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Stellar Interiors - Physical Principles, Structure, and Evolution

By Carl J. Hansen, Steven D Kawaler, Virginia Trimble



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The first edition of this text appeared in 1994. Shortly after the third printing, our editor suggested that we attempt a second edition because new developments in stellar structure and evolution had made our original work outdated. We (the original authors, CJH and SDK) reluctantly agreed but with reservations due to the effort involved. Our initial reluctance disappeared when we were able to convince (cajole, twist the arm of, etc.) our new coauthor colleague Virginia Trimble to join us. (Welcome Virginia!) We (i.e., all three of us) hope that you agree that the present edition is a great improvement compared to the 1994 effort. Our objectives in this edition are the same ones we set forth in 1994: What you will find is a text designed for our target audience: the typical senior undergraduate or beginning graduate student in astronomy or astrophysics who wishes an overview of stellar structure and evolution with just enough detail to understand the general picture. She or he can go on from there to more specialized texts or directly to the research literature depending on talent and interests. To this end, this text presents the basic physical principles without chasing all the (interesting!) details. For those of you familiar with the first edition, you will find that some things have not been changed substantially ($F = ma$ is still $F = ma$), while others definitely have. For example, Chapter 2 has been completely rewritten.



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Editorial Review

Review

From the reviews of the second edition:

"This updated edition will be welcomed by the scientific community. ... gives an excellent general introduction to the subject. ... This book is especially suited for students in astrophysics and astronomy at the master level or starting a Ph.D. thesis, but also for post-graduate science students looking to enlarge their horizon." (Cyriel Wagemans, *Physica*, Vol. 57(3), 2005)

"This book is aimed at senior undergraduate or early graduate students in astronomy It provides a broad overview of the physical basics of stellar structure and evolution sufficient to whet the appetite of the student sufficiently Recommended, yes, but only for serious students of stellar physics, as light reading, or a pretty picture book, it is not." (Roger Feasey, *Journal of the Auckland Astronomical Society AAS*, February, 2005)

From the Back Cover

This text, updated and expanded from the first edition, is designed for beginning students of stellar physics, and introduces the fundamentals of stellar structure and evolution. In emphasizing the general picture of the life cycles of stars and the physics responsible, it also allows prospective specialists a taste of many of the detailed aspects of this mature discipline. The authors develop a solid foundation in important theory that is often overlooked in typical courses yet steer clear of extraneous intensive mathematics and physics.

Topics include:

- *The life stories of stars explained by observation and theory
- *Equations of state of stellar material
- *Basic radiative transfer and stellar spectra
- *Stellar energy sources and nucleosynthesis
- *Phenomenological approaches to convection
- *Numerical techniques for computation of stellar evolution

Keeping pace with recent developments, the authors incorporate important elements such as asteroseismology, and the effects of rotation and magnetic fields.

This edition contains an extensive set of exercises that supplement and expand on the text.

About the authors:

Carl Hansen is Professor Emeritus of Astrophysical and Planetary Sciences, and Fellow Adjoint of JILA, at the University of Colorado, Boulder.

Steve Kawaler is Professor of Astrophysics at Iowa State University, Ames, Iowa.

Virginia Trimble is Professor of Physics at the University of California, Irvine, and Visiting Professor of Astronomy at the University of Maryland, College Park.

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