A Few Personal Recollections and Some Over-Arching Perspectives

Memorial Symposium to Honor
Riccardo Giacconi

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Center for Astrophysics | Harvard & Smithsonian
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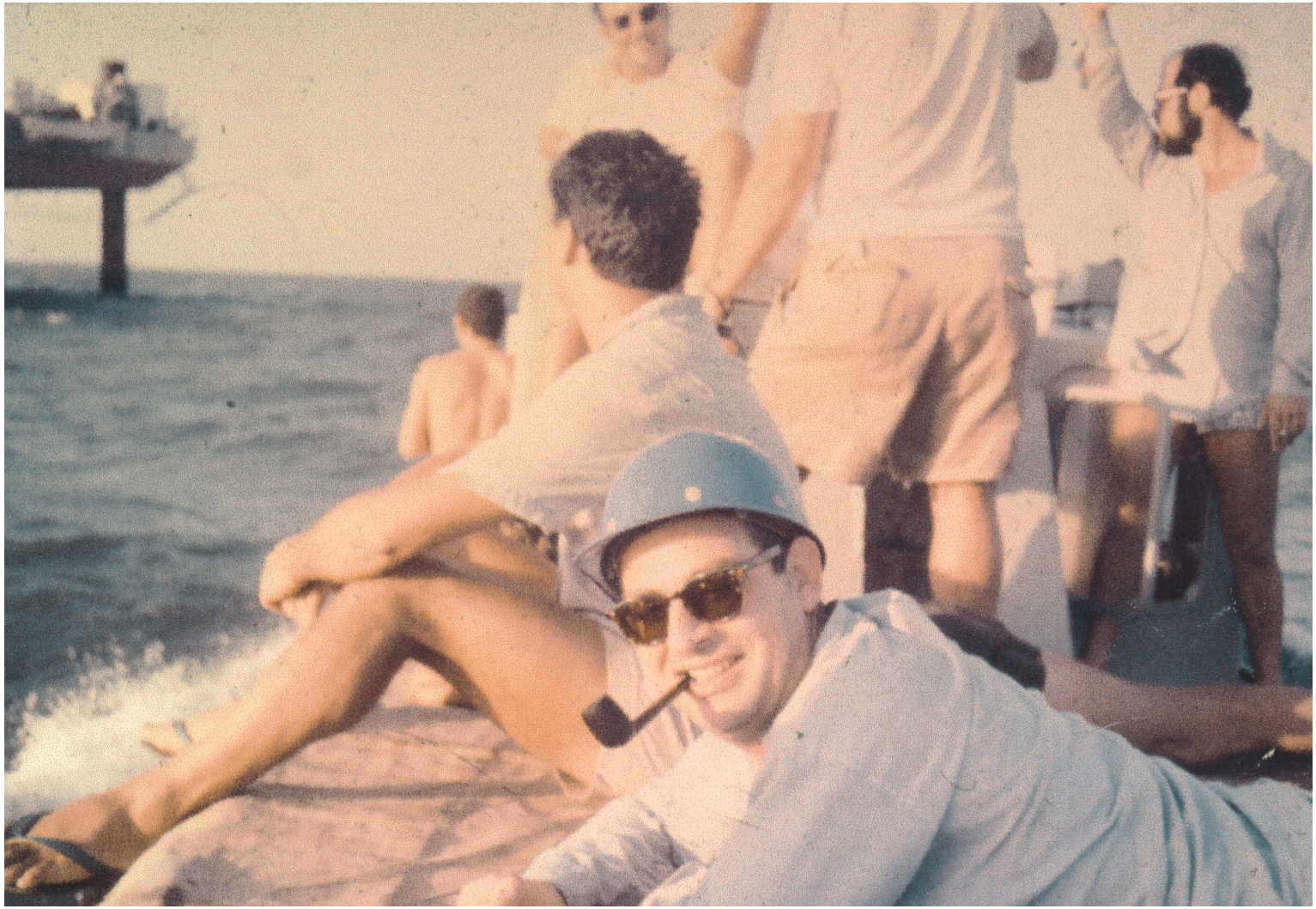
Recollections of the Uhuru Launch

- AS&E team arrived in Kenya ~1 month before launch
- 3 of us – Dick Goddard, M.E. Stan Mickiewicz, E.E. Harvey Tananbaum, PS
- All very young – late 20's and early 30's
- Perhaps amazing in retrospect that we were given these responsibilities – but Riccardo had trained us well and we were quietly confident that we could/would do our jobs
- Riccardo arrived ~1 week before launch



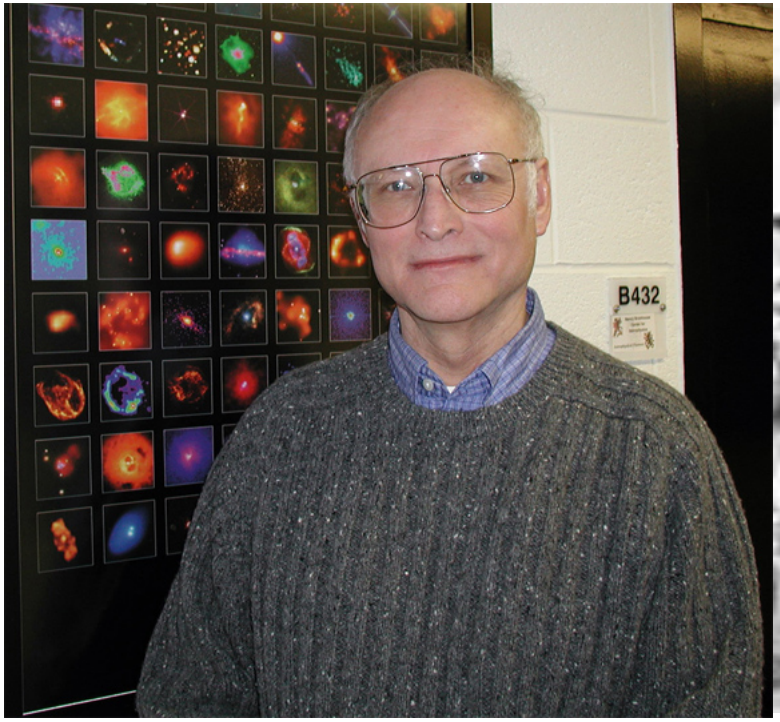
Riccardo “nervously” awaits the Launch

Transport to Launch
(San Marco)
and Test *(Santa Rita)*
Platforms

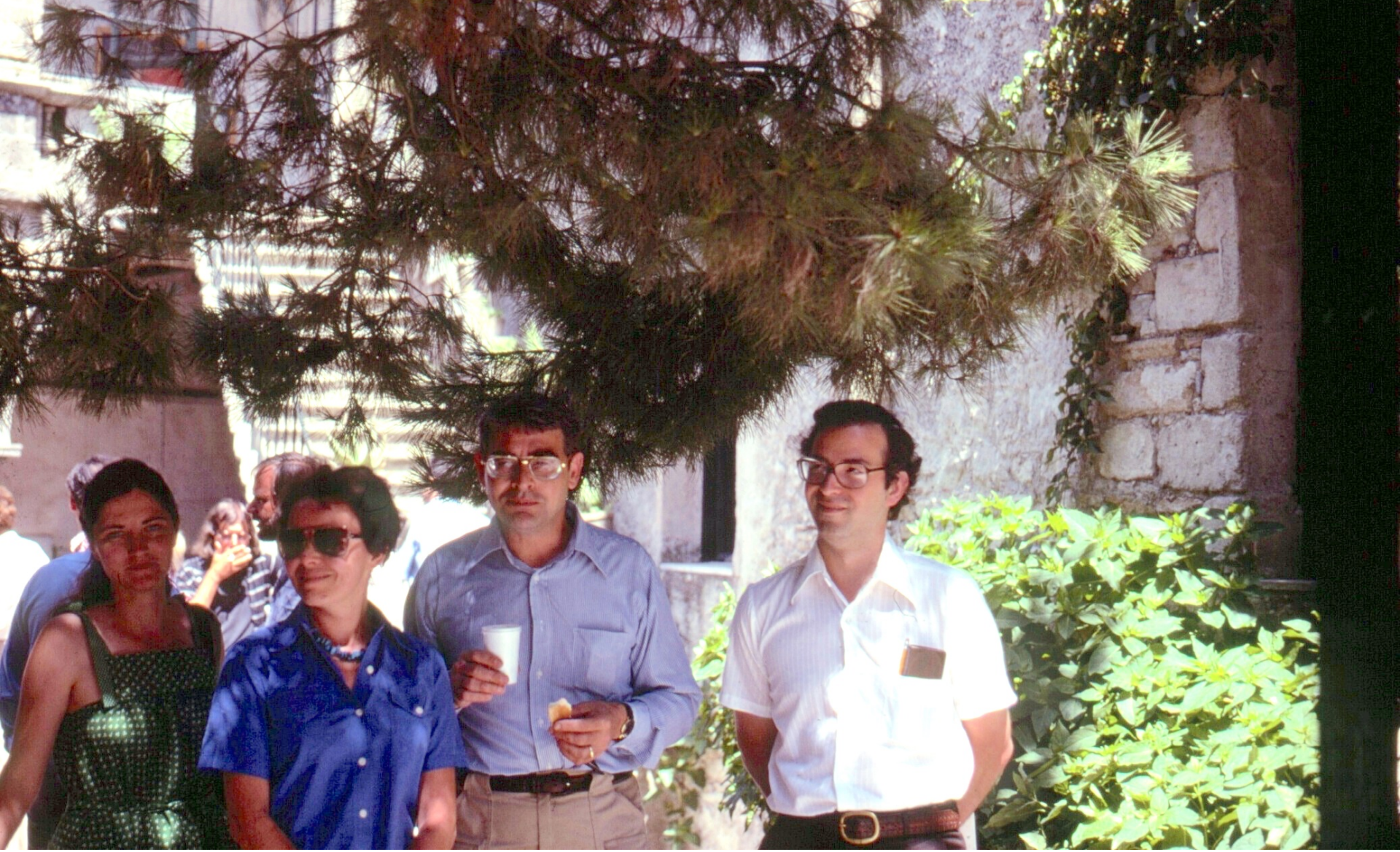
Plans for a 1.2 Meter Telescope

- 1963 White Paper/Proposal to NASA by Giacconi and Gursky – launch in 1968
- 1970 Large X-ray Orbiting Telescope (LOXT) by AS&E, MIT, Columbia, and GSFC consortium with Riccardo as PI – accepted by NASA with launch in 1975/6
- Downsized version launched in 1978 as HEAO-2/Einstein!
- 1976 Proposal to Study 1.2 Meter X-ray Telescope – launch in late 1982
- Is there a pattern here?
- Note that angular resolution, detectors, and longevity achieved with Chandra far exceed what could have been done in 60's, 70's and 80's

The LOXT and Einstein Science Consortium Leads
at 1988 Celebration



Leon Van Speybroeck and Steve Murray



Good Times in Italy – Erice 1979

Bologna 2009

Perspective 1
Initial Discoveries not an Accident

- 1962 discovery flight encompassed larger detector area, lower background, and broader field of view than previous attempts

- Funded to look for fluorescent X-rays from the moon but designed and flown to survey large swath of the sky to see what might be there → Sco X-1 and XRB for starters

- Commemorating 50th anniversary of discovery of Sco X-1 and XRB, Riccardo wrote:

> Successes of X-ray astronomy were not a fluke — result from bounty of Nature, aspirations of many people, rigorous and methodical research effort, and development of new technology and new operational approaches (Mem. S. A. It. 84, 472)

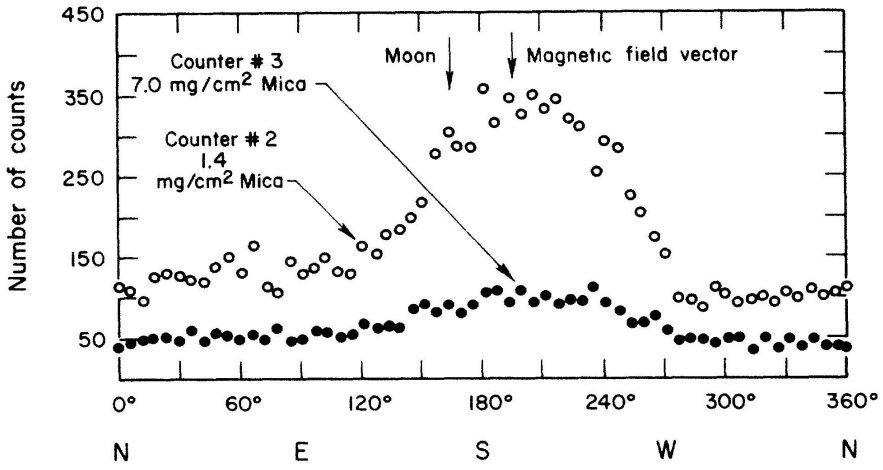
Perspective 2
Some Principles for Riccardo's Approach (Secrets of the Hoary Deep)

- Work at limit of what he could conceive and build within available resources
- Insure useful science even with partial success – soft failure and redundancy
- Apply principles of systems engineering to science projects (Ethan's talk)
- Keep instruments as simple as possible to attain specific results, reducing costs and risk of total failure
- Use best available engineers, managers, programmers, etc and work as integrated team
- Develop a common vision with science staff having research time along with service responsibilities

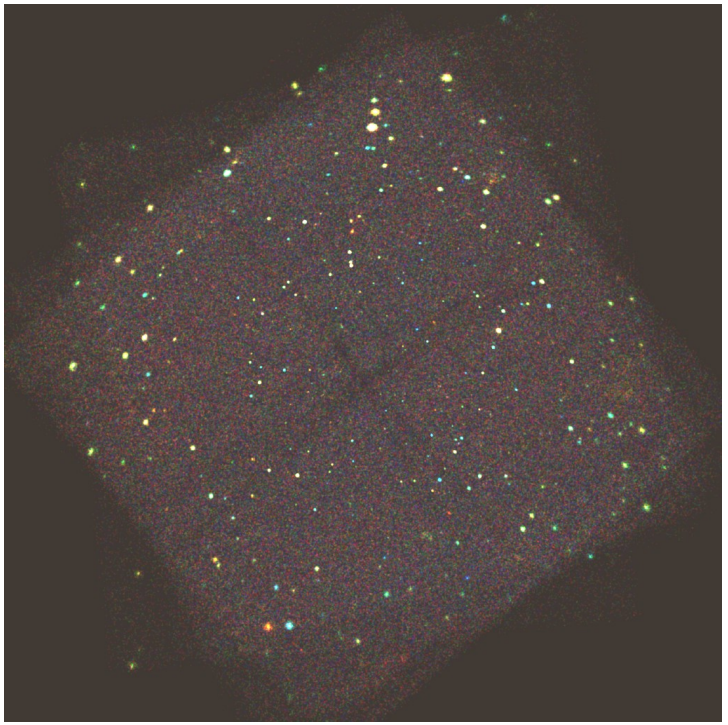
Perspective 3
Riccardo's Persistence and Resiliency

- Initial proposal to NASA not funded. Turned to AFCRL and added moon as an objective
- First 2 flights failed (rocket on 1st and detector doors on 2nd). Success on June 18, 1962 (launch 1 minute before midnight local time)
- In 1975/6 requested that $400K set aside for science enhancement on HEAO-2 be used to add magnetic torquers and extend lifetime. NASA management refused – extended missions were not a priority in the 70's
- Making lemonade from lemons – went back to NASA HQ and proposed and approved to study bigger, better, and longer-lived mission even before Einstein launched
- Riccardo didn't always win – at least not on the first attempt

Perspective 4
Riccardo's Vision for X-ray Astronomy (1963 Proposal)



Discovery of Sco X-1 and XRB (1962)



1 Ms Chandra exposure on CDFS (2002)

Observations from Mirella Giacconi and Others

When things ran smoothly, Riccardo would get a little bored and start looking for a new challenge.

-Mirella Giacconi

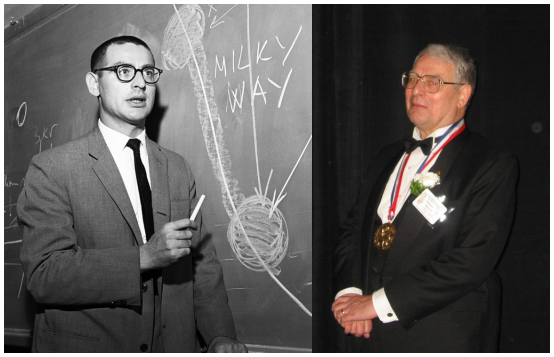
Riccardo set future directions before he moved on: studies underway for *Chandra* when he left CfA; for the *James Webb Space Telescope* when he left the STScI; and for the European Extremely Large Telescope when he left ESO.

- Wallace Tucker, Ethan Schreier, and Harvey Tananbaum

When I visited Riccardo during the last few years he always said that he kept track of the latest news from Chandra, Hubble, the VLT, and ALMA. All of his favorites!

- Harvey Tananbaum

Paraphrased from Riccardo's Own Words (Secrets of the Hoary Deep)



- While analyzing Uhuru data, I came to love discovery for its own sake (p143)
- I felt my greatest contribution to the field could be to build great instruments available to the entire astronomical community and to operate them in such a way as to maximize the scientific returns (p143)
- As a young man of 28, I had invented the X-ray telescope; at 31, I had discovered the first X-ray star and the XRB. The nature of the X-ray binaries had become clear with Uhuru which also discovered the intergalactic plasmas in clusters. Einstein made X-ray astronomy relevant to all astronomers. Thanks to Chandra, the nature of the XRB has almost been solved by 2002. It seemed as if my scientific career has come full circle (p367)