Inside Astrophysics

National Aeronautics and Space Administration

Spring 1994

Final Issue

Astrophysics Division Director Dan Weedman (left) and past Directors George Newton (center) and Charlie Pellerin (right) together at Newton's retirement party in February.

From the Director

Events happen rapidly enough in Washington that any comments for print can easily be outmoded by the time the ink dries. Consequently, future communications from the Astrophysics Division will use our new FTP server facility. All of these comments are also posted electronically as described in this final issue of our Newsletter. It will now be possible to provide more timely updates on important issues and events.

In February, the Astrophysics Subcommittee met to discuss the Fiscal Year 1995 (FY 95) budget proposal and the longer range Strategic Plan for the Astrophysics Division. Our strategic priorities are being integrated into the overall Strategic Plan for the Office of Space Science, covering the years through FY 99. The consensus of the Subcommittee, accepted by the Space Sciences Advisory Committee in their March meeting, is that the top priority in Astrophysics for these years is to achieve new starts in infrared astrophysics, including in particular the Stratospheric Observatory for Infrared Astronomy (SOFIA) and the Space Infrared Telescope Facility (SIRTF). This Strategy reaffirms the priorities for space astrophysics as stated in the decade review of astronomy and astrophysics for the 1990s ("Bahcall Committee").

The first step toward achieving our strategic goals would be a new start for SOFIA in FY 96. This will be the top priority for the Division in the budget cycle whose planning begins this summer, but a NASA commitment to obtain and modify the aircraft is contingent on the ability of the German Space Agency (DARA)-long time collaborators in SOFIA planning-to provide the telescope assembly. A dramatic and creative redesign of SIRTF has yielded a mission that retains most of the scientific capabilities which give SIRTF its number-one priority. Yet, this design produces a SIRTF which is of significantly less launch mass than the old Infrared Astronomical Satellite (IRAS). Consequently, SIRTF remains compelling and affordable, even in today's severely constrained fiscal environment. Efforts to gain a new start for SIRTF will be the focus of Division actions leading to the FY 97 budget cycle.

What should be the next priorities of the Astrophysics Division, after starts are achieved in infrared astrophysics? In order to pursue other recommendations from the decade review, the Division is supporting activities by a Submillimeter Science Working Group, to define appropriate participation in a future submillimeter mission, and by a Space Interferometry Science Working Group, to define an Astrometric Interferometry Mission. To lay the foundation for community evaluation of more future initiatives, the Division will soon release a NASA Research Announcement (NRA) designed to provide modest support for a variety of mission concept studies. A primary goal of these studies is to produce a set of mission ideas which can be properly evaluated in the next decade review for astronomy and astrophysics, a review whose priorities will set the goals for our science as the 3rd millenium begins. ♦

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The Astrophysics Division Budget: Fiscal Year 1995

The Fiscal Year 1995 (FY 95) budget now pending in Congress contains a total request for programs within the NASA Astrophysics Division of $851M. This level would allow all on-going mission development to continue and would support operations of all current missions. This modest increase in the Division budget over last year's budget comes in the context of a slight increase in the FY 95 budget of the Office of Space Science (Astrophysics, Solar System Exploration, and Space Physics Division combined), but a decrease in the overall NASA budget. For more details see this Newsletter's insert letter from Wes Huntress, the Associate Administrator for the Office of Space Science.

In the Astrophysics Division budget, there is an increase in funding for both the Hubble Space Telescope (HST) and other missions. For HST, a total of $227M is requested for mission operations, development of new instruments, other preparations for future servicing missions, and support of the Space Telescope Science Institute. Funding for data analysis by HST guaranteed time observers and guest observers goes to $42.7M. For the Compton Gamma Ray Observatory, $22.5M is requested for Mission Operations and Data Analysis (MO&DA) combined. For all other operating missions, the total MO&DA request is $66.5M. Other large items in the FY 95 budget are development of the Advanced X-Ray Astrophysics Facility ($234M), the Explorer program for both Astrophysics and Space Physics Divisions ($120M), and the Gravity Probe B mission ($50M).

Budget Reductions Force Changes to Astrophysics Mission Planning

Up until March 1992, the model for operating Astrophysics missions assumed that: 1) missions would be operated as long as they were functional and produced useful observations, and 2) science analysis and interpretation would continue as long as significant insights were obtained. Indeed, analysis of past missions has shown that a mission's most valuable, most-quoted papers are written several years after all the data has been gathered!

Figure A shows the budget plan for Astrophysics Mission Operations and Data Analysis (MO&DA) - not including HST and AXAF. The top curve was the budget plan (Program Financial Plan PFP93) as of March 1992 associated with the old mission model. Since then there has been a series of budget reductions caused by NASA-internal adjustments, reductions mandated by Congress, and attempts to create new funding "wedges" for extended and new missions. The lowest curve on Figure A shows today's budget expectation, again for all Astrophysics MO&DA except HST and AXAF.

With this budget expectation, we obviously cannot support the old mission model. Instead, the new model, illustrated in Figure B, requires mission terminations at the end of FY 1995, or at the end of the "prime mission phase," as appropriate. The prime mission phase will be followed by a one-year period of data analysis, and outright termination of all mission analysis, science centers, and grants support thereafter.

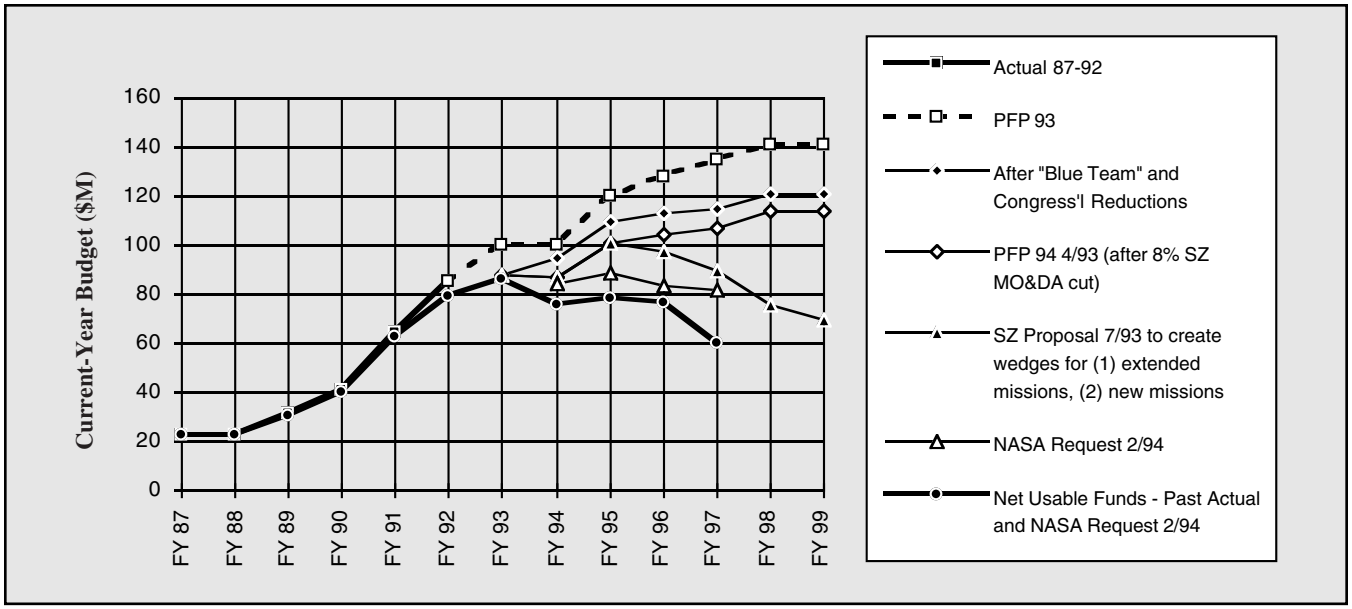


Figure A: Evolution of the Astrophysics MO&DA Budget Plan (without HST and AXAF)

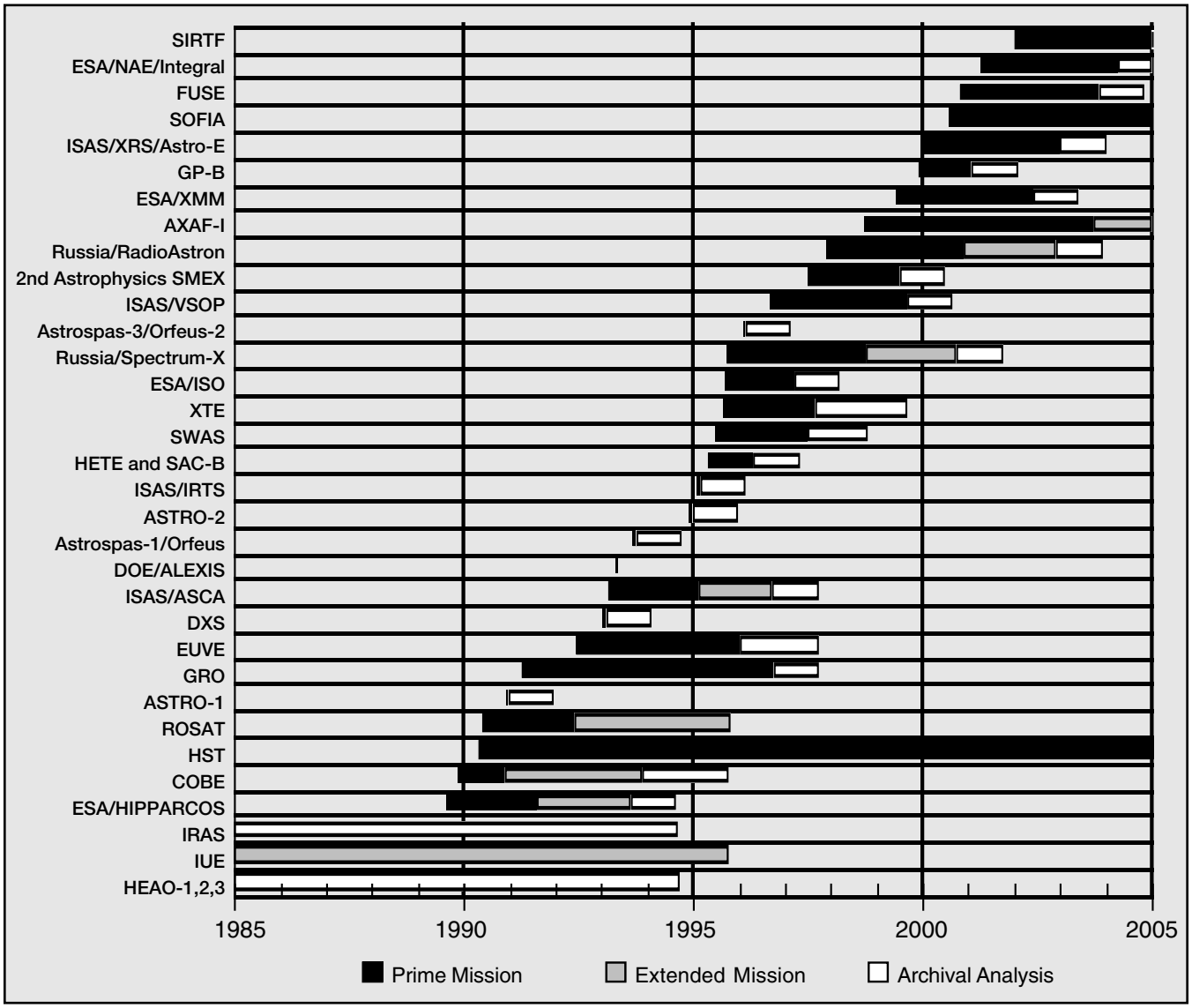


Figure B: New Mission Model

MIDEX Program

In response to recommendations of the science community for more frequent access to space, the MIDEX program has been scoped at $75M per mission, resulting in approximately one launch opportunity each year. MIDEX is to be phased into the Explorer Program as the larger Delta-class missions (XTE, ACE & FUSE) are launched. The Explorer Program would then consist of Small Explorers (SMEX) and MIDEX.

It is anticipated that the first MIDEX launch will be in 2002. The first AO to participate in MIDEX is planned for release in late 1995.

The lack of new start opportunities for Intermediate-size missions resulting from space science budget reductions and questions about a science niche for missions 1.5 to 2 times SMEX have caused us to revisit the strategy for sizing MIDEX. A decision regarding details about the MIDEX scope will be made over the summer.

The Explorer Program supports the science disciplines in astrophysics and space physics and is managed by the Astrophysics Division at NASA HQ.

Astrophysics NRA Grant Statistics

A NASA Research Announcement (NRA) Grants database was developed containing basic information on all peer-reviewed data analysis grants issued by the NASA Astrophysics MO&DA program. These data were analyzed to obtain a "snapshot" of the investigators supported by the Grant Cycles listed below:

Observing Grants
- IUE-Cycle 16
- ROSAT-Cycle 4
- GRO-Cycle 3
- EUVE-Cycle 1
- ASCA-Cycle 1
- HST-Cycle 2

Non-Observing Grants
(Open in FY93 from Multiple Previous NRAs)
- LTSA FY93 Grants
- ADP FY93 Grants
- Theory 93 Grants

These NRAs resulted in 997 grants spread over 577 PIs and 1307 CoIs, a total of 1524 Investigators (some CoIs are also PIs). About 1/4 of the American Astronomical Society (AAS) membership was either a grant PI, CoI, or both—the same as the proportion of the AAS estimated to be active researchers. Over $37M in grants was distributed.

Grant Demographics

Figure 1 illustrates the demographics of Astrophysics NRA grants. Maryland has more grants and more grant funding than any other state. This is due in part to the presence of the NASA Goddard Space Flight Center and the Hubble Space Telescope Science Institute in that state. California and Massachusetts are second and third respectively. Figure 2 is an attempt to normalize the grant data by dividing the grants funding per state by AAS member in each state.

Multiple Grants

Figure 3 provides an overview of the total number of grants awarded to individual principal investigators. Most PIs only receive one grant, but most grants (60%) go to PIs with more than one grant. Figure 4 shows the number of PIs as a function of total funding per PI (from one or more grants). The median total funding per individual PI is just over $30,000.

Oversubscription and Average Grant

Figure 5 plots oversubscription ratio (# proposals/# grants) against the average grant size for observing and non-observing programs. Note that non-observing grants are larger and generally have higher oversubscription ratios. The oversubscription ratio for observing time was typically in the range of 4 to 7. LTSA-90, the first LTSA NRA is off-scale to the right with an oversubscription ratio of 8.

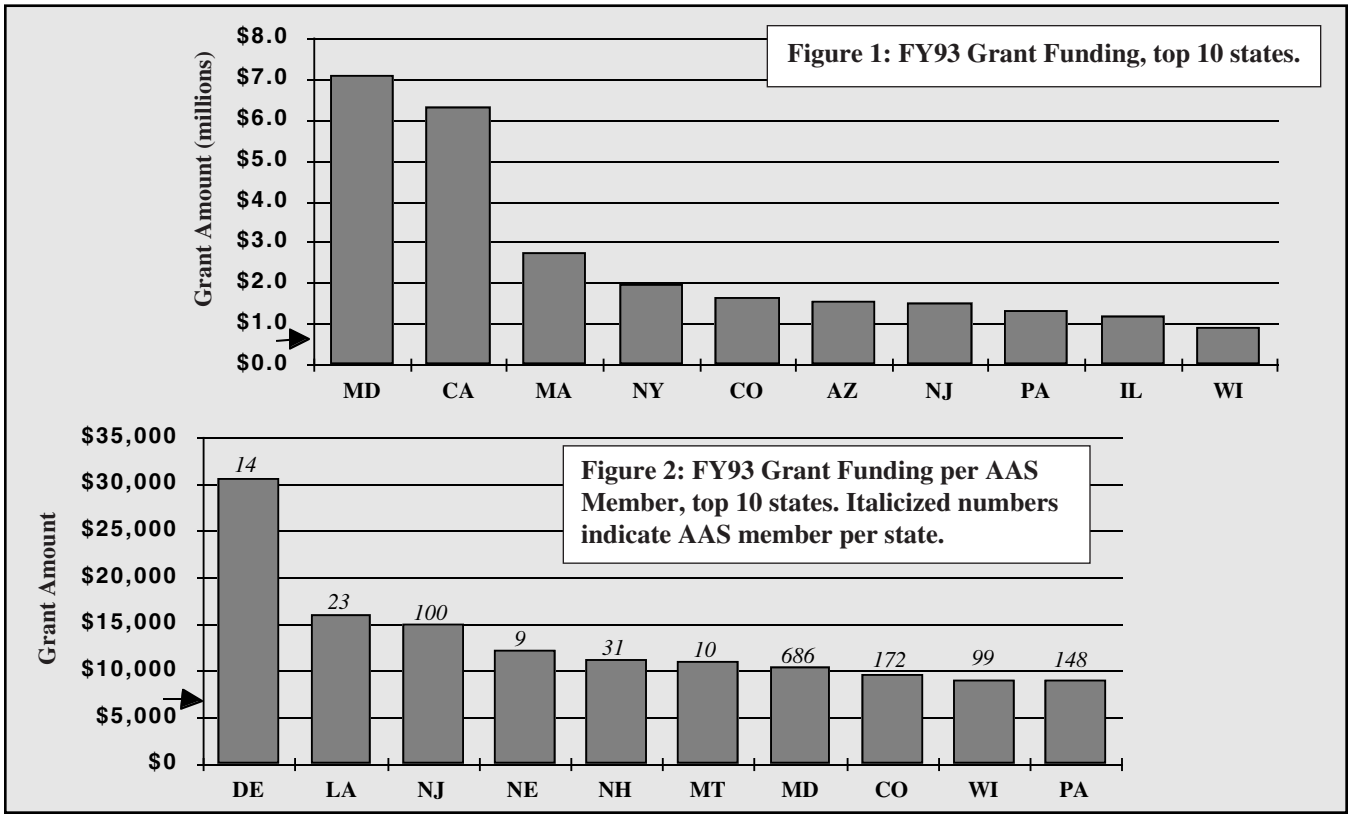


Figure 1: FY93 Grant Funding, top 10 states.

Figure 2: FY93 Grant Funding per AAS Member, top 10 states. Italicized numbers indicate AAS member per state.

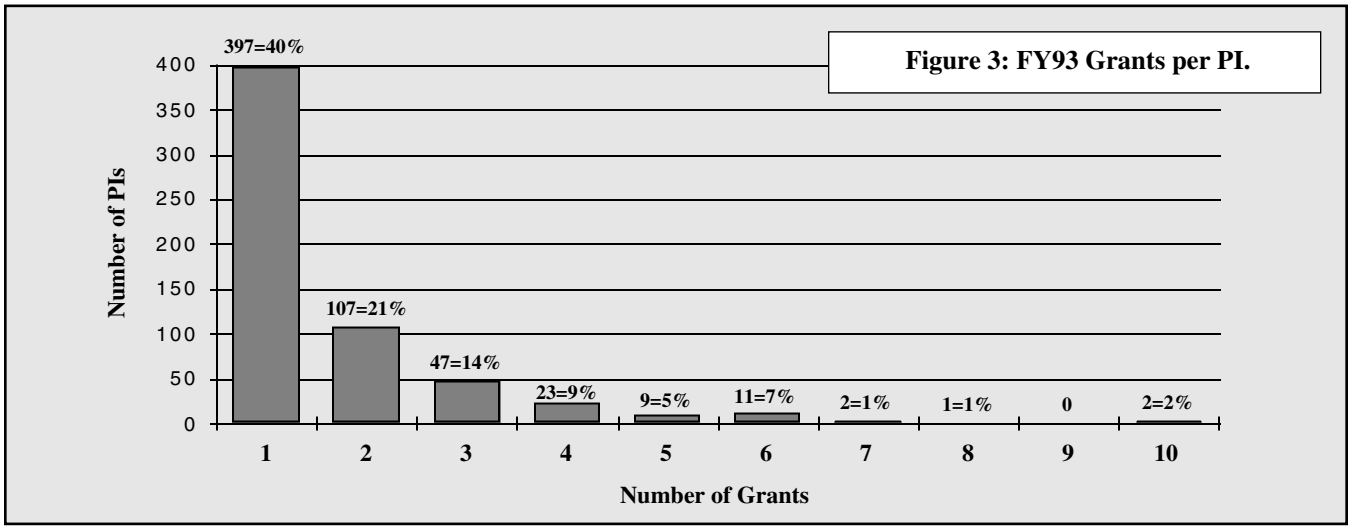


Figure 3: FY93 Grants per PI.
Number of PIs
Number of Grants
397=40%
107=21%
47=14%
23=9%
9=5%
11=7%
2=1%
1=1%
0
2=2%

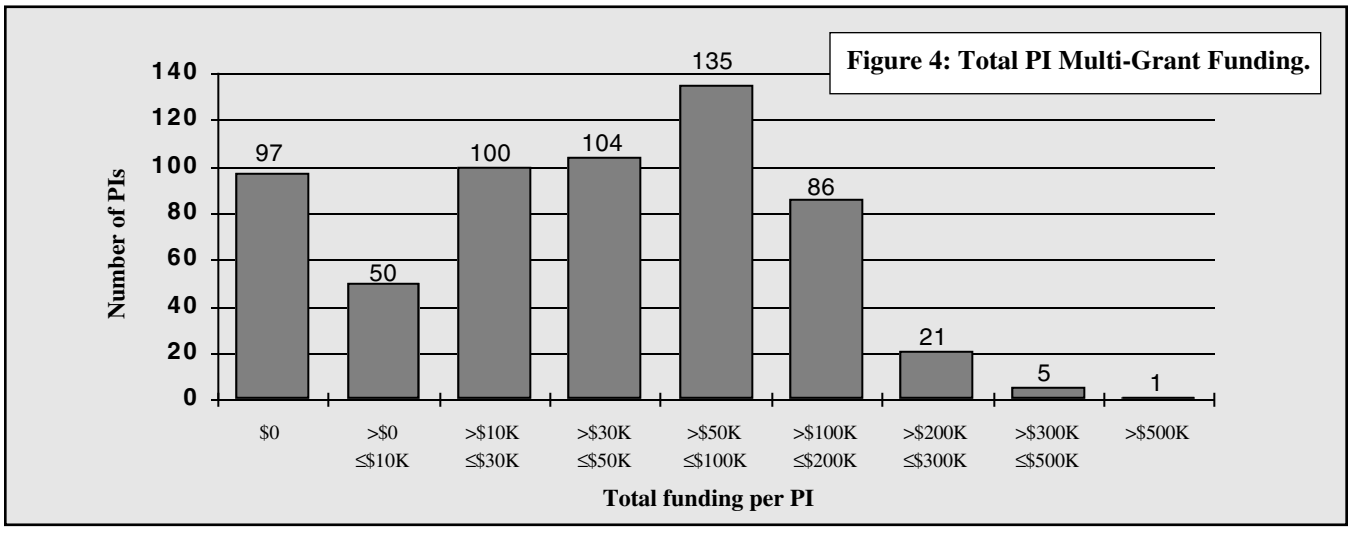


Figure 4: Total PI Multi-Grant Funding.
Number of PIs
Total funding per PI
97
50
100
104
135
86
21
5
1
$0
>$0 ≤$10K
>$10K ≤$30K
>$30K ≤$50K
>$50K ≤$100K
>$100K ≤$200K
>$200K ≤$300K
>$300K ≤$500K
>$500K

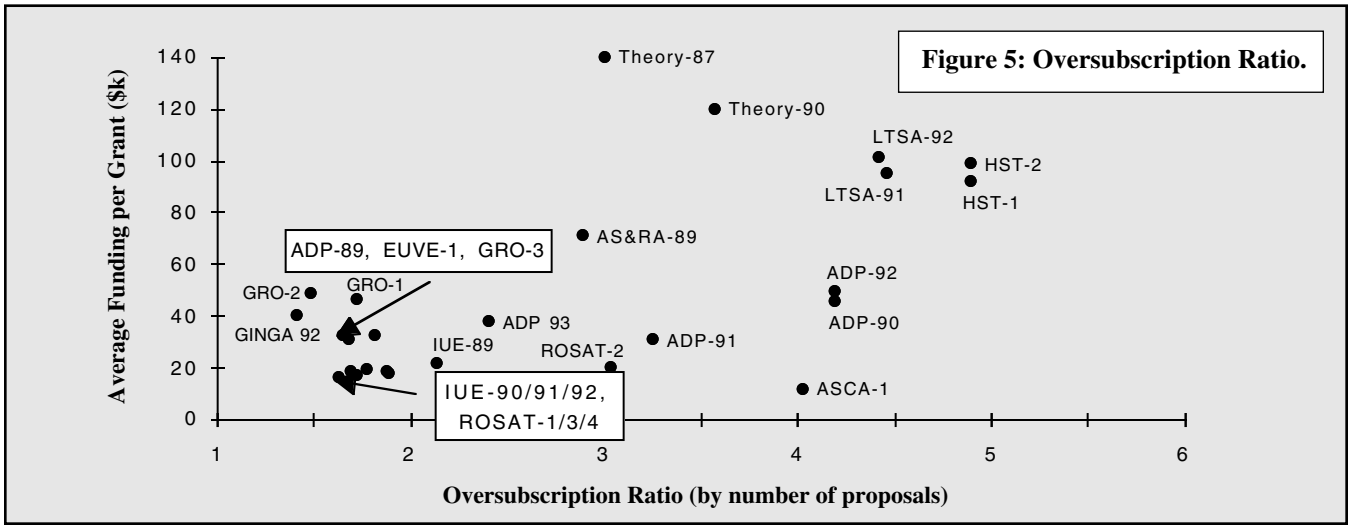
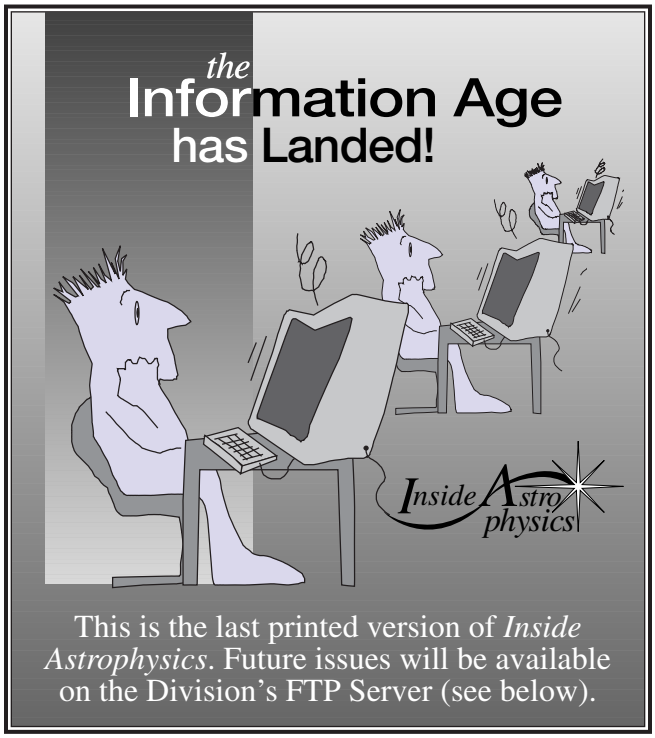


Figure 5: Oversubscription Ratio.
Average Funding per Grant ($k)
Oversubscription Ratio (by number of proposals)
Theory-87
Theory-90
LTSA-92
LTSA-91
HST-2
HST-1
AS&RA-89
ADP-89, EUVE-1, GRO-3
ADP-92
ADP-90
GRO-2
GRO-1
GINGA 92
ADP 93
IUE-89
ROSAT-2
ADP-91
ASCA-1
IUE-90/91/92, ROSAT-1/3/4



Communications Update

To complement its current electronic mail system, the Astrophysics Division has set up the File Transfer Protocol (FTP) Server at NASA Headquarters in order to more easily make information publicly available on the Internet. In addition, the FTP Server will simplify quick exchanges of "working" files between Division employees and external working partners on the Internet. The ability to exchange files so easily and quickly by using the FTP server will greatly enhance the Division's ability to communicate and work with individuals around the world. The FTP server can foster the electronic exchange of many types of files: working files (word processing, spreadsheets, graphics), reports, announcements, proposals, newsletters, general information, etc...

Anyone on the Internet may have read-only access to the public information on the Astrophysics Division FTP Server by either:

1. Utilizing FTP client software* to connect to ftp.astrophysics.hq.nasa.gov. To login, enter "anonymous" for the username, your internet e-mail address for the password, and /pub for the default directory. Transfer any files you desire back to your computer. When done, please disconnect from the FTP server.

- or -

2. Utilizing Mosaic client software* to connect to the NASA Headquarters home page at the following URL: http://www.mtpe.hq.nasa.gov/HQ_homepage.html

Click on the Astrophysics Division FTP Server to access it. Click on the file you want to view or download.

*Available at no cost for major computer platforms. This software is available at the ftp.ncsa.uiuc.edu anonymous ftp server.

If you would like to use this new capability to exchange working files with employees in the Astrophysics Division, please let them know of your interest. In order to exchange textual or binary (specially formatted) files, external users will have to use FTP client software to connect to the Astrophysics Division FTP server and they will have to enter a registered username and password provided by a Division staff member.

If you have any questions or concerns on the Astrophysics Division FTP Server, please contact:

Mr. Jeff Golding (BDM)
(202) 863-2950
jgolding@gm.ossa.hq.nasa.gov

Changes to Astrophysics Theory Program

Theoretical research programs originally supported separately by each of the three Astrophysics Division science branches (infrared, ultraviolet/visible, and high energy) will be consolidated into a single Astrophysics Theory Program. Funding levels for the expanded program are expected to be commensurate with the program's enlarged scope.

Responses to the NASA Research Announcement (NRA) for the Astrophysics Theory Program, released in August 1993, are now due May 30, 1994. The NRA appendices are available through anonymous File Transfer Protocol (FTP) from Internet host nssdca.gsfc.nasa.gov (128.183.36.23) or NSI-DECnet host nssdca:: (15.188). ASCII and Postscript files for all appendices and required forms are located in the directory [.hq-nras], sub directory [.nra_93-oss-06]. For further information, please contact Dr. Guenter Riegler or Darrell New, Astrophysics Division, Code SZE, National Aeronautics and Space Administration, Washington DC 20546, at email: theory@gm.ossa.hq.nasa.gov (telephone 202-358-0370).

Inside Astrophysics Editor Cheri Morrow departs NASA Heaquarters on September 1, 1994. The manager of the Division's new FTP server will continue to provide the information that traditionally has been included in this Newsletter.

From the Associate Administrator–Office of Space Science

Science Budget News

February 14, 1994

Dear Colleagues:

I write to you today to provide an overview of the President's FY 1995 budget proposal to the U.S. Congress and the result for Space Science. The President's FY 1995 budget proposes significantly reduced spending across the entire Federal Government over the next 5 years in order to address the Federal budget deficit problem. NASA has been treated relatively well in this budget. Most departments and agencies in the Federal Government have taken large reductions. NASA's proposed budget was maintained (in real-year dollars) near its current level reflecting the Administration's commitment to science and space.

The proposed budget level for NASA in FY 1995 is $14.30 billion, compared to $14.55 billion actual in FY 1994 with a flat budget projected for the next 5 years. This translates into a loss in spending power over the next 5 years at the annual rate of inflation. In spite of this, no major programs have been canceled, and some new ones have even been added. In order to meet the Administration's priorities in science, aeronautics, and technology (SAT), spending for the human space flight program at NASA has been reduced during the last 2 years and new investments made in SAT including increases in Mission to Planet Earth for the Earth Observing System (EOS) and in Space Science for AXAF and Cassini. The NASA budget has been restructured this year into four budget line items, one for Human Space Flight (HSF) that includes Shuttle and Space Station, one for SAT, one for Mission Support, and a small one for the Inspector General. The budgets for SAT and HSF are roughly equivalent at about 40 percent of Agency spending in FY 1995 and beyond. The Science portion of the SAT line contains funding for Space Science, Mission to Planet Earth, Life and Microgravity Science and Applications, and the launch vehicles and communications services required to support them. The Science portion of the NASA budget is up from 22 percent of the Agency budget In FY1994 to 24 percent in FY 1995.

Space Science emerged from the Administration's budget process this year with a very satisfactory budget proposal. The proposed budget level of $1766.0 million for Space Science in FY 1995 keeps pace with inflation relative to the level of $1721.9 million in FY 1994 and is sufficient to maintain our current programs at reasonable levels. There are no major problems and no major program cancellations. Even in these constrained times, the budget contains a low-cost replacement program for Mars Observer and a Tether satellite reflight. Considering the reductions in the overall Federal budget, and reductions elsewhere in the NASA budget, Space Science was treated well for FY 1995. This does not mean, however, that there are no losses against hopeful expectations in Space Science. There is no continuing space physics flight development program, and belt tightening will be required in our research and analysis, information systems, and suborbital programs as these budgets are held at their FY 1994 levels.

The Space Science program for the years beyond FY 1995 will be addressed in a new Strategic Plan for Space Science that is being constructed by the Office of Space Science in partnership with its Space Science Advisory Committee. The challenge will be to find ways to start new high priority science missions in a climate where decreasing budgets are forecast. We need to ensure continuance of a discipline-sustaining program of small, frequent space flight missions for each discipline (Explorers and Discovery) and continue to restructure our proposed larger missions to lower cost through innovative means, including new technologies and international cooperation. We must search for ways to launch our missions on less costly vehicles and examine our large and growing mission operations budgets to free funds for starting new missions. The science community and our implementing institutions must work together to devise such solutions if Space Science is to maintain a continuing pace of new missions.

The scientific enterprise in this Nation is undergoing a revolution at the end of the Cold War. The social contract between science and the public is undergoing

change as the imperative for conducting the Nation's science enterprise is being scrutinized. The Administration is now crafting the first new national policy on science since the end of the Second World War. If Space Science is to maintain its vision and mission in the next several years, it must expressively articulate to the American public and to its decision makers in the Administration and Congress the benefits that the Nation derives from the enterprise.

Space Science is 12 percent of the NASA budget and is the only program in the Agency that explores beyond earth orbit and looks outward to the universe beyond the solar system. Space Science produces new discoveries and new knowledge that advance our understanding of the sun, solar system, and universe. Investment in Space Science brings with it technological advances in automation, robotics, instrumentation, electronics, information technology and communication that are required to conduct our enterprise.

In addition, Space Science can make a major contribution to improving this Nation's educational system in science and mathematics.

I ask your support for this budget in FY 1995. This will be a particularly important year as Congress searches for ways to reduce liens against the future and reduce the budget deficit while, at the same time, we must convince them to invest in Space Science for a better future.

Sincerely,

Wesley T. Huntress, Jr.
Associate Administrator for Space Science

National Aeronautics and
Space Administration

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