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Obituary

Riccardo Giacconi (1931–2018)

Professor Riccardo Giacconi died on 9th December 2018; he was 87. He was an outstanding, extraordinary scientist – a pioneer and founder of X-ray astronomy and a Nobel laureate. Professor Giacconi had a major influence on modern astronomy and astrophysics and through his leadership, energy and contribution, ensured the completion and delivery of facilities of international importance, including the Hubble Space Telescope, ESO Very Large Telescope (VLT) and the Atacama Large Millimeter/submillimeter Array (ALMA).



Riccardo Giacconi (1931–2018)
Photograph credit: ESO

Riccardo Giacconi was born in Genoa, Italy in 1931; he spent his early years in Milan, and studied for his first degree in Physics at the University of Milan and then completed his PhD in 1954, working and collaborating with the physicist Giuseppe "Beppo" Occhialini. In 1956, Giacconi moved to the USA as a Fulbright scholar, to work with R.W. Thompson and subsequently gained a fellowship at Princeton University. In 1959, he was introduced to the company American Science and Engineering

(AS&E) by Bruno Rossi, who was a professor at MIT, and chairman of the Board of AS&E; and Giacconi had the task of developing a space science programme including the possibility of X-ray observations of celestial objects from space. X-rays dissipate as they pass through the Earth's atmosphere so space-based telescopes are necessary for X-ray astronomy and in the 1960s, Giacconi made several significant contributions in the development of these telescopes. He began his pioneering research work on this instrumentation which included rocket and satellite payloads, and in 1962, the first cosmic source of X-rays in the constellation of Scorpius (known as Sco X-1) was discovered and this presented a new opportunity for the exploration and study of the universe.

In 1970, Uhuru the first orbiting X-ray astronomy satellite was launched from the Italian space station "San Marco" in Kenya; it performed the first X-ray survey of the entire sky, identified hundreds of cosmic X-ray sources and led to the discovery of black holes. Following the success of Uhuru, in 1973, Giacconi and his team moved to Harvard-Smithsonian Center for Astrophysics (CfA) to develop and construct the new X-ray telescope/Einstein Observatory which was launched in 1978. This was the first imaging X-ray telescope in space and confirmed beyond any doubt, the significance of X-ray imaging in all types of astronomical systems. Giacconi also established the implementation of procedures and techniques to schedule and archive the observations and so making the observatory accessible to the astronomy community.

In 1976, Giacconi made the proposal for NASA's Chandra X-ray Observatory (the successor to Einstein) which was launched in 1999. Chandra has proved to be one of the most successful observatories and twenty years later it continues to produce sub-arcsecond X-ray images and data. In 1981, Giacconi was Professor of physics and astronomy and research at Johns Hopkins University, and he was appointed as Director of Space Telescope Science Institute in Baltimore, and applied his methodology in the planning and implementation of the science operations of the Hubble Space Telescope. This included the introduction of extensive data management systems, calibration and archiving; he also played an important role in the development of the necessary corrective optics to deliver the Hubble Space Telescope as an outstanding scientific tool. As Director, he also established a successful outreach programme for the general public as well as for students and scientists.

In 1993, Giacconi became Director General of European Southern Observatory (ESO) based in Garching, Germany at the start of the development, construction and installation of the ambitious and successful Very Large Telescope (VLT) on Cerro Paranal, in Chile. He established modern techniques of management and organisation appropriate for the operation of large scientific programmes and encouraged collaboration between the centres in Chile and Germany. During his seven years as Director General there were successful developments of existing and new telescopes including the installation of 3.6-metre telescope and he also initiated the involvement of ESO in the international project, the Atacama Large Millimeter/submillimeter Array (ALMA).

Giacconi returned to USA in 1999, as President of Associated Universities Incorporated (AUI) where he continued to work on the development of the Atacama Large Millimeter Array (ALMA) which was constructed at high altitude in northern Chile, by a team of American, European and Japanese institutions; it became fully operational in 2013.

Riccardo Giacconi received many honours and awards for his scientific research including the Dannie Heineman Prize for Astrophysics; the Bruce Gold Medal; the Gold Medal of the Royal Astronomical Society; the Wolf Foundation Prize in Physics. In 2002, he shared the Nobel Prize in Physics.

The following are quotes from the Nobel Foundation: "The Nobel Prize in Physics 2002 was divided, one half jointly to Raymond Davis Jr. and Masatoshi Koshiba "for pioneering contributions to astrophysics, in particular for the detection of cosmic neutrinos" and the other half to Riccardo Giacconi "for pioneering contributions to astrophysics, which have led to the discovery of cosmic X-ray sources."*

"In order to investigate cosmic X-ray radiation, which is absorbed in Earth's atmosphere, it is necessary to place instruments in space. Riccardo Giacconi has constructed such instruments. He detected for the first time a source of X-rays outside our solar system and he was the first to prove that the universe contains background radiation of X-ray light. He also detected sources of X-rays that most astronomers now consider to contain black holes. Giacconi constructed the first X-ray telescopes, which have provided us with completely new – and sharp – images of the universe. His contributions laid the foundations of X-ray astronomy".**

Throughout his successful career, Riccardo Giacconi published extensively in journals and was an internationally well-known author and editor of monographs, lectures, textbooks and technical books, including the following titles. His scientific legacy, outstanding work and contribution to astronomy and astrophysics will continue and endure in the further development of X-ray astronomy and future space missions.

Riccardo Giacconi, Wallace Tucker. *The X-Ray Universe*, Cambridge, MA: Harvard University Press, 1985

Riccardo Giacconi, Remo Ruffini. *Physics and Astrophysics of Neutron Stars and Black Holes*, First edition, Società Italiana di Fisica, 1978. Second edition, Cambridge Scientific Publishers, 2009

Riccardo Giacconi. *Secrets of the Hoary Deep: A Personal History of Modern Astronomy*, The Johns Hopkins University Press, 2008

*https://www.nobelprize.org/prizes/physics/2002/summary/

**https://www.nobelprize.org/prizes/physics/2002/press-release/