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Riccardo Giacconi (1931–2018)

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Opening a new window on the Universe

There are few people who have had such a great influence across all of astronomy as Riccardo Giacconi (b. Genoa 1931, d. San Diego 2018). He studied physics and obtained a PhD in Milan under the renowned cosmic-ray physicist "Beppo" Occhiliani in 1956. Soon after that he moved to the USA, and following stints in Indiana and Princeton, he joined American Science and Engineering (AS&E). Bruno Rossi — another giant in the field — suggested that Riccardo develop an X-ray astronomy programme. At that time the only X-ray source known was the Sun, and judging from the solar X-ray to optical flux ratio, it was clear that the detection of X-rays from other stars would be challenging, to say the least.

A major stride was made in 1962 when one of the AS&E rockets rose above the atmosphere (80 km) for a few minutes, thus setting the scene for Riccardo's 2002 Nobel prize. The payload consisted of three mica X-ray counters[a] that scanned the sky thanks to the spin of the rocket. The objective of that rocket mission was to observe the Moon's albedo in X-rays. However, the telemetry of the two working detectors revealed a very bright X-ray source (Sco X-1 — later identified as an X-ray binary) and a pervasive X-ray radiation dubbed the X-ray background. That date, 12 June 1962, is considered the beginning of X-ray astronomy.

The opening of a new observational window on the Universe provided Riccardo, Herbert Gursky and others at AS&E the momentum they needed to convince NASA to launch the first X-ray observatory into orbit to conduct a census of the X-ray sky. Uhuru (the Swahili word for freedom) was launched from Malindi, Kenya in 1970, and it discovered that accreting black holes — which have much higher X-ray to optical light ratios than the Sun — dominated the X-ray sky.

Riccardo's group moved to Harvard in 1973. From then on he invested a good fraction of his (boundless) energy pushing for imaging X-ray telescopes, his priority being image resolution above any other consideration. That approach resulted in the resounding success of the Einstein Observatory (1978–1983), which demonstrated that the X-ray sky at high galactic latitudes is largely populated by active galactic nuclei which make up most of the cosmic X-ray background that Giaconni had discovered in 1962. His tireless efforts ultimately led to NASA's current X-ray observatory workhorse, Chandra, which was launched in 1999. The Chandra telescope optics deliver sub-arcsecond X-ray imaging, enabling the deepest X-ray surveys to date.

A community of thousands of astronomers have grown up using X-ray observations, following in Riccardo's wake. The field that he initiated, X-ray astronomy, has transformed — starting from two known sources in 1962 (coincidentally the year when ESO was founded) to almost a million X-ray sources that have been catalogued to date. Despite insisting at various science conferences that astronomy should not be qualified with prefixes such as "X-ray" or "optical", it was Riccardo who placed X-rays at the centre of observational astrophysics, for example, by promoting the Chandra Deep Field South project, one of the very first cosmological deep fields studied at all wavelengths.

Moving the Hubble Space Telescope (HST) and ESO's Very Large Telescope (VLT) forward

Riccardo is also remembered for guiding the HST through the near catastrophe that was the spherical aberration in its primary mirror. Assembling teams to solve technical problems, providing the backing for them to operate, and convincing the powers that be that these teams could and would address the problems were skills that Riccardo simply had. Beyond the successful technical and scientific operation of pretty much everything he laid his hands on, Riccardo's vision of how observatories should operate, calibrating the instrument and not just the data, has profoundly changed the way we build and operate facilities. It enabled the construction of data archives that can be reduced and rereduced long after the teams that built the instruments, or the PIs of the programmes that took the data, have moved on.

In 1993, Riccardo left the HST with a recovery plan in place and arrived at ESO at a particularly busy time, whence he embarked upon the changes necessary to deliver the VLT programme. The VLT programme was in full swing, and had been structured according to management techniques appropriate to its size and complexity. Riccardo implemented this transformation across the entire organisation and rapidly aligned the organisational goals with the success of the VLT. He insisted that everything ESO did had science and the astronomical community as the key drivers. He empowered teams to address the challenges and see the job through; he followed their work closely, and was always there to question and challenge, but also to provide support. He contributed the vision and drove ESO to a path of success with tireless enthusiasm and a piercing intellect.

He instituted annual VLT reviews, which later evolved into today's annual overview, and focused ESO staff on the baseline project. He became convinced that ESO needed to evolve and to that end convinced Council both to increase the resources (financial and human) of the organisation and to curtail the programme — pausing the VLT Interferometer (VLTI) — in order to provide the organisation with room to manoeuvre and to successfully complete the VLT. Pausing the VLTI ruffled many feathers but Riccardo ensured the infrastructure was there to resume when the organisation was ready to do so. The famous telescope baseline never lost the ability to do interferometry and, indeed, by the end of Riccardo's tenure the interferometer was back.

The legacy to ESO

Riccardo recognised that the next big project after the VLT and VLTI would require a global effort. The plans in

Europe (ESO/Onsala/Institut de radioastronomie millimétrique [IRAM]/Netherlands Foundation for Research in Astronomy [NFRA]) for a Large Southern Array merged with plans for the MilliMetre Array (MMA) in the USA, to become the Atacama Large Millimeter/submillimeter Array (ALMA). Riccardo launched ALMA from the ESO side, ensuring Europe would become an equal partner with the USA in that programme. After he left ESO in 2000, he became the natural leader for Associated Universities, Inc. (AUI) in the USA, closing the loop on ALMA from the other side of the ocean.

"The immediate purpose of ESO is to provide European astronomers with first-rate observational capabilities of a size and complexity which are not achievable in the national programmes of the member states. In achieving this goal ESO can place European astronomy at a competitive level with respect to astronomical research worldwide. ESO's task has not been accomplished by building the NTT, nor will it be accomplished by building the VLT or the VLTI. It should be understood as an ongoing process in which, from time to time specific facilities or instruments are built, but the overarching role is to support and foster astronomical research in the member states and in Europe.

These simple declarations have a number of obvious consequences which it may, however, be worth stating. The manner in which we conduct the ESO programmes must be directed to maximise scientific returns over the long run. In building new facilities we cannot sacrifice current research which prepares the astronomer who will use them."

So Riccardo began his address to the ESO council in Florence in June 1993, when taking up the duties of Director General (Giacconi, 1993). This enduring vision continues to guide us. Modern-day ESO, with financial discipline, technical excellence, managerial competence and a firm commitment to quality at its core, is very much part of Riccardo's legacy.

References

Giacconi, R. 1993, The Messenger, 72, 1

Notes

[a] The flight spare of that legendary payload can still be seen at the Air & Space Museum in Washington DC, USA.