

# **X-Ray Astronomy Discovery Experiments, II**

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## ABSTRACT

**X-Ray Astronomy Discovery Experiments, II\***. P. C. FISHER, Ruffner Associates, LTD. — Paper I provided proof of concurrent discovery experiments at the start of cosmic x-ray source studies<sup>1</sup>. It was noted that since the Lockheed discovery was postulated before any source was observed, that discovery was of equal or greater importance to the start of such studies than the discovery of Sco X-1. Illusions about the nonexistence of the Lockheed discovery that may have been caused by organizers<sup>2</sup> and invited reviewers<sup>3,4</sup> of a meeting, and related events (including<sup>5</sup> and<sup>6</sup>), will be described. This paper's goal is to have the American Institute of Physics require members to properly credit contributions of others.

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<sup>1</sup>P. C. Fisher, BAPS 53 No. 2, 165 (2008).

<sup>2</sup>S. B. Pikelner *et al.*, *Transactions of the IAU* (L. Perek ed.), D. Reidel, Dordrecht/Holland and Springer-Verlag, New York XIII A, p. 179 (1968).

<sup>3</sup>H. Friedman, *op cit*, p.180.

<sup>4</sup>R. Giacconi, *op cit*, p. 184.

<sup>5</sup>A. E. Whitford, private communication (1975).

<sup>6</sup>R. Giacconi, *Les Prix Nobel*, Nobel Foundation, Stockholm, Sweden, p. 114 (2003).

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This is work that I performed many years ago. The Lockheed Missiles and Space Co. (Lockheed) submitted a proposal to NASA to search for cosmic x-ray sources in December 1960, over a year before Riccardo Giacconi's discovery of Sco X-1. Quoting the abstract of Paper I [1], (this is Paper Number II) the primary purpose of the initial effort of the Lockheed proposal was obtaining a scan along the galactic equator in the direction of the galactic center, plus trying to see the Crab Nebula [2]. Unfortunately, the attitude-controlled rocket required was not available until four years later.

The first vu-graph, shows data from the discovery, in June 1962, of the source (Giacconi *et al.*) called Sco X-1. The top part of the figure shows the count rate (of a detector) on a spinning rocket as a function of detector azimuth. The bottom part of the figure shows, in the shaded square, the location on the sky of the one source they discovered [3].

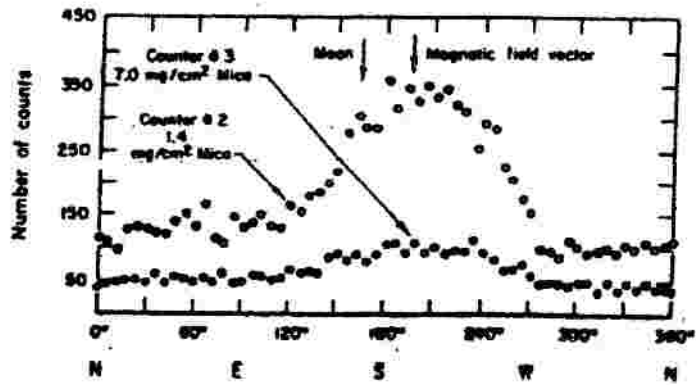


FIG. 1. Number of counts versus azimuth angle. The numbers represent counts accumulated in 350 seconds in each  $6^\circ$  angular interval.

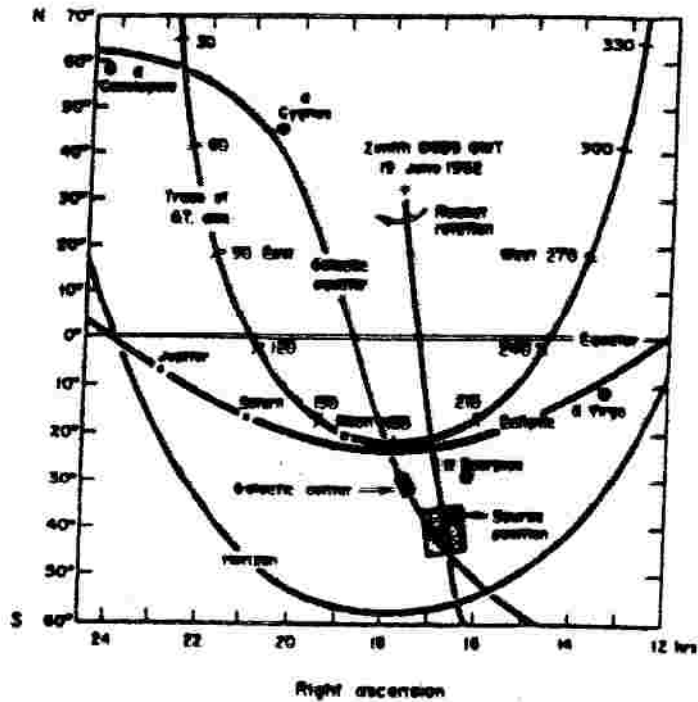


FIG. 2. Chart showing the portion of sky explored by the counters.

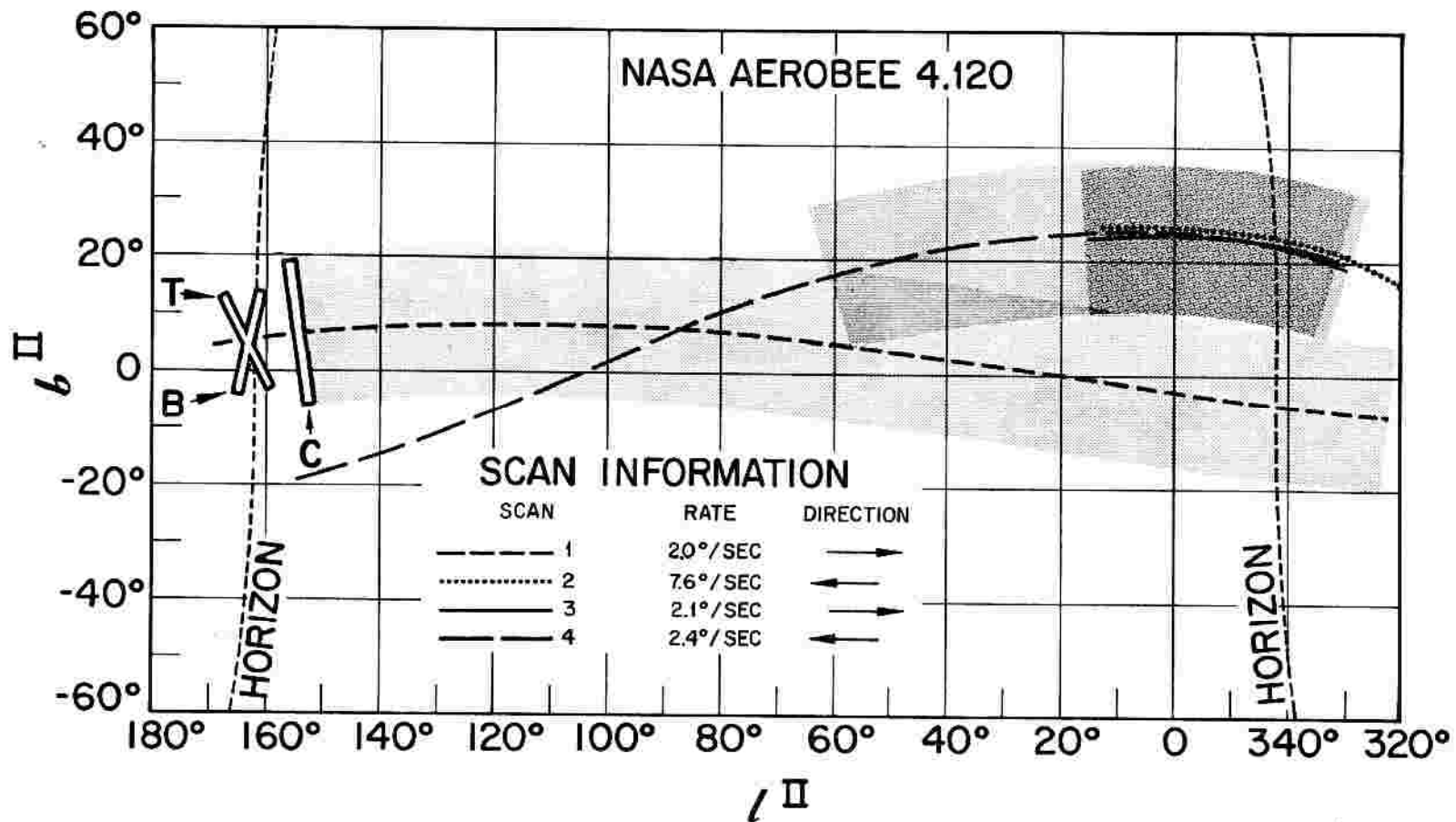
Reprinted from R. Giacconi *et al.*, Phys. Rev. Lett **9**, 439 (1962) by permission of R. Giacconi.

vu-graph 1

The second vu-graph shows the planned implementation of the Lockheed proposal. (Although the fields of view of three counters are indicated, only one functioned properly so only galactic longitude information was secured). Yes, thank you (?). This figure and preliminary results were presented at a December 1964 meeting [4]. Better resolution of sources at low longitude and latitude information about those sources was obtained from a second attitude-controlled rocket flight. Detailed results of each of these two flights were published in 1966 [5,6].

The results of the first flight were accurately reviewed by Giacconi and seven co-authors in 1965 [7], and by H. Friedman and several co-authors, all of the US Naval Research Laboratory, in the spring of 1967 [8].

The next vu-graph shows latitudes of 18 of the 20 sources observed (from the two flights [9]). The top part shows latitudes of

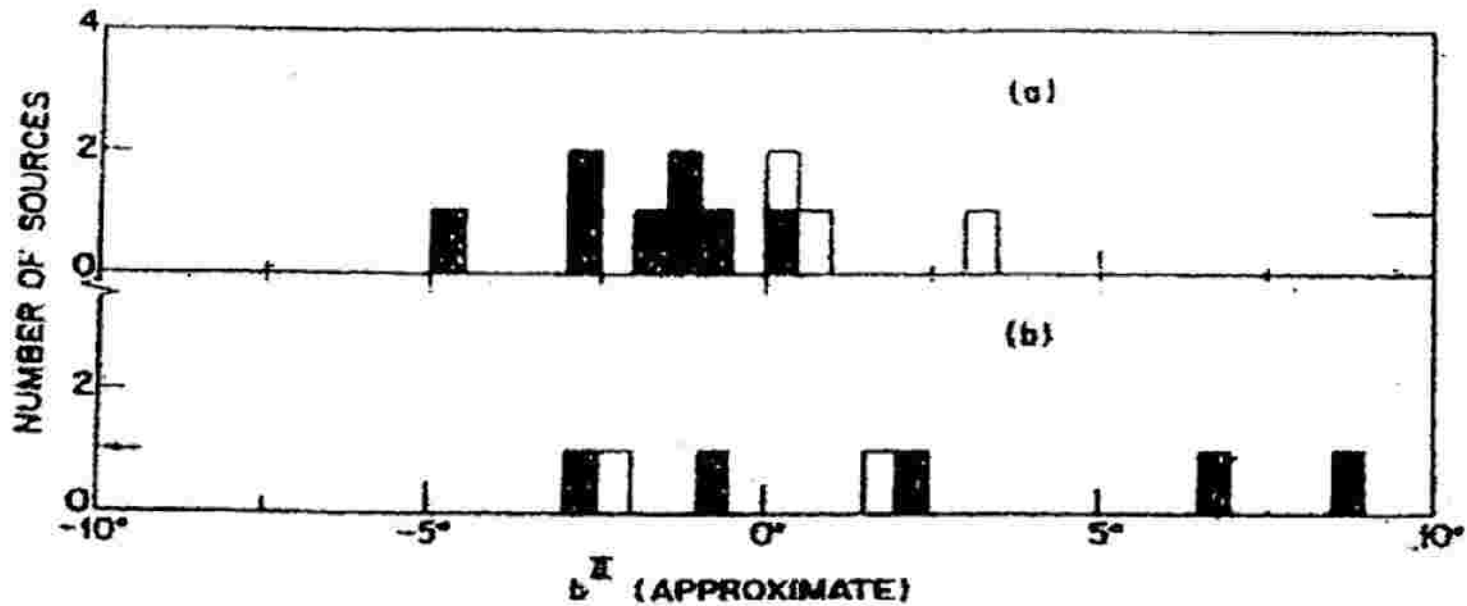


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(Revised 1964 figure of Fisher, Jordan and Meyerott in reference 4.)

vu-graph 2



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vu-graph 3

brighter sources, while the bottom part shows latitudes of fainter sources. Clearly, my original (pre Sco X-1 discovery) postulate about the location of the apparently brightest x-ray sources was verified. A pre-print of the summary of this effort [9] was distributed to 11 persons before an August 1967 meeting on x-ray astronomy sponsored by the International Astronomical Union, the IAU. The distribution list included the prior and the then sitting president of the American Astronomical Society, the AAS.

The first review of cosmic x-ray experiments before a large international audience occurred at the 1967 IAU meeting. Table 1 summarizes most of the related behavior of some AIP members, starting with the organizers of the 1967 IAU meeting [10]. The (United States) organizers were Hugh Johnson, a former Lockheed associate and co-author, and still at Lockheed and Friedman. Since no member of the Lockheed x-ray group was present at the meeting, the presence of Johnson as an organizer, probably caused the meeting audience to



Table 1. Some Actions of Some AIP Members

Year	Person	Capacity	Action(s)	Ref.
1967	H.M. Johnson	co-organizer	no apparent arrangement for accurate review of competitor's (Lockheed x-ray group's) effort (believed to be leader of Lockheed x-ray group by the 1969 IAU meeting chairman)	10 11
1967	H. Friedman	co-organizer	no apparent arrangement for accurate review of competitor's (Lockheed x-ray group's) effort	10
1967	H. Friedman	reviewer	caused illusion of no Lockheed discovery from inaccurate review of competitor's effort	12, (8)
1967	R. Giacconi	reviewer	caused illusion of no Lockheed discovery by failure to reference competitor's prior effort	13, (7)
1967	A. E. Whitford	AAS Pres.	recognized IAU audience misinformed by persons named above, but kept silent	15, 9
1967	L. Goldberg	past AAS Pres.	somehow described above behavior to part or all of IAU Executive Committee (who bypassed standard procedure and quietly accepted me as member of IAU)	16, 9
1967	H. Friedman	co-organizer	probably backed up Goldberg description to same part of IAU Executive Committee	
1967	H. Gursky <i>et al.</i>	authors	in The Astrophysical Journal noted discovery but no reference to discoverers, reference to Lockheed and Lockheed data presented disagree, acknowledged interesting discussions with B. Rossi of MIT, (all authors from ASE, but later indirect inquiries re Rossi being their employer rebuffed)	17, (7) 17, (7) 17, (7)
1969	H. Friedman	co-organizer	if I was recommended to speak, action rejected by chairman, who later issued invitation	19
1969	B. Rossi	co-organizer	"	19
1969	M. Walt	Superior	refused request to let me give invited lecture at 1969 IAU meeting	20
1974	H. Gursky +	authors	by reference falsely said Lockheed used spinning rather than attitude-controlled rocket (so no discovery), two references to Lockheed results misleading	22, (7)
1979	R. F. Hirsh	reviewer	had December 1960 Lockheed proposal plus interviews, missed concurrent discovery	24
2003	R. Giacconi	lecturer	misleading comment re 1964/1965 Lockheed data, in spite of Lockheed publications, and multiple <i>Marquis Who's Who in America</i> listings starting 1997 = reference 25	4-6, 9 26, (7)
2005	R. Giacconi	author	possibly no knowledge of pre Sco X-1 discovery (December 1960) Lockheed proposal	1, 27

vu-graph 4

## Notes for Table 1

### Abbreviations

Ref. = reference

IAU = International Astronomical Union

AAS = American Astronomical Society

Pres.= President

MIT = Massachusetts Institute of Technology

ASE = American Science and Engineering, Inc.

believe that Johnson was the scientific leader of the Lockheed x-ray group. The 1969 letter of mine to Geoff Burbidge [11] indicates this fact. In the table, a reference given as a number in parentheses indicates (the co-authorship of) a prior accurate review of the Lockheed effort.

As the first invited reviewer, Friedman gave a lecture on survey experiments [12]. Despite the fact that Lockheed had published a prediction that was found to be true, Friedman described his (group's) efforts and the more recent results of Giacconi's group in some detail, but only gave a perfunctory description of the Lockheed effort. This probably created the illusion that no discovery experiment had been performed by Lockheed. Friedman's published 1967 IAU review disagreed fundamentally with the published earlier in 1967 review [8], and with the data published by Lockheed a year before Friedman's talk, and disagrees with Lockheed in its first paper's (paper I's) abstract. Friedman's published IAU talk gave no literature references for any data described.

Giacconi spoke next [13]. Like Friedman, Giacconi did not mention Lockheed's galactic equator survey performed three years earlier that he and others had accurately reviewed several years earlier [7], and presented only the Lockheed results from a range of low galactic longitudes that were examined on the second flight. (Although) a literature reference was given for the efforts of Friedman's group, no literature reference was given for results of either of (the) Lockheed group's attitude-controlled rocket flights.

Friedman's and Giacconi's failure to disclose all significant relevant information or otherwise properly acknowledge the Lockheed contribution to the IAU audience, whether intentionally or negligently, I offer no opinion. But the failure was noted essentially immediately by my contact for rocket services at NASA Goddard [14], and as it occurred by the sitting president of the American Astronomical Society [15], who deliberately chose to remain quiet and not correct the misinformation that

had been presented.

The IAU's response to this situation occurred within a few days, when standard procedure was bypassed and I was very quietly, but publicly, made a member of the IAU [16]. But the misinformation given to the 1967 IAU x-ray astronomy meeting audience was never corrected. Only the few members of the AAS and the IAU directly involved knew of the significant Lockheed information that had not been mentioned by Friedman and Giacconi.

About the same day IAU membership was granted, a paper was submitted to The Astrophysical Journal by Gursky and associates [17]. A discovery was noted, but no discoverers were cited, in spite of the (several year) earlier accurate review by Giacconi and co-authors [7].

Because time is short, let me skip several of the next situations of

the table. For a thesis Richard Hirsh was given a copy of my December 1960 pre Sco X-1 discovery proposal. When I was interviewed in 1976 by Hirsh for several reasons I was afraid to point out to him the success of the Lockheed discovery experiment and to tell him that the published data of others contained significant omissions or misleading or false statements. His ignorance about my discovery that was concurrent with the discovery of Sco X-1, was evident on several pages of his thesis [24].

For an observant person, in 1997, some thirty years later, Marquis Who's Who publication Who's Who in America [25] , eliminated the decades of ignorance by publishing a *curriculum vitae* listing the essence of my 1960 proposal to NASA. Predicting something to be true in a previously nonexistent field and proving it to be true is normally considered to be at least as important a discovery as finding something unpredicted, for example, Sco X-1.

A more recent misleading appraisal of my efforts at Lockheed

was given in a 2002 lecture by Giacconi [26]. He stated that after the discovery of Sco X-1 the NRL group and the Lockheed group, led by me, continued mostly broad surveys. This statement was made in spite of data in four Lockheed publications, the Who's Who in America data [25] that were published annually starting in 1997, and the accurate 1966 review article by Giacconi *et al.* [7]. Apparently, he wasn't aware of or did not accept the reference [25] statement that my accomplishments included postulation and proof that the apparently brightest non-solar x-ray sources would lie in our galaxy at a low galactic latitude.

The most recent misleading statement (by Giacconi) about the Lockheed effort was in a paper published in 2005. I'm sorry if I shake some but it has taken 40 years to speak. (Giacconi's statement was the discovery of Sco X-1 stimulated renewed observational efforts at Lockheed.) Actually Lockheed was merely continuing what it had proposed to NASA over a year before the discovery of Sco X-1.

I present no opinion how the situation came to exist. I do request that the American Institute of Physics require speakers to publish information that has been produced by other people relevant to what speakers produce. Thank you.

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1. Numbers in [ ] represent references in the handout for the talk.
2. The author had this transcript made because he has no recollection of any comments made between reference to Hugh Johnson as a meeting organizer, and the uncontrollable shaking of the legs, and the final garbled paragraph.
3. The original (unedited) transcript was prepared by Christa Poe, Administrative Services for Hire, of Vacaville, California.



## REFERENCES

1. P. C. Fisher, BAPS **53** No. 5, 165 (2008)
2. P. C. Fisher, Proposal for Mapping the Night Sky in the 10ev to 16kev Photon Range, Lockheed Missiles and Space Company Documents LMSD 702172, Palo Alto, p. 2 (12 December 1960).
3. R. Giacconi *et al.*, Phys Rev Lett. **9**, 439 (1962).
4. P. C. Fisher, *et al.*, *Quasars and High Energy Astronomy including Proceedings of the 2<sup>nd</sup> Texas Symposium on Relativistic Astrophysics 15-19 December 1964* (K.N. Douglas *et al.*, eds.) Gordon and Breach Science Publishers, New York, p. 253 (1969).
5. P. C. Fisher *et al.*, Astrophys. J. **143**, 203 (1966).
6. P. C. Fisher *et al.*, Nature **211**, 920 (1966).
7. R. Giacconi *et al.*, International School of Physics “Enrico Fermi” at Varenna, Italy, 12-24 July 1965 (L. Gratton ed.) Academic press, New York, p. 73 (1966).

8. H. Friedman *et al.*, *Science* **156** 374 (1967).
9. P. C. Fisher *et al.*, *Astrophys. J.* **151**, 1 (1968).
10. S. B. Pikelner *et al.*, *Transactions of the IAU* (L. Perek ed.) D. Reidel, Dordrecht, Holland and Springer-Verlag, New York **XIII A**, p. 179 (1968)
11. P. C. Fisher, private communication to G.R. Burbidge (6 January 1969).
12. H. Friedman, *Transactions of the IAU* (L Perek ed.) D. Reidel, Dordrecht, Holland and Spring-Verlag, New York **XIII A**, p. 180 (1968).
13. R. Giacconi, *op. cit.* p. 184.
14. Private verbal communication from J.E. Kupperian Jr., NASA (1969)
15. Private verbal communication from A. E. Whitford, AAS (1975)
16. Membership roster Commission 44 of IAU, *Transactions of the IAU* (L. Perek ed.) D. Reidel, Dordrecht, Holland and Springer-

- Verlag, New York **XIII** B, p.249 (1968).
17. H. Gursky *et al.*, *Astrophys. J.* **150**, L75 (1967).
  18. P. C. Fisher, private verbal communication to Lockheed superior M. Walt.
  19. IAU Bulletin No. 21, p. 9 (1968).
  20. Lockheed superior M. Walt verbally refused request to let me give invited lecture at 1969 IAU meeting.
  21. L. Gratton, *Non-solar X- and Gamma-Ray Astronomy* (L. Gratton ed.) D. Reidel, Dordrecht, Holland and Springer-Verlag, New York, p. 162 (1969).
  22. H. Gursky and D. Schwarz, *X-Ray Astronomy* (R. Giacconi and H. Gursky eds.) D. Reidel, Dordrecht, Holland, Boston, USA, p. 25 (1974).
  23. P. C. Fisher, cover letter for December 1960 Lockheed proposal to NASA HQ to thesis student R. F. Hirsh (13 July 1976).
  24. R. F. Hirsh, *Science Technology and Public Policy: The Case of X-*

- Ray Astronomy 1959-1972, Ph. D. thesis, U. of Wisconsin, Madison, p.88 and 153 (1979).
25. P. C. Fisher, *Who's Who in America*, Marquis Who's Who Publications LLC, New Providence, NJ (annually, 1997-2004) and *Marquis Who's Who*, Marquis Who's Who, 2009, Biography Resource Center, Farmington Hills, Mich., Gale, 2009.
  26. R. Giacconi, *Les Prix Nobel*, Nobel Foundation, Stockholm, Sweden, p. 114 (2003).
  27. R. Giacconi, *Annual Review of Astronomy and Astrophysics* (R. Blandford, ed.) Annual Reviews, Inc., Palo Alto, CA 43, p. 1 (2005).