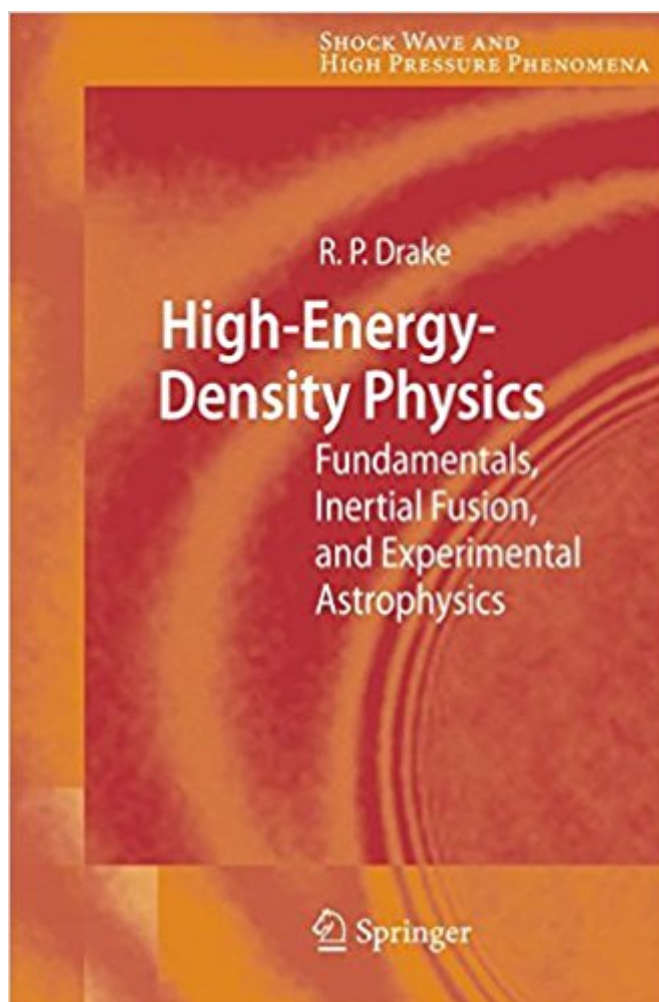


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# High-Energy-Density Physics: Fundamentals, Inertial Fusion, And Experimental Astrophysics (Shock Wave And High Pressure Phenomena)





## Synopsis

This book has two goals. One goal is to provide a means for those new to high-energy-density physics to gain a broad foundation from one text. The second goal is to provide a useful working reference for those in the field. This book has at least four possible applications in an academic context. It can be used for training in high-energy-density physics, in support of the growing number of university and laboratory research groups working in this area. It also can be used by schools with an emphasis on ultrafast lasers, to provide some introduction to issues present in all laser experiments with high-power lasers, and with thorough coverage of the material in Chap. 11 on relativistic systems. In addition, it could be used by physics, applied physics, or engineering departments to provide in a single course an introduction to the basics of fluid mechanics and radiative transfer, with dynamic applications. Finally, it could be used by astrophysics departments for a similar purpose, with the benefit of training the students in the similarities and differences between laboratory and astrophysical systems. The notation in this text is deliberately sparse and when possible a given symbol has only one meaning. A definition of the symbols used is given in Appendix A. In various cases, additional subscripts are added to distinguish among cases of the same quantity, as for example in the use of  $\rho$  and  $\rho_1$  to distinguish the mass density in two different regions.

## Book Information

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## Customer Reviews

The raw numbers of high-energy-density physics are amazing: shock waves at hundreds of km/s (approaching a million  $\hat{\text{A}}$  km per hour), temperatures of millions of degrees, and pressures that exceed 100 million atmospheres.  $\hat{\text{A}}$   $\hat{\text{A}}$  This book introduces the reader to the fundamental tools and discoveries of high-energy-density physics. It surveys the production of high-energy-density conditions, the fundamental plasma and hydrodynamic models that can describe them and  $\hat{\text{A}}$   $\hat{\text{A}}$  the problem of scaling from the laboratory to the cosmos.  $\hat{\text{A}}$   $\hat{\text{A}}$  Connections to astrophysics  $\hat{\text{A}}$   $\hat{\text{A}}$  are discussed throughout. The book is intended to support coursework in high-energy-density physics, to meet the needs of new researchers in this field, and also to serve as a useful reference on the fundamentals. Specifically the book has been designed  $\hat{\text{A}}$   $\hat{\text{A}}$  to enable academics in physics, astrophysics, applied physics and engineering departments to provide in a single-course  $\hat{\text{A}}$   $\hat{\text{A}}$  introduction to fluid mechanics and radiative transfer, with dramatic applications in the field of high-energy-density systems.

Professor Drake works primarily in high-energy-density physics and its applications to astrophysics. High-energy-density physics studies the properties and behavior of matter and radiation at pressures of millions of atmospheres (or more) and temperatures above 10,000 degrees (or more). He is internationally recognized as a pioneer in this field. His work emphasizes the dynamic behavior of such systems, which also may be strongly radiative or magnetized. His team produces this kind of behavior in the laboratory, generally by driving a complex target with a high-energy laser. This lets the team directly examine processes that also occur in hot, dynamic astrophysical systems such as supernovae, supernova remnants, and cataclysmic variable stars. The processes they study are also relevant to Inertial Confinement Fusion, where some of his students continue their careers. Professor Drake is also known for work in laser-plasma interactions, and is a Fellow of the American Physical Society. --This text refers to an alternate Hardcover edition.

This book gives a good summary of the equations and models for high-energy density physics. However, you will not get much information on how to write simulation codes and experimental details. This book appears to be the result of the HEDP summer school taught by the author. Not many detailed derivations of equations. Every topic in this book requires at least a whole other book in order to understand. I'm not an astrophysicist, so many of the topics in this book were not very enlightening for me. The info/price ratio for this book is very low. I would recommend Zeldovich and Raizer's book if you want to understand shock wave theory. Atzeni's book on ICF is far superior to this one.

The book is aimed to be an introduction to the interdisciplinary subject of HEDP. As such, it serves as a fine entry-level text book for physicists of various background: Plasma, Astro, Optics and more. It does its job very well and suits both theory and experimental physicists. The examples are chosen from open questions in the field, with going into details only when necessary. The detailed bibliography lists the up-to-date literature and it would help anyone interested in further studying a specific subject. Most recommended!

The book serve the purpose of introducing the HEDP field to beginners. In that scope, it is very well written, and it covers all the aspects which are needed for that purpose. The writing is clear and understandable, and the logical build up of the content is very well written. Highly recommended.

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