X-ray Astronomy: towards the next 50 years!

Milan, October 1-5, 2012
National Museum of Science and Technology Leonardo da Vinci

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FOREWORD

The discovery of the first X-ray source outside the solar system (Sco X-1) by Riccardo Giacconi and his group, in 1962, initiated a new era in astronomy. For the first time it was realized that celestial bodies could emit enormous powers outside the traditional optical wavelength range.

In its first 50 years, X-ray astronomy has provided a new vision of the universe, with unsuspected high-energy activities at all scales.

In our Galaxy, a wide variety of systems: rapidly rotating Neutron Stars - remnants of Supernova explosions - compact objects accreting matter in binary systems - a Super Massive Black Hole lurking at the Galaxy's centre - emit X-rays carrying fundamental information on their nature and evolution. Similar sources are found in external galaxies, and can be traced back in time, to witness their collapse and merging history.

On cosmological scales, the intergalactic gas in clusters of galaxies shines at X-ray energies allowing us to probe the gravitational field in these systems, related to the original seeds of structure in the early Universe. Super Massive Black Holes at the centers of galaxies, fed by the infall of gas, release extreme luminosities, that can be traced to very large distances, carrying information on high energy processes near the Black Hole horizon as well as on the evolution of the Universe.

In these five decades, astronomical instrumentation at other wavelengths, both from ground and from space, has also seen a fantastic progress in capabilities and in the opening of new observing windows, strongly driven by questions posed by the High Energy Universe and by Cosmology at large.

Understanding the physics of the High Energy Universe needs a fundamental step forward in space projects, reaching fainter fluxes and resolving structures across a large field of view with improved timing and spectroscopic capabilities over a wide energy range.

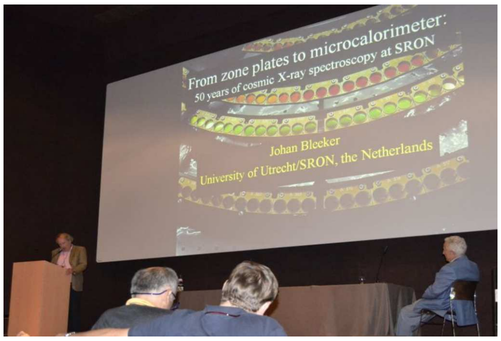
The Conference held in Milan in October 2012, on the occasion of the 50^{th} birthday of X-ray astronomy, was conceived to bring together the fundamental knowledge and experience accumulated in the past, recognize the current scientific and technological achievements of X-ray astronomy today with a view to envisaging the scientific challenges for the next 50 years.

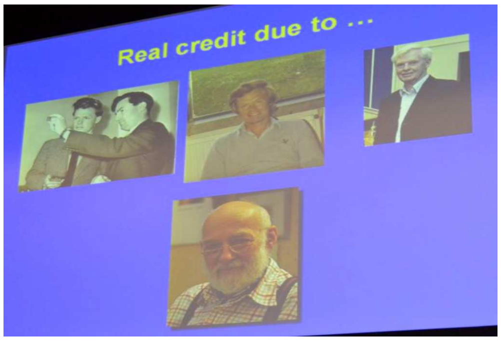
The meeting was well attended. Close to 200 scientists participated in an atmosphere of open discussions and collaboration. Some of the most representative scientists from around the world were among the participants. Lord Martin Rees, Astronomer Royal, gave an inspiring opening talk. The Nobel Prize Riccardo Giacconi, Joachim Trümper and Jasuo Tanaka Johan Bleeker, Mike Watson and Luigi Piro presented the pioneering missions that were developed in the early days of X-ray astronomy.

Weather and location, with a wide cloister hosting lunches and coffee breaks, collaborated in favoring exchanges of ideas between scientists of different countries and generations notwithstanding animated discussions. The enclosed pictures may give a hint of the meeting atmosphere.

With the present volume we hope to provide the community at large with a testimonial of the essence of the meeting. We thank all speakers, authors, participants and supporters for their contributions that helped to make the event pleasant and successful.

G. Trinchieri, R. Della Ceca, T. Maccacaro, L. Maraschi, G. Pareschi


From zone plates to microcalorimeter:
50 years of cosmic X-ray spectroscopy at SRON
Johan Bleeker
University of Utrecht/SRON, the Netherlands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