## NSSDC Activities Bolster Education

For 25 years, NSSDC has provided data archiving and dissemination services that have been vital in supporting the NASA and worldwide space and Earth science research efforts. Little known, however, is the fact that NSSDC has also played a very limited but important role (as the neon art and thank-you letters on NSSDC's bulletin boards testify) in the U.S. education endeavor at the elementary through high school levels.

Much of NSSDC's data are used in a variety of products and publications that are made available through NASA's national network of Teacher Resource Centers (TRCs). These digital, textual, and image data appear in magazines, slides, posters, videos, compact discs, lesson plans, articles, coloring books, photographs, etc. The printed materials are free of charge to educators, but videos and slides need to be copied onto blank film provided by the individual users. At the end of this article is a list of telephone numbers of TRCs located across the United States. Although this is not a complete listing, staff members at these sites have more complete information

about both local and regional resources and laboratory locations.

NSSDC is working with the science and education communities to make data on CD-ROM disc sets available for previewing and copying data onto floppy disks at

various TRCs around the country. This process makes data produced through highly advanced technology available to educators at a very low cost. Although right now few TRCs have the necessary hardware for sharing CD-ROM data, the goal is for all TRCs to someday have this equipment in place.
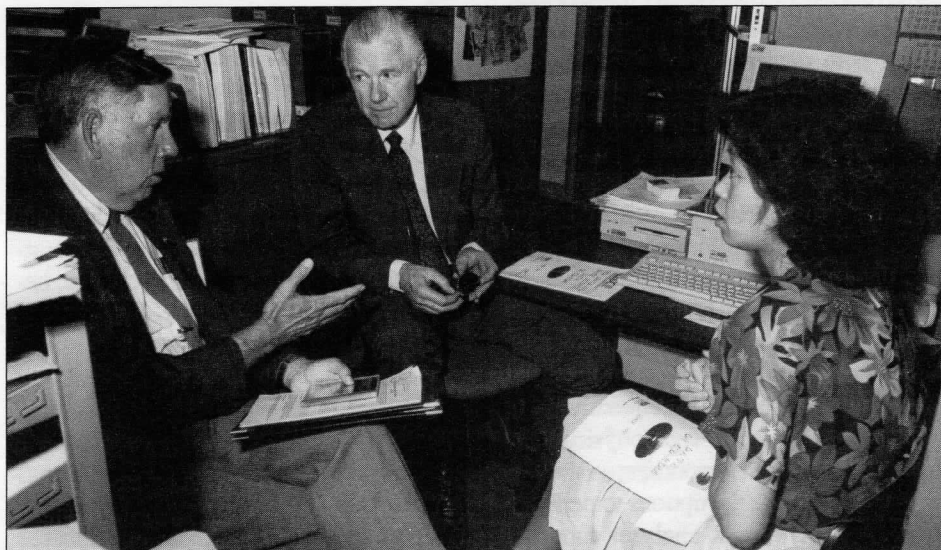
*As a middle school teacher, Ken Selee (left) of Turlock, California, discussed NSSDC's CD-ROM data with Charles Boyle (center) of Environmental Education Programs (Earth Sciences Directorate) and Carolyn Ng (right) of NSSDC's Request Office. Selee recently has joined Goddard's Educational Programs Office.*

## *inside:*

*Dedicated to providing multidisciplinary data and information for the worldwide science community*
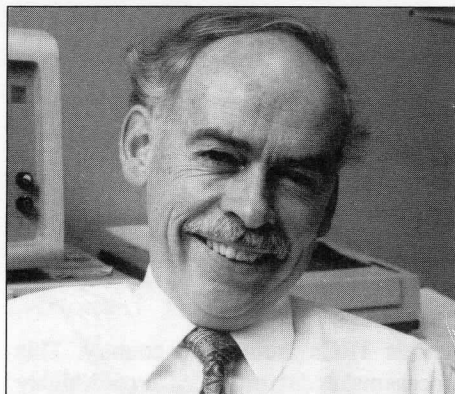
# Identifying the Right Data and Documentation for Archiving

It is necessary to make judgements in deciding what data and supporting documentation, ancillary data, and software should be archived from each data-generating NASA-funded investigation. As a matter of principle, the highest-level data set wherein data have not been irreversibly transformed is the ideal data set to archive. It is this data set that both preserves all of the science content of the original investigation and is the most conveniently organized data set that preserves this content.

In practice, these ideal data sets frequently require comprehensive documentation study by secondary users, and a great deal of effort and processing to bring them to a state of "geophysical parameters" that are the typical input to publishable scientific analyses. For this reason it is frequently very desirable to also archive geophysical parameter data sets with temporal/spatial resolutions that preserve the options to perform virtually all the science analyses supportable by the original data.

Consider what documentation needs to be archived to support data sets that have not been irreversibly transformed, and those which have been so transformed. In both cases, the general principle is that sufficient documentation should be archived to enable the correct and independent use of the data. "Correct" means that uncertainties and errors in the data must be communicated, so that data will not be over-interpreted or otherwise misinterpreted in analyses.

"Independent use" implies that, although there may be Discipline Data Systems (DDSs) created with one of their major objectives being to support scientists' use

of data archived by those DDSs, the true goal in documenting data should be to minimize, or eliminate if possible, the need of archival data researchers to turn to experts (who may not be available as long as the data) for support.

For very-low-processing-level data ("raw" data, organized telemetry data, etc.), the documentation required to enable correct and independent use is typically very extensive. A key element of such documentation often includes well-documented software. In this case, it is important that such software not become inoperative as operating systems (or other factors) change, because that would cause a loss of usability of the data. Recent trends towards software standards that promote transportability across platforms and across time should help this. The approach NSSDC has used in archiving low-level (software-requiring) data from the Dynamics Explorer spacecraft is to bring in well-documented source code listings so that if any executable software became inoperative, it could, in principle, have its functionality rebuilt if needed.

In the case of documentation of reversibly transformed data, it is very desirable to document the various transformations, and their associated assumptions, to which the data were subjected. This will enable archival researchers to make independent assessments of the uncertainties in the data, to supplement the original data producers' stated estimates of uncertainties in the data.

Traditionally, few of the past data-generating missions or investigations have achieved the stated ideals in their preparation and archiving of data and supporting documen-

tation. More recently, missions have become increasingly sensitive to identifying and archiving the "right" data and documentation. Because such archiving may be expensive for a mission, it should be planned for early.

As a general principle, total mission funding should be apportioned to supporting current analyses by Principal Investigators, Guest Observers, etc., and to documenting and archiving activities of PIs, Gos, etc., in such a way as to maximize the totality of near term and long term (i.e., archive-based) science from the data. There may be some cases wherein archiving of only the higher-level reversibly transformed data, or wherein archiving low-level data with less than the ideal level of documentation, is supported by this criterion.

It is argued by some that there are low-level data sets where the cost of sufficient documentation (to allow correct and independent data use across the full range of physical problems to which the data might be applied) is prohibitively high, yet where use beyond the science teams creating the data is desirable or expected. For such cases, it is important that the original expertise exists to support such use, and also to recognize that when the original expertise is finally lost (or cannot be "regenerated" in the context of a DDS), the utility and value of the data will also decrease, perhaps to zero.

As a distinct point, it might also be noted that NASA's public archives (NSSDC, the DDSs) may sometimes hold "raw" data that might be reasonably judged to be unusable,

# HPCC Software Support Begins

NSSDC is coordinating the development of the High Performance Computing and Communications Software Exchange (HPCC-SE) for use by the eight federal agencies in the HPCC program. The goal of the HPCC-SE is to facilitate the exchange and reuse of software over the eight federal agencies making up the HPCC program. These agencies include NASA, DARPA, DOE, NSF, DoC/NIST, HHS/NIH, DoC/NOAA, and EPA.

The specific objectives of the HPCC-SE are to:

*   develop and demonstrate a distributed architecture and supporting technology that support software exchange
*   implement an initial distributed HPCC Software Exchange (HPCC-SE) that supports the needs of the HPCC
*   speciy an open non-proprietary architecture that will facilitate the emergence of a national HPCC-SE and national software exchange

The development of the HPCC-SE initial capability is scheduled to take place in three two-year phases. An Experimental System will help discover some of the intrinsic problems of distributed software

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## Director's Message, *from p. 2*

for want of sufficient documentation, beyond the scientists associated with the original missions.

The data environments of the various NASA discipline domains differ considerably. The above two paragraphs do not apply uniformly across all.

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Many issues ago, our NSSDC Newsletter tried to initiate an active and productive "Letters to the Editor" feature. If the comments above stimulate replies to NSSDC, we shall be very pleased, and we shall then activate the deferred Letters to the Editor feature. (Of course, letters on other subjects are welcome also.)

Joseph King

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sharing and is intended for a limited audience. A Prototype System will be a more extensive version and will serve a much wider audience. The final stage will be an initial Operational System, which will provide the initial operational capability of the HPCC-SE. Results of the Experimental System will generate requirements for the Prototype System. Similarly, the Prototype System will provide requirements for the Operational System.

During fiscal year '92, NSSDC led the development of the first phase—the HPCC-SE Experimental System. The Experimental System integrated the following software repositories: Netlib, GAMS, Citlib, Softlib, GAMS, CUGDUS, COSMIC, MASPAR, and Supernet.

The Experimental HPCC Software Exchange is accessible via Internet in X-Windows and VT100 modes. In addition, a document entitled "An HPCC Software Exchange-Architectural Elements and Metrics" was produced, which describes the major elements of the system and provides benchmarks for various approaches to these elements.

The document will serve as the basis of an open architecture workshop at which other alternative approaches can similarly be measured.

Barry Jacobs

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# NASA Center for Computational Sciences Offers Supercomputing Support

*(Ed. Note: This article is intended as a service to those readers who may be eligible for NCCS support but who may have been unaware of such an option.)*

The NASA Center for Computational Sciences (NCCS) supercomputing facility is part of the Space Data and Computing Division (SDCD) at Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. It is supported by the NASA/Headquarters Office of Space Science and Applications (OSSA). The NCCS was established in 1984 by combining two existing computing facilities at GSFC to provide a unique blend of world-class supercomputing power and a data-rich environment.

The NCCS offers computational tools and services required by scientists performing research funded by OSSA. The user community is composed of GSFC scientists as well as scientists affiliated with university programs, government institutions, and private organizations.

The research efforts represented in the user community span virtually the entire spectrum of space and Earth sciences disciplines. With a wide variety of resources available to support computing needs, the NCCS supercomputing facility offers major hardware components including a CRAY Y-MP8/464 supercomputer, a CONVEX C3240, and an IBM 9021 processor. Four StorageTek automated cartridge systems provide over four terabytes of near-line storage. The CRAY and CONVEX both run UNIX-based operating systems. A UNIX system will be available on the IBM in the near future.

The primary graphics packages being used at the NCCS are the Applications Visualization System (AVS) and NCAR graphics. AVS supports interactive visualization on the CONVEX. NCAR Graphics is available on the CRAY, CONVEX, and IBM. The Scientific Visualization Studio produces animation sequences for the NCCS user community.

To use NCCS systems, you must have an allocation of computing units (CUUs). The NCCS allocates CUUs upon authorization by the NASA/Headquarters Office of Space Science and Applications (OSSA). For more information, please contact the NCCS at (301) 286-8541.

Patricia Cunningham
Carol Boquist

## New Data Received at NSSDC:
# July - September Arrivals Now Available

*This column describing new data that are available through NSSDC will be a regular feature of our newsletter, beginning with this issue.* —Editor

Over the past few months, NSSDC has received many new data sets, and some details about these arrivals are summarized on the table on page 5.

New data sets in the area of space physics include RIMS (retarding ion mass spectrometer) data from DE-1 and magnetometer (MAG-B) and WATS (wind and temperature spectrometer) data from DE-2. MAG-B and WATS are complete sets of all existing data. IMP-J distribution functions (1-10 keV electrons and protons) and hourly average count rates (protons and alpha particles, 1-12 MeV) were received on magnetic tape. ISEE-1 1-second measurements by the plasma wave experiment were pro-

vided on seven 12" Optimem WORM optical disks. A new addition to the solar wind electron moments (168-second) data set extends the time period to June 1992. These data are derived from measurements of the Los Alamos electron experiment on ISEE-3/ICE. NSSDC received additional 15-minute pulse height tapes from the Charged Particle Instrument on Pioneer 10 and 11, and 5-minute sectored rate tapes from the same experiments.

Archival Tracking Data Files (ATDF) obtained with the Deep Space Network (DSN) were received on magnetic tape. These data are in support of the Pioneer 10 and 11 celestial mechanics experiment.

Planetary data arrivals include color and black-and-white press release photographs from Magellan radar and several radar data sets on CD-ROM from Magellan. These

images include full resolution, compressed once, and compressed twice Mosaic Image Data Records (MIDR); and microwave emissivity, surface slope, reflectivity, and topographic Global Data Records. Pioneer Venus Orbiter orbit plots were also received on microfiche.

In the astrophysics discipline, NSSDC received additional IUE spectroscopic image data.

New solar physics data include a Yohkoh solar image display demonstration available on PC diskette, and San Marco D/L solar data.

Earth science data sets received include ERBS ephemeris data and three new Nimbus 7 data sets: ERB solar and Earth flux data; TOMS ultraviolet radiance data with ancillary meteorological information; and SBUV radiance, ultraviolet solar radiation, and ancillary meteorological data.

Joy Beier

# Falgout Joins CRUSO, as Ng Steps into New Role

Sheryl Falgout has just joined NSSDC's Coordinated Request and User Services Office (CRUSO), replacing Carolyn Ng as User Services Coordinator. Formerly an Administrative/Logistics Specialist in the User Support Branch of the Space Telescope Science Institute in Baltimore, Falgout's experience includes developing user documentation, establishing support procedures, and serving as a liaison between users and technical and scientific staff members.

Carolyn Ng assumes a new position within NSSDC, leading an effort to assess the quality of the Data Center's data and information products and services from the perspective of NSSDC's scientific customer community.

Carol Kanga

# NSSDC Welcomes Visitors from Around The World

*During the recent international meetings that are discussed elsewhere in this newsletter, a number of visitors took advantage of the opportunity to come to the National Space Science Data Center and become better acquainted with the ongoing international activities and the technologies being used for data archiving and dissemination.*

*Among the guests who visited with NSSDC personnel during these meetings were: Kohei Cho and Shoji Takeuchi of the Resource Technology Center in*

*Tokyo, Japan; Randall Thomas, serving as a consultant to the International Geosphere-Biosphere Program and presently residing in Copenhagen, Denmark; Terry Fisher of the Canadian Centre for Remote Sensing in Ottawa, Canada; Jose Luiz Aguirre of the Brazilian Space Agency (INPE); Alexander Feldstein of the Center for Planetary Geophysics in Moscow, Russia; and Gunter Schreier of the German Space Agency in Oberpfaffenhofen, Germany.*

*James Thieman*

## New Data Arrivals at NSSDC

| Platform | Instrument | Contact | Measurement | Time Span | Medium |
|---|---|---|---|---|---|
| DE-1 | RIMS | Craven | spectra | 10/7/81 - 12/28/81 | optical disk |
| DE-2 | MAG-B | Slavin | magnetic field measurements | | optical disk |
| DE-2 | WATS | Wharton | neutral wind, neutron particle temperature | | optical disk |
| ERBS | SAGE II | McMaster | solar radiance, telemetry and ephemeris | 11/1/84 - 7/31/92 | magnetic tape |
| IMP-J | Electron and Proton Detectors | Huang | electrons, protons (1-10 keV) | 1/1/78 - 12/28/82 | magnetic tape |
| IMP-J | Electron and Hydrogen and Helium Isotope Detectors | Stone | protons and alpha part. (1-12 MeV) | 10/28/73 - 12/31/90 | magnetic tape |
| ISEE-1 | PWE | Anderson | solar wind and wave phenomena | 10/22/77 - 7/15/86 | optical disk |
| ISEE-3 | SWP | Gosling | solar wind electron, ion velocity distribution | 2/27/80 - 6/13/92 | magnetic tape |
| IUE | UV Spectrograph Package | | spectra | 4/1/78 - 5/15/91 | magnetic tape |
| Magellan | SAR | | press release photos | | 4×5 b/w negative |
| Magellan | SAR | | press release photos | | 4×5 color negative |
| Magellan | SAR | | C1 MIDR | | 8×10 b/w negative |
| Magellan | SAR | | C2 MIDR | | 8×10 b/w negative |
| Magellan | SAR | Arvidson | Full Resolution MIDR | | 8×10 b/w negative |
| Magellan | SAR | | Global Emissivity | | 8×10 color negative |
| Magellan | SAR | | Global Reflectivity | | 8×10 b/w negative |
| Magellan | SAR | | Global Surface Slope | | 8×10 b/w negative |
| Magellan | SAR | | Global Topography | | 4×5 color negative |
| Nimbus-7 | ERB | Jacobwitz | radiance, Earth-located and solar | 11/16/78 - 9/29/90 | magnetic tape |
| Nimbus-7 | TOMS | Krueger | Earth-located UV radiance | 10/31/78 - 6/15/91 | magnetic tape |
| Nimbus-7 | SBUV | Heath | Earth-located radiance | 10/31/78 - 5/18/91 | magnetic tape |
| Pioneer 10 | Charged Particle Detectors | Lentz | count rates, pulse heights | 3/3/72 - 12/31/90 | magnetic tape |
| Pioneer 10 | Celestial Mechanics | Hierath | archival tracking data files | | magnetic tape |
| Pioneer 11 | Charged Particle Detectors | Lentz | count rates, pulse heights | 4/7/73 - 12/31/90 | magnetic tape |
| Pioneer 11 | Charged Particle Detectors | Lentz | count rates | 4/7/73 - 12/31/90 | magnetic tape |
| Pioneer Venus | | Russell | orbits | 12/5/78 - 4/12/91 | microfiche |
| San Marco D/L | Airglow/Solar | Spencer | solar data | | magnetic tape |
| Yohkoh | X-ray Telescope | Batchelor | solar image | 10/25/91 - 10/25/91 | PC diskette |

## *News from the NOST:*

# NSSDC Active in Standards Arena

*Welcome to the first in an ongoing column to keep you up to date about activities at the NASA/OSSA Office of Standards and Technology (NOST). After a brief introduction, the article addresses some highlights of NOST activities during the past three months.*
*—Editor*

The NOST has been established to serve the space and Earth science communities' in their use of standards to evolve cost-effective, interoperable data systems. The NOST performs a number of functions designed to facilitate the recognition, development, adoption, and use of standards by the space and Earth science communities. The range of activities include the operation of the NOST Standards Library, support for standards development, and user support.

The NOST Standards Library constantly acquires and ingests various technical standards and documents as well as responds to requests for these documents. The Standards and Technology Information System (STIS)—accessible from the NODIS account on the NSSDC VAX cluster—is an on-line data base that allows a user to peruse more than 600 standard and document references in the library.

The library and STIS also carry information describing various standards organizations. Also functioning as administrative support for the other NOST offices, the librarian has the task of coordinating workshops and meetings, such as the NOST Invitational Formats Workshop (June 16-18, 1992) and the Goddard Conference on Mass Storage Systems and Technologies (September 22-24, 1992).

The NOST is active in standards development, particularly in the Flexible Image Transport System (FITS), Standard Formatted Data Unit (SFDU), and Common Data Format (CDF) arenas. As the home of the FITS Support Office, the CDF Support Office, and the SFDU Support Office, NOST staff are available to answer users' questions and to help NASA projects make effective use of these standards.

The NOST FITS Technical Panel is working closely with the IAU FITS Working Group while developing the NOST FITS Standard. NSSDC anticipates that the NOST FITS Standard will be endorsed as the international standard for FITS when it is completed.

The NOST is heavily involved in development of the SFDU concept. It coordinates the NASA effort and plays an active role in developing and coordinating the preparation of NASA positions regarding recommendations developed by the Consultative Committee for Space Data Systems (CCSDS) Panel 2. The NOST Office personnel participate in the NASA and international meetings of Panel 2.

The NOST office looks forward to serving the needs of its community and always welcomes any comments regarding its services and products.

### FITS File Validation Software Is Available

Currently, the FITS Support Office is making a prototype of FITS file validation software available for user testing. This version checks the primary header for the presence of the required keywords in the proper order; it also checks their syntax. It can read integer primary arrays and produce a data set with members of the array selected by the user.

The software can create the data set in a form convenient to read in the user's host machine. The current version requires that a machine use the ASCII character code and two's complement integers, but the integers may be stored with the most significant byte either first or last. Requests for the software, which is available electronically, can be made to the FITS Support Office.

### CCSDS Panel 2 Makes Recommendations

The SFDU Support Office is involved in consolidating the comments received in the GSFC and NASA review of two proposed CCSDS Recommendations, "ASCII Encoded English (CCSD0002)" and "Standard Formatted Data Units—Control Authority Procedures" Red Books. These positions will be presented at the CCSDS Panel 2 meeting in November.

CCSDS Recommendations start out as internal documents for the CCSDS Panels, which, at this stage, are known as the White Books. After they have received adequate technical review and discussion within the CCSDS panel, the books are released as Red Books and are reviewed by the larger community represented by all Member Agencies of the CCSDS. Finally, when all the CCSDS Member Agencies representing the entire international space community agree to endorse the Recommendation, the documents are released in final form as the Blue Books.

Two Recommendations, entitled "Parameter Value Language" and the "SFDU Structure and Construction Rules," have recently been approved as Blue Books by all CCSDS Member Agencies. Copies of these documents are available through the NOST Standards Library.

### Prototype Control Authority Office Information System Established

The prototype NASA/NSSDC Control Authority Office Information System (CAOIS) is being populated with data de-

# New Option Available on the NODIS Account Points to Data Center's Other On-Line Services

Electronic network users of the NSSDC/NODIS account can now select a new NODIS option (number 14 on the menu) for information about other on-line services at NSSDC. Within this option, two text files are available for viewing; they describe both the ANONYMOUS account for access to on-line data files and the NDADS (NSSDC Data Archiving and Distribution Service) system for access to near-line data files. Although ANONYMOUS and NDADS cannot yet be accessed directly from NODIS, they can be reached easily via DECnet or Internet.

The ANONYMOUS files include key parameter data and related information for heliospheric spacecraft experiments, orbital ephemeris data for magnetospheric and heliospheric spacecraft, and also include high-interest astronomy data or catalogs from Hubble Space Telescope, International Ultraviolet Explorer, and the Astronomical Data Center. Information and software for standard data formats (e.g., CDF and FITS) are also available. File retrievals from the ANONYMOUS directories are done by the DECnet COPY command or by Internet FTP commands.

Through an electronic mail server program, the NDADS system provides near-line access to fully documented data sets from astronomy, astrophysics, and space physics spacecraft experiments. The mail server responds automatically to user queries with information about NDADS, the data set holdings, and documentation on using the Automated Retrieval Mail System (ARMS). The actual NDADS data sets are not directly accessible but are instead retrieved by NDADS from optical disk jukeboxes in response to specially-formatted mail messages that are processed by ARMS.

John Cooper

scriptions registered under the SFDU approach to data labeling and description. When it becomes operational, the CAOIS will speed up the registration process for NASA data description originators and will provide online access to these descriptions. Access information should be available in the next issue of this newsletter.

## NOST Hosts Invitational Formats Workshop

As reported in the last issue of *NSSDC News*, the workshop went very well and generated a lot of enthusiasm for promoting synergism between the formats. Since then, the format specialists have returned home and are actively developing their sections for the formats comparison document.

The table to the right gives information about how to contact support personnel within each area of the NOST Office.

John Garrett
Don Sawyer

## NOST Office Contact Information

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Greenbelt, MD 20771 USA
E-Mail:       Internet: sawyer@nssdca.gsfc.nasa.gov
DECnet:    NCF::SAWYER
Phone:      (301) 286-2748            FAX:      (301) 286-4952

**NOST Standards Library** (Standards Information, Document Requests, and NOST Workshop Information )
E-Mail:       Internet: nost@nssdca.gsfc.nasa.gov
DECnet: NCF::NOST
Phone:      (301) 286-3575            FAX:      (301) 286-4952

**FITS Support Office**
E-Mail:       Internet: fits@nssdca.gsfc.nasa.gov
DECnet: NCF::FITS
Phone:      (301) 513-1634            FAX:      (301) 513-1608

**SFDU Support Office**
E-mail:       Internet: gross@nssdca.gsfc.nasa.gov
DECnet: NCF::GROSS
Phone:      (301) 513-1636            FAX:      (301) 513-1608

**Software Support (STIS or CAOIS)**
E-mail:       Internet: garrett@nssdca.gsfc.nasa.gov
DECnet: NCF::GARRETT
Phone:      (301) 513-1632            FAX:      (301) 513-1608

## _CDF News:_

# Version 2.3 Is Ready for Release

_This is the first of a planned series of regular articles reporting on the evolution, support, and use of the Common Data Format (CDF). The series will focus on events since the publication of the preceding_ NSSDC News. —_Editor_

CDF is an NSSDC-developed and NSSDC-supported data structure of general relevance to a wide range of scientific data types. It has been adopted by a number of projects and has been described in earlier issues of _NSSDC News_ and elsewhere. (You may contact the author for general information.)

Over the last several months, CDF staff members have been preparing for the next release of the CDF software, CDF version 2.3. This version is scheduled to be released in early October and will be available via the anonymous FTP accounts on the NSSDC's SUN 4/330 and the VAX 9410. The following new features are offered in version 2.3:

- The CDF-to-Interactive Data Language (IDL) interface will enable IDL users to access their CDFs from IDL through an interface consistent with the interface supported through the CDF library. This will provide many more options for scientists and researchers to manipulate and visualize their data.

- The software has been ported to the NeXT computer running the Mach operating system (with the exception of the CDFBrowse, CDFList, and CDFWalk programs, because System V Curses is not supported on the NeXT).

- Version 2.3 supports zVariables. The zVariables differ from the non-zVariables in the CDF in that their dimensionality can differ from the

dimensional structure dictated by CDF dimensional structure; zVariables can only be accessed via the CDF Internal Interface.

- A shareable version of the CDF library is now available on VMS systems and certain flavors of UNIX such as the Sun/SunOS, HP9000/HP-UX, and IBM RS6000/AIX.

- A CDF with any encoding can now be read on any other machine and version 1 CDFs can now be read on any machine.

Gregg Goucher

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# GGS/ISTP Data Standards Receive Critical Support

An essential ingredient in achieving the ultimate objectives of the GGS (Global Geospace Science) and larger ISTP (International Solar Terrestrial Physics) programs is the cost-effective use of a range of appropriate standards in data management and data formats to best enable use of the collected data to address the global science problems that were key motivations in implementing these programs.

The concept of "key parameters," time-continuous data products to come from each instrument in the program at a (canonical) resolution of approximately 10 parameters per instrument per minute, is one project mechanism to support a "global" view of the data being collected.

In April of last year, the GGS project decided to use NSSDC's Common Data Format (CDF) for key parameters. However, participants then realized that the global

view of data could only be achieved with a set of detailed "implementation guidelines" that would define a common baseline for how key parameter data should be organized within the framework of CDF.

Since then, the Space Physics Data Facility has developed these "implementation guidelines" and supported Geotail and ground-based investigation teams in correctly and effectively structuring their data (the first of GGS). A new and much more complete edition of those guidelines has now been prepared by Roman Kessel, Kent Hills, Norman Schofield, Jr., and Jeffrey Love for inclusion in the GGS _Standards and Conventions_ document. NSSDC continues to further extend the functionality and appropriately support the core CDF capability being used.

GGS guidelines for the use of the underlying CDF software have also been developed with the goal to define a useful standard for efforts beyond GGS (for example, the joint ESA-NASA Cluster missions and the Interagency Consultative Group solar-terrestrial science initiative) and for potential GGS data products beyond key parameters (such as "event data" or other "definitive" parameters).

An explanation of how the basic CDF capabilities were combined with the implementation guidelines, while oriented towards space physics, is available on request and could easily prove relevant to other projects contemplating use of CDF or other standard formats to construct a "global-scale" data base using data from many sources.

Robert McGuire
Joseph King

_Did you know?_
CDF is the data standard that was selected by NASA's GGS program for their key parameters.

# Computer Scientist Joins NSSDC To Support CDF Effort

On August 24, 1992, Jason Mathews joined the NSSDC staff. He contributes to the development of the Common Data Format (CDF) software library and graphical analysis tools.

"A CDF is a conceptual data abstraction for storing, manipulating, and accessing multi-dimensional data sets," explains Mathews. "The CDF software library provides an interface to data that hides the physical data format and provides a conceptual view of the data." CDF software is used by the scientific communities of Goddard and is being used more and more by outside communities as well.

While Mathews is new to the data center, he is not new to Goddard. From September 1990 until his appointment this past August, he had worked with the Mission Operations Division. "There, I developed and managed the command management and other operational software systems, supporting the Small Explorer (SMEX) Projects."

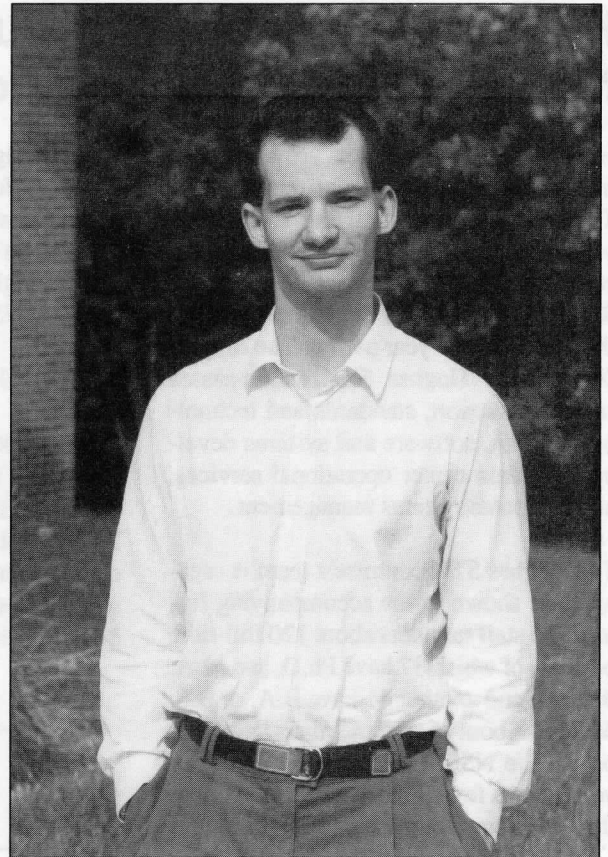While in college, Mathews worked as an analyst and consultant, developing software in support of computer researchers and users for a number of medical and scientific facilities in New York.

Mathews continues to advance his education. In January, 1991, with the support of NASA, he began and is currently working on an M.S. at George Washington University, specializing in the areas of computer graphics and user interface design. He earned his B.S. in computer science from Columbia University in May 1990. "The majority of my experience lies with C and C++ programming on MS-DOS and UNIX platforms," Mathews says, "but I have experience with many other languages on many other platforms."

The data center is pleased to welcome Jason Mathews aboard. His talents, skills, and training will help the NSSDC to better

*Formerly with the Small Explorer (SMEX) projects, Jason Mathews now supports NSSDC's Common Data Format (CDF) software library and graphical analysis tools.*

serve the scientific community.

Kenneth Silberman

# Visiting Scientist Receives Award

On September 2, 1992, Yoshiharu (Yoshi) Omura, an Associate Professor at Kyoto University's Radio Atmospheric Science Center, received the COSPAR Commission D Zeldovich Award for his work in the "new area of computational space physics simulations." The Commission D award is given for work with space plasmas in both the Solar System and planetary magnetospheres.

The presentation took place at the open meeting of Commission D at the World Space Congress in Washington, D.C. In his acceptance speech, Omura thanked all of the people involved in the award selection process, his many colleagues, his Ph.D. advisor, and his family.

"It is a pleasant surprise and an honor as a young scientist to be recognized for my work over the past ten years," Omura remarked later, when asked about the significance of the award. "At the same time, I believe there is a long way to go before the realization of my dream—recreating whole phenomena of space plasma on computers."

From July 1991 through July 1992, Omura worked with James Green at the NSSDC as a Research Associate, under a National Research Council grant to study ray tracing. (See the article entitled "Visiting Scientist Dr. Omura studies Plasma Waves at NSSDC" in the Summer 1991 issue of *NSSDC News*.)

The COSPAR Zeldovich Awards are presented to young scientists under the age of 35 who have demonstrated excellence and achievement in a field of research within the space sciences. They are conferred by COSPAR, the Institute for Space Research (IKI), and the Intercosmos Council of the Russian Academy of Sciences in memory of the distinguished astrophysicist and academician Yakov B. Zeldovich.

Each award consists of a medal, a certificate, and an invitation for the recipient to spend a short period visiting institutes in Russia, or elsewhere if the recipient is Russian, that are related to the recipient's work. One award is available for each of COSPAR's seven commissions.

Kenneth Silberman

# Hughes STX Corporation Supports the National Space Science Data Center

Hughes STX Corporation provides contractor support functions at the NSSDC. The company is completing the second year of a five-year support contract. Its subsidiary company Science Applications Research (SAR) held the contract during the previous five-year period. The support provided by Hughes STX encompasses scientific support, standards and technology support, software and systems development, data center operational services, and computer systems management.

The Hughes STX contractor team is organized as shown in the accompanying figure. The staff numbers about 120 full-time persons, of which 37 have Ph.D. and M.A. degrees, and another 41 have B.A. or B.S. degrees. About 25 staff members have supported the NSSDC for more than seven years, and a few of these have put in more than 15 years of service to the data center.

Richard Tighe is the Hughes STX Project Manager for NSSDC support. The four major areas of support are described in the paragraphs below, and each of these groups will be highlighted in an article in future issues of *NSSDC News*.
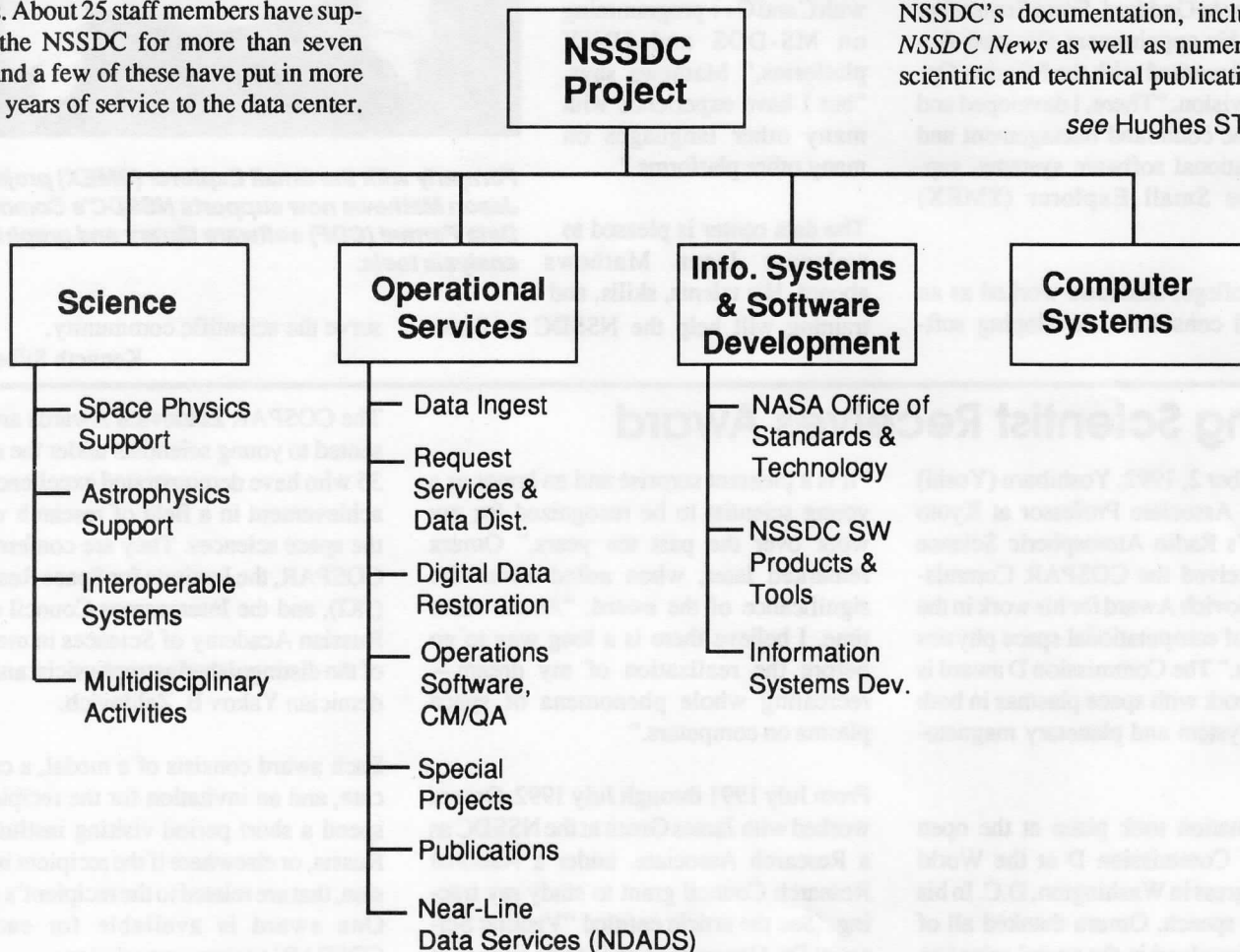
## Science Group

The NSSDC Science Group, managed by Joy Beier, is composed of 32 staff members, including approximately 20 M.S.- and Ph.D.-level scientists and support staff specializing in scientific programming, user support, and administrative assistance. The Science Group is currently divided into

four sections: Space Physics, Astrophysics, Multidisciplinary (including planetary and Earth sciences), and Interoperable Systems. Tasks within this group include Master Directory operations, Coordinated Request and User Support Office activities, data acquisition in all disciplines, Astronomical Data System and Space Physics Data System support, and multidisciplinary activities and NSSDC project coordination.

## Operational Services Group

Ron Blitstein manages the Operational Services Group, which supports the ingest, archive, and distribution of data for the NSSDC. It also provides configuration management and administrative support for information systems and application programs that are used to manage the archive holdings. Operations staff also produce NSSDC's documentation, including the *NSSDC News* as well as numerous other scientific and technical publications.

**NSSDC Project**

- **Science**
  - Space Physics Support
  - Astrophysics Support
  - Interoperable Systems
  - Multidisciplinary Activities
- **Operational Services**
  - Data Ingest
  - Request Services & Data Dist.
  - Digital Data Restoration
  - Operations Software, CM/QA
  - Special Projects
  - Publications
  - Near-Line Data Services (NDADS)
- **Info. Systems & Software Development**
  - NASA Office of Standards & Technology
  - NSSDC SW Products & Tools
  - Information Systems Dev.
- **Computer Systems**

*Hughes STX Corporation's NSSDC Project Organization Chart depicts the operations in each group.*

Hughes STX, *from p. 10*

The staff of 40 individuals is divided into five sections, most of whom perform data technician functions, with their numbers equally split between senior- and junior-level positions. A programmer staff of 12 is similarly divided between senior and junior positions. Three senior technical editors and two senior word processors comprise the publications group.

Each of the five section supervisors reports to the group manager. Approximately 30 percent of the staff have received undergraduate degrees, and several more are currently enrolled in degree programs at local universities. Over 30 percent of the staff have been associated with the NSSDC for over seven years, another 30 percent have served between two and seven years, and the remainder are new to the project.

The Operational Services Group provides support for six tasks at the NSSDC. These tasks are: Data Ingest, Request Services and Data Distribution; Digital Data Restoration; Operational Software Configuration Management and Quality Assurance; Special Programming Projects and Technology Infusion; Publications; and Ingest and Distribution of data from near-line optical disk juke box systems.

### Information Systems and Software Development Group

The Information Systems and Software Development Group, managed by Rick Payne, has a three-fold mission:

- to provide software development and maintenance support to the various software products provided by the NSSDC
- to develop and maintain information management systems to allow access, management, and distribution of NSSDC and other related holdings
- to operate and maintain the NASA/OSSA Office of Standards and Technology at the NSSDC

The Information Systems and Software Development Group is divided into three sections: Data Structures and Visualization, NASA/OSSA Standards and Interoperability, and Data System Development. The group currently has a staff of 28, of whom 27 have degrees, including 11 M.S.- and Ph.D.-level scientists and engineers.

### Computer Systems Group

Rick Payne also manages the Systems Group, which provides systems analysis and technical support to NSSDC's operational computer activities. Basic support functions include maintaining existing hardware and system-level software to ensure the optimal performance and utilization of these resources; integrating new hardware and system-level software into existing systems to achieve upgraded capabilities and provide state-of-the-art facilities; and providing users with the necessary documentation, training, and assistance so that NSSDC resources are fully utilized.

Of the ten persons in the Systems Group, more than half have degrees, primarily in Computer Science. Several members of the team are actively pursuing their Masters degrees.

All of the above managers have network addresses given by NCF::(lastname). Comments and suggestions from the NSSDC's user community are welcomed.

Richard Tighe

# International Directory Network/CEOS Catalog Subgroup Meet

Multiple meetings were held in Frascati, Italy, in September. These included a meeting of technical and discipline coordinators for the International Directory Network (IDN), the Committee on Earth Observations Satellites (CEOS) Catalog Subgroup, the CEOS Network Subgroup, and the CEOS Working Group on Auxiliary Data Sets. The group meetings were held close to each other to encourage interaction where common interests applied. Several joint sessions were held among the groups.

The first week was devoted to a meeting of the IDN technical coordinators so that they could be trained in the new Windows-like version of the Master Directory software developed by NSSDC. Sixteen people attended from around the world, some representing what will become new IDN nodes.

The second week began with a meeting of the discipline coordinators of the IDN, both present and future. Representatives of directory nodes in Italy, Germany, France, Japan, United Kingdom, and even potential nodes in New Zealand, Russia, and the Netherlands were present. The discussion mainly concerned the structuring of information for entry into the directory network and the consistency of the information within the network. The second day of this meeting included status reports from present nodes and planning for future nodes.

The rest of the week consisted of a meeting of the CEOS Catalog Subgroup and joint meetings with the other subgroups. The following points were agreed to at these meetings:

- CEOS would be the sponsoring organization of the IDN, that is, the policies and procedures would continue to be determined in the catalog subgroup where that task has always been, but the IDN would still involve more than just Earth science data.

- More general meetings of IDN-related personnel would take place separately from CEOS meetings and include more than just CEOS member agencies. Thus, the first general meeting of the IDN would likely take place in the spring in San Diego rather than in Japan, the site of the next CEOS Catalog Subgroup.

Jim Thieman

# STEP International Symposium Held August 24-28

## NSSDC Participates in Meetings

Several members of the NSSDC and its new sister organization, the Space Physics Data Facility (SPDF) actively participated in the 1992 STEP (Solar-Terrestrial Energy Program) Symposium on "The Initial Results from STEP Facilities and Theory Campaigns."

The symposium was held at the Johns Hopkins University/Applied Physics Laboratory August 24-28, 1992, and was also designated as the 5th COSPAR (Committee on Space Research) Colloquium in connection with the World Space Congress that was held in conjunction with the International Space Year (ISY).

Papers (oral and poster) involving members and staff of the Space Science Data Operations Office (Code 630) included:

* *Selected Data Standards for STEP*—Sawyer and Teague

* *On-Line STEP Bulletin Board at NSSDC*—James and King

* *Directory of Solar-Terrestrial Models*—Bilitza

* *Multi-Spacecraft Mission Planning Resources for STEP at NSSDC/WDC-A-R&S*—Parthasarathy, Peredo, Sprayregen, and McGuire

* *The NASA/Space Physics Data System*—McGuire, Sharma, Teague, Walker, and Willett

* *A Discipline Independent Scientific Data Management Package: The NSSDC Common Data Format*—Goucher, Love, and Leckner

Several of the above papers included active system demonstrations.
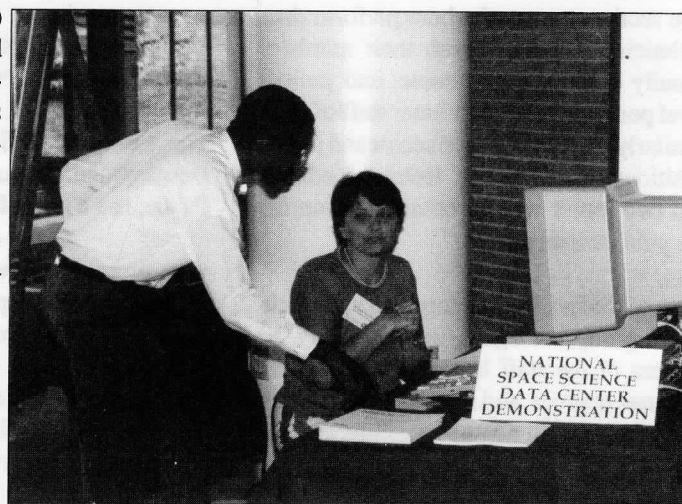


*Nathan James of NSSDC helps Symposium attendee Natasha Papitashvili to access the STEP Bulletin Board.*

In addition, NSSDC/SPDF had a booth with a variety of demonstrations of various online services including the Master Directory, the NSSDC Online Data & Information Service (NODIS) with its several independent options (including the STEP Bulletin Board), the NSSDC Data Archive and Distribution System (NDADS) and its Automated Retrieval Mail System (ARMS), PC-based software for solar image display, and science planning software being used in the Satellite Situation Center.

NSSDC and SPDF also supported the organization of this meeting in various ways (e.g., preparation and publication of the program guide, and assistance in the loan and set-up of the network connection of computer equipment for various demonstrations). In addition, Joe King was a member of the local organizing committee for this meeting.

The high level of involvement of NSSDC and SPDF in this STEP meeting is evidence of the broad range of support offered by these organizations to the NASA and international space physics endeavor.

Robert McGuire
Joseph King



*Alexander Feldstein (left) of World Data Center B2 in Moscow converses with Gurli and Bengt Hultqvist of Sweden during an evening event at the STEP International Symposium.*

## STEP Bulletin Board Highlighted

At the recent International STEP (Solar Terrestrial Energy Program) Symposium, a poster paper and demonstration of the STEP Bulletin Board (BB) was given by NSSDC's Nathan James. This network-accessible BB, developed and initially populated by NSSDC about two years ago, was one of the earliest products of the STEP Project. Over the past year, the contents of the STEP International Newsletter have been added to the BB, and a few other contributed items have been added as well.

At their executive sessions, key STEP personnel addressed the status of the population of the STEP BB. It has been recognized from its earliest times that NSSDC would not be chartered to actively solicit material for the STEP BB. At this recent symposium, key STEP management personnel reaffirmed that policy, and agreed to more systematically attempt to stimulate input to the BB, which will make it more fully reach its potential as an information exchange tool for the STEP community.

As a reminder to readers, the STEP BB is accessible on the widely-advertised, no-password NODIS account on the NSSDCA VAX. Readers with information on STEP projects or other STEP-relevant activities are encouraged to log onto the BB, and to use the facility there to leave that information for insertion into the BB.

Joseph King

## Ease of Use and Up-To-Date Personnel Information Win Users' Congratulations

The following comment is one of many recently received from satisfied NSSDC customers who have used NSSDC's Personnel Information Management System (PIMS). PIMS is an online service to the scientific community designed to electronically aid science users in finding both mailing and electronic addresses of their colleagues.

"This is a greatly improved system for finding people .... Congratulations!" wrote a worker at Lockheed's Palo Alto Research Laboratory. How does it work?

PIMS, which is one of several on-line information mechanisms within NSSDC's On-line Data and Information Service (NODIS) system, interfaces to NSSDC's 33,000-person/name data base called IRAND. PIMS acts as a maintenance tool for IRAND; in fact, so far this year, at least 120 updates per month have been submitted to the IRAND data base via the PIMS facility. In a typical month, about 200 NODIS users average 300 PIMS accesses per month.

Most users find the system easy to use: "Thanks for the personnel info system (PIMS). I found it very easy to use ... and I found the person I wanted info on. Also, the update facility is easy to follow and use. Well done!" avers a scientist at the National Center for Atmospheric Research.

"First time I've ever used this. Fantastic! I'm glad to know this facility exists and is kept well up to date," offers a colleague at Goddard Space Flight Center. Here is the procedure to follow to access PIMS via NODIS (note: no password is required):

from NSI/DECnet (SPAN):
    set host nssdca
    [username:] NODIS or NSSDC

from the Internet:
    TELNET nssdca.gsfc.nasa.gov
    [username:] NODIS or NSSDC

After identifying yourself, you will be provided with the NODIS menu options. PIMS is option 2. For more information, please contact Nathan James at NSSDCA::James or call (301) 286-9789.

Nathan James

## SAMS CD-ROM Production Supported

A standard instrument package on Life Sciences and Microgravity shuttle flights is SAMS, the Shuttle Acceleration Measurement System. Output of this instrument is required by each of the several Principal Investigators (PIs), to correlate "events" in their various investigations with shuttle acceleration events.

During the recent USML-1 (U.S. Microgravity Lab) mission, about 1.4 GB of acceleration data were acquired. It was the task of the Lewis Research Center (LeRC) to package these data and disseminate them to the PIs. The staff members there decided to create CD-ROMs. NSSDC was able to expedite this process by providing the Lewis team with access to a standing CD-ROM

mastering contract with Metatech-Discovery, Inc.

The three-way interaction involving GSFC, LeRC, and the vendor went very smoothly. The CD-ROMs were prepared, produced, and disseminated according to the required schedule. NSSDC received a note of appreciation from Dr. Clifford Siegert at Lewis.

Both the Life Sciences and Microgravity Divisions at NASA Headquarters are presently assessing needs for discipline-specific data management and archiving systems/facilities, and what role, if any, NSSDC can play in the management of their (non-sample) data.

Joseph King

# STELAR: An Experiment in the Electronic Distribution of Astronomical Literature

In March 1991, NASA and the American Astronomical Society (AAS) began hosting a series of workshops to explore the methods and potential impact of placing most of the astronomical documentation and literature on-line. These meetings identified a need for an experiment to study the technical and practical issues associated with the project. In response, STELAR, the STudy of Electronic Literature for Astronomical Research, was launched.

STELAR is an effort jointly undertaken by AAS, the Astronomical Society of the Pacific (ASP), NASA, publishers, editors, research libraries, and astronomers. Additional support is being provided by the American Institute of Physics (AIP), the Library of Congress, the National Science Foundation, and the University of North Carolina at Chapel Hill.

STELAR is a pilot project managed at NASA's Astrophysics Data Facility (ADF), located at the Goddard Space Flight Center in Greenbelt, Maryland. Its formal goal is to explore the use of electronic means for improving access to scientific literature. STELAR will use astronomical publications to evaluate distribution, search, and retrieval techniques for full text and graphics display.

The project is conducting a multi-phased study, the initial phases of which focus on the problem of converting existing literature for on-line access. STELAR will incorporate machine-readable abstracts provided by NASA's Scientific and Technical Information (STI) program and page images of several years' worth of the *Astrophysics Journal, Astrophysics Journal Supplement, Astronomical Journal*, and the *Publications of the Astronomical Society of the Pacific*. Recently, the publishers of *Astronomy & Astrophysics* have also granted permission to use their journal for this study.

In the current phase of the study, a prototype system is under development to allow a limited number of test subjects to search these materials and view the articles of interest. The libraries at the Space Telescope Science Institute, NOAO/KPNO, NRAO/Charlottesville, and Goddard Space Flight Center will work with selected astronomers to evaluate the initial prototype expected to be available this fall.

## Current Status

The STELAR prototype system uses a highly portable and fully open, multi-disciplinary document query and delivery system known as Wide Area Information Server (WAIS). STELAR now provides access to machine-readable abstracts for the following leading academic journals of interest to the astronomical community:

*Astrophysics Journal*
*Astrophysics Journal Supplement*
*Astronomical Journal, Publications of the
    Astronomical Society of the Pacific*
*Astronomy & Astrophysics*
*Astronomy & Astrophysics Supplement*
*Monthly Notices of the Royal Astronomical
    Society*
*Journal of Geophysical Research*

These abstracts have been supplied by NASA/STI from a data base prepared for NASA's RECON system by an independent abstraction service. The RECON sys-

tem data base contains abstracts from as early as the mid-1960s. The ADF will update the set of available abstracts on a regular basis.

The current prototype links the abstracts to scanned bitmaps of the individual articles' pages. Access to the bitmaps will initially be limited to test groups at the libraries to alleviate any copyright-protection concerns of the societies and the journal publishers.

In addition to this controlled study, the ADF and STI are making the abstracts and several other text data bases available to the astronomical community as part of NASA's commitment to its science community. The STELAR project is seeking feedback from researchers on the usability and value of the system. This feedback will guide the refinement of successive prototypes.

## Future Plans

Subject to the approval of the copyright holders of the various journals, the STELAR Project plans to gradually make the scanned bitmaps of the article pages available to the astronomical community.

Additional enhancements being investigated include indexing of the full text of the articles (when machine-readable versions of the published articles are available), making articles available in a mark-up language (TeX, SGML) or device-independent form, and the addition of errata and other forward references to the basic STELAR article structure.

If you are interested in being one of the test individuals at the library or for additional information about the STELAR Project, please contact the author at:

STELAR-INFO@HYPATIA.GSFC.NASA.GOV.

Michael Van Steenberg

# Continuous Measurable Improvement Strategy Benefits CRUSO and Requesters

NSSDC is applying Continuous Measurable Improvement (CMI)—also known as Total Quality Management (TQM)—techniques in order to provide better and faster services to the scientific community. The Coordinated Request and User Support Office (CRUSO) serves as the point of contact between the data center and data requesters. CRUSO's staff members assist requesters in identifying data sets of interest and also coordinate the actions taken by the data center to fulfill requests.

CRUSO employees currently measure the data center's response to requests for data and information in several ways. First, CRUSO captures statistics on the number of requests received and filled by the data center (as well as those forwarded to other data centers) and reports these on a monthly basis. Information about requests received and fulfilled includes the affiliation of the requester, the scientific discipline to which

the data relates, and the nature of the data requested. In addition, CRUSO circulates a monthly report to NSSDC management containing details of all outstanding requests for data, including the date the request was received and all action subsequently taken on the request. Finally, all people who have received data from NSSDC are sent a user survey form on which they are asked to comment about the quality of data and documentation delivered by the data center. Completed user surveys are circulated to NSSDC management biweekly. NSSDC managers regularly analyze these statistics and reports to identify problem areas and ways to streamline request processing procedures.

The CRUSO is currently engaged in other activities designed to improve the quality of NSSDC services. These include promoting awareness of what data and information are available electronically via NSSDC's

Data Archival and Delivery System/Automated Retrieval Mail System (NDADS/ARMS) and anonymous accounts. CRUSO is also involved in improving other mechanisms for data ordering and information, such as providing information on planetary data and CD-ROMs to users via NSSDC's On-line Data and Information Service (NODIS). Accounts receivable services have recently been expanded to include credit card sales, which facilitate the processing of data orders. The CRUSO staff is currently being reorganized in response to the growing number of requests received by the data center. In addition, NSSDC management has recently created a new quality control position that concentrates on improving data set documentation.

NSSDC is dedicated to the application of CMI in CRUSO and other data center activities. These methods, coupled with the application of new technologies and awareness of the needs of scientific data users, will help to improve the quality of NSSDC services to the community in the future.

Joy Beier

# *Data Management Issues Explored at Goddard Conference*

A paper describing the NSSDC data management requirements was presented by Ron Blitstein to the Goddard Conference on Mass Storage Systems and Technology. This conference, held from September 22 through September 24, 1992, provided a forum for data managers and product vendors to get together and contribute to a better understanding of the future of data management.

NSSDC's contribution to the conference was in two key areas, the presentation of standards activities as they pertain to data management and media technology, and the specification of requirements of these systems in actual data center environments.

NSSDC Director Joseph King chaired the opening session on standards. This session included a panel discussion on the implementation of the theoretical IEEE Mass
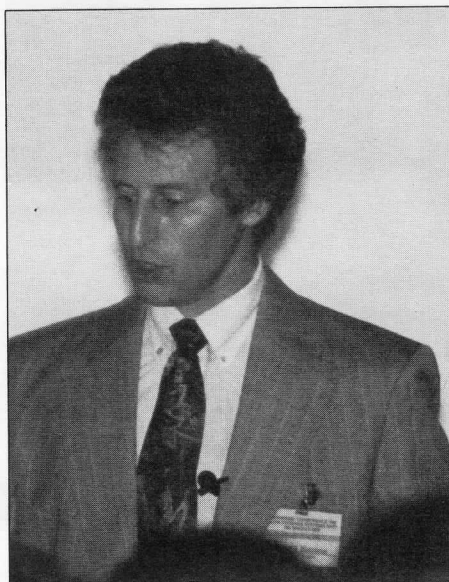
*Ron Blitstein, NSSDC's Manager of Operations, presents the data center's requirements for managing its data.*

Storage Reference Model through the established international standards committees. This discussion, led by NSSDC's NASA/OSSA Office of Standards and Technology staff member Al Dwyer focused on the recent work of the X3B5 committee on magnetic recording and the X3B11 committee on optical recording technologies (a related article appears on pages 6 and 7 in this issue of the *NSSDC News*).

Blitstein's paper described the NSSDC in terms of its interactions with the data provider, data requester, and commercial technology, as well as its own internal functions. Each of these functions drives the NSSDC to support specific goals.

This conference has grown in scope since its beginnings last year, when it was sponsored by NSSDC.

Ron Blitstein

# NSSDC Employees Get Students Excited About Science!

Visitors walking through NSSDC's main facility at Goddard Space Flight Center can see bulletin boards peppered with neon artwork and thank you letters crafted with the imagination and penmanship of grade-school students.

NSSDC's Valerie Thomas helped organize a group called Science, Mathematics, Aerospace, Research, and Technology, Inc. (SMART) that is working with various organizations to address the problem of the under-representation of African Americans in science and technology. SMART, in cooperation with the Smithsonian National Air and Space Museum staff, recently launched a program that attracts preschool, elementary school, and middle school students in the D.C. metropolitan area to the museum's planetarium on the second Saturday of each month for lectures, workshops, and hands-on demonstrations.

So far the speakers, who are all role models, have included an astrophysicist, a computer scientist, an astronaut, and a pilot. One of Thomas' goals for this program is to
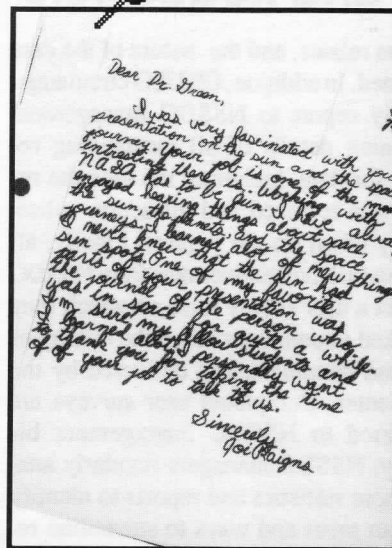


Jim Green's mail includes bright thank-you art from students and staff of the Burton R-7 School in South Australia; thoughtful letters arrive from many local students.

give children—especially those who traditionally have had limited or no access to science and scientists—the opportunity to be exposed to exceptional science resources.

"The most exciting thing for me is seeing tiny, little pre-school and elementary school kids being totally captivated and turned on by science—and then to realize that they are really absorbing a lot of useful information," says Thomas. "These children's minds are like sponges, and they are understanding a lot of what they hear and see. They are enjoying science before anyone has told them that it's too difficult."

Thomas relished the surprise "when one little girl started talking to me about spectra! Normally, she wouldn't have learned about that until college."

Space Science Data Operations Office Director James Green has visited many schools in Maryland to give talks in individual classrooms. "Of course the students have many different notions about space, so we have a question and answer period first; that way I can get an idea about what they already know," explains Green. After showing some video clips, he goes over the material a couple of times, in different ways, to concentrate attention on the study area. "Now, at the end," Green smiles, "is when I entertain all the really wild stuff that kids come up with about an incredible variety of Earth- and space-related topics."
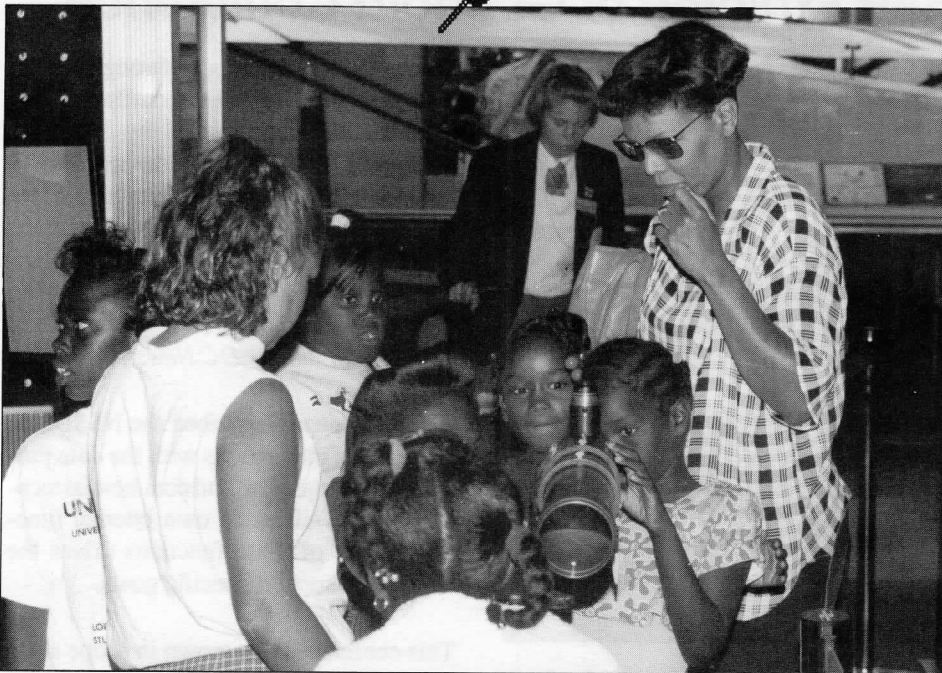


While Alma Smith, both a Washington, DC, high school teacher and graduate student looks on, SMART program students carefully examine a telescope at the National Air & Space Museum, after hearing astrophysicist Dr. George Carruthers speak about the universe.

Carol Kanga

Education, *from p. 1*

NSSDC receives about 40 general information requests each month from individual students, and these are forwarded to appropriate NASA education affairs or public affairs offices. Some requests, however, are specifically appropriate to and handled by NSSDC—as 39 have been so far this year, 30 of which were for CD-ROMs.

Because the CD-ROM is such a popular and effective medium for data, NSSDC offers special rates (that became effective in June 1992) for Kindergarten through Grade 12 educators. Although the normal charge is $20 for the first CD-ROM ordered and $6 for each additional disc *per order*, NSSDC has decided that it will provide free of charge one sample CD-ROM disc to those educators who cannot pay the normal $20 fee. Microcomputer software for display of some CD-ROM data is available for $9 per disk, to defray reproduction and handling costs. Questions about data available through NSSDC should be addressed to NSSDC's Coordinated Request and User Support Office, as specified on the back page of this newsletter.

In another education-related endeavor, NSSDC coordinated NASA's input for the Joint Education Initiative (JEDI) Earth Science Education CD-ROM set. This three-disc set was produced through a federal multi-agency effort to create CD-ROMS specifically designed for use by middle and high school students. Included on the discs are International Halley Watch (IHW) data, Nimbus 7 Scanning Multichannel Microwave Radiometer (SMMR) sea ice data, Total Ozone Mapping Spectrometer (TOMS) data, Voyager images from the outer planets, and the NASA Master Directory. If you are interested in obtaining a copy of the JEDI set of CD-ROMs, please contact Dr. Robert Ridky in the Geology Department of the University of Maryland, College Park, MD 20742; his telephone number is (301) 405-4090.

Last Spring, NSSDC participated in the Interactive NASA Space Physics Ionosphere Radio Experiment (INSPIRE) project, which was described on page 23 of the Spring 1992 issue of *NSSDC News*. Joseph King stated in his article, "NSSDC enjoyed supporting INSPIRE for both its intrinsic scientific importance and its community outreach, whereby young people in their formative years are brought into the NASA space endeavor." Several other NSSDC employees are involved in educational programs or give talks at local schools. A few highlights of these sessions appear on page 14 of this newsletter.

Through the years, NSSDC has been pleased to help youngsters gain enthusiasm and knowledge about space and Earth sciences.

**List of Teacher Resource Centers**

NASA Ames Research Center
Telephone: (415) 604-3574

NASA Ames-Dryden Flight Research Facility
Telephone: (805) 258-3456

NASA Goddard Space Flight Center
Telephone: (301) 286-8570

Wallops Flight Facility
Telephone: (804) 824-2295

NASA Jet Propulsion Laboratory
Telephone: (818) 354-6916

NASA John F. Kennedy Space Center
Telephone: (407) 867-4090

NASA Johnson Space Center
Telephone: (713) 483-8696

NASA Langley Teacher Resource Center
Telephone: (804) 727-0800

NASA Lewis Research Center
Telephone: (216) 433-2017

NASA Stennis Space Center
Telephone: (601) 688-3338

U.S. Space & Rocket Center
Telephone: (205) 544-5812

Carol Kanga

# *Astronomy Magazine* Plans To Highlight PC Display Software for Solar X-ray Images

NSSDC scientist David Batchelor recently completed browse software for IBM/PC-compatible desktop computers to display Skylab and Yohkoh (Solar-A) spacecraft solar X-ray images.

The Skylab data is from the NSSDC archives. Both NSSDC and the Space Physics Data Facility received a request from Dave Bruning, Associate Editor of *Astronomy Magazine*, for permission to mention the PC image software in an article. Batchelor wrote and submitted to the magazine an article describing NSSDC, the Skylab X-ray telescope, and the PC image display system.

Batchelor recently demonstrated the software and data at the Solar-Terrestrial Energy Program 5th Symposium at Johns Hopkins University. At the SOHO Workshop in Annapolis, Maryland, he contributed a short talk on the Skylab images.

The demonstration of Skylab images uses modern digital image enhancement techniques to greatly improve the clarity of the images. Many additional requests for the Skylab images have been generated by these presentations.

The PC software makes low-cost research on these images possible for a large new community of students, teachers, and scientists.

David Batchelor

# *newsbriefs*   *newsbriefs*

## NSSDC Services Demonstrated at World Space Congress

NSSDC staff shared an exhibit with the NASA Planetary Data System (PDS) at the World Space Congress held August 30-September 4, 1992, at the Washington DC Convention Center. Demonstrations of NSSDC and PDS on-line data catalog and information services were available to meeting attendees.

In addition, NSSDC staff members showed PDS data on CD-ROM, including Magellan, Viking, and Voyager planetary images, and image display software for Macintosh and PC-compatible platforms. The Satellite Situation Center was also represented.

Joy Beier

## IRI Selects New Chairman

Dieter Bilitza, an ionospheric scientist with NSSDC/Hughes STX, was elected as the new Chairman of the COSPAR/URSI Group on the International Reference Ionosphere (IRI) at the IRI meeting during the World Space Congress (COSPAR/IAF) in Washington, DC.

The IRI working group is tasked with the development and improvement of a standard model for the Earth's ionosphere using all available ground and space data. The IRI team includes about 20 experts representing different ionospheric regions/parameters, different measurement techniques, and different countries. A very successful scientific meeting on 'Verification and Comparisons with IRI-90' was organized by the IRI group during the recent COSPAR General Assembly in Washington, DC.

Bilitza has been involved in IRI-related research over the past several years and was previously Vice-Chairman of the group—a position now occupied by K. Oyama from ISAS, Japan. The IRI model is used in a wide range of applications for scientific, engineering, and educational purposes, and it is one of the most frequently requested space physics items from NSSDC's data archives.

Dieter Bilitza

## ADF Hosts Workshop on Client/Server Tools for Z39.50 Protocol

The Astronomical Data Facility staff members working on the Document Processing task recently sponsored a workshop at Goddard Space Flight Center on using the Z39.50 communications protocol for information services based on client/server interactions. A number of organizations have been actively exploring using the Wide Area Information Server (WAIS) search and retrieval system, which is based on Z39.50-1988. The Document Processing task is using WAIS for its initial prototype for on-line searching of document data bases. This work is part of the efforts of STELAR (the STudy of Electronic Literature for Astronomical Research). Some of the other groups represented at this workshop were the USGS, NASA Headquarters, EOSDIS, UNC-Chapel Hill, and the MD.

Michael Van Steenburg

## NSSDC Hosts SYBASE Users Group Meeting

NSSDC recently hosted a meeting of the Baltimore-Washington area SYBASE Users Group at GSFC. SYBASE is a relational database management system used at the Data Center and elsewhere at Goddard. As a tool for managing data, SYBASE has become very popular with users of workstations. SYBASE is operational on a variety of computer platforms. Approximately 150 people representing many different organizations including Fannie Mae, NOAA, and NIH attended the meeting. The NSSDC presented two of its SYBASE applications:

Development of the ISTP Information System - Pradip Sitaram/Hughes STX
Development of Browse Tools for IUE - Co Horgan/Hughes STX

Jeanne Behnke

## GRO and ROSAT Data Arrive at NSSDC

The NSSDC received the first delivery of public domain Compton Gamma Ray Observatory (GRO) data from the Compton Observatory Science Support Center (COSSC) for ingest into NDADS. The data set consists of the first 50 burst triggers from the Burst and Transient Source Experiment (BATSE). After ingest into the NDADS optical WORM jukebox, the data will be used in an end-to-end test with the COSSC interface GRASP (Generic Retrieve/Archive Services Protocol).

Work is in progress to prepare for the opening of the ROSAT archive, expected to become publicly accessible November 1; it initially will be located exclusively on the NDADS. Meetings were held during the last few months with the ROSAT Science Data Center (RSDC) staff to define data structure and data formats. Sample public data from the early Calibration phase have been ingested into NDADS and are being used to test the archive data flow with the RSDC.

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These data flows are part of NSSDC's support of the High-Energy Astrophysics Science Archival Research Center.

Cynthia Cheung

## Electronic Access Provided to IMP Magnetometer Data

In its first full month of residence on NSSDC's network-accessible optical disk jukeboxes (NDADS), the 18-year data set of 15-sec resolution IMP-8 magnetometer data was the subject of 71 distinct accesses by members of the space physics community. The data are organized into one-day files. 1,543 such files were downloaded during these 71 accesses. The IMP-8 magnetometer data set has been NSSDC's most frequently requested space physics data set even when it was only available via magnetic tape replication and mailing. Online access to this valuable data set will significantly increase its dissemination and usage, as is already evident from our September statistics.

Joseph King

## MU-SPIN Users Conference Held

The second annual Minority University - Space Interdisciplinary Network (MU-SPIN) Users Conference was hosted at Goddard on September 13-15, 1992. It attracted approximately 120 participants representing 36 academic institutions; NASA; the National Science Foundation; Dept. of Defense; and private industry.

Highlights of the Users Conference included: the formation of the MU-SPIN Users Working Group; technical sessions

on supercomputing, design and installation of low cost Local Area Networks (LANs), and video teleconferencing applications; and the following tutorials:

Resources on the Internet
Scientific Network Applications
Network/System Management and Security

At the MU-SPIN Awards Dinner, Jerry Soffen, University Programs Office; Dan VanBelleghem, National Science Foundation; and others were recognized for their outstanding support to the MU-SPIN Program.

Valerie Thomas

## Bilateral Talks and TIC Meeting Held

The Astrophysics Data Facility (Code 631) hosted the Spectrum-X-Gamma Bilateral Talk on the mission data archive and the Technical Implementation Committee (TIC) meeting from August 24 to 28. Five Russian scientists, eight European scientists, and several managers and scientists from NASA HQ Astrophysics Division, GSFC, and NASA-funded research centers attended the meetings.

The Spectrum-X-Gamma mission is a Russian/International mission scheduled to be launched in mid-1995. Two U.S. instruments are under development for flight on this mission:

- an All-Sky X-Ray Monitor (MOXE) provided by Los Alamos National Laboratory (LANL) and GSFC Laboratory for High Energy Astrophysics
- an X-Ray Polarimeter (SXRP) from a consortium led by Columbia University.

The requirements for the ground system and the archive were discussed in detail. The U.S. reaffirmed the intention to assist

Russia with designing the archive portion of the ground system.

Two Russian scientists, Michael Boyarsky (August 31 - September 11) and Ravil Nazirov (September 8 - 11), continued their visit at GSFC Code 630 to study the NASA data archive and distribution methods. Boyarsky toured the STScI in Baltimore as well as different Astrophysics data facilities in GSFC, including the NSSDC/NDADS optical archive, the IUE Operations Center, the SMM analysis facility, the Cosmological Data Center, the HEASARC, and the ROSAT Data Center. Technical discussions were held with the cognizant scientists in each of these centers.

Cynthia Cheung

## Cooperative Venture Developed

As part of the Intelligent Data Management project's research into the real-time automatic characterization of satellite data, a prototype planning/scheduling system is being developed with participation from Honeywell's Systems and Research Center. Honeywell has contributed software (the "Time Map Manager"), has jointly submitted with Goddard and Brown University for funding from the HPCC NRA initiative for scheduling large-scale analysis for ground processing and archiving systems, and has committed internal R&D funds to the development of the prototype system.

Results from this research are being used in a 1992 Director's Discretionary Fund project that includes work from Joann Harnden (924) and Jim Chesney (521). Participants in this research include Nick Short (GSFC), Mark Boddy (Honeywell), Tom Dean (Brown), Phil Klein (Brown), and Bill Campbell (GSFC).

Nick Short

# IMP-8 Begins 20th Year of Operation

October 26, 1992, marks the start of the 20th year of in-space operations of the Interplanetary Monitoring Platform (IMP-8) spacecraft. Launched 19 years ago, IMP-8 continues the measurements begun with the 1963-launched IMP-1 spacecraft of cosmic rays and of other energetic particles, magnetic fields, and plasmas populating the Earth's magnetosphere and the nearby solar wind.

In recent years, IMP-8 has played a vital role in providing correlative data to aid the interpretation of data from other spacecraft, including the Pioneer, Voyager, and Ulysses spacecraft in the far reaches of the heliosphere and the ISTP/Geotail spacecraft in the near and far geomagnetotail. In addition, IMP-8 will provide key data in support of the passage of the Jupiter-bound Galileo spacecraft through the geomagnetotail on December 8, 1992.

In addition, IMP data are important in studies of long term variations in solar field/ plasma/particle output.

IMP-8 will remain uniquely important until the successful launch of the ISTP/WIND spacecraft, and it will remain important thereafter.

Joseph King