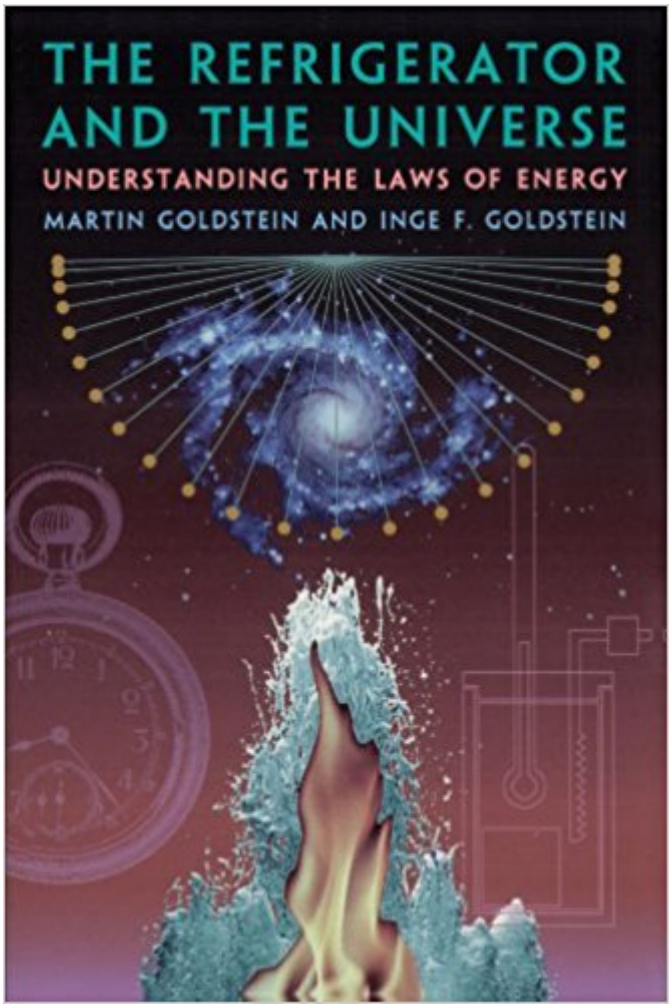
The Refrigerator And The Universe: Understanding The Laws Of Energy



Synopsis

C. P. Snow once remarked that not knowing the second law of thermodynamics is like never having read Shakespeare. Yet, while many people grasp the first law of energy, "Energy can neither be created nor destroyed," few recognize the second, "Entropy can only increase." What is entropy anyway, and why must it increase? Whether we want to know how a device as simple as a refrigerator works or understand the fate of the universe, we must start with the concepts of energy and entropy.In The Refrigerator and the Universe, Martin and Inge Goldstein explain the laws of thermodynamics for science buffs and neophytes alike. They begin with a lively presentation of the historical development of thermodynamics. The authors then show how the laws follow from the atomic theory of matter and give examples of their applicability to such diverse phenomena as the radiation of light from hot bodies, the formation of diamonds from graphite, how the blood carries oxygen, and the history of the earth. The laws of energy, the Goldsteins conclude, have something to say about everything, even if they do not tell us everything about anything.In The Refrigerator and the Universe, Martin and Inge Goldstein explain the laws of thermodynamics for science buffs and neophytes alike. They begin with a lively presentation of the historical development of thermodynamics. The authors then show how the laws follow from the atomic theory of matter and give examples of their applicability to such diverse phenomena as the radiation of light from hot bodies, the formation of diamonds from graphite, how the blood carries oxygen, and the history of the earth. The laws of energy, the Goldsteins conclude, have something to say about everything, even if they do not tell us everything about anything.

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Customer Reviews

Readers at all levels, from high school to professional scientists, will find something intriguing in this book...It provides a very readable and informative account of a difficult topic. (Science Books and Films)The strengths of [this book] are its scope and coverage and much excellent writing...It contains a rich mix of interesting ideas covering important historical events and applications of the laws of energy and entropy. (Harvey S. Leff American Journal of Physics)The writing is clear, uncluttered, insightful, and makes use of many excellent analogies to explain and clarify difficult but important concepts. (Choice)

C.P. Snow once remarked that not knowing the second law of thermodynamics is like never having read Shakespeare. Yet, while many people grasp the first law of energy, 'Energy can neither be created nor destroyed, ' few recognize the second, 'Entropy can only increase.'

I have owned the hard-cover edition since its publication. This paperback one was for a gift (to a precocious high-school junior).One simply cannot do meaningful work in physics, chemistry, biology, engineering without a solid grasp of thermodynamics. Some thermodynamic topics are intuitively very difficult for students. This is the book to take a science student, high-school or college, into and through several essential topics, making formal classroom work much easier.No, this is not a book just for science students. It's an excellent refresher for us older hands, as well. And a downright pleasant and lively read.

Great!!!

Great explanation of entropy for the scientifically literate reader. Still, there were some things that I am still quite hazy about, like the concept of reversability. That is probably unavoidable unless one works out exercises, textbook style, and this is assuredly not a textbook. The explanation of the parallel between physical entropy and information entropy was mind-blowing. Numerous historical notes add flavor to the explanations. The later chapters cover a potpourri of grand topics like the age of the earth, why life can exist, quantum mechanics, and relativity. The idea was to address these topics from the standpoint of entropy. The authors tried to do that, although it's a bit of a stretch at times, but it doesn't matter - they cover these topics wonderfully, probably communicating as much about each of them as one chapter for each can possibly do, and very readably. This was one of my favorite reads. One caveat - I think this book would be a bit over the head of someone

who hasn’t had a math course since high school.

What an amazing journey reading this wonderful book has been for me! The authors have written a sweeping exposition of the science of thermodynamics including its development from the earliest thinkers on the subject, through the discovery of its laws, on to the applicability of these laws to various fields such as chemistry, biology and geology. Finally, they discuss the perseverance of these laws when confronted with quantum mechanics, relativity and the entire universe.The authors’ approach is to focus on concepts and principles and their development and meaning rather than mathematical rigour. Since mathematics is kept to a bare minimum, this book could be a very valuable complement to any of the usual (much more mathematical) courses on thermodynamics.The writing style is very clear, friendly, lively, accessible and quite captivating. The authors are not stingy with words and, consequently, they thoroughly explain the various ideas presented along with plenty of useful examples. In addition to students of thermodynamics, those most likely to thoroughly enjoy this book are science buffs, especially those, like me, who have a particular love and fascination for thermodynamics and the laws of energy.

Quite a few good to excellent pop science books have been published since this volume was released in 1995. After close to a score of years the Goldsteins’ book still stands for this reader as one of the most rewarding. For one thing, the authors are serious about getting historical detail right. They write fluently, but there is a clear expectation that the details of the intellectual adventure, not merely fun but peripheral anecdotes, are what will engage and sustain your interest. For those not already well versed in thermodynamics, the book will require closer attention than some other very good books on overlapping topics such as Boltzmann’s Atom by David Lindley. The payoff from the Goldsteins’ book is, however, exceptional. As with John Derbyshire’s Prime Obsession, when you finish this book, you will have much of an insider’s understanding of an important but difficult subject (up through the early 1990s), even if you knew little or nothing about it going in. Highly recommended.

The book presents the three laws of thermodynamics: the first law (conservation of energy)in chapters 1-4, the second law (dispersal of energy) in chapters 5-9, and the third law (low temperature behavior) in chapter 14. Other chapters apply thermodynamics to light, chemistry, biology, geology, and cosmology. The authors present thermodynamics using both classical and statistical mechanical arguments. References are listed for further study of topics. Although the

book is intended for a general audience, the book will be interesting even to a reader who already has some familiarity with thermodynamics because the book probably treats at least a few applications with which he is unfamiliar. The book also makes a number of refreshing admissions about the limits of thermodynamics; for example, thermodynamics can't be strictly applied to living organisms (p. 297), and in general relativity, energy need not be conserved (p. 370). The book requires a knowledge of simple algebra and logarithms; however, a tutorial on these subjects is presented in an appendix.

Cathedral