

Merging Processes In Galaxy Clusters

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Chemical Evolution of Galaxies Francesca Matteucci
2012-01-05 The term "chemical evolution of galaxies" refers to the evolution of abundances of chemical species in galaxies, which is due to nuclear processes occurring in stars and to gas flows into and out of galaxies. This book deals with the chemical evolution of galaxies of all morphological types (ellipticals, spirals and irregulars) and stresses the importance of the star formation histories in determining the properties of stellar populations in different galaxies. The topic is approached in a didactical and logical manner via galaxy evolution models which are compared with observational results obtained in the last two decades: The reader is given an introduction to the concept of chemical abundances and learns about the main stellar populations in our Galaxy as well as about the classification of galaxy types and their main observables. In the core of the book, the construction and solution of chemical evolution models are discussed in detail, followed by descriptions and interpretations of observations of the chemical evolution of the Milky Way, spheroidal galaxies, irregular galaxies and of cosmic chemical evolution. The aim of this book is to provide an introduction to students as well as to amend our present ideas in research; the book also summarizes the efforts made by authors in the past several years in order to further future research in the field.

Fundamentals of Galaxy Dynamics, Formation and Evolution

Ignacio Ferreras 2019-04-02 Galaxies, along with their underlying dark matter halos, constitute the building blocks of structure in the Universe. Of all fundamental forces, gravity is the dominant one that drives the evolution of structures from small density seeds at early times to the galaxies we see today. The interactions among myriads of stars, or dark matter particles, in a gravitating structure produce a system with fascinating connotations to thermodynamics, with some analogies and some fundamental differences. Ignacio Ferreras presents a concise introduction to extragalactic astrophysics, with emphasis on stellar dynamics, and the growth of density fluctuations in an expanding Universe. Additional chapters are devoted to smaller systems (stellar clusters) and larger ones (galaxy clusters). *Fundamentals of Galaxy Dynamics, Formation and Evolution* is written for advanced undergraduates and beginning postgraduate students, providing a useful tool to get up to speed in a starting research career. Some of the derivations for the most important results are presented in detail to enable students appreciate the beauty of maths as a tool to understand the workings of galaxies. Each chapter includes a set of problems to help the student advance with the material.

Extragalactic Astronomy and Cosmology Peter Schneider
2014-10-08 This second edition has been updated and substantially expanded. Starting with the description of our home galaxy, the Milky Way, this cogently written textbook introduces the reader to the astronomy of galaxies, their structure, active galactic nuclei, evolution and large scale distribution in the Universe. After an extensive and thorough introduction to modern observational and theoretical cosmology, the focus turns to the formation of structures and astronomical objects in the early Universe. The basics of classical astronomy and stellar astrophysics needed for extragalactic astronomy are provided in the appendix. While this book has grown out of introductory university courses on astronomy and astrophysics and includes a set of problems and solutions, it will not only benefit undergraduate students and lecturers; thanks to the comprehensive coverage of the field, even graduate students and researchers specializing in related fields will appreciate it as a valuable reference work.

Extragalactic Astronomy and Cosmology Peter Schneider
2007-08-16 This book outlines the fundamentals of this fascinating branch of astronomy, and explores the forefront of astronomical research. The author's passion for the topic shines with an intensity that rivals the book's many colourful illustrations, and will deeply inspire the reader. The cogently written text introduces the reader to the astronomy of galaxies, their structure, their active galactic nuclei, their evolution and their large scale distribution. Starting with a detailed description of our Milky Way, and a review of modern observational and theoretical cosmology, the book goes on to examine the formation of structures and astronomical objects in the early universe.

The Large-Scale Structure of the Universe P. J. E. Peebles 2020-09-15 The classic account of the structure and evolution of the early universe from Nobel Prize-winning physicist P. J. E. Peebles An instant landmark on its publication, *The Large-Scale Structure of the Universe* remains the essential introduction to this vital area of research. Written by one of the world's most esteemed theoretical cosmologists, it provides an invaluable historical introduction to the subject, and an enduring overview of key methods, statistical measures, and techniques for dealing with cosmic evolution. With characteristic clarity and insight, P. J. E. Peebles focuses on the largest known structures—galaxy clusters—weighing the empirical evidence of the nature of clustering and the theories of how it evolves in an expanding universe. A must-have reference for students and researchers alike, this edition of *The Large-Scale Structure of the Universe* introduces a new generation of readers to a classic text in modern cosmology.

Astroquizzical - the Illustrated Edition Jillian Scudder
2021-09-28

Mining of Massive Datasets Jure Leskovec 2014-11-13 Now in its second edition, this book focuses on practical algorithms for mining data from even the largest datasets.

Literature 1997, Part 1 Astronomisches Rechen-InstitutARI 2013-11-11 *Astronomy and Astrophysics Abstracts* is devoted to the recording, summarizing and indexing of astronomical publications throughout the world. Two volumes are scheduled to appear per year. Volume 67 records 10,903 papers covering besides the classical fields of astronomy and astrophysics such matters as space flights related to astronomy, lunar and planetary probes and satellites, meteorites and interplanetary matter, X rays and cosmic rays, quasars and pulsars. The abstracts are classified under more than one hundred subject categories thus permitting quick surveying of the bulk of material published on the same topic within six months. For instance, this volume records 119 papers on minor planets, 155 papers on supernovae, and 554 papers on cosmology.

The Origin of Cosmic Rays V. L. Ginzburg 2013-10-22 *The Origin of Cosmic Rays* examines the astrophysical phenomena that cause cosmic rays. The title details the concerns in the study of tracing the sources of cosmic rays. The text presents the primary cosmic rays on earth, and then proceeds to tackling the cosmic magnetic bremsstrahlung radio emission and cosmic rays in the universe. Next, the selection deals with the motion of cosmic rays in the interstellar medium and the origin of cosmic rays. The text also talks about the quantitative galactic theory of the origin of cosmic rays. The book will be of great use to astronomers, astrophysicists, and scientists who studies phenomena that involves celestial bodies.

Astronomical Data Analysis Software and Systems XIV
Patrick L. Shopbell 2005

Galaxy Formation and Evolution Houjun Mo 2010-05-20 A coherent introduction for researchers in astronomy,

particle physics, and cosmology on the formation and evolution of galaxies.

A Grand and Bold Thing Ann K. Finkbeiner 2010-08-17 LATE IN THE TWENTIETH CENTURY, what had been a fevered pace of discovery in astronomy for many years had slowed. The Hubble Space Telescope continued to produce an astonishing array of images, but the study of the universe was still fractured into domains: measuring the universe's expansion rate, the evolution of galaxies in the early universe, the life and death of stars, the search for extrasolar planets, the quest to understand the nature of the elusive dark matter. So little was understood, still, about so many of the most fundamental questions, foremost among them: What was the overall structure of the universe? Why had stars formed into galaxies, and galaxies into massive clusters? What was needed, thought visionary astronomer Jim Gunn, recently awarded the National Medal of Science, was a massive survey of the sky, a kind of new map of the universe that would be so rich in detail and cover such a wide swath of space, be so grand and bold, that it would allow astronomers to see the big picture in a whole new way. So was born the Sloan Digital Sky Survey, a remarkable undertaking bringing together hundreds of astronomers and launching a new era of supercharged astronomical discovery, an era of "e-science" that has taken astronomy from the lonely mountaintop observatory to the touch of your fingertips. Critically acclaimed science writer Ann Finkbeiner tells the inside story of the Sloan and how it is revolutionizing astronomy. The Sloan stitched together images of deep space taken over the course of five years, providing a remarkably detailed, three-dimensional map of a vast territory of the universe, all digitized and downloadable for easy searching on a personal computer, and available not only to professional astronomers but to the public as well. Bringing together for the first time images of many millions of galaxies—including the massive structure known as the Sloan Great Wall of galaxies, never seen before—the Sloan is allowing astronomers and armchair enthusiasts alike to watch the universe grow up, providing so many discoveries at such a fast pace that, as one astronomer said, it's like drinking out of a fire hose. They are watching galaxies forming and galaxies merging with other galaxies, seeing streams of stars swirling out from galaxies, and forming a new understanding of how the smooth soup of matter that emerged from the Big Bang evolved into the universe as we know it. Ann Finkbeiner brings the excitement and the extraordinary potential of this new era of astronomy vividly to life and allows all readers to understand how they, too, can become part of the discovery process. A Grand and Bold Thing is vital reading for all.

Cosmic Collisions Lars Lindberg Christensen 2010-04-07 Like no other telescope ever invented, the NASA/ESA Hubble Space Telescope has given us magnificent high resolution views of the gigantic cosmic collisions between galaxies. Hubble's images are snapshots in time and catch the colliding galaxies in different stages of collision. Thanks to a new and amazing set of 60 Hubble images, for the first time these different stages can be put together to form a still-frame movielike montage showing the incredible processes taking place as galaxies collide and merge. The significance of these cosmic encounters reaches far beyond aesthetics. Galaxy mergers may, in fact, be some of the most important processes that shape our universe. Colliding galaxies very likely, hold some of the most important clues to our cosmic past and to our destiny. It now seems clear that the Milky Way is continuously undergoing merging events, some small scale, others on a gigantic scale. And the importance of this process in the lives of galaxies is much greater than what was previously thought.

Modern Statistical Methods for Astronomy Eric D. Feigelson 2012-07-12 "Modern astronomical research is beset with a vast range of statistical challenges, ranging from reducing data from megadatasets to characterizing an amazing variety of variable celestial objects or testing astrophysical theory. Yet most astronomers still use a narrow suite of traditional statistical methods. Linking astronomy to the world of modern statistics, this volume is a unique resource, introducing astronomers to advanced statistics through ready-to-use code in the public-domain R statistical software environment"--

Wealth Creation in the World's Largest Mergers and

Acquisitions B. Rajesh Kumar 2018-11-29 This book highlights research-based case studies in order to analyze the wealth created in the world's largest mergers and acquisitions (M&A). This book encourages cross fertilization in theory building and applied research by examining the links between M&A and wealth creation. Each chapter covers a specific case and offers a focused clinical examination of the entire lifecycle of M&A for each mega deal, exploring all aspects of the process. The success of M&A are analyzed through two main research approaches: event studies and financial performance analyses. The event studies examine the abnormal returns to the shareholders in the period surrounding the merger announcement. The financial performance studies examine the reported financial results of acquirers before and after the acquisition to see whether financial performance has improved after merger. The relation between method of payment, premium paid and stock returns are examined. The chapters also discuss synergies of the deal-cost and revenue synergies. Mergers and acquisitions represent a major force in modern financial and economic environment. Whether in times of boom or bust, M&As have emerged as a compelling strategy for growth. The biggest companies of modern day have all taken form through a series of restructuring activities like multiple mergers. Acquisitions continue to remain as the quickest route companies take to operate in new markets and to add new capabilities and resources. The cases covered in this book highlights high profile M&As and focuses on the wealth creation for shareholders of acquirer and target firms as a financial assessment of the merger's success. The book should be useful for finance professionals, corporate planners, strategists, and managers.

Unveiling Galaxies Jean-René Roy 2017-10-12 A thought provoking study of the powerful impact of images in guiding astronomers' understanding of galaxies through time.

Clusters of Galaxies: Beyond the Thermal View Jelle Kaastra 2008-05-01 The existence of soft excess emission originating from clusters of galaxies, dened as emission detected below 1 keV in excess over the usual thermal emission from hot intracluster gas (hereafter the ICM) has been claimed since 1996. Soft excesses are particularly - portant to detect because they may (at least partly) be due to thermal emission from the Warm-Hot Intergalactic Medium, where as much as half of the baryons of the Universe could be. They are therefore of fundamental cosmological importance. Soft excess emission has been observed (and has also given rise to controversy) in a number of clusters, mainly raising the following questions: (1) Do clusters really show a soft excess? (2) If so, from what spatial region(s) of the cluster does the soft excess originate? (3) Is this excess emission thermal, originating from warm-hot intergalactic gas (at 6 temperatures of 10^4 K), or non-thermal, in which case several emission mechanisms have been proposed. Interestingly, some of the non-thermal mechanisms suggested to account for soft excess emission can also explain the hard X-ray emission detected in some clusters, for example by RXTE and BeppoSAX (also see Petrosian et al. 2008—Chap. 10, this issue; Rephaeli et al. 2008—Chap. 5, this issue).

Radio Continuum Processes in Clusters of Galaxies

Christopher P. O'Dea 1986

Cosmic Magnetism, Percy Seymour 1986 The study of extraterrestrial magnetic fields is a relatively new one, confirmation of the existence of the first such field (that of our Sun) having come as late as 1908. In the past 30 years a great amount of knowledge has been accumulated on Cosmic Magnetism, which has turned out to be a truly fascinating topic for study. Percy Seymour's book is the first to deal with the topic in a non-mathematical way, and he offers a fine introduction to his subject. The first three chapters consolidate our knowledge on magnetism in general and the magnetic field of the Earth, as well as discussing the reasons for studying astronomy and cosmic magnetism in particular. The remainder of the book is devoted to the main areas of cosmic magnetism - solar, planetary and interplanetary fields, fields in stars and pulsars, fields of the milky way and fields in other galaxies. Cosmic Magnetism is an ideal book for sixth-formers and undergraduates studying physics or astronomy and will also appeal to amateur astronomers. as previous work on this topic has been 'hidden' in specialised academic journals.

The Shapes of Galaxies and Their Dark Halos Priyamvada Natarajan 2002 This book constitutes the proceedings of a very topical workshop aimed at understanding the shapes of the baryonic and dark matter components of galaxies. Several groups presented their recent results from observations and numerical N-body simulations.

Study of Diffuse Light in CD Galaxy Clusters Xania Scheick 1993

Precision Cosmology with Galaxy Cluster Surveys Hao-Yi Wu 2011 The acceleration of the universe, which is often attributed to "dark energy," has posed one of the main challenges to fundamental physics. Galaxy clusters provide one of the most sensitive probes of dark energy because their abundance reflects the growth rate of large-scale structure and the expansion rate of the universe. Several large galaxy cluster surveys will soon provide tremendous statistical power to constrain the properties of dark energy; however, the constraining power of these surveys will be determined by how well systematic errors are controlled. Of these systematic errors, the dominant one comes from inferring cluster masses using observable signals of clusters, the so-called "observable--mass distribution." This thesis focuses on extracting dark energy information from forthcoming large galaxy cluster surveys, including how we maximize the cosmological information, how we control important systematics, and how precisely we need to calibrate theoretical models. We study how multi-wavelength follow-up observations can improve cluster mass calibration in optical surveys. We also investigate the impact of theoretical uncertainties in calibrating the spatial distributions of galaxy clusters on dark energy constraints. In addition, we explore how the formation history of galaxy clusters impacts the self-calibration of cluster mass. In addition, we use N-body simulations to develop a new statistical sample of cluster-size halos in order to further understand the observable--mass distribution. We study the completeness of subhalos in our cluster sample by comparing them with the satellite galaxies in the Sloan Digital Sky Survey. We also study how subhalo selections impact the inferred correlation between formation time and optical mass tracers, including cluster richness and velocity dispersion.

Introduction To The Theory Of The Early Universe: Hot Big Bang Theory (Second Edition) Rubakov Valery A 2017-06-29 This book is written from the viewpoint that a deep connection exists between cosmology and particle physics. It presents the results and ideas on both the homogeneous and isotropic Universe at the hot stage of its evolution and in later stages. The main chapters describe in a systematic and pedagogical way established facts and concepts on the early and the present Universe. The comprehensive treatment, hence, serves as a modern introduction to this rapidly developing field of science. To help in reading the chapters without having to constantly consult other texts, essential materials from General Relativity and the theory of elementary particles are collected in the appendices. Various hypotheses dealing with unsolved problems of cosmology, and often alternative to each other, are discussed at a more advanced level. These concern dark matter, dark energy, matter-antimatter asymmetry, etc. Particle physics and cosmology underwent rapid development between the first and the second editions of this book. In the second edition, many chapters and sections have been revised, and numerical values of particle physics and cosmological parameters have been updated.

Introduction to Galaxy Formation and Evolution Andrea Cimatti 2019-10-31 A comprehensive examination of nearly fourteen billion years of galaxy formation and evolution, from primordial gas to present-day galaxies.

Starbursts Richard de Grijs 2006-03-30 Starbursts are important features of early galaxy evolution. Many of the distant, high-redshift galaxies we are able to detect are in a starbursting phase, often apparently provoked by a violent gravitational interaction with another galaxy. In fact, if we did not know that major starbursts existed, these conference proceedings testify that we would indeed have difficulties explaining the key properties of the Universe! These conference proceedings cover starbursts from the small-scale star-forming regions in nearby galaxies to galaxy-wide events at high redshifts; one of the major themes of the conference proved to be "scalability", i.e., can we scale up the small-scale events to describe the physics

on larger scales. The key outcome of this meeting - and these proceedings - is a resounding "yes" to this fundamental, yet profound question. The enhanced synergy facilitated by the collaboration among observers using cutting-edge ground and space-based facilities, theorists and modellers has made these proceedings a true reflection of the state of the art in this very rapidly evolving field.

The Origin of the Galaxy and Local Group Joss Bland-Hawthorn 2014-02-11 This volume contains the updated and expanded lecture notes of the 37th Saas-Fee Advanced Course organised by the Swiss Society for Astrophysics and Astronomy. It offers the most comprehensive and up to date review of one of the hottest research topics in astrophysics - how our Milky Way galaxy formed. Joss Bland-Hawthorn & Ken Freeman lectured on Near Field Cosmology - The Origin of the Galaxy and the Local Group. Francesca Matteucci's chapter is on Chemical evolution of the Milky Way and its Satellites. As designed by the SSAA, books in this series - and this one too - are targeted at graduate and PhD students and young researchers in astronomy, astrophysics and cosmology. Lecturers and researchers entering the field will also benefit from the book.

Active Galactic Nuclei Volker Beckmann 2013-08-29 This AGN textbook includes phenomena based on new results in the X-Ray domain from new telescopes such as Chandra and XMM Newton not mentioned in any other book. Furthermore, it considers also the Fermi Gamma Ray Space Telescope with its revolutionary advances of unprecedented sensitivity, field of view and all-sky monitoring. Those and other new developments as well as simulations of AGN merging events and formations, enabled through latest super-computing capabilities. The book gives an overview on the current knowledge of the Active Galactic Nuclei phenomenon. The spectral energy distribution will be discussed, pointing out what can be observed in different wavebands and with different physical models. Furthermore, the authors discuss the AGN with respect to its environment, host galaxy, feedback in galaxy clusters, etc. and finally the cosmological evolution of the AGN phenomenon.

UV and X-Ray Spectroscopy of Astrophysical and Laboratory Plasmas Yamashita, K. 1996

X-Ray Emission from Clusters of Galaxies Craig L. Sarazin 1988-03-17 this book is a comprehensive survey of the astrophysical characteristics of the hot gas that pervades clusters of galaxies. In our universe, clusters of galaxies are the largest organised structures. Dr Sarazin describes the theoretical description of the origin, dynamics, and physical state of the cluster gas.

Outskirts of Galaxy Clusters (IAU C195) International Astronomical Union. Colloquium 2004-12-16 This book contains the proceedings of the International Astronomical Union Colloquium no. 195, held in Torino, Italy in 2004. The meeting investigated the formation of galaxies within a full cosmological context, focusing on the outer regions of galaxy clusters. The observed correlation of optical and radio properties of galaxies with their environment indicates that the formation and evolution of galaxies is intimately linked to the formation of large scale structure. With chapters written by leading authorities in the field, this timely volume investigates the role of the environment in determining the properties of galaxies. It describes the distribution of matter and galaxies on the largest scales in the Universe, the processes of cluster and galaxy formation, their role and interplay. This is a valuable collection of review articles for professional astronomers.

Galaxies in the Universe Linda S. Sparke 2007-02-15 This extensively illustrated book presents the astrophysics of galaxies since their beginnings in the early Universe. It has been thoroughly revised to take into account the most recent observational data, and recent discoveries such as dark energy. There are new sections on galaxy clusters, gamma ray bursts and supermassive black holes. The authors explore the basic properties of stars and the Milky Way before working out towards nearby galaxies and the distant Universe. They discuss the structures of galaxies and how galaxies have developed, and relate this to the evolution of the Universe. The book also examines ways of observing galaxies across the whole electromagnetic spectrum, and explores dark matter and its gravitational pull on matter and light. This book is self-contained and includes several homework problems with hints. It is

ideal for advanced undergraduate students in astronomy and astrophysics.

Galaxy Collisions Curtis Struck 2011-02-04 The spectacular images of galaxy collisions capture the imagination. This book will show what is out there in the universe, what it's like in other galaxies, what they might look like, and how cosmic processes might affect life in other solar systems. It will explain crucial stages in the development of physical structure in the universe, and the effect of galaxy scale processes. Professor Struck will explore all the issues surrounding galaxy collisions. He will begin with a brief broad review of the background on galaxies, the history of their discovery, and how this has been driven by steadily improving technology. Chapter 2 gives details of the early stages of different types of galaxy collision - Rings of Fire, Tidal Swings and Retrograde and Sideways Reels - while Chapter 3 describes collisions between galaxies of very different masses: minor merger or dwarf destruction. Chapter 4 covers ultra-luminous infrared galaxies and major mergers and Chapter 5 briefly examines the techniques used for computer simulation results and how increasing computer capacity has affected the development of this field. The following chapter looks at understanding the physical processes of triggered star formation and nuclear activity. Chapters 7-9 look at the broader view of cosmological structure growth which determines the environment and conditions in which galaxy collisions occur. In the densest environments, this process repeats itself on the larger scale of galaxy clusters. The concluding chapter considers what a galaxy collision looks like from a solar system like ours. Although the galaxy is completely restructured and the night sky view would change greatly over the course of several hundred million years, the direct effects on our planet would be few and infrequent, with only a small probability of being truly catastrophic. These issues will be explored along with the ideas that galaxies must reach a certain evolutionary "maturity" before they can even form solar systems, and that there are habitable zones within galaxies. Thus, galaxy scale processes, like collisions, can determine the fate of life on Earth-like planets.

The Physics and Evolution of Active Galactic Nuclei Hagai Netzer 2013-09-16 A comprehensive introduction to the theory underpinning our study of active galactic nuclei and the ways we observe them.

An Introduction to Galaxies and Cosmology David J. Adams 2004-05-31 Publisher Description

Merging Processes in Galaxy Clusters L. Feretti 2006-04-18 Mergers are the mechanisms by which galaxy clusters are assembled through the hierarchical growth of smaller clusters and groups. Major cluster mergers are the most energetic events in the Universe since the Big Bang. Many of the observed properties of clusters depend on the physics of the merging process. These include substructure, shock, intra cluster plasma temperature and entropy structure, mixing of heavy elements within the intra cluster medium, acceleration of high-energy particles, formation of radio halos and the effects on the galaxy radio emission. This book reviews our current understanding of cluster merging from an observational and theoretical perspective, and is appropriate for both graduate students and researchers in the field.

Clusters of Galaxies: Physics and Cosmology Andrei M. Bykov 2020-10-31 Clusters of galaxies are large assemblies of galaxies, hot gas and dark matter bound together by gravity. Galaxy clusters are now one of the most important cosmological probes to test the standard cosmological models. Constraints on the Dark Energy equation of state from the cluster number density measurements, deviations from the Gaussian perturbation models, the Sunyaev-Zeldovich effect as well as the dark

matter probes are among the issues to be studied with clusters. The baryonic composition of clusters is dominated by hot gas that is in quasi-hydrostatic equilibrium within the dark matter-dominated gravitational potential well of the cluster. The hot gas is visible through spatially extended thermal X-ray emission, and it has been studied extensively both for assessing its physical properties and as a tracer of the large-scale structure of the Universe. Magnetic fields as well as a number of non-thermal plasma processes play a role in clusters of galaxies as we observe from radioastronomical observations. The goal of this volume is to review these processes and to investigate how they are interlinked. Overall, these papers provide a timely and comprehensive review of the multi-wavelength observations and theoretical understanding of clusters of galaxies in the cosmological context. Thus, the volume will be particularly useful to postgraduate students and researchers active in various areas of astrophysics and space science. Originally published in Space Science Reviews in the Topical Collection "Clusters of Galaxies: Physics and Cosmology" (The Formation of the Milky Way Spain) Iaa-Iac-University of Pisa Workshop (1994 Granada 1995-08-03 This review examines all the key physical processes involved in the formation and evolution of the Milky Way, based on an international meeting held in Granada (Spain).

Formation of Structure in the Universe Avishai Dekel 1999-04-15 An up-to-date and comprehensive graduate-level textbook on the fast-moving subject of structure formation in cosmology, written by eleven world-leading authorities.

Encyclopedia of Astronomy & Astrophysics P Murdin 2001-01-01 In a unique collaboration, Nature Publishing Group and Institute of Physics Publishing have published the most extensive and comprehensive reference work in astronomy and astrophysics. This unique resource covers the entire field of astronomy and astrophysics and this online version includes the full text of over 2,750 articles, plus sophisticated search and retrieval functionality and links to the primary literature. The Encyclopaedia's authority is assured by editorial and advisory boards drawn from the world's foremost astronomers and astrophysicists. This first class resource is an essential source of information for undergraduates, graduate students, researchers and seasoned professionals, as well as for committed amateurs, librarians and lay people wishing to consult the definitive astronomy and astrophysics reference work.

Galaxies Françoise Combes 2021-03-23 Galaxies are vast ensembles of stars, gas and dust, embedded in dark matter halos. They are the basic building blocks of the Universe, gathered in groups, clusters and super-clusters. They exist in many forms, either as spheroids or disks. Classifications, such as the Hubble sequence (based on mass concentration and gas fraction) and the color-magnitude diagram (which separates a blue cloud from a red sequence) help to understand their formation and evolution. Galaxies spend a large part of their lives in the blue cloud, forming stars as spiral or dwarf galaxies. Then, via a mechanism that is still unclear, they stop forming stars and quietly end in the red sequence, as spheroids. This transformation may be due to galaxy interactions, or because of the feedback of active nuclei, through the energy released by their central super-massive black holes. These mechanisms could explain the history of cosmic star formation, the rate of which was far greater in the first half of the Universe's life. Galaxies delves into all of these surrounding subjects in six chapters written by dedicated, specialist astronomers and researchers in the field, from their numerical simulations to their evolutions.