HEASARC and Related Data Center Activities

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HEASARC Overview

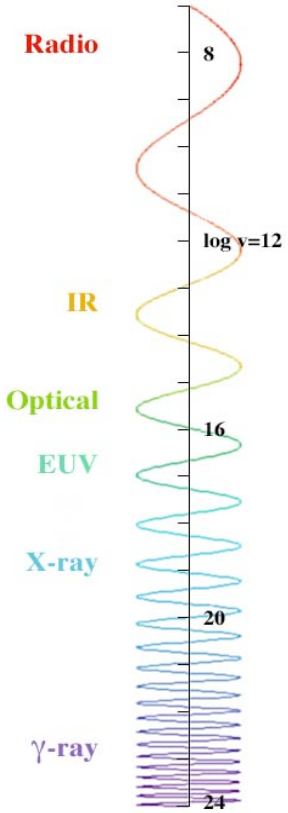
NASA's archive for X-ray and Gamma ray data

- Established in Nov 1990
  - First wavelength specific "active" archive
- Partnership between GSFC and SAO (since 1999)
- Contains data from 23 missions
- All data in FITS format, along with associated software and calibrations
- Provides the necessary scientific and technical expertise for the use and interpretation of the data
- Develop/maintain multi-mission analysis/support tools such as XSPEC, PIMMS, and Proposal Submission
- Online access to all data, catalogs of observations and sources and browse data products
- Defines and coordinates data, software, and media standards

The Astrophysics Data Infrastructure

- HEASARC is part of a confederation of wavelength specific astrophysics archive centers & dedicated value added services
  - *EUVE, X-ray, Gamma ray: CXC, HEASARC*
  - *UV/Optical: STScI/MAST*
  - *IR: IPAC*
  - *CMB/Submm: Lambda*
  - *Data Services: NED, ADS*
- *Coordinated via the Astrophysics Data Executive Committee (ADEC)*
  - *Representatives from each data center or service*
  - *Meets 3 times a year*
  - *Currently increasing archive interoperability*

Astrophysics Data & Information Services



Mission Science Centers

MAP
SWAS
Planck
Herschel
SIRTF
SOFIA
2MASS
HST
GALEX
FUSE
Chandra
XMM-Newton
BeppoSAX
RXTE/Swift
INTEGRAL
GLAST

Wavelength Focused Science Archive Centers

LAMBDA
IRSA
MAST
HEASARC

Permanent Archive

NSSDC

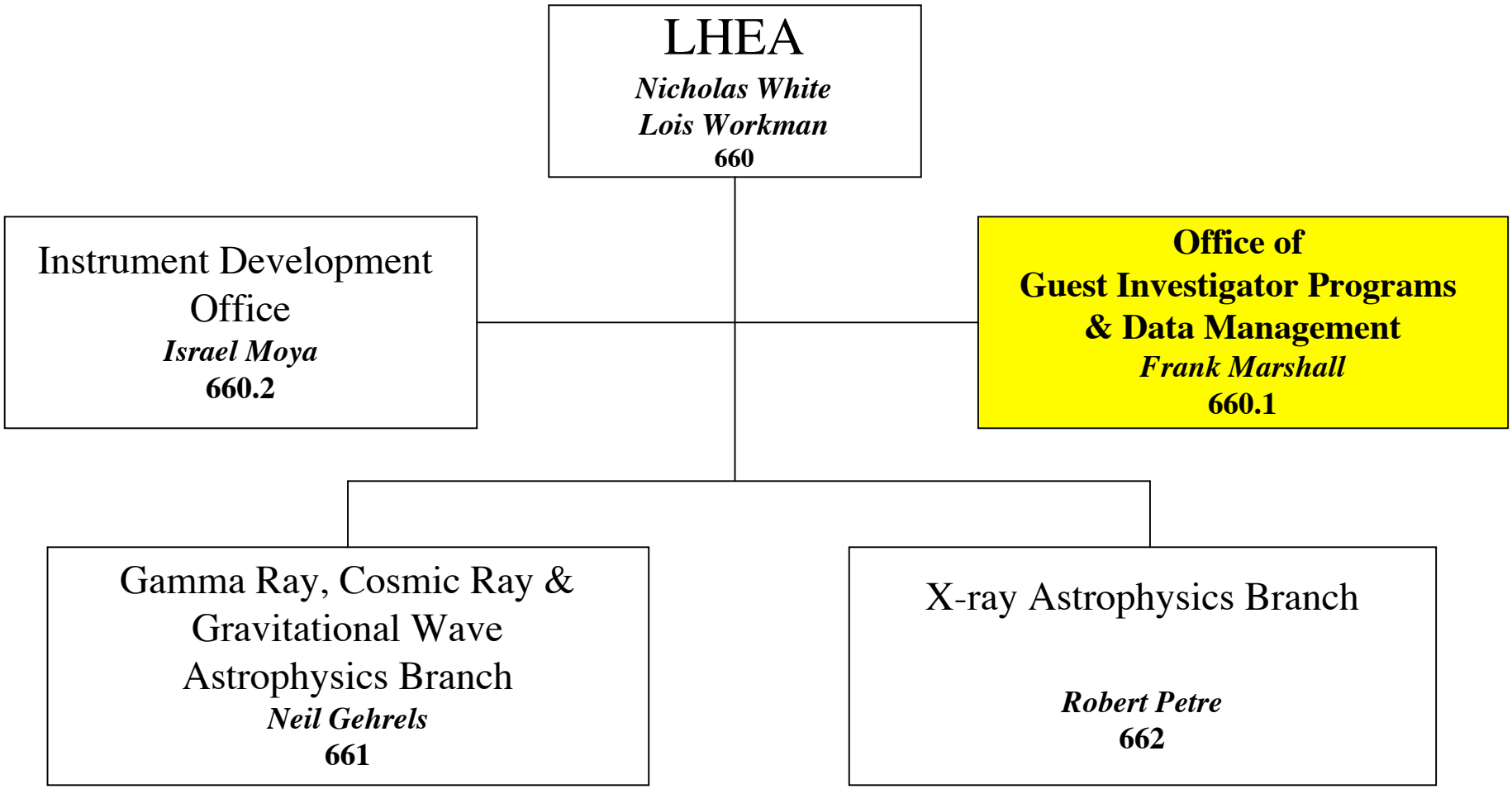
Integrating Services

NED
ads
SkyView
SIMBAD/CDS

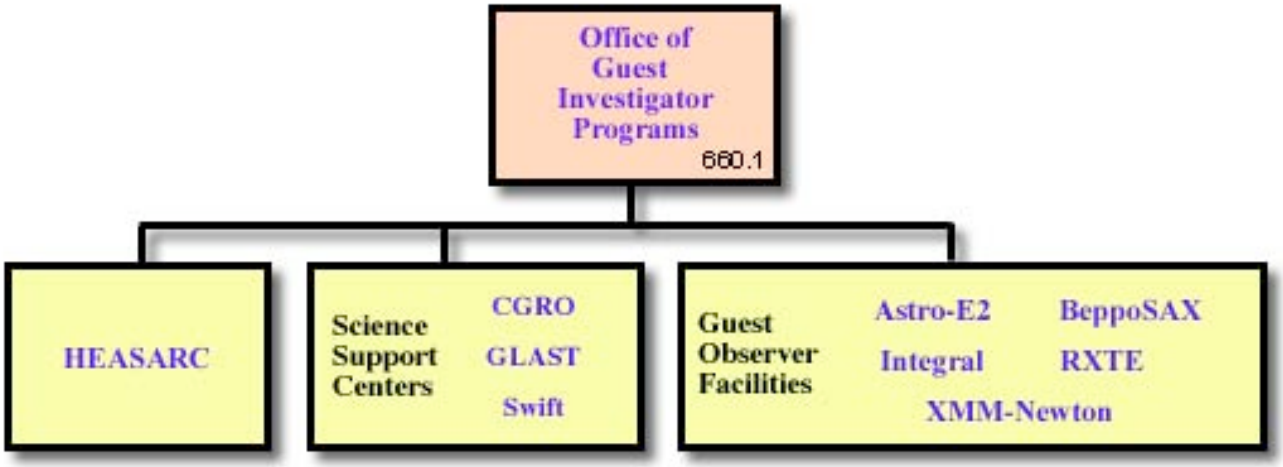
Astronomy and Physics Community
General Public
Education Community

HEASARC

Laboratory for High Energy Astrophysics Organization



HEASARC Overall Organization



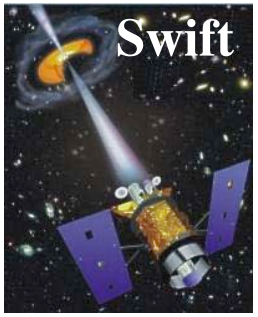
HEASARC provides the **multi-mission infrastructure** that is used by the GOFs and science support centers:
Archive, database, web services, FITS standards, multimission software, & expertize

Science staff are colocated with LHEA science branches

HEASARC Mission Support

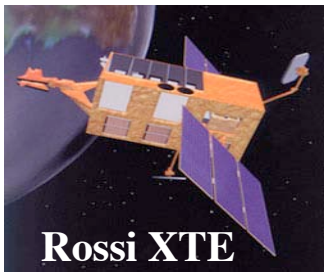
HEASARC provides the multi-mission infrastructure that is used by dedicated mission data centers (RXTE, Chandra, XMM-Newton, INTEGRAL, Swift, Astro-E2, and GLAST)

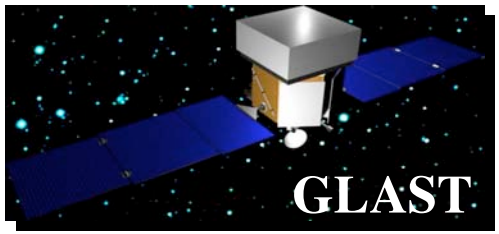
Archive infrastructure, database support, web services, proposal software, FITS standards, multimission software, & science expertize

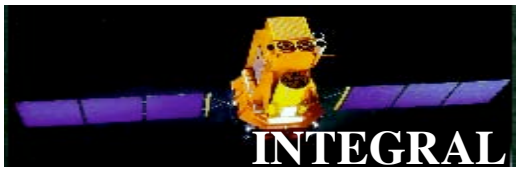


Prevents duplication of effort and promotes reuse of software which result in cost savings to missions

At the end of mission life the HEASARC maintains the archive, science expertise and software (e.g. CGRO, ASCA, ROSAT)







HEASARC Budget & Staffing

- Budget of $1.5M that mostly pays for people
- LHEA Science Staff (5 USRA, 1 UMD, 2 GSFC):
  - Angelini (Restoration, BeppoSAX, Swift, XIMAGE, XRONOS)
  - Arnaud (XSPEC, XSELECT)
  - Corcoran (ROSAT, Caldb, HETE-2)
  - Drake (User support, EUVE, Archive population)
  - Lochner (E/PO)
  - McGlynn (Archive Scientist, Skyview, ClassX)
  - Pence (FTOOLS, FITSIO, FITS standards, HERA, FV)
  - White (Director)
- Two addition FTE at SAO (separately funded)
- Science staff have 30% time for research
  - Successfully compete for observing time e.g. XMM-Newton and Chandra
- Programming Staff (5 Software contractor, 1 GSFC)
  - Database, archive access, data ingest, data restoration, web services, XANADU analysis software, education & outreach, system support, and user support.
- Additional funding competed for via e.g. AISRP

HEASARC Colocated Data Centers

- Provide dedicated support to specific missions utilizing HEASARC infrastructure
  - Develop mission specific software
  - Interface between community, instrument teams and/or foreign data center
  - Data processing and archive creation
  - Proposal support and grants administration
  - Science expertise in the specific mission
- Currently there are 8 active GOFs/SSCs:
  - XMM-Newton, RXTE, BeppoSAX, INTEGRAL, Swift, Astro-E2, GLAST, CGRO
  - 1 to 5 scientists per mission (typically 3), plus comparable number of programmers and support staff
  - Colocated staff at foreign data centers (XMM-Newton, INTEGRAL, Astro-E2)
  - Current total cost ~ $3M (depending on mission phase)

SAO Connection

- Coordinates SAO Chandra and HEASARC activities
  - Chandra calibration data & archive interface
  - Transparent access to Chandra archive from HEASARC Browse
  - DS9 Software
  - Remote Proposal Submission Software
  - Two FTE staff at SAO
  - Steve Murray directs the activity

The HEASARC Physical Archive

Past Missions

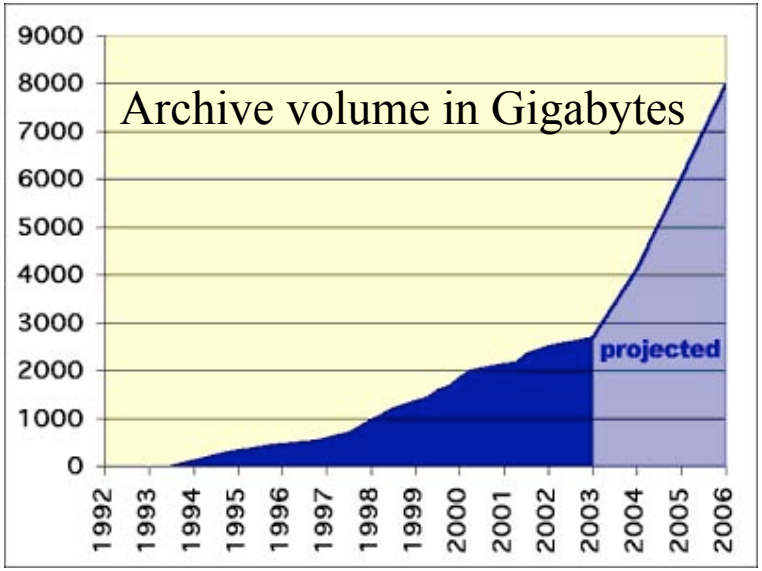
Ariel 5
ASCA
BBXRT
BeppoSAX
CGRO
Copernicus
COS B
DXS
Einstein
EUVE
EXOSAT
Ginga
HEAO 1
HEAO 3
OSO 8
ROSAT
SAS 2
SAS 3
Vela 5B

Active Missions

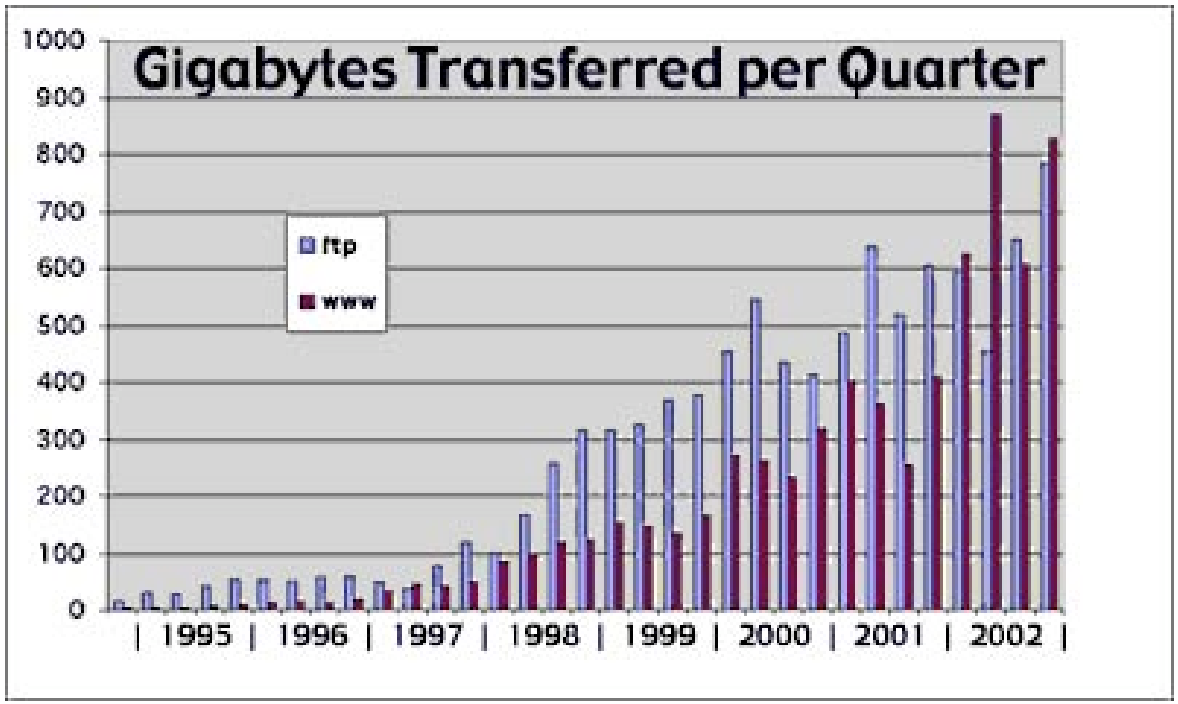
RXTE (1995-
Chandra (1999- [data at CXC]
XMM-Newton (1999-
HETE-II (2000-
INTEGRAL (2002-

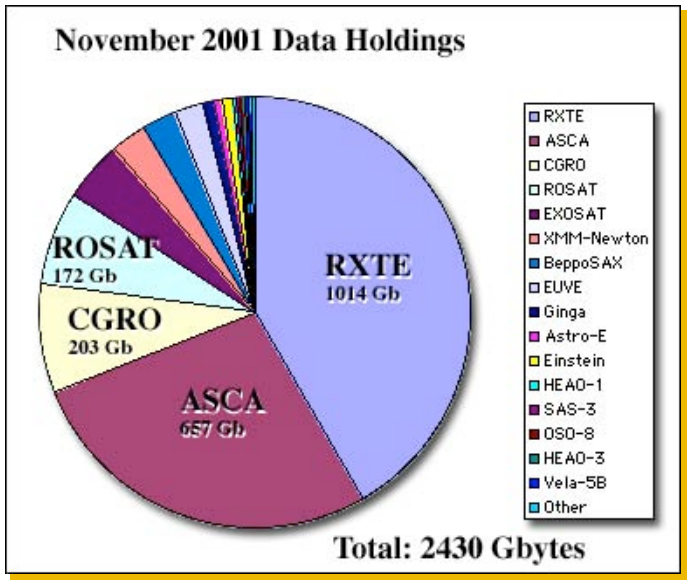
Upcoming Missions

Swift (2003 Launch)
Astro-E2 (2005 Launch)
GLAST (2007 Launch)



Usage & Data Statistics



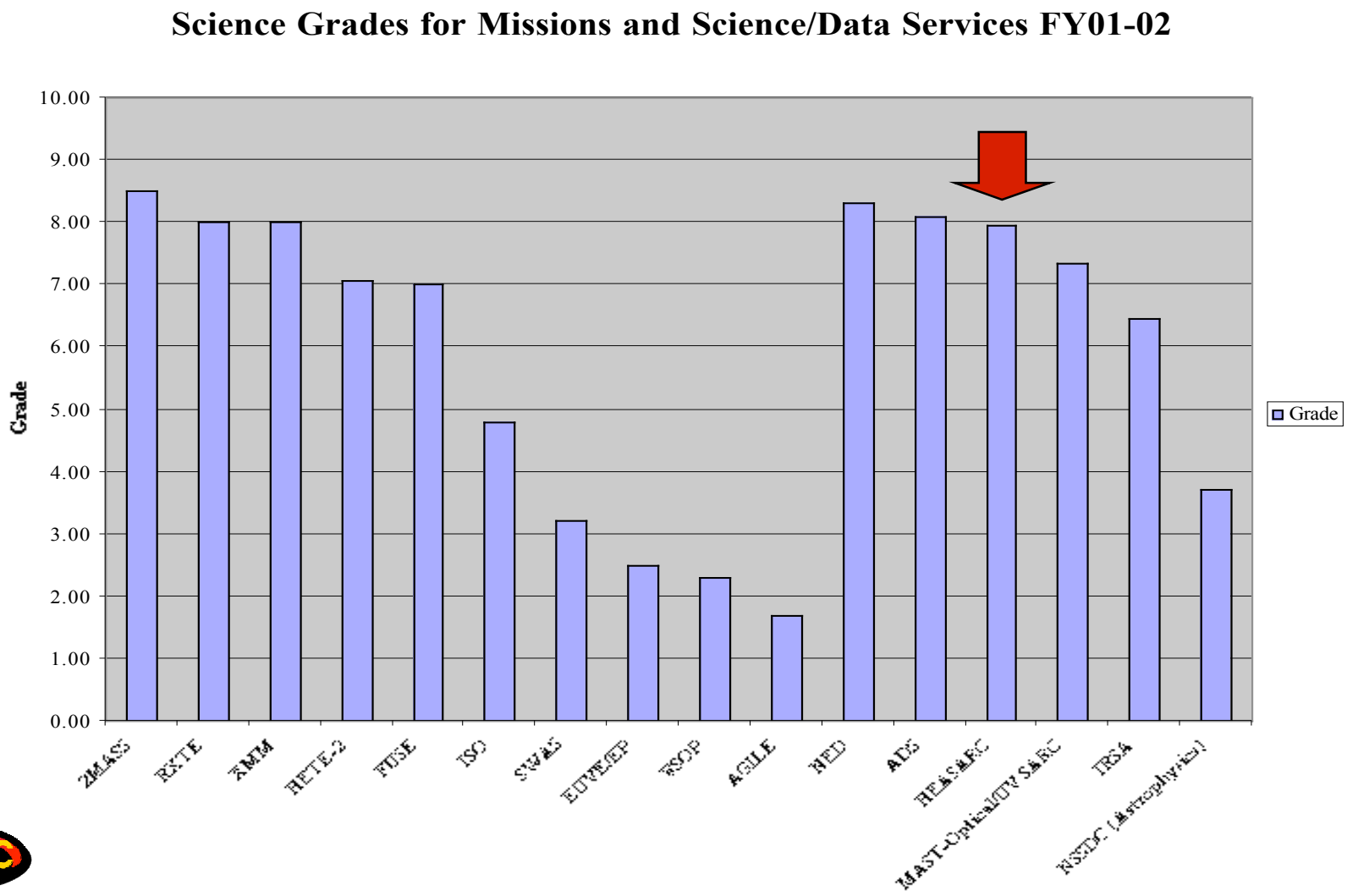


- Archive is now 3.0 Terabytes (1.0 TB of RXTE data)
  - Served 4.8 TB last year (ftp + http)
  - 2.6 million queries of Browse (100% increase)
  - SkyView generated 1 million images and named a top 50 Web site by Scientific American

Evaluation

- LHEA and support scientists are users themselves, so provide constant feedback
- HEASARC Users Group meets every year to provide community advice and feedback
- Used external company (Cornerstone) to evaluate Web interface and E/PO program
- Senior Review in 2000 evaluated HEASARC relative to other astrophysics data centers

Senior Review 2000



Conclusions

- HEASARC and related data centers provide a cost effective & high quality service
- Scientists working on the data and part of the LHEA research staff are essential ingredient to the success - a science driven service