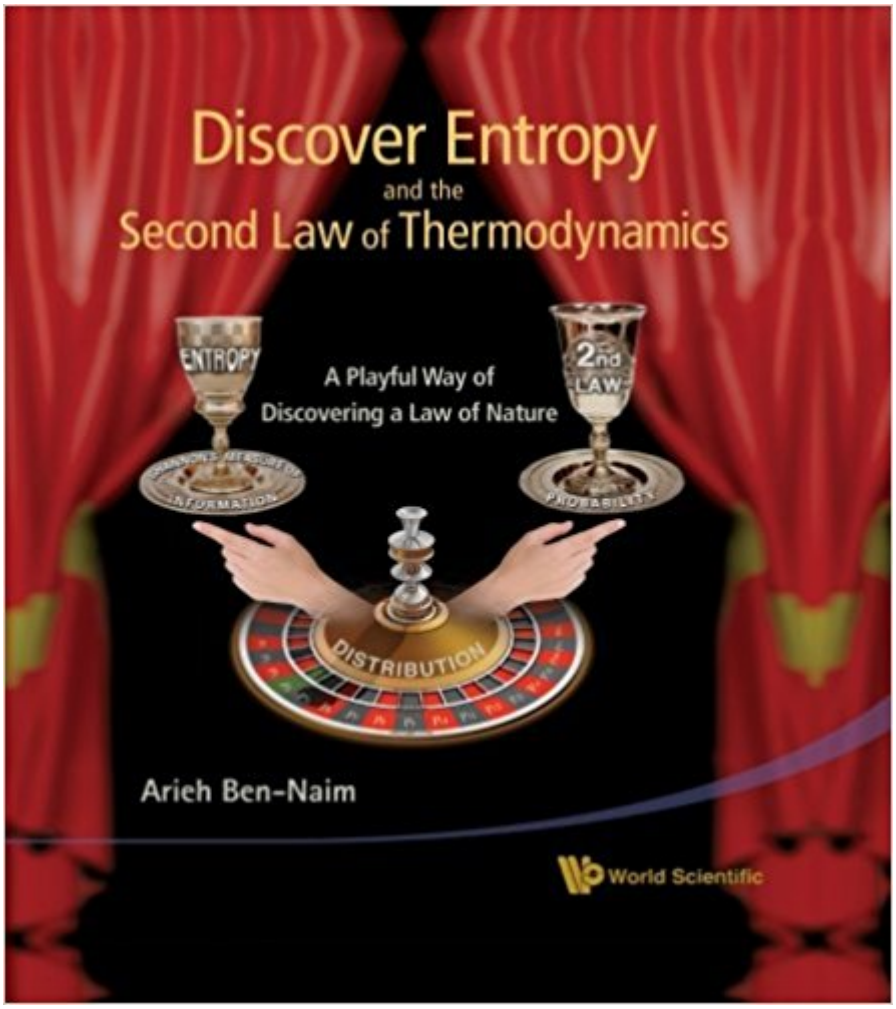
Discover Entropy And The Second Law Of Thermodynamics: A Playful Way Of Discovering A Law Of Nature



Synopsis

This is a sequel to the author’s book entitled “Entropy Demystified” (Published by World Scientific, 2007). The aim is essentially the same as that of the previous book by the author: to present Entropy and the Second Law as simple, meaningful and comprehensible concepts. In addition, this book presents a series of “experiments” which are designed to help the reader discover entropy and the Second Law. While doing the experiments, the reader will encounter three most fundamental probability distributions featuring in Physics: the Uniform, the Boltzmann and the Maxwell–Boltzmann distributions. In addition, the concepts of entropy and the Second Law will emerge naturally from these experiments without a tinge of mystery. These concepts are explained with the help of a few familiar ideas of probability and information theory. The main “value” of the book is to introduce entropy and the Second Law in simple language which renders it accessible to any reader who can read and is curious about the basic laws of nature. The book is addressed to anyone interested in science and in understanding natural phenomenon. It will afford the reader the opportunity to discover one of the most fundamental laws of physics - a law that has resisted complete understanding for over a century. The book is also designed to be enjoyable. There is no other book of its kind (except “Entropy Demystified” by the same author) that offers the reader a unique opportunity to discover one of the most profound laws - sometimes viewed as a mysterious - while comfortably playing with familiar games. There are no pre-requisites expected from the readers; all that the reader is expected to do is to follow the experiments or imagine doing the experiments and reach the inevitable conclusions.

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Customer Reviews

This is a sequel to the author’s book entitled "Entropy Demystified." The aim is essentially the same as that of the previous book by the author: to present Entropy and the Second Law as simple, meaningful and comprehensible concepts. In addition, this book presents a series of "experiments" which are designed to help the reader discover entropy and the Second Law. While doing the experiments, the reader will encounter no unexpected results, and concepts of entropy and the Second Law will emerge naturally from these experiments without a tinge of mystery. These concepts are explained with the help of a few familiar ideas of probability and a 20-question game. The main "value" of the book is to introduce entropy and the Second Law in simple language which renders it accessible to any reader who can read and is curious about the basic laws of nature. The book is addressed to anyone interested in science and in understanding natural phenomenon. It will give the reader the opportunity to discover one of the most fundamental laws of physics a law that has resisted complete understanding for over a century. The book is also designed to be enjoyable. There is no other book of its kind (except "Entropy Demystified" by the same author) that offers the reader a unique opportunity to discover one of the most profound laws sometimes viewed as a mysterious law without the tinge mystery. There are no pre-requisites expected of the readers; all that the reader is expected to do is to follow the experiments or imagine doing the experiments and reach the inevitable conclusions.

I have two views on this excellent book (or envision two uses of it, if you wish). I put them down separately below, for a general reader and for a physical chemistry teacher:1. A note for a reader interested in understanding of the key principle of nature in the most efficient way----------This book helps you approach the most confusing (and misinterpreted) concepts in thermodynamics: entropy and the Second Law. The author designed a series of simulation-games, which are easy to picture or actually reproduce to observe results (the website also has simulations to view). The results lead you to building your own feel for why spontaneous changes occur in systems with many particles. You, generally, do not need math to find that out--only enough imagination.As I just mentioned, this book is not giving you a mathematical route to definitions of Second Law and entropy but, rather, helps you harness your common sense for this task. Indeed, everything what we see around and know obeys the Second

Law. This book helps you to use your natural, observer's knowledge for what the law of spontaneous change is to grasp its details, presented in an easy context of games of marbles. In a later section the author translates the "language of marbles" into terms of physics and thermodynamics.This book is very much like a real scientific study the author guides the reader through. If you are looking for entertainment book or an accessible general-overview text, this a wrong book to pick. To fully experience a joy of discovery of the most fundamental principle in Nature you will have to use some patience to sit through all exercises (games) designed by the author. There are no statements like "trivial to show"--the author truly leads you step-by-step and you never lose feeling that this journey is all still "under your control".Most important feeling I had after I was done with these exercises: no more fog or mystery is left around the concept of entropy and its meaning for me.2. A note for a teacher of Physical Chemistry----------I would like to mention one important application of the approach presented in this book. I am teaching a Physical Chemistry class for Biology majors. The thermodynamics and, specifically, entropy are the most confusing parts for my students. They generally try to "endure" this discussion, learn to reproduce the relationships for the exam--only to happily forget them as soon as they can afterwards. In my opinion, this is because all thermodynamics is taught in a historical prospective, asking a student to follow its 400-year-long track. This is natural but not the most productive way of teaching this important science. Modern students are already accustomed to thinking that the matter is atomistic, they have general sense of what probability and information is. Why don't we use this background to advantage of their learning?The author of this book designed an easy-to-follow scheme of delivering the ideas of spontaneous change leading to formulation of the Second Law. The entropy comes as an application of Shannon's Measure of Information to thermodynamics of atomistic matter. I believe, this type of discussion coupled with Maxwell's kinetic theory of gases should precede topics of thermodynamics. This is what I am trying to implement in my own teaching.

As a Chemical Engineer, I've always had a difficult time fully understanding the concept of entropy. I was taught this concept from the Classical Thermodynamics point of view and learned how to effectively use it to solve problems associated with, for example, chemical reaction and phase equilibria. However, I never really understood what I was doing from a molecular standpoint. Hence my resulting excitement at reading this wonderful book.Inspired by the work of Claude Shannon, Arieh Ben-Naim created a set of very clever computer simulations involving marbles and boxes to visually demonstrate - - - very good and colorful figures, by the way - - - the link between Information

Theory and the 2nd Law of Thermodynamics. Especially instructive to me was seeing how the Maxwell-Boltzmann Distribution easily evolves from this simple and yet very powerful approach. Ben-Naim's patience is carefully walking me, the reader, through this demonstration and also through a discussion about how these results relate to the 2nd Law, including a visually-enhanced discussion of how the slope of the entropy-energy curve corresponds to inverse-temperature as per Clausius' equation dS = dQ/T, was very much welcomed.I highly recommend this book to anyone wanting to truly understand what entropy really is.

It has been known in some quarters that "elementary" does not mean "easy".Professor Ben-Naim now demonstrates that "playful" does not mean "easy" either. I do want to commend Ben-Naim for putting a quantitative concept of information and elements of Shannon's theory to the fore in a teaching text - to my mind, there cannot be too much of this. In this respect chapters 1 through 6 of the book are extremely welcome.Elementary mathematical representations of physical and chemical processes are aptly given and discussed along the way.In spite of Ben-Naim's intentions, however, you cannot proceed from "information" to "physical entropy" in this book without previously being acquainted with the latter. In this sense you do not "discover" entropy and the second law. You do learn about the use of elementary information theory as a tool for reasoning and theorizing, about the approach to statistical equilibrium, about statistical fluctuations. Ben-Naim's book is not a sequentially spun tale, it is uncomfortable to read at times. In the spirit of engineering Ben-Naim relies heavily on repetition and redundancy.Unfortunately a number of mistakes and errata have survived the edition of the book which will not be detailed. However, one serious mistake in section 7.3.5, page 211, must be mentioned: in the relevant paragraph Ben-Naim attempts to improve on Gibbs while contradicting his own numerous references to and discussion of statistical fluctuations. It looks as if an unwarranted afterthought was hastily inserted into the text.A carefully revised second edition of this book will certainly be quite valuable to high-school teachers, beginning college students and ambitious students generally, both science and non-science, at any age. A thoroughly revised edition might also improve language and, perhaps, remove the word "playful" from the title. It does not seem helpful at all. It is just a word, but if Shannon was ever right, words are everything.I found the price too steep. It may not be so to people making 10 dollars an hour, but that is not the average rate on planet Earth at all. Cheaper paper and a cheaper binding will not detract from the learning value of this book.Bitching aside, I am glad to have this book on my shelves.

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Nature Entropy - God’s Dice Game: The book describes the historical evolution of the understanding of entropy, alongside biographies of the scientists who ... communication theory, economy, and sociology Non-equilibrium Thermodynamics and the Production of Entropy: Life, Earth, and Beyond (Understanding Complex Systems) A History of Thermodynamics: The Doctrine of Energy and Entropy Simulation with Entropy in Engineering Thermodynamics: Understanding Matter and Systems with Bondgraphs Engines, Energy and Entropy: A Thermodynamics Primer Discover Nature Close to Home: Things to Know and Things to Do (Discover Nature Series) Discover Nature in Water & Wetlands: Things to Know and Things to Do (Discover Nature Series) Thermodynamics, Kinetic Theory, and Statistical Thermodynamics (3rd Edition) Thermodynamics, Statistical Thermodynamics, & Kinetics (3rd Edition) Entropy and the Second Law: Interpretation and Misss-Interpretations Entropy and the Second Law: Interpretation and Misss-Interpretationsss Entropy Demystified: The Second Law Reduced to Plain Common Sense Discovering Thermodynamics (Scientist’s Guide to Physics) Knit the Sky: Cultivate Your Creativity with a Playful Way of Knitting Keeping a Nature Journal: Discover a Whole New Way of Seeing the World Around You Georgia Nature Weekends: 52 Adventures in Nature (Nature Weekend Series) Driving and Discovering Hawaii: Oahu, Honolulu and Waikiki (Driving and Discovering Books) Molecular Driving Forces: Statistical Thermodynamics in Biology, Chemistry, Physics, and Nanoscience, Second Edition Discovering Wine: A Refreshingly Unfussy Beginner’s Guide to Finding, Tasting, Judging, Storing, Serving, Cellaring, and, Most of All, Discovering Wine