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Frontiers of X-Ray Astronomy

X-ray astronomy has undergone a revolution in recent years. With the launch of two new orbiting observatories, Chandra and XMM-Newton, astronomers are now able to obtain spectra and images at a higher resolution than ever before. New observations have had a major impact on topics ranging from protostars to cosmology. The contributions in this work, by leading authorities in the field, originate from a Royal Society Discussion Meeting that was held to review the most recent results from the current generation of X-ray telescopes, and set them in context. This book is a valuable reference for research astronomers and graduate students wishing to understand the latest developments in this exciting field.

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Preface

X-ray astronomy reached its fortieth anniversary in 2002. In the four decades since the discovery of Scorpius X-1 and the cosmic-X-ray background radiation, X-ray observations of increasing sensitivity and resolution have led the development of the new field of high-energy astrophysics, which has had a major impact on the whole of astronomy and much of physics, and is now, arguably, the most dynamic field of astronomical research.

With the launch of two world-class X-ray observatory missions, Chandra and XMM-Newton, X-ray astronomy has now entered its 'third age', bringing data of unsurpassed quality and richness. The first detailed studies of the physical environment and nature of a wide range of objects are now being made with the high-resolution X-ray spectra provided by dispersive grating spectrometers on both satellites. In addition, CCD cameras are producing a wealth of X-ray images in distinct X-ray 'colours', yielding direct information on plasma temperatures and chemical abundance.

Particularly powerful are the sub-arc-second X-ray images provided by the high-resolution Chandra telescope mirrors, revealing previously unseen structure in objects as distinct as supernova remnants and jets in active galaxies. The complementary power of XMM's EPIC cameras, with the highest 'photon capture' yet, is particularly beneficial in the study of faint extended sources. Together, Chandra and XMM-Newton are yielding new insights on the physical processes by which powerful X-ray emission is produced in objects as diverse as comets, active stars, accreting binary systems, supernovae, active galactic nuclei and galaxy clusters. Furthermore, very deep observations are targeting the final fraction of the X-ray background radiation, and yielding the first X-ray data on cosmologically interesting sources, such as those being found at visible and infrared wavelengths in the Hubble deep fields.

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This collection of articles is based on the talks given at a Royal Society Discussion Meeting, in February 2002, by key researchers in the field, and represents a unique review of the current status and exciting potential of a major branch of astronomy.

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