What was it like sitting next to Riccardo?
First Views of the X-ray Sky with Chandra

- Normal galaxy with ULX among first six objects detected in HDF-N (166 ks)
First Views of the X-ray Sky with Chandra

Normal galaxy with ULX among first six objects detected in HDF-N (166 ks)

HST f300w ≈2″ X 3″
Optical properties of CDF-N Sources, 221 ks

“New” population seen to arise (just past 166 ks)

Hornschemeier et al. (2001)

Range of expected $f_x/f_R$ values for AGN

OBX

STARS

0.5–2 keV flux (erg cm$^{-2}$ s$^{-1}$)
The X-ray output of binaries exceeds that of AGN at $z > 6$
X-rays from star formation affect the primordial IGM at $z \approx 20$ (courtesy A. Mesinger)

The X-ray mean free path through the IGM is very sensitive to $E_x$:

thus the **patchiness** of the heating tells us about the X-ray SED
High-z 21 cm observations (HERA, SKA, etc.): Softer SEDs result in more inhomogenous IGM heating

‘hard’ SED ~ HMXBs

‘soft’ SED ~ hot ISM

Pacucci, AM+ 2014
Sharing a laugh with Riccardo
Lynx: a new great observatory for X-ray astronomy

X-RAY MIRROR ASSEMBLY
0.5″ Point-Spread Function, stable over a 20 arcminute FoV

Reference mission baseline optics technology:
GSFC silicon metashells

HIGH DEFINITION X-RAY IMAGER
Designed for exquisite imaging and wide surveys, the HDXI is an active pixel array covering a 20’ x 20’ field of view with subarcsecond imaging.

LYNX X-RAY MICROCALORIMETER
Spatially resolved 3 eV spectroscopy across a 5’x5’ field of view, sampled with 1″ pixels. Two subarrays optimized for finer imaging and higher spectral resolution.

X-RAY GRATINGS SPECTROMETER
Spectral resolving power of $R > 5000$ with ~4000 cm$^2$ of effective area across the critical X-ray emission and absorption lines of C, O, Mg, Ne, and Fe-L.

30 May 2019
Ann Hornschemeier
Giacconi Memorial Symposium
National Academy of Sciences
X-ray astronomy owes a huge debt of gratitude to Riccardo Giacconi.

Thank you!

Ann.Hornschemeier@nasa.gov
But we can learn more!

The X-ray mean free path through the IGM is very sensitive to $E_x$:

$$
\lambda_X \approx 34 \, \bar{x}_{\text{HI}}^{-1} \left( \frac{E_X}{0.5 \text{ keV}} \right)^{2.6} \left( \frac{1 + z}{15} \right)^{-2} \, \text{comoving Mpc} ,
$$

thus the *patchiness* of the heating tells us about the X-ray SED