

Preface

The physical properties of the hot interstellar matter (ISM) in elliptical galaxies are directly related to the formation and evolution of these systems, via star formation episodes, the passive evolution of their aging stellar population, environmental effects such as stripping, infall, and mergers, and the growth of supermassive black holes. The recent successful X-ray space missions Chandra and XMM-Newton have provided a large amount of unprecedented high quality observational data on the hot ISM in elliptical galaxies. Thanks to the outstanding angular resolution of Chandra and the large collecting area of XMM-Newton, the fine structure of the hot gas has been imaged in detail, and key physical quantities have been accurately measured, so that theoretical predictions can be compared and tested against the observational results. At the same time, theoretical studies with numerical simulations and analytical modeling of the dynamical and chemical evolution of elliptical galaxies and their hot gas have made significant progress, and start to predict various observable quantities. With contributions from eight leading experts in this field, we intend in this book to review the most significant improvements to our understanding of the hot ISM in elliptical galaxies, and present in detail a number of key discoveries obtained during the last 10 years of the Chandra and XMM-Newton missions, and the corresponding theoretical work.

The need for this book originally emerged during the Joint Discussion between the “Galaxies” and “ISM” IAU Divisions, organized for the XXVII IAU General Assembly of 2009 in Brazil; upon this occasion both observers and theorists in the field were brought together to identify important, but unsolved problems for further investigation, with special emphasis on the spectral and spatial properties of the hot ISM and the comparison with recent theoretical models. Throughout this Joint Discussion, it became clear that time was ripe for an extensive publication, covering a large amount of new important material, and acting as a useful reference for students who approach this field, as well as for experts in related fields.

As this book is primarily intended for graduate students and non-specialists, we provide first in each chapter an introductory and historical background, followed by state-of-the-art results, with a special emphasis on the balance between

observational and theoretical aspects. Throughout the book, the chapters are arranged in such a way that the observational and theoretical results can be compared side by side. Among the eight chapters, roughly half are observationally oriented and the other half are theoretically oriented. All chapters are cross-referenced whenever necessary, so that the readers can easily overview and grasp a coherent picture by finding the related materials discussed in the different parts of the book.

By nature of the state-of-the-art science that is continuously advanced through arguing and counter-arguing, there may be occasionally differing views on an issue, and this is the case for the last two chapters of the book. While we try to minimize any potential confusion, conflicting views are unavoidable sometimes, so the two different positions are presented as they are, and we ask the readers to carefully consider the arguments of both. We hope that this case provides an excellent example for the students to start building their own research framework for their solid future.

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