



K. Weiler (Ed.)

Supernovae and Gamma-Ray Bursts



Springer

Supernovae And Gammaray Bursters

Alain Mazure, Stéphane Basa



Supernovae And Gammaray Bursters:

Supernovae and Gamma-Ray Bursters Kurt Weiler, 2003-04-09 Since the dawn of mankind observers of the sky have wondered at the sudden appearance of new stars on the seemingly unchanging heavens and for at least 2000 years have recorded these phenomena in their annals and archives Even in more modern times since the discovery of SN1885A in S Andromeda which figured in the important island universe discussions of the 1920 s the puzzle of supernovae SNe has played an important role in astrophysics Only with the seminal work of Fritz Zwicky and Walter Baade in the 1930 s did we begin to understand the differences between novae and SNe and the importance of SNe as the fonts of energy for the interstellar medium and as drivers of chemical evolution in galaxies As recently as the 1940 s and 1950 s the early days of radio astronomy were heavily influenced by the familiar names of Cassiopeia A and Taurus A two young supernova remnants and two Nobel prizes have been awarded for discovery and study of a related phenomenon pulsars In spite of the great age of the study of SNe since at least the Chinese records of SN185 and probably earlier the field is in fact very young having only attracted a large devoted following since the spectacular Type II SN1987A in the Large Magellanic Cloud the first naked eye SN in more than 400 years

Supernovae and Gamma-Ray Bursters Kurt Weiler, 2014-03-12 Since the dawn of mankind observers of the sky have wondered at the sudden appearance of new stars on the seemingly unchanging heavens and for at least 2000 years have recorded these phenomena in their annals and archives Even in more modern times since the discovery of SN1885A in S Andromeda which figured in the important island universe discussions of the 1920 s the puzzle of supernovae SNe has played an important role in astrophysics Only with the seminal work of Fritz Zwicky and Walter Baade in the 1930 s did we begin to understand the differences between novae and SNe and the importance of SNe as the fonts of energy for the interstellar medium and as drivers of chemical evolution in galaxies As recently as the 1940 s and 1950 s the early days of radio astronomy were heavily influenced by the familiar names of Cassiopeia A and Taurus A two young supernova remnants and two Nobel prizes have been awarded for discovery and study of a related phenomenon pulsars In spite of the great age of the study of SNe since at least the Chinese records of SN185 and probably earlier the field is in fact very young having only attracted a large devoted following since the spectacular Type II SN1987A in the Large Magellanic Cloud the first naked eye SN in more than 400 years

Supernovae and Gamma-Ray Bursts Mario Livio, Nino Panagia, Kailash Sahu, 2001-07-02 Since the dramatic discovery that the supernova SN1998bw coincided in position and time with a gamma ray burst the possibility was raised that these two types of spectacular explosions are related This timely volume presents especially written articles by a host of world experts who gathered together for an international conference at the Space Telescope Science Institute This was the first meeting in which the communities of supernova researchers and gamma ray burst researchers were brought together to share ideas The contributions review the mechanisms for these explosive events the possible connections between them and their relevance for cosmology Both observations and theoretical developments are

covered This book is an invaluable source of information for both active researchers and graduate students in this exciting area of research

Cosmic Explosions in Three Dimensions Peter Höflich, Pawan Kumar, J. Craig Wheeler, 2004-12-16 Supernovae and gamma ray bursts are the strongest explosions in the Universe Observations show that rather than being symmetrical they are driven by strong jets of energy and other asymmetrical effects These observations demand theories and computations that challenge the biggest computers This volume marks the transition to a fresh paradigm in the study of stellar explosions It highlights the burgeoning era of routine supernova polarimetry and the insights into core collapse and thermonuclear explosions With chapters by leading scientists the book summarises the status of a fresh perspective on stellar explosions and should be a valuable resource for graduate students and research scientists

Supernova 1987A: 20 Years After Stefan Immler, Kurt Weiler, Richard McCray, 2007-10-05 The discovery of supernova SN 1987A has led to the rise of a new branch in astronomy and astrophysics which is solely devoted to this object In this proceedings book all aspects of the broad SN 1987A research topics are covered and all observed wavelength regimes are discussed The proceedings book further includes other SNe of all types SN cosmology and Gamma Ray Bursts GRBs with emphasis on SN GRB connections This volume will be for all those interested in astronomy

Exploding Superstars Alain Mazure, Stéphane Basa, 2008-11-01 The exceptional cosmic history and the fabulous destinies of exploding stars supernovae and gamma ray bursters are highly fertile areas of research and are also very special tools to further our understanding of the universe In this book cosmologists Dr Alain Mazure and Dr Stéphane Basa throw light on the assemblage of facts hypotheses and cosmological conclusions and show how these beacons illuminate their immediate surroundings and allow us to study the vast cosmos like searchlights revealing the matter comprising our universe

Death of Massive Stars (IAU S279) Peter W. A. Roming, Nobuyuki Kawai, Elena Pian, 2012-09-20 Massive stars end their lives in fiery explosions and are manifest as core collapse supernovae CCSNe or gamma ray bursts GRBs In rare cases a highly stripped massive star explodes and exhibits properties of both CCSNe and GRBs In contrast there are clear cases in which no bright supernova is found to be associated with a GRB and vice versa The quest in understanding supernovae and GRBs and the connection between them has raised many questions Since the elements synthesized in the explosion of massive stars are the building blocks for much of the visible Universe it is important to understand the life cycle of these massive stars IAU Symposium 279 brings together international leaders who study CCSNe and GRBs to discuss their environments and hosts progenitors and subsequent explosions as well as multiwavelength observations of these objects and their implications as cosmological probes particularly in the very early Universe

Supernova 1987A, 2007 *The Physics of Gamma-Ray Bursts* Bing Zhang, 2019 A complete text on the physics of gamma ray bursts the most brilliant explosions since the Big Bang

Gravitational Radiation, Luminous Black Holes and Gamma-Ray Burst Supernovae Maurice H. P. M. van Putten, 2005-12-15 Black holes and gravitational radiation are two of the most dramatic predictions of general relativity The quest for rotating black holes discovered by Roy P Kerr as exact solutions

to the Einstein equations is one of the most exciting challenges facing physicists and astronomers

Gravitational Radiation Luminous Black Holes and Gamma Ray Burst Supernovae takes the reader through the theory of gravitational radiation and rotating black holes and the phenomenology of GRB supernovae Topics covered include Kerr black holes and the frame dragging of spacetime luminous black holes compact tori around black holes and black hole spin interactions It concludes with a discussion of prospects for gravitational wave detections of a long duration burst in gravitational waves as a method of choice for identifying Kerr black holes in the Universe This book is ideal for a special topics graduate course on gravitational wave astronomy and as an introduction to those interested in this contemporary development in physics

Gamma-Ray Bursts: 30 Years of Discovery E.E. Fenimore, Mark Galassi, 2004-10-21 In the last thirty years gamma ray bursts have grown from an oddity to a central position in astrophysics Not only are they the largest explosions since the big bang capable of flooding most of the universe with gamma rays but their brilliance serves as a backlight that can illuminate the cosmos far deeper into the early universe than any other object Their unpredictability has forced researchers to use extreme measures to observe them completely autonomous satellites and robotic ground based telescopes Their bizarre physical properties have pushed us to develop new theories of astrophysical explosions Topics include global properties of GRBs X ray flashes ultra high energy gamma rays neutrinos gravity waves prompt emission and early afterglows relativistic jets and polarization GRB030329 GRB progenitors GRB connection to supernovae dark versus bright GRBs late afterglows GRBs and cosmology general observations general theory analysis and observation techniques present satellites Swift satellite future satellites and robotic observing systems

THE ENGINES BEHIND SUPERNOVAE AND GAMMA-RAY BURSTS., 2007 The authors review the different engines behind supernova SNe and gamma ray bursts GRBs focusing on those engines driving explosions in massive stars core collapse SNe and long duration GRBs Convection and rotation play important roles in the engines of both these explosions They outline the basic physics and discuss the wide variety of ways scientists have proposed that this physics can affect the supernova explosion mechanism concluding with a review of the current status in these fields

Gamma-Ray Bursts Gilbert Vedrenne, Jean-Luc Atteia, 2009-03-20 Since their discovery was first announced in 1973 gamma ray bursts GRBs have been among the most fascination objects in the universe While the initial mystery has gone the fascination continues sustained by the close connection linking GRBs with some of the most fundamental topics in modern astrophysics and cosmology Both authors have been active in GRB observations for over two decades and have produced an outstanding account on both the history and the perspectives of GRB research

Die private Krankenversicherung im Jahre.., 1958

Blowing Bubbles in the Cosmos T. W. Hartquist, J. E. Dyson, D. P. Ruffle, 2004-02-26 Many astrophysical bodies produce winds jets or explosions which blow spectacular bubbles From a nonmathematical unifying perspective based on the understanding of bubbles the authors address many of the most exciting topics in modern astrophysics including supernovae the production of structure in the Early Universe the environments of supermassive black holes and gamma ray

bursts Neutrinos and Explosive Events in the Universe Maurice M. Shapiro, Todor Stanev, John P. Wefel, 2006-01-26

Neutrinos and Explosive Events in the Universe brought together experts from diverse disciplines to offer a detailed view of the exciting new work in this part of High Energy Astrophysics Sponsored by NATO as an Advanced Study Institute and coordinated under the auspices of the International School of Cosmic Ray Astrophysics 14th biennial course the ASI featured a full program of lectures and discussion in the ambiance of the Ettore Majorana Centre in Erice Italy including visits to the local Dirac and Chalonge museum collections as well as a view of the cultural heritage of southern Sicily Enri ment presentations on results from the Spitzer Infrared Space Telescope and the Origin of Complexity complemented the program This course was the best attended in the almost 30 year history of the School with 121 participants from 22 countries The program provided a rich ex rience both introductory and advanced to fascinating areas of observational Astrophysics Neutrino Astronomy High Energy Gamma Ray Astronomy P ticle Astrophysics and the objects most likely responsible for the signals plosions and related phenomena ranging from Supernovae to Black Holes to the Big Bang Contained in this NATO Science Series volume is a summative formulation of the physics and astrophysics of this newly emerging research area that already has been and will continue to be an important contributor to understanding our high energy universe **The Many Facets of Cosmic Explosions** Alicia Soderberg, 2007-10 Over the past few years long duration gamma ray bursts GRBs including the subclass of X ray flashes XRFs have been revealed to be a rare variety of Type Ibc supernova SN Ibc While all these events result from the death of massive stars the electromagnetic luminosities of GRBs and XRFs exceed those of ordinary Type Ibc SNe by many orders of magnitude The observed diversity of stellar death corresponds to large variations in the energy velocity and geometry of the explosion ejecta Using multi wavelength radio optical X ray observations of the nearest GRBs XRFs and SNe Ibc I show that GRBs and XRFs couple at least 10^{48} erg to relativistic material while SNe Ibc typically couple less than 10^{48} erg to their fastest albeit non relativistic outflows Specifically I find that less than 3 percent of local SNe Ibc show any evidence for association with a GRB or XRF Interestingly this dichotomy is not echoed by the properties of their optical SN emission dominated by the radioactive decay of Nickel 56 I find that GRBs XRFs and SNe Ibc show significant overlap in their optical peak luminosity and photospheric velocities Recently I identified a new class of GRBs and XRFs that are under luminous in comparison with the statistical sample of GRBs Owing to their faint high energy emission these sub energetic bursts are only detectable nearby z **Observations and Theory of Short GRBs at the Dawn of the Gravitational Wave Era** Giulia Stratta, Andrea Rossi, Maria Giovanna Dainotti, 2019-09-30 The book starts with a review of the established facts on the numerical simulations of binary neutron star mergers and simulations of short GRB jets that highlights the issues that need to be revised and further clarified as the need to understand how the relativistic outflow was launched what the initial structure of the outflow is and how it evolved through its interaction with the binary ejecta Constraints on a local population of faint short duration GRBs are then provided in light of the GW170817 GRB

170817A event at $d \approx 40$ Mpc by considering statistical limits on a $d \approx 200$ Mpc population Using past and current GRB detectors results suggest that GRB 170817A like events are likely to be rare in existing short GRB catalogues and if binary neutron star merger rates are at the high end of current estimates then at most a few percent will be accompanied by detectable gamma ray flashes in the forthcoming LIGO Virgo science runs Indirect information on the nature of short GRBs can be obtained from their host galaxy The host galaxies of most short GRBs are found to be star forming but an important fraction $\sim 1/5$ are elliptical with negligible star formation Short bursts often occur at very large offsets from their hosts in regions where there is little or no underlying host light These results provide evidence of progenitors associated with merger of compact object binaries with kick velocities of a few tens of km s⁻¹ and merger times of ~ 1 Gyr The last two issues of the book tackle the physics of the short GRB radiative processes Interestingly it was already noted in the past that the prompt emission for short GRBs and the initial 2 s of long duration GRBs show similarity in the low energy photon index This result has been further confirmed using a larger sample of Fermi Gamma ray burst monitor data In particular it has been found that for 25% of GRBs the photon index is shallower than 2/3 challenging the standard synchrotron emission scenario The extent up to which the reverse shock component is detectable for short GRBs in radio wavelengths is analyzed Results show that early radio bright reverse shock is expected in many cases but more rapid follow up observational campaigns are required in order to test these predictions

Cosmic Catastrophes J. Craig Wheeler, 2007-01-04 From supernovae and gamma ray bursts to the accelerating Universe this is an exploration of the intellectual threads that lead to some of the most exciting ideas in modern astrophysics and cosmology This fully updated second edition incorporates new material on binary stars black holes gamma ray bursts worm holes quantum gravity and string theory It covers the origins of stars and their evolution the mechanisms responsible for supernovae and their progeny neutron stars and black holes It examines the theoretical ideas behind black holes and their manifestation in observational astronomy and presents neutron stars in all their variety known today This book also covers the physics of the twentieth century discussing quantum theory and Einstein's gravity how these two theories collide and the prospects for their reconciliation in the twenty first century This will be essential reading for undergraduate students in astronomy and astrophysics and an excellent accessible introduction for a wider audience

Supernova Explosions David Branch, J. Craig Wheeler, 2017-08-02 Targeting advanced students of astronomy and physics as well as astronomers and physicists contemplating research on supernovae or related fields David Branch and J. Craig Wheeler offer a modern account of the nature causes and consequences of supernovae as well as of issues that remain to be resolved Owing especially to 1 the appearance of supernova 1987A in the nearby Large Magellanic Cloud 2 the spectacularly successful use of supernovae as distance indicators for cosmology 3 the association of some supernovae with the enigmatic cosmic gamma ray bursts and 4 the discovery of a class of superluminous supernovae the pace of supernova research has been increasing sharply This monograph serves as a broad survey of modern supernova research and a guide to

the current literature The book s emphasis is on the explosive phases of supernovae Part 1 is devoted to a survey of the kinds of observations that inform us about supernovae some basic interpretations of such data and an overview of the evolution of stars that brings them to an explosive endpoint Part 2 goes into more detail on core collapse and superluminous events which kinds of stars produce them and how do they do it Part 3 is concerned with the stellar progenitors and explosion mechanisms of thermonuclear Type Ia supernovae Part 4 is about consequences of supernovae and some applications to astrophysics and cosmology References are provided in sufficient number to help the reader enter the literature

This book delves into Supernovae And Gammaray Bursters. Supernovae And Gammaray Bursters is a vital topic that must be grasped by everyone, from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Supernovae And Gammaray Bursters, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:
 - Chapter 1: Introduction to Supernovae And Gammaray Bursters
 - Chapter 2: Essential Elements of Supernovae And Gammaray Bursters
 - Chapter 3: Supernovae And Gammaray Bursters in Everyday Life
 - Chapter 4: Supernovae And Gammaray Bursters in Specific Contexts
 - Chapter 5: Conclusion
2. In chapter 1, the author will provide an overview of Supernovae And Gammaray Bursters. This chapter will explore what Supernovae And Gammaray Bursters is, why Supernovae And Gammaray Bursters is vital, and how to effectively learn about Supernovae And Gammaray Bursters.
3. In chapter 2, the author will delve into the foundational concepts of Supernovae And Gammaray Bursters. The second chapter will elucidate the essential principles that must be understood to grasp Supernovae And Gammaray Bursters in its entirety.
4. In chapter 3, the author will examine the practical applications of Supernovae And Gammaray Bursters in daily life. This chapter will showcase real-world examples of how Supernovae And Gammaray Bursters can be effectively utilized in everyday scenarios.
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6. In chapter 5, the author will draw a conclusion about Supernovae And Gammaray Bursters. This chapter will summarize the key points that have been discussed throughout the book.

This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of Supernovae And Gammaray Bursters.

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Table of Contents Supernovae And Gammaray Bursters

1. Understanding the eBook Supernovae And Gammaray Bursters
 - The Rise of Digital Reading Supernovae And Gammaray Bursters
 - Advantages of eBooks Over Traditional Books
2. Identifying Supernovae And Gammaray Bursters
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Supernovae And Gammaray Bursters
 - User-Friendly Interface
4. Exploring eBook Recommendations from Supernovae And Gammaray Bursters
 - Personalized Recommendations
 - Supernovae And Gammaray Bursters User Reviews and Ratings
 - Supernovae And Gammaray Bursters and Bestseller Lists
5. Accessing Supernovae And Gammaray Bursters Free and Paid eBooks
 - Supernovae And Gammaray Bursters Public Domain eBooks
 - Supernovae And Gammaray Bursters eBook Subscription Services
 - Supernovae And Gammaray Bursters Budget-Friendly Options
6. Navigating Supernovae And Gammaray Bursters eBook Formats
 - ePub, PDF, MOBI, and More
 - Supernovae And Gammaray Bursters Compatibility with Devices
 - Supernovae And Gammaray Bursters Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Supernovae And Gammaray Bursters
 - Highlighting and Note-Taking Supernovae And Gammaray Bursters
 - Interactive Elements Supernovae And Gammaray Bursters

8. Staying Engaged with Supernovae And Gammaray Bursters
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Supernovae And Gammaray Bursters
9. Balancing eBooks and Physical Books Supernovae And Gammaray Bursters
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Supernovae And Gammaray Bursters
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Supernovae And Gammaray Bursters
 - Setting Reading Goals Supernovae And Gammaray Bursters
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Supernovae And Gammaray Bursters
 - Fact-Checking eBook Content of Supernovae And Gammaray Bursters
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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