# Foreword

It is a great pleasure for me to write a foreword to this very comprehensive book on gamma-ray bursts, or GRBs, written by my colleague and friend Bing Zhang. GRBs are the most powerful and intense explosive events in the universe, delivering in a matter of tens of seconds an energy which would take ten billion years for the Sun to produce, or a hundred years for the entire Milky Way to produce; and instead of emitting this in the form of mild optical light, it emits it mainly in $\gamma$-rays. Over most of the past two decades Professor Zhang has been deeply involved at the forefront of the theoretical study of GRBs, as well as in the detailed matching of theoretical models to the increasingly sophisticated data provided by specialized satellite missions and ground-based telescopes. He has been responsible for a number of theoretical ideas for interpreting the rapidly evolving phenomenological landscape of this field, including significant studies of the role played by photospheres and magnetic fields in the prompt $\gamma$-ray emission, the constraints provided by high-energy neutrinos, the causes for X-ray plateaus and flares in the afterglow phase, and the origin of the extended soft emission in short GRBs. He has also, unusually for a theorist, been responsible for valuable empirical analyses aimed at pinpointing the basic parameters of the overall emission, as well as for statistical correlations between various observables on the prompt $\gamma$-ray emission spectra and the parameters of the afterglow lightcurves, which are aimed at finding a common scale by which all GRBs can be measured.

The material in this book has been painstakingly researched and developed by Professor Zhang, with a large number of useful diagrams and supplementary material, referring to a large array of resources, publications, and databases. Starting with a comprehensive historical perspective, it goes on to delve extensively into all of the major aspects of the field up to the present date, with insightful discussions of the relevant physics involved in the various phenomenological aspects, including perspectives on the possible developments expected from future observations. It then goes on to place GRBs in the broader astrophysical context of stars, galaxies, and the universe, and the possible implications for fundamental physics. This is the most complete, comprehensive, and up-to-date monograph on the physics of gamma-ray bursts, by one of the leading experts in the field, which will be an invaluable resource both for advanced researchers and for those wishing to gain an overview of one of the most exciting topics in contemporary astrophysics.

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