



Atmospheric Thermodynamics

By Craig F. Bohren, Bruce A. Albrecht

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This comprehensive text is based on the authors' course notes, refined and updated over 15 years of teaching. The core of the text focuses on water and its transformations. Four chapters lay the foundation, from energy conservation to the ideal gas law, specific heat capacities, adiabatic processes, and entropy. An extensive chapter treats phase transitions of water, and a lengthy discussion of the van der Waals equation sets the stage for phase diagrams. Free energy is applied to determining the effect of dissolved substances, total pressure, and size on vapor pressure. The chapter on moist air and clouds discusses wet-bulb and virtual temperatures, isentropic ascent of saturated air, thermodynamic diagrams, stability, and cloud formation. The final chapter covers energy, momentum, and mass transfer, topics not usually considered part of thermodynamics.

Measurements are included and experiments and observations are suggested, all with the aim of breathing life into equations. The authors are careful to recognize and unafraid to criticize the treatments of thermodynamics that have been unchanged for more than a hundred years.

Atmospheric Thermodynamics contains over 200 exercises, mostly applications of basic principles to concrete problems. Often inspired by inquisitive students and colleagues, the exercises cover everything from automobiles and airplanes to baseball, wind turbines, and ground hogs. The authors weave history into the text by drawing on original writings rather than using textbook anecdotes, and molecular interpretations are given wherever possible. Assumptions and approximations are carefully laid out, derivations are detailed, and equations are interpreted physically and applied. No previous knowledge of thermodynamics or kinetic theory is assumed, although students are expected to be well-grounded in calculus, differential equations, vector analysis, and classical mechanics.

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Review

"I've never been more excited about a book! I couldn't put it down. It's about time somebody wrote an understandable and intuitive book about thermodynamics. Bohren and Albrechts' book is really a breath of fresh air!" --Glenn E. Shaw, *Geophysical Institute, University of Alaska*

About the Author

Craig F. Bohren is Distinguished Professor of Meteorology at Pennsylvania State University. He is the author of two popular scientific books, *Clouds in a Glass of Beer* (for which he received the American Meteorological Society's Louis J. Battan Author's Award) and *What Light Through Yonder Window Breaks?*, also available from Wiley.

DONALD R. HUFFMAN is Regents Professor of Physics at the University of Arizona. In 1983 he and colleague Wolfgang Kratschmer produced the first sample of C₆₀, buckminsterfullerene. The pair was honored with the MRS medal and shared in the 1994 Hewlett-Packard Europhysics Prize.

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