developed the following flexible set of "tools" to use in its research solicitations:

a. Requiring that science communications plans in appropriate NASA science activities be submitted and evaluated as an evaluation criteria in the awarding process.

b. Issuing supplemental or separate educational grants.

c. Encouraging research proposers to become more active in science communications.

Several recent research solicitations have incorporated these tools. The Discovery program Announcement of Opportunity is a notable example, in which NASA has called for a science communications plan as part of the proposal requirements.

Recommendation: **NASA Speakers Bureau**

NASA has established a unified, agency-wide Speaker's Bureau, complete with a data base, which allows better matching of speakers to the speaking engagement. A variety of tools are under development to enhance the speaker's ability to communicate.

The SCWG finds that senior NASA management needs to openly validate the role of NASA employees in participating in the Speaker's Bureau and provide recognition and support to those employees that do participate in the program. To this end, the Office of Public Affairs should draft a memo from the NASA Administrator to officials in charge encouraging support for NASA employee participation in the Speaker's Bureau.

Science Codes should provide support to Public Affairs for the development and implementation of a proactive speaker's strategy to communicate science to the public effectively.

Recommendation: **Recognizing Excellence in Science Communication**

Per a recommendation by the SCWG, NASA has revised the language used in its annual call for awards to emphasize that non-NASA individuals should be considered for NASA awards for recognition of achievements in communication of science to the public. NASA employees have been encouraged to consider the nomination of such non-NASA individuals. Such encouragement should be continued.

Recommendation: **Astronaut Appearance Program**

The Astronaut Appearance Program has often been referred to as one of NASA's most effective resource in making the public aware of the agency's policies, programs and achievements.

The Office of Public Affairs, the Office of Space Flight and the Johnson Space Center's Astronaut Office should review their joint policies, practices and strategies for accepting and declining astronaut appearance requests to ensure they share the same priorities. Such a review should include an attempt to coordinate astronaut appearances with other NASA science communications efforts, such as exhibits, to further communicate NASA's science messages. Further, the review should identify budget and target opportunities for astronauts to communicate science to the public with a focus on groups not traditionally reached.

Other PARTICIPATION Recommendations:

- The Chief Scientist, working with the science offices, Public Affairs and Human Resources and Education should develop a science communications message for the Administrator to present to NASA employees. This message should stress the responsibility of each NASA employee to support science communications efforts. The Office of Mission to Planet Earth has agreed to lead this effort.

- NASA's science offices should explore the use of IPA's and cooperative agreements to bring in outside expertise and to provide assistance in NASA's science communications efforts

- The Office of Human Resources and Education should develop a training plan for the science community and others to improve their ability to convey NASA's science results in the best way possible.

Theme 5 LEVERAGING

Whether through funding or partnership, NASA must work more extensively with its intermediaries and customers to more efficiently and effectively convey science results. To do this, NASA should pursue relationships with non-NASA individuals, agencies and organizations who have the expertise and resources to extend NASA's ability to more effectively communicate science. A successful leveraging effort is essential if the agency is to make its scientific discoveries available to a broader audience while extending its limited resources.

Recommendation: **Identify Leveraging Opportunities and Undertake New Pilot Leveraging Efforts**

Over the next year, NASA should work to identify a broad range of potential new partners and undertake new pilot leveraging efforts. In doing so, NASA should seek leveraging arrangements in which the agency plays a specific, defined role and for which there is a finite aspect to our participation. NASA should also explore a wide range of financial arrangements, and should not automatically exclude those which require the expenditure of its resources.

Recommendation: **Improve Access to NASA Information**

NASA should improve its intermediaries' and customers' access to NASA information (See recommendations under Integration of Emerging Technologies)

Theme 6 EVALUATION

Metrics for performance and continual assessment of effectiveness should be a fundamental element of all science communications efforts, followed by any necessary adjustments.

Recommendation: **Annual Review of Science Communications Strategy**

The NASA Science Council should review the Science Communications Strategy on an annual basis. Science Communications Performance Goals, which have been developed by the SCWG (Appendix B), should be used to conduct this evaluation, along with specific metrics provided by each of NASA's science offices, Public Affairs and Human Resources and Education.

Other EVALUATION Recommendations:

- NASA should seek regular customer input and evaluation of programs, as well as advice from existing agency advisory committees.

- When appropriate, non-FACA advisory groups such as Focus Groups and Round Tables should be implemented to obtain independent perspectives on how well NASA communicates science. This approach offers:

  --flexibility
  --immediate initiation of process
  --instantaneous feedback
  --easy adjustments of memberships
  --greater potential for media professional participation

Appendix A

Science Communications Steering Committee and Working Group Membership:

Steering Committee Membership	
France Cordova	Chair, NASA Chief Scientist
Spence Armstrong	AA/Human Resources and Education
Laurie Boeder	AA/Public Affairs
Wesley Huntress	AA/Space Science
Harry Holloway, M.D.	AA/Life and Microgravity Sciences
Charles Kennel	AA/Mission to Planet Earth
Working Group Membership:	
Lyn Wigbels	Chair
Neal Newman	Executive Secretary
Pamela Mountjoy Bacon	Human Resources & Education
Rick Smith	Human Resources & Education
Paula Cleggett-Haleim	Public Affairs
Terri Hudkins	Public Affairs
Jens Feeley	Space Science
Margo Bailey	Space Science
Stephan Fogleman	Life and Microgravity Sciences
Dan O'Connor	Life and Microgravity Sciences
Mark Pine	Mission to Planet Earth
Lisa Ostendorf	Mission to Planet Earth
Working Group Advisors:	
Julie Baker	Office of the Comptroller
Pam Werner	Office of the General Counsel

Appendix B

NASA SCIENCE COMMUNICATIONS STRATEGY PERFORMANCE GOALS

OUTCOME:
We involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds. In doing so, NASA seeks to promote excellence in America's education system through enhancing and expanding scientific and technological competence.

OUTPUTS:
1. NASA student programs provide exposure to the NASA mission, participation in research and/or training experiences in science, mathematics, engineering, and technology and other related disciplines.

2. NASA opportunities for teachers/faculty provide information, techniques and experiences emphasizing discipline, content and depth related to teacher/facility teaching levels and subject areas.

3. NASA instructional products target customer needs, support the national education standards, and utilize educational technologies when appropriate.

OUTCOME:
We provide the widest practicable and appropriate dissemination of information to the news media and general public concerning the objectives, methods and results of NASA programs.

OUTPUTS:
1. Broadcast media coverage of NASA science discoveries and results improve through the increased use of electronic means.

2. NASA communicates science news to the media that has historically covered NASA.

3. NASA's public speaker and exhibit programs convey NASA messages.

OUTCOME:
We work closely with the research community to provide ready access to data and analysis and we assist them in communicating these results and their significance to the broader public.

OUTPUTS:
1. Science communication has been incorporated into all appropriate scientific research announcements.

2. NASA provides access to data and information for the research community to communicate NASA's science results.

OUTCOME:
We cooperate with PUBLIC AND PRIVATE ORGANIZATIONS to leverage their unique skills, expertise and resources to significantly assist in the interpretation, APPLICATION and dissemination of information.

OUTPUTS:
1. NASA forms partnerships which communicate science.

2. NASA forms partnerships to develop innovative communications technologies, tools and products.

Appendix C

Science Communications Working Group (SCWG)
IMPLEMENTATION PLAN

Subject:	Action:	Actionee:
Administrator's message on Science Communications	Develop and submit script	Chief Scientist/ Y lead, Codes S/U/F/P support
Incorporate Science Communications into NASA Mission Statement.	Chief Scientist propose changes to current Mission Statement in Strategic Planning process	Chief Scientist with support from Codes F, P, S, U, Y
Define proper government role for Science Communications	Establish NSTC Subcommittees	Subcm established. Will be supported by appropriate NASA offices
Incorporate science communications strategy/plan into Program Commitment Agreements and New Start requirements	Develop strategy for major science themes as they relate to missions and programs; revise existing NMI's	Science Codes, with Codes F, P support and concurrence
Incorporate science communications strategy/plan into program and project plans and provide for regular review of such plans	Develop as part of normal program planning activities, beginning immediately	Science Codes with Code F, P support and concurrence
Establish Integrated Communications Teams (ICT) for major science themes as they relate to major missions and programs	Immediately establish ICT's	Science Codes
Increase science community involvement in science communications	Develop and utilize selected "tools" in NASA research solicitations	Science Codes
Recognize excellence in public communication of science	Continue to encourage NASA employees to nominate external individuals for appropriate awards	Code F lead, Codes P/Y/U/S/ support
Establish Communications Roundtable and conduct quarterly meetings	Dailey memo to Officials in Charge establishing Roundtable and designating Code P as chair	Code P

Subject:	Action:	Actionee:
NASA Exhibits:	Review by Codes P, & Centers. Review inventory; develop and implement exhibits strategy; increase coordination; initiate study of creating on-line exhibits	Code P lead, Codes F/Y/U/S support
Customer Request Mechanism	Create a mechanism/process for responding to public inquiries	Codes P, F, lead, Codes Y/U/S support
	Prepare draft responses to frequently asked questions	Code P lead, Code F/Y/U/S support
	Explore greater reliance on automated information systems	Science Codes Codes P, F
	Science Codes to build electronic distribution into publication development	Science Codes
	Conduct feasibility study on "Post-Haste"-style 1-800 interactive information system	*Recommend Code J with support from Code P
	Explore increasing 1-800 access to Spacelink/Quest	Codes F and R
	Expand use of automated list servers	Science Codes Codes F, P
	Develop 1-page, NASA information request guide	Codes F, P
Increase use of leveraging in science communications	Seek new partnerships and undertake pilot leveraging efforts	Codes F, P, S, U, Y
Science Communications Training for Scientists	Develop training plan	Code F lead Science Codes, Code P support

*Code P recommends postponing study until after streamlining is implemented

Subject:	Action:	Actionee:
Computer Communications Technology		
-Establish coordination policy	Establish policy and format for electronic dissemination	Recommend CIO lead, Codes F, P, S, U, Y support
-Location of relevant NASA information and tools	Develop customer friendly paths and automated systems (feasibility study)	Code R lead, Other offices as appropriate
-Equitable and Universal Access	Conduct pilot program providing toll-free access to NASA info	Code O lead; other Codes as approp. (funding to be determined, may be an issue)
-Electronic Publishing	Conduct cost/benefit analysis of providing NASA publications electronically	Code J lead, Codes F, P, support
Minimize impact of loss of NASA Support Contractors	Explore use of IPA's, cooperative agreements, other SCWG options	Science Codes
Speaker's Bureau	Draft memo from Administrator to officials in charge encouraging support for NASA employee participation in the Speaker's Bureau	Code P
	Provide training on speaking and presentation	Codes P, F
Astronaut Appearances	Coordinate astronaut appearance priorities across NASA	Code P, with support from Code M, JSC

Appendix D

NASA Administrator's Letter to Participants of Chantilly, Virginia "Public Communication of NASA's Science" Meeting

Dear (Meeting Participant):

NASA is committed to communicating our science to the public more effectively. We have stepped up to the challenges you posed last year and recommitted ourselves to sharing the excitement and inspiration of our programs with all people.

I would like to highlight the progress NASA has made since our January 1994 meeting on the Public Communication of NASA's Science. Your participation in that meeting helped to spark an Agency wide reevaluation of our science communications activities. As a result, we have taken a number of steps (summarized in the enclosure) to improve our performance as science communicators.

Following the Chantilly meeting, Dr. France Cordova, NASA's Chief Scientist, led an Agency wide review to identify ways in which NASA could better communicate its science. We identified eight goals for the Agency which encompassed the themes discussed at the meeting. NASA also took a comprehensive look at the way the agency communicates science to ensure that any changes the agency made were long-term improvements. We developed a Science Communications Strategy to guide these efforts with over two dozen recommendations to implement the strategy, which are described in the first goal of the enclosure.

NASA recognizes that science communications is one of the most important activities the Agency can and should perform. One step we took was to include science communications as one of the Agency's goals in the 1995 update to NASA's Strategic Plan.

In 1994, the Administration issued a report, *Science in the National Interest*, identifying new national science goals. Two of the five goals are related to science communications: Produce the finest scientists and engineers for the 21st century and raise the scientific and technological literacy of all Americans. The goals and strategies outlined in the enclosure underscore NASA's commitment to communicate our science results effectively. However, we cannot do this alone. To achieve fully the goals in *Science in the National Interest*, I strongly urge you to challenge your colleagues to communicate, at every opportunity, the results and relevance of their science. Only in this way can the public reap the full benefit of its investment.

Sincerely,

[original signed by]

Daniel S. Goldin
Administrator

Enclosure

STATUS OF GOALS AND PLANS RESULTING FROM JANUARY 1994 NASA PUBLIC COMMUNICATIONS MEETING

INTRODUCTION

Since the January 1994 public communications meeting, NASA recognized that the goals and plans identified in this meeting were representative of broader science communications processes. Therefore, while NASA addressed these specific goals and plans, it also reviewed the broader science communications processes underlying the goals and plans to ensure that the resulting changes were long-term improvements in the manner in which NASA communicates science to the public.

Goal: Form a NASA Public Communications Steering Group.

A Science Communications Steering Committee was established in April 1994 to establish policies for and coordinate NASA's Science Communications activities. The Steering Committee is chaired by the NASA Chief Scientist and is composed of the Associate Administrators from the NASA Science, Public Affairs, and Education offices. The Steering Committee established a Science Communications Working Group (SCWG) to coordinate the goals and plans derived from the January meeting and to review and make more comprehensive recommendations on NASA's science communications processes and activities. The Working Group identified six principles that must guide NASA's science communications processes:

Leadership: NASA must provide interagency leadership to help define the appropriate Government role in communicating science.

Coordination: NASA efforts must be fully coordinated to focus a broad range of views and capabilities to most effectively communicate science to the public and to extend limited resources.

Integration: Science communications must be embedded in everything that NASA does, as an essential component of the Agency's mission.

Participation: Broader participation by key groups in communicating science -- most notably the scientific community -- is essential.

Leveraging: Whether through funding or partnership, NASA must work more extensively with external organizations and groups to effectively convey science results.

Evaluation: Metrics for performance and continual assessment of effectiveness should be a fundamental element of all efforts, followed by any necessary adjustments.

Complementing the work of the Steering Committee, NASA has established a NASA Information Center to coordinate NASA communications to ensure that they are timely and accurate.

Finally, as evidence of NASA's leadership initiative in communicating science, NASA's Chief Scientist was recently appointed as Chair of the National Science and Technology Council's Subcommittee on Communicating Science to the Public. This Subcommittee has been tasked with defining the appropriate role of the Government and in determining action to achieve the goal of communicating science to the public.

Goal: Develop education/outreach for NASA research missions.

To strengthen the translation of scientific research into science communications, NASA has developed the following flexible set of tools to use in its research solicitations:

a. Requiring that science communications plans in appropriate NASA science activities be submitted and evaluated as an evaluation criteria in the awarding process.

b. Issuing supplemental or separate educational grants.

c. Encouraging research proposers to become more active in science communications.

Specific samples of these tools are enclosed as
Attachment A. Note in particular the recent Announcement of Opportunity for the planetary science missions named "Discovery." The announcement calls for a science communications plan as part of the proposal requirements.

In addition, each NASA science office is developing science education strategies in collaboration with the Office of Human Resources and Education to be consistent with the Agencywide education strategy. These strategies incorporate the unique educational aspects of each of NASA's science offices to support the national education agenda.

Further, the SCWG has developed plans for the use of integrated communications teams for the development of science communications products and activities for all major missions or program disciplines/themes. Such teams have successfully been used in the past to develop effective communications strategies; NASA's Hubble servicing mission is just one example.

Goal: Leverage the impact of NASA's mission products through proactive distribution of video, graphic and CD ROM materials to educators, science service organizations, museums, planetariums and the commercial sector.

NASA has tasked the Imaging Node of NASA's Planetary Data System (PDS), located at the U.S. Geological Survey (USGS) in Flagstaff, Arizona, to provide planetary images to educational product developers. NASA has identified $100,000 in fiscal year 1995 to support USGS's enhanced role in this area. Further, a Management Operation Working Group (MOWG), composed of user representatives, the Imaging Node Director, a JPL public information representative, and scientists at large from the planetary science community, was established. The MOWG will advise the PDS Imaging Node on developmental and operations issues regarding public outreach. The members of the MOWG have exchanged written evaluations of current practices and ideas on the future direction of this activity in advance of their first formal meeting, scheduled for late April. In the interim, USGS is assisting individual educational product developers upon request; a more proactive approach is envisioned once the MOWG meets to discuss future direction.

Proactive electronic distribution of NASA mission products, research data, and other information has increased dramatically in the last year, as exemplified in the following:

a. NASA Spacelink, our primary electronic information network for educators, has been upgraded to allow full internet connectivity as well as enhanced dial-in capacity and limited toll-free access.

b. Internet servers have been established at 10 NASA Centers, NASA Headquarters, the Goddard Institute for Space Studies, and for many NASA programs and services.

c. The Office of Public Affairs has created its Homepage; news and information is now available via Internet and Compuserve.

d. Three Internet sites were established for Shoemaker-Levy 9 data, resulting in 2.5 million public inquiries in just 1 week.

To help disseminate "hardcopy" materials to elementary and secondary educators, NASA Program Offices have increased their utilization of the Teacher Resource Center Network (TRCN). The Network comprises Teacher Resource Centers (TRC), located at NASA Centers, Regional Teacher Resource Centers (RTRC) at colleges and museums, and the Central Operation of Resources for Educators (CORE). Educators may copy NASA text, audio, visual, and computer materials at TRC's and RTRC's, while CORE processes U.S. and international educator requests by mail.

The SCWG has recommended that NASA develop "customer- friendly" paths through its online systems that allow customers to easily locate relevant NASA information and tools.

Further, the SCWG recommended that a cost/benefit analysis be conducted of transitioning NASA's publications facility into a "virtual warehouse" in which electronic access and print on demand of NASA publications would be possible.

Goal: Increase coverage of NASA activities and missions by the television medium.

A media outreach plan was developed to seek new opportunities to collaborate with producers of television, broadcast, feature film, and documentary productions to best communicate the Agency's missions and discoveries to the public. NASA recognizes the value of leveraging its resources by collaborating with the entertainment and broadcast media. A variety of projects are in progress involving the Discovery Channel, NBC, CNN, and PBS, to name a few. This initiative strengthens and expands efforts to better leverage NASA resources.

In January, NASA implemented a refocused NASA TV system to make the Agency's information more usable by the broadcast news medium. The new approach shifts from scheduled "programming," which benefits limited audiences, to real-time mission coverage and daily news feeds of material, such as live interviews with senior officials, scientists and engineers, as well as educational and historical materials. This approach has already enabled wider dissemination to the general public and allows NASA to directly reach important local, regional, and specialized markets with its story.

Our new approach to television is off to an excellent start. All networks picked up the El Nino story and transmitted it to affiliates. One-on-one interviews were conducted with 13 news networks and individual stations that reached an estimated two million households. El Nino also claimed substantial press coverage.

Goal: Expand use of new communication technologies as part of NASA's education technology plan.

NASA has concluded an agreement with the Wheeling Jesuit College in West Virginia to establish a Classroom of the Future (COTF) program. This cooperative arrangement will allow NASA's research data bases, technology tools, and technical expertise to be adapted to the needs of the educational community. This state-of-the-art facility was dedicated October 25, 1994, and staff was in place by December 1994. Teacher workshops will begin in 1995.

NASA has issued awards and grants for the development and application of technologies to help provide NASA science data to various user communities via the Internet. These awards and grants were issued by means of innovative solicitation approaches, involving commitment of resources of both NASA and the awardee. A list of the awards issued to date are enclosed as Attachment B.

Goal: Develop a NASA's Speaker's Bureau

NASA established a unified, Agencywide Speaker's Bureau. Officials-in-Charge across the Agency have identified skilled employees who can serve as speakers to a variety of audiences. A data base is being developed that characterizes the designated NASA speakers by geographical location, area of expertise, and speaking experience so that speakers can be better matched to the speaking engagement. NASA Centers expand the Agency's presence in communities within their region. Speakers can be scheduled by contacting either the NASA Headquarters Public Affairs office or the nearest NASA Center.

The following tools are being developed to enhance the speakers' ability to communicate:

a. NASA themes, messages, and talking points

b. "This is NASA" slide presentation

c. Answers to 20 questions most commonly asked

d. NASA Strategic Plan

e. Up-to-date budget information

f. Other support materials

Development of these products is already under way.

Goal: Establish award to recognize excellence in public education.

NASA has recently revised the language used in its annual call for awards to emphasize that non-NASA individuals should be considered for NASA awards for recognition of achievements in communication of science to the public and has encouraged NASA employees to consider the nomination of such non-NASA individuals. Specific awards that apply are the Distinguished Public Service Medal, Public Service Medal, Public Service Group Achievement Award, and Group Achievement Award.

Goal: Facilitate and enhance the Space Telescope Institute's education and outreach program.

NASA identified $1 million this year to augment the highly successful education and public outreach program being run by the Space Telescope Science Institute (STScI) under contract to NASA's Goddard Space Flight Center (GSFC). These additional funds are being used to enhance existing activities to increase the numbers and types of materials being produced for communicating science to the public. In August 1994, STScI submitted a proposal to further enhance its science communications activities. As a result, NASA and STScI have agreed in principle to augment the existing contract between GSFC and STScI by $3 million per year to expand STScI education and public outreach activities. In addition, STScI has agreed to assist in the administration of the Astrophysics Division's Initiative to Develop Education through Astronomy (IDEA) program; the IDEA program is described in detail on the following page. The total value added to the STScI contract should be in excess of $3.4 million per year. It is expected that all final paperwork in support of this activity will be in place by the end of March 1995.

EXAMPLES OF SCIENCE COMMUNICATIONS RESEARCH SOLICITATION "TOOLS"

Direct Quotations from Existing Research Solicitations

Discovery Program -- "The Discovery Program ... will also provide an opportunity for educational program activities that support the Nation's educational initiatives. Finally, the Discovery Program also represents an opportunity for NASA to enhance and broaden public awareness of, appreciation for, access to, and participation in, solar system exploration."

"Discovery investigations should include activities which will enhance the level of understanding and awareness of solar system exploration by the public. Public information programs that will inform the public by mass media or other means or other innovative ideas for bringing planetary science to the public are encouraged. Educational activities coordinated with educational institutions are also encouraged. Such activities might include substantial participation by teachers and students in the investigation and the development and utilization of programs that will involve educational institutions at any level in the investigation."

Initiative to Develop Education through Astronomy (IDEA) --
"The purpose of the IDEA program is to encourage the participation of research astronomers, particularly those funded by NASA, in experimenting with projects that take advantage of their special talents and the excitement of astronomy to promote greater mathematical, technological, and scientific literacy."

"IDEA grants are intended to promote math, science, and astronomy education among nonspecialists. It is, therefore, expected that most grants will target K-12 teachers and students or public audiences. However, some consideration will be given to innovative proposals to enhance or improve introductory college courses in astronomy or math/science literacy. In particular, proposals targeting undergraduate or graduate students training for careers in K-12 education are permitted and encouraged."

Space Physics Education Outreach (SPEO) **Program** --
"The intent of the SPEO program is to encourage the space physics research Principle Investigators and Co-Investigators to become actively involved with local schools and/or undergraduate colleges, as well as with appropriate public educational institutions such as science museums or planetariums. In doing so, it is emphasized that the purpose of this SPEO program is to provide educational opportunities and/or materials that promote general scientific literacy, especially with respect to the understanding of space sciences."

NASA Research Announcement on NASA Specialized Centers of Research and Training (NSCORT) -- The NSCORT program provides funding for institutions to advance basic knowledge and generate effective strategies for coping with specific problems in the life sciences area.

One of the goals of the NSCORT program is "to involve students, research scientists, and engineers from academia and the public and private sectors, so that the training of professionals is enhanced and that knowledge is transferred expeditiously among these sectors."

One of the evaluation criteria for awarding grants to become an NSCORT is "strength of proposed education and training plan and prior experience of the proposing institution in education and training."

REMOTE SENSING DATABASE (RSDB) AND DIGITAL LIBRARY TECHNOLOGY (DLT) GRANTS AND AGREEMENTS

A total of nine projects to develop RSDB applications are receiving funding through cooperative agreements or grants. They are:

Athena: Curriculum Development, Implementation and Support on the Internet -- a $900,000 cooperative agreement between NASA and Science Applications International Corporation, Seattle, Washington. Associates include Northshore School District, Bothell, Washington; Seattle Public Schools, Seattle, Washington; Lake Washington School District, Kirkland, Washington; Bellevue Public Schools, Washington; and the Office of the Superintendent of Public Instruction, Olympia, Washington. The project will develop curriculum materials integrating ocean, weather, land and space data for grades K-12.

Bay Area Digital GeoResource (BADGER): A Model for Public/Private Shared Access to Earth Science Data Over the Internet -- a $3 million cooperative agreement between NASA and Lockheed Missiles and Space Company, Research and Development Division, Palo Alto, California. Associates include NASA Ames Research Center, Moffett Field, California; International Geomarketing Corporation, Redwood City, California; and the City of Mountain View, California. BADGER will enable local governments, utilities, businesses and the public to find, use and share data sets referenced by geological features that help them manage current responsibilities and improve the quality of their products and services.

Earth System Science Community Curriculum Testbed -- a $1.1 million cooperative agreement between NASA and ECOlogic Corp., Washington, DC. Gonzaga High School, Washington, DC, is an associate in this project. The effort will develop Internet access and curriculum materials for investigation- based science instruction by high school and college students.

Enhanced Access for Forest Management Planning -- a $600,000 grant to the University of Minnesota. The Minnesota Department of Natural Resources, Grand Rapids, will cooperate in this endeavor to use LANDSAT imagery, digitized aerial photography and ground-based forest databases aiding in the management of forest resources.

Enhancing the Teaching of Science in Elementary Education Through the Application of NASA Remote Sensing Data Bases and Internet Technology -- a $200,000 cooperative agreement between NASA and The Analytic Sciences Corporation, Arlington, Virginia, with support from the Franconia, (VA), Elementary School and the Fairfax, (VA), County school district. This project will develop weather-based curriculum for grades K-6.

Exploring the Environment -- a $1.8 million cooperative agreement with the NASA Classroom of the Future at Wheeling Jesuit College, Wheeling, West Virginia. The project will develop computer software modules for use by high school students and teachers investigating Earth science questions via extended inquiries over the Internet.

NASA Digital Image Data Distribution for Education, Public Access, and Tourism in Hawaii: A Model System -- a $900,000 grant to the University of Hawaii, Honolulu. Associates are the NASA Jet Propulsion Laboratory, Pasadena, California; Maui Community College, Kahului, Hawaii; Leeward Community College, Pearl City, Hawaii; and Highlands Intermediate School, Pearl City. This effort will prepare and present current data and imagery of the Hawaiian Islands over the Internet for use by the tourism industry as well as that of education, television, and researchers.

VOLCANOWATCH: Bringing Volcano Remote-Sensing Data to Classrooms and National Parks and Monuments -- awarded a $900,000 grant to the University of North Dakota, Grand Forks. Other participants include Lincoln Elementary School, Grand Forks; University of Hawaii, Honolulu; Educational Services
District 112, Vancouver, Washington; Gifford Pinchot National Forest, USDA Forest Service, Vancouver, Washington; and Hawaii Volcanoes National Park. The project will present information over the Internet covering current and historical activity of terrestrial and planetary volcanoes. Targeted audiences include visitors to Mount Saint Helens National Volcanic Monument and Hawaii Volcanoes National Park as well as grade-school students.

Public Access to Earth and Space Science Data Via Television -- a $2.2 million cooperative agreement between NASA and WRC-TV, Washington, DC. Partners in this endeavor include the Jet Propulsion Laboratory, Pasadena, California; NASA's Stennis Space Center, Mississippi.; and the National Oceanic and Atmospheric Administration's National Weather Service, Washington, DC. The project will develop visualizations of current Earth and space science data to be included as part of the daily weather and news reports for WRC-TV and other NBC affiliates. More importantly, the data will also be available over the Internet for use in science classes.

The following six DLT projects are receiving funding to help provide for the future technologies for our libraries and research information:

Compression and Progressive Transmission of Digital Images -- a $500,000 grant to the University of Wisconsin, Madison, and the Space Telescope Science Institute, Baltimore, Maryland. This team will improve the rate at which large digital images can be transferred across the network.

Creating the Public Connection: Interactive Experiences with Real-Time Earth and Space Science Data -- an $800,000 grant to Rice University, Houston, Texas, in collaboration with the Houston Museum of Natural Sciences. The work will advance kiosk technology, allowing touch navigation through multidisciplinary science data, as well as making NASA data available to all who visit the Houston Museum of Natural Sciences.

Retrieval of Digital Images by Means of Content Search -- a $2 million cooperative agreement with IBM Corporation, Yorktown Heights, New York. The project focuses on content retrieval on compressed images.

Test Applications and Digital Library Technologies in Support of Public Access to Earth and Space Science Data -- a $2.1 million cooperative agreement between NASA and the University of Illinois, National Center for Supercomputing Applications, Urbana-Champaign. The team will develop Mosaic file format enhancements and a space science and astronomy server. Mosaic is a popular software tool used to access information on the Internet.

Useability and Interoperability: A Dual Strategy for Enabling Broader Public Use of NASA's Remote-Sensing Data on Internet -- a $2.3 million cooperative agreement between NASA and Bellcore, Morristown, New Jersey, in collaboration with Camber Corporation, Huntsville, Alabama; Open GIS Foundation, Cambridge, Massachusetts.; and the Goddard Space Flight Center, Greenbelt, Maryland. The team plans to develop a virtual geodata model to enable broader public use of remote-sensing data.

"Reaching NASA from Home -- Internet Access via Cable TV" -- a $700,000 cooperative agreement with Computer Sciences Corporation, Calverton, Maryland, in collaboration with Jones Intercable, Gambrills, Maryland; Integral Systems, Lanham, Maryland; and the Goddard Space Flight Center. The team will develop a system to provide Internet access to the general public using channels on a local cable television connection.

NASA INFORMATION INFRASTRUCTURE TECHNOLOGY AND APPLICATIONS (IITA) INTERNET GRANTS AND COOPERATIVE AGREEMENTS

Passport to Knowledge: Electronic Field Trips to Scientific Frontiers via Interactive TV and the Internet -- a $902,000 cooperative agreement between NASA and The Childhood Project, Incorporated, Summit, New Jersey. The NASA-funded portion of this project will use the Internet to provide online access to scientists' diaries and other curriculum materials in support of live, national, and interactive television field trips to the Antarctic, the Kuiper Observatory, and the Hubble Space Telescope.

Surfing the Net: Aquatic Applications of Archival Satellite Imagery -- a $266,000 cooperative agreement between NASA and the Gulf of Maine Aquarium, Portland, Maine. This project will develop innovative K-12 learning activities using online data to investigate the land-sea interface, oceanographic applications, and studies of the effect of human activities on the environment. Early efforts will be tested by classes in the Yarmouth, Maine, school district.

Windows to the Universe - An Earth and Space Science Internet-Based Active Learning System for the General Public -- a $900,000 grant to the University of Michigan to create a learning system for Earth and simulation-guided animation and voice overlays to be implemented in museums and libraries nationwide. Collaborators in this project include the Hands On Museum, Ann Arbor, Michigan; Cranbrook Institute of Science, Bloomfield Hills, Michigan; and Pioneer High School, Ann Arbor.

A Science Infrastructure for Access to Earth and Space Science Data Through the Nation's Science Museums -- a $900,000 grant to the University of California, Berkeley, to create a national Science Information Infrastructure, a natural partnering of science museums, teachers, and research institutions to stimulate public awareness and use of remote- sensing data and to deliver this information to the general community. This project presents a consortium of museums which include the Smithsonian Astrophysical Observatory, Cambridge, Massachusetts; Lawrence Hall of Science, Berkeley, California; Boston Museum of Science, Boston, Massachusetts; The Exploratorium, San Francisco, California; National Air and Space Museum, Washington, DC; New York Hall of Science, Flushing Meadows Corona Park; and Science Museum of Virginia,
Richmond, Virginia.

Dissemination of Atmospheric Sciences and Space Sciences Data and Information for K-12 and the Public: A Pacific Northwest Approach -- an $880,000 grant to the University of Washington, Seattle, to make real-time and retrospective, atmospheric, and space science data available to the general public with special emphasis on products for use in science and mathematics instruction. Products will be tailored to display and explore the unique meteorology of the Pacific Northwest and the Puget Sound area.

Using Science and the Internet as Everyday Classroom Tools -- a $667,000 cooperative agreement between NASA and the Smithsonian Institution Astrophysical Observatory, Cambridge, Massachusetts. Associates include Tenon Intersystems and AT&T. This project will develop a K-6 "hands-on" astronomy curricular theme that integrates science and Internet/computer activities into the daily life of the classroom.

Flood Management Enhancement Using Remotely Sensed Data -- a $609,000 cooperative agreement between NASA and SENTAR, Incorporated, Huntsville, Alabama, to provide enhancements to existing flood-management capabilities by using remotely sensed Earth data and the extension of Internet for the communication of data to the field.

Satellite Data-Driven, Real-Time Agricultural Management Decision Aids -- an $842,000 grant to the University of Wisconsin, Madison, to develop four end-user applications of satellite data in the agricultural and environmental management arena: (1) irrigation scheduling for on-farm use, (2) irrigation electrical demand prediction system for power generation decisions by utility companies, (3) estimation of the duration of leaf wetness leading to foliar disease prediction in potatoes, and (4) prediction of frost damage for protection of cranberry crops.

Emergency and Crisis Management: A Remote-Sensing Application -- a $263,000 grant to the University of
North Texas, Denton, to build an application on the Internet to demonstrate the usefulness of NASA's remote-sensing data for use in mitigation, preparation, response, and recovery from natural and technological disasters.

SAIRE - A Scalable Agent-Based Information Retrieval Engine -- a $600,000 cooperative agreement between NASA and Loral AeroSys, Seabrook, Maryland, with support from Bowie State University in Maryland. This project will develop an intelligent software program that will accept simple descriptions of a request, then correct errors or add missing information, learn the user's preferences, and shield the user from complex querying mechanisms in order to access and present Earth and space science data available over the Internet.

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