



Chandra, Riccardo, and Me

Presentation at the Memorial Symposium to Honor
Riccardo Giacconi

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Washington DC, May 30, 2019

1969 – My First Meeting with Riccardo

- Bob Novick took me to a meeting at AS&E
- There, I learned a lot from Riccardo and the others about this new field I was about to enter (thank you)

"SEX" & the "PIG"

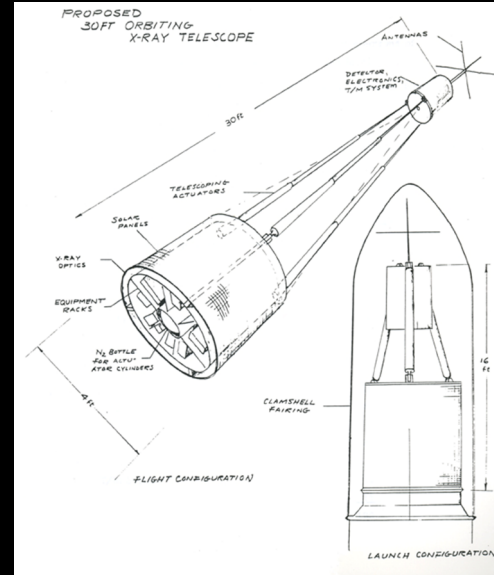
- SEX = Super EXplorer
- PIG = Principal Investigator Group

UHURU

- My work on Cygnus
 - Learning about shot noise
 - Was I the first ever “Guest Investigator” ? (thank you)

1973 – LOXT to HEAO-B

- The original proposal for a Large Orbiting X-ray Telescope (LOXT) was approved as part of the original HEAO Program in 1970
- Traces back to Riccardo's insight for X-ray Astronomy in 1963



- The (as we were to learn) inevitable descope took place in 1973
- The revised proposal, which I worked on, included, for the first time, the concept of a Guest Investigator Program, another of Riccardo's innovations
- I also learned that the best instrument (e.g. the barn door) is not necessarily the best instrument for space flight (thank you)

1977

- Bob Novick comes into my office and laughingly and sarcastically asks me “How would you like to live in Huntsville Alabama?”
 - “A successor to the Einstein Mission is being considered and they are looking for a Project Scientist”
- I got an offer and took the job (“An offer I didn’t refuse”)
 - Because I had a bona-fide track record as an experimental X-ray Astronomer
 - Because I told them I could tell Riccardo to be quiet (not precisely the words I used) and they believed me
 - Because I believed in the mission
 - Because I wanted to build my own group
 - Because Riccardo must have approved (thank you)

1977 — 1999

- There were two AXAF/Chandra Science Working Groups (SWGs) during the years of development up to launch on July 23, 1999
- The first was chaired by Riccardo and I served as Vice Chair (thank you)
- The second SWG I chaired beginning in 1985



1977 — 1999

- Following Riccardo's lead, and making use of the SAO-based Chandra Mission Support Team, first led by Riccardo and then by Harvey Tananbaum, together with the group of scientists I accreted at MSFC, and our Telescope Scientist Leon Van Speybroeck we performed complete science systems analysis of every aspect of the Observatory: from star cameras to batteries, from X-ray optics to gyroscopes, from reaction wheels to cost estimates, etc.
- The scientific systems engineering played no small role in Chandra's technical, programmatic and, of course, scientific success (thank you)
 - Designed for 3 years with a goal of 5 Chandra is about to celebrate its 20-th year of operation!

1999 — Present

- I am extraordinarily proud to have played a role in realizing Riccardo's dream of 1963 and to have participated in the design, construction, calibration, and operation of the scientific cathedral we all know as the Chandra X-Ray Observatory
- I am so glad that Riccardo could see how scientifically powerful his dream was when realized
- We all have learned much along the way and the entire scientific community, certainly me, owes him a huge debt of gratitude
- Let us not forget
 - Project Science cannot be accomplished by a one, or even a handful, of people
 - Scientific systems engineering is every bit as important as the usual systems engineering
 - Involving a broad community in a meaningful way enhances scientific output
 - Major scientific facilities should be operated by scientists
 - The importance of making strides in angular resolution

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