Riccardo Giacconi FREE

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Ethan J. Schreier; Harvey Tananbaum; Wallace Tucker

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OBITUARIES

Riccardo Giacconi

Riccardo Giacconi, one of the most influential figures in scientific research over the past 60 years, died on 9 December 2018 in La Jolla, California.

Riccardo received a share of the 2002 Nobel Prize in Physics for pioneering contributions to astrophysics. He conceived and executed a series of missions that established x-ray astronomy as an essential discipline of astronomy. He then revolutionized optical astronomy and was pivotal in establishing the world's foremost millimeter-wave observatory. Many in the astronomy community base their research on data from observatories he conceived, built, or critically influenced.

At heart a physicist, Riccardo was driven to explore the universe. His outstanding scientific capabilities were complemented by extraordinary leadership and management skills. He had a deep belief in a scientific approach to problem solving and to establishing systematic processes. He insisted that instruments and observatories be built to answer driving scientific questions. A key factor underlying his success was the legendary dedication and drive of the research teams he assembled, which could be traced directly to Riccardo's deep commitment to creating an environment of intellectual honesty and trust.

Born in Genoa, Italy, on 6 October 1931, Riccardo received his doctorate in 1954 from the University of Milan, where he studied cosmic rays. He went to the US in 1956 as a Fulbright Fellow at Indiana University, then moved to Princeton University. In 1959 he joined American Science and Engineering Inc in Massachusetts, where he carried out the pioneering rocket flights that discovered the first cosmic x-ray sources.

Riccardo had gradually become convinced that studying the short-wavelength domain, characteristic of high-energy processes in nature, was essential to a deep physical understanding of the universe. With strong conviction and remarkable persistence, Riccardo developed a blueprint for the new field of x-ray astronomy and persuaded NASA to support a program of research and technology development. As early as the mid 1960s, he envisioned a subarcsecond imaging x-ray capability on the scale of NASA's current *Chandra X-Ray Observatory*.

In 1970, NASA, with Riccardo as principal investigator, launched *Uhuru*, the first satellite dedicated to x-ray astronomy. It demonstrated that luminous x-ray sources in our galaxy were powered by accretion onto compact stars in binary systems. At least one of those stars, Cygnus X-1, provided the first compelling evidence for the existence of black holes.

The merging of x-ray astronomy into the mainstream of astronomy was accelerated in the late 1970s with Riccardo's next great achievement, the *Einstein Observatory*. By then he had moved to the Harvard–Smithsonian Center for Astrophysics (CfA), where he led the new high-energy astrophysics division. *Einstein*'s imaging capabilities revealed that essentially all types of astronomical objects radiate in the x-ray band. Riccardo also initiated a guest-observer program enabling all astronomers to use *Einstein*.

Riccardo was asked to direct the new Space Telescope Science Institute (STScI) in 1981. He recruited first-rank scientists and operations staff to oversee the science ground system for the *Hubble Space Telescope* (*HST*) and to formulate an approach to conducting its science program that could serve the entire astronomy community.

In 1993 Riccardo was recruited as director general of the European Southern Observatory (ESO), where he oversaw the building of the Very Large Telescope and set ESO on a path to working with global partners on the Atacama Large Millimeter/Submillimeter Array (ALMA). In 1999 he returned to the US to serve as president of Associated Universities Inc, the managing organization of the National Radio Astronomy Observatory. Before he retired in 2004, construction was initiated on the Expanded Very Large Array and ALMA.

Riccardo inspired several generations of students and colleagues. He also encouraged diversity before it became the norm. In the 1970s several women were already in his relatively small x-ray group. In the early 1980s, Riccardo recruited to the STScI several early career women who rose through the ranks and now occupy some of the most senior positions in astronomy. He strongly supported the first Women in Astronomy workshop and conceived of the Baltimore Charter for Women in Astronomy.

Riccardo was keenly aware of the need to share science results with the general public. Even before the *HST* was launched, he established an outreach group at the STScI and close ties to science journalists. *HST* public outreach became a model for astronomy.

NASA/MSFC

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Science writer Simon Mitton characterized Riccardo's approach as "a new way of doing business" in astronomy. One key to Riccardo's success and a testament to his drive and vision was that he set future directions before he moved on: *Chandra* was already being planned when he left CfA; studies were under way for what became the *James Webb Space Telescope* when he left the STScI; and the European Extremely Large Telescope was being planned when he left ESO.

Riccardo's conviction about the importance of x-ray astronomy was formally confirmed by his Nobel Prize. All of astronomy continues to reap the benefits of Riccardo's systematic approach to answering fundamental science questions and of his unique scientific vision and management abilities.

Ethan J. Schreier
Baltimore, Maryland
Harvey Tananbaum
Wallace Tucker
Center for Astrophysics | Harvard & Smithsonian
Cambridge, Massachusetts

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