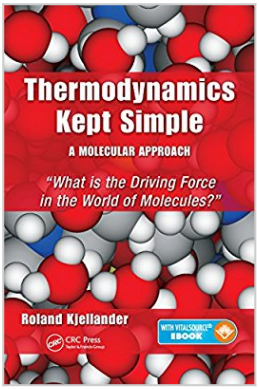

Thermodynamics Kept Simple – A Molecular Approach: What is the Driving Force in the World of Molecules?

By Roland Kjellander

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Thermodynamics Kept Simple – A Molecular Approach: What is the Driving Force in the World of Molecules? offers a truly unique way of teaching and thinking about basic thermodynamics that helps students overcome common conceptual problems.

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The book delivers a concise and brilliantly conceived introduction to thermodynamics by focusing at the molecular level in a manner that is easy to follow and illustrated by engaging, concrete examples. By providing a guided tour of the world of molecules, the book gives insights into essential principles of thermodynamics with minimal use of mathematics. It takes as a unifying theme an application of simple but appropriate reasoning that leads to the correct mathematical relationships.

Many well-chosen examples are employed to clearly illustrate the core laws and to supply valuable insight into the molecular events underlying the thermodynamic macroscopic description, such as how spreading of energy and spreading of particles can sometimes oppose each other and at other times work together. Thereby, insight into the world experienced in everyday life also is gained.

The book covers key concepts such as entropy, energy transfer, heat exchange, work, enthalpy, free energy, irreversible and reversible processes, chemical equilibrium, and phase transitions. It provides an intuitive understanding of the distinction between microscopic and macroscopic states and shows how statistics play out in the molecular world.

Based on the author’s popular, classroom-proven Swedish textbook, this book presents the fundamentals of thermodynamics in a straightforward manner accessible to students at the first-year university level and beyond.

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Review

"This book is a pleasure to read. Especially noteworthy is the considerable attention that has been devoted to the concept of entropy … neatly explained via very simple model systems."
?Jan Forsman, Professor, Lund University

"… an excellent complement to traditional thermodynamics textbooks. The author clearly explains concepts in chemical thermodynamics using a molecular approach."
?Enrique Peacock-Lopez, Professor, Department of Chemistry, Williams College

"*Thermodynamics Kept Simple* is an excellent book. It demystifies, with great devotion on the confusing details, the concepts of temperature, pressure, entropy, enthalpy, and free energy. It then explains, mainly qualitatively, topics such as mixing, chemical equilibrium, vapor pressure, and so on."
?Kristofer Modig, Department of Biophysical Chemistry, Lund University

"The author's treatment is straightforward and appropriate for first-year students. His examples are clear, his intuitive arguments are convincing, the math is always kept simple … [and] the language is flawless."
?Stephen C. Harvey, University of Pennsylvania

"This reviewer highly commends Kjellander for engaging readers immediately in the concept of energy and entropy via a simple description of microstates coupled with straightforward algebra. The author covers other areas informally and includes sufficient algebra and simple calculus for students to follow the text. This non-rigorous approach may meet the objectives of science and engineering technology majors who lack preparation in multivariate calculus…. Kjellander provides helpful hints in footnotes scattered abundantly throughout the book, including messages about accurate methods to derive concepts from first principles."
?Choice (Review by R. N. Laoulache, University of Massachusetts Dartmouth)

"I recommend the textbook for a first exposure to thermodynamics. Kjellander has indeed kept it simple."
?*Contemporary Physics* (Sep 2016), review by Robert S. MacKay

"Unlike most textbooks on statistical mechanics and thermodynamics there is very little math in this book. Instead, clear explanations and illustrative examples have been put forward to support the discussions. The book also takes a very interesting and novel approach in introducing the concepts of temperature and entropy, which clears up the usual confusions and sets a strong foundation for more advanced courses. The text is easy to read and follow and does not require any particular, university level knowledge of mathematics and physics. These make it ideal for the first year students. It will be definitely in the essential reading list for my first year thermodynamics course."
?Dr Nader Karimi, School of Engineering, University of Glasgow

About the Author

Roland Kjellander acquired a master's degree in chemical engineering, a Ph.D in physical chemistry, and the title of docent in physical chemistry from the Royal Institute of Technology, Stockholm, Sweden. He is

currently a professor emeritus of physical chemistry in the Department of Chemistry and Molecular Biology at the University of Gothenburg, Sweden. His previous appointments include roles in various academic and research capacities at the University of Gothenburg, Sweden; Australian National University, Canberra; Royal Institute of Technology, Stockholm, Sweden; Massachusetts Institute of Technology, Cambridge, USA; and Harvard Medical School, Boston, USA. He was awarded the 2004 Pedagogical Prize from the University of Gothenburg, Sweden, and the 2007 Norblad-Ekstrand Medal from the Swedish Chemical Society. Professor Kjellander's field of research is statistical mechanics, in particular liquid state theory.

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