



# Relativistic Hydrodynamics

*Luciano Rezzolla, Olindo Zanotti*

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## **Relativistic Hydrodynamics** Luciano Rezzolla, Olindo Zanotti

Relativistic hydrodynamics is a very successful theoretical framework to describe the dynamics of matter from scales as small as those of colliding elementary particles, up to the largest scales in the universe. This book provides an up-to-date, lively, and approachable introduction to the mathematical formalism, numerical techniques, and applications of relativistic hydrodynamics. The topic is typically covered either by very formal or by very phenomenological books, but is instead presented here in a form that will be appreciated both by students and researchers in the field.

The topics covered in the book are the results of work carried out over the last 40 years, which can be found in rather technical research articles with dissimilar notations and styles. The book is not just a collection of scattered information, but a well-organized description of relativistic hydrodynamics, from the basic principles of statistical kinetic theory, down to the technical aspects of numerical methods devised for the solution of the equations, and over to the applications in modern physics and astrophysics. Numerous figures, diagrams, and a variety of exercises aid the material in the book. The most obvious applications of this work range from astrophysics (black holes, neutron stars, gamma-ray bursts, and active galaxies) to cosmology (early-universe hydrodynamics and phase transitions) and particle physics (heavy-ion collisions).

It is often said that fluids are either seen as solutions of partial differential equations or as "wet". Fluids in this book are definitely wet, but the mathematical beauty of differential equations is not washed out.

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