The Chandra X-ray Observatory

Vital Statistics

- <0.5" spatial res.
- 600cm² area @1.5keV
- 16"x16" FoV
- F_x ~4e-16 in 10^5 secs
- >1000 E/ΔE (50-160Å)

Chandra Status

- Currently observing Cycle 7 targets
- Cycle 8 Peer Review in June, results 7 July 2006
- Satellite and instruments performing well
- No major changes anticipated
- Scheduling restricted by need to moderate on-board temperatures, change in limits Dec 2005 eased this somewhat
- Oversubscription continues at ~6.5 (on time)
- Science, papers, citations continue at high levels
- No lifetime issues, determined by funding only
ROSAT (10") vs Chandra (0.5")

Chandra “Must Do” Science

Jets
- High spatial-resolution (<1") studies:
  - QSO Jets: high-z searches, detailed structure, feedback
  - Central Structure: clusters, galaxies, SNR
  - Surveys: Deep, Medium, Shallow
- Will not be possible again until Gen-X: 2020 or later (Con-X: 5-15"")
- Multi-wavelength data enhances all these studies, e.g. HST imaging
Actual Chandra First Light

- Point Source to focus: Quasar PKS0637-75, z=0.5
- X-ray Jet visible: 5"
  long, 200,000 yrs
- New “industry”! (20% of AGN/Survey proposals)
- Compton scattering: internal/CMB

X-ray/Radio Jets in Quasars

(Marshall et al)
Supernova Remnants

- Detect shocks, sharp B/ρ/P/T changes
- Finding central stellar remnant

Hwang et al

Cas A: First Light

Crab Nebula

CHANDRA  HST

(Hester et al.)
NGC 6240

Fainter source approaches us

Great Observatories Workshop  Belinda Wilkes, May 2006

Clusters of Galaxies

Complex:
AGN outbursts,
shock waves,
cold fronts,
bubbles,
feedback

Need well-defined samples

Great Observatories Workshop  Belinda Wilkes, May 2006
Investigating Dark Energy with Chandra Observations of Clusters
(Allen et al)

Calibrate distance scale via assumption of constant gas fraction

Ratio of Ordinary to Dark Matter for Clusters vs. Distance
Low-z clusters too bright → smaller distance

SCDM Cosmology

ΛCDM Cosmology
Great Observatories Workshop
Belinda Wilkes, May 2006

**Cosmological Parameters**

Clusters (+BBNS+HST)

- $\Omega_m$
- $\Omega_b$
- SN1a
- CMB

**HETG Spectrum: NGC3783**

George, Netzer, Kaspi et al.; Krongold, Elvis et al.

Absorption:
3 components

**Chandra X-Ray Observatory**

NGC 3783

CXC
Surveys

• Complementary:
  – Deep, narrow: CDFS, CDFN (Brandt, Hasinger et al)
  – Medium wider: SWIRE, ChaMP (Lonsdale, Wilkes, Green et al)
  – Shallow, wide: Bootes (Murray, Forman et al)

• Aim: to find large enough samples of rare objects for detailed study by Con-X

• Are we doing enough?
  X-ray Surveys Workshop, Nov 6-8, Cambridge MA