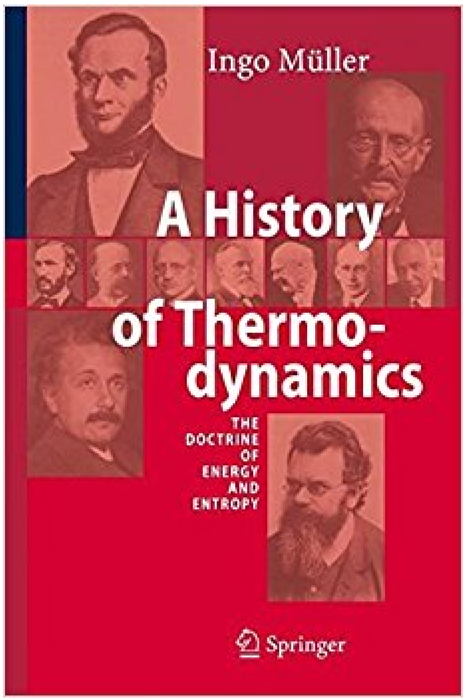
A History Of Thermodynamics: The Doctrine Of Energy And Entropy



Synopsis

This book offers an easy to read, all-embracing history of thermodynamics. It describes the long development of thermodynamics, from the misunderstood and misinterpreted to the conceptually simple and extremely useful theory that we know today. Coverage identifies not only the famous physicists who developed the field, but also engineers and scientists from other disciplines who helped in the development and spread of thermodynamics as well.

Book Information

Hardcover: 320 pages
Publisher: Springer; 2007 edition (March 22, 2007)
Language: English
ISBN-10: 3540462260
ISBN-13: 978-3540462262
Product Dimensions: 6.1 x 0.8 x 9.2 inches
Shipping Weight: 1.3 pounds (View shipping rates and policies)
Average Customer Review: 3.7 out of 5 stars 3 customer reviews
Best Sellers Rank: #3,028,939 in Books (See Top 100 in Books) #71 inÃ Â Books > Science & Math > Physics > Entropy #1161 inÃ Â Books > Science & Math > Physics > Dynamics > Thermodynamics #2386 inÃ Â Books > Textbooks > Science & Mathematics > Mechanics

Customer Reviews

From the reviews: "MÃƒÂ ller Ã¢â ¬Â¦ summarizes the historical development of thermodynamic concepts, going into great depth to detail how certain discoveries were interconnected and how numerous researchers developed these theories based on current available knowledge. Ã¢â ¬Â¦ Readers will appreciate how researchers in the 19th century had to develop basic concepts Ã¢â ¬Â¦ . Summing Up: Recommended. Upper-division undergraduates through professionals." (H. Giesche, CHOICE, Vol. 45 (2), 2007) "An exhaustive history and presentation of current state of research in the subject of thermodynamics. Ã¢â ¬Â¦ This book is too good Ã¢â ¬Â¦ . The author is an important leader in this field, with most impressive record of research publications. This is a great book, which should be in the library of any scientist interested in thermodynamics. It is easy to read Ã¢â ¬Â¦ . It contains a lot of information about thermodynamics, certainly the history, and biographies of prominent creators of our knowledge." (Vadim Komkov, Zentralblatt MATH, Vol. 1131 (9), 2008)

The development of thermodynamics in the second half of the 19th century has had a strong impact on both technology and natural philosophy. It is true that the steam engine for the conversion of heat into work existed before thermodynamics was developed as a branch of physics. However, the systematic theory improved the conversion process, and it succeeded in developing other processes essential to modern life, notably refrigeration and rectification. So, altogether thermodynamics has provided humanity with cheap energy, and cheap fuel, -- consequently with cheap, and abundant, and unspoiled food. Thus thermodynamics has made populations grow, and life expectancy increase beyond anything people could possibly have imagined 200 years ago. At the same time thermodynamics has uncovered the precarious balance between determinism and stochasticity which is essential to processes on earth, including life. The competition of those intentions is described by the doctrine of energy and entropy in thermodynamics; energy tends to force a system into one single state, and entropy tends to spread the system evenly over all possible states. These competing tendencies are weighted by temperature such that minimal energy determines cold systems. The knowledge gained by thermodynamic research led to quantum mechanics, whose rules become predominant at low temperatures, and to stellar physics, where temperature is high enough to make relativity theory essential. The expansion of thermodynamic technology and natural philosophy is reviewed in the book along with the struggles and fates of some of the engineers and physicists who pioneered the development.

Although, I have not yet finished reading the book (I'm on hold in chapter six, presently, while I finish other projects), I hate to see a two-star review sit on such an excellent book. As far as I know (with over 180+ thermodynamics books in my personal collection):[...]%27+thermodynamics+book+collectionaside from books such as Tait's 1868 Sketch of Thermodynamics, Truesdell's 1980 The Tragicomical History of Thermodynamics (1822-1854), or Cardwell's 1989 From Watt to Clausius: the Rise of Thermodynamics in the Early Industrial Age, and the new 2007 book Heat and Thermodynamics: A Historical Perspective by Christopher Lewis, there has never been a full-length book on the history of thermodynamics. With this in mind, MÃƒÂ ller does a very good job in this endeavor. This sort of book is long overdue. The only down point that I will make is that he does quote Asimov a bit too many times; the novice reader will come away with the idea that Isaac Asimov is a famous thermodynamicist. Anyone interested in thermodynamics will enjoy reading this book.

Had this book been marketed as, say, "an august scientist's rambling [or 'delightful', as publishers say] and highly personal musings on the history of his field," and had it been given a more poetic title, an innocent reader would have been able to approach it with due caution. However, it was not, and I took the title at face value.Judging the book by that standard, it's a self-indulgent and amateurish scientific history. The author, Prof. Dr. rer. nat. Dr. h.c. Ingo Mueller (IM), a physicist and emeritus professor at the Technical University of Berlin, either grossly underestimated what's involved in professional historical scholarship, or was too delighted with his own opinions to care.On the plus side, the book includes coverage of 20th Century topics like irreversible processes (IrrP) and relativistic thermodynamics, whereas many histories of thermodynamics (TD) end sometime around 1905-ish or sooner. (However, coverage of these topics, while broad, is not deep.) IM also shows a sensitivity to the pragmatic aspects of measuring TD quantities. The discussion of the "kinetic theory of rubber" (@111-117) was one of the most lucid and interesting passages of the book.If you re-set your expectations along the lines of my imagined blurb, you may find the rest of my comments to be mitigated in whole or in part. But if you're considering this book because your interest is history of physics, here's an abbreviated list of reasons I feel I paid *way* more than this book was worth.A. TONE: There's a tension in this book between (i) writing history and (ii) simply using history as a roadmap for the sequence of topics, which are discussed with modern concepts and notation. IM isn't consistent about these, though he tends to (ii). IM has written a textbook called "Basic Principles of Thermodynamics, with Historical Notes" (in German). I suspect that many problems with the present book stem from underestimating the difficulties of porting content from the textbook to this one.Sometimes IM calls his anachronisms to the reader's attention and apologizes, e.g., for using Boltzmann's constant in the 19th Century version of the ideal gas law (law of Mariotte and Gay-Lussac) (@5n.9). Other times, though, this is sprung unannounced on the unsuspecting reader. See, e.g. the presentation of Maxwell's laws in tensor notation and using the Einstein summation convention @32 (OK, maybe pretty obvious) and the presentation of Bolztmann's 1868 paper @92 in terms of a function G(E) (not obvious unless you check the paper). There are also several anachronistic references to concepts, such as state functions. If you're interested in the history of ideas, this is quite irritating -- it's like reading Shakespeare in modern English.B. HISTORY & SOURCES:1. Treatment of individual scientists is very inconsistent. About some we hear little more than some anecdotes (e.g. Landau, @ 183-185, and Prigogine, of whom more later), some are mentioned only as a name attached to an equation (e.g., Langevin, @ 279), and others are discussed in more depth and with some balance between equation and anecdote. Many others are missing completely, e.g.: we hear about Bose but not Fermi or Dirac; Chandrasekhar (apropos of relativistic TD), but not Beckenstein, Penrose or Hawking; Shannon but not Landauer or Bennett; in a discussion of "what is life", Schroedinger but not S. Kauffman. Callen and R. Stirling (of Stirling engine fame) are also among the missing. (Nor are we ever told who first called the First Law the "First Law".)2. IM relies on a very narrow and questionable range of sources. Chapter 1 relies almost exclusively on a book by W..K. Middleton. Biographical information about Maxwell comes from an article in the German edition of Scientific American, notwithstanding the appearance of Mahon’s full-length biography of Maxwell (2004) more than a year before IM finished writing (July 2006). IM even back-translates Maxwell’s words from the article’s German into English, instead of bothering to find Maxwell’s English original (@31).3. The principal source of historical information is, I kid you not, the "Biographical Encyclopedia of Science and Technology" by the late Isaac Asimov. Asimov appears on more pages than Carnot, Onsager and many others. IM even sometimes quotes Asimov verbatim, e.g. for such gems of prose as "The country was deforested and what trees remained were needed for the navy and could not be used for fuel." (@48). I’d have been ashamed to cite Asimov’s reference works (which are mostly tertiary, not even secondary sources) even when I was in high school; I guess when you’re a Prof. Dr. rer. nat. Dr. h.c. you transcend shame.4. IM’s laziness about sources extends to the scientific substance of the book. E.g., he claims never to have been able to find original versions of Einstein’s papers in the Annalen der Physik, since they were always stolen (@39n.70). However, the complete contents of Annalen der Physik have been available in digitized form on the website of the Bibliotheque Nationale de France since before July 2006. Apropos of which see immediately below.5. A particularly egregious case is a text box (Insert 3.5) entitled "Clausius’s derivation of the second law", purportedly based on Clausius’s 1865 paper in Annalen der Physik 125, 353 in which he coined the word ’entropy’. Among other points, IM mentions that Clausius decomposed an arbitrary cycle into Carnot cycles with infinitesimal isothermal steps; IM also reproduces an engraved P-V diagram (Fig. 3.10), captioned "Smooth cycle decomposed into narrow Carnot cycles" (@67).I downloaded Clausius’s paper from the BNF website and read it, since I was curious whether he used the phrase "Carnot cycles". Aside from never using that phrase (though he does mention a "Kreisprocess" (cyclic process), a more general term), he does not decompose a Kreisprocess into lots of narrow ones. Toward the end of the paper he does make the dubious claim that when a body is put through a series of transformations resulting in the end state being different from the initial state, you can put it through more transformations to bring it back to its original state, Annalen 125 @396-397, but this isn’t what IM is discussing. Moreover, **there isn’t a single diagram in Clausius’s paper**.So what is the source? According to _PrÃƒÂ©histoire & histoire de la thermodynamique classique _ by R. Locqueneux (1996), the decomposition of a cyclic process into a series of infinitesimal Carnot cycles was taught by E. Verdet in his course on the theory of heat at the Sorbonne in 1863-64 (PrÃƒÂ©histoire @285).

(This pre-dates Clausius's paper, BTW.) Locqueneux also reproduces our -- or I should say Verdet's -- diagram. Verdet, of course, is never mentioned in IM's book.It looks like IM was working from some secondary source, not Clausius. Nor do I expect that source was Locqueneux, which is way more meticulous than IM's usual references. IM doesn't clue us in with a footnote. But whatever he was referring to, how could he claim that he was presenting Clausius's own derivation? I utterly lost confidence in the book from this point.C. ATTITUDE1. Though IM accuses Shannon and von Neumann of being "intellectual snobs" for the facetious way in which they introduced the word "entropy" into information theory (@ 124), he's no slouch in that department himself. E.g., of Maxwell's demon (MD): it is "much discussed, primarily, I suspect, because it can happily be talked about by people who do not possess the slightest knowledge of mathematics .... Enough of that! Brush [n.61] recommends an article by Klein [n. 62] for the readers who want to familiarize themselves with _the voluminous secondary literature on Maxwell's demon_ [emphasis in IM's original]. But we shall leave the subject as quickly as possible. It has a touch of banality. We might just as well go into some belly-aching over a demon that could improve our chances in a game." (@108).Not only could IM not be troubled to reference Klein's article directly, he also rather selectively read Leff & Rex's anthology on MD, which he cited for his Shannon anecdote (@124n.91). Or I suppose Szilard, Zurek, Bennett, Landauer & al. lack "the slightest knowledge of mathematics" compared to IM?2. Despite a long chapter about IrrP, we hear nothing about the theories of Prigogine (chemistry Nobel 1976), even to be disputed. Prigogine appears only twice. First he is made to look like a buffoon in an anecdote IM relates about an argument between Prigogine and Tiszla (@ 123). Second, he is blamed for stealing the limelight from C. Eckert, by publishing a "very similar" theory after Eckert (@ 246). Onsager (chemistry Nobel 1968), too, while discussed at some length in a few chapters, is disparaged both for his theories and his Norwegian accent (see e.g.@ 282-283).3. Other targets of IM's spleen (partial list): religion (e.g., @79, 92, 110); philosophers (see esp. the incoherent disparagement of K. Popper and the rest of the Vienna School, "a niche for philosophers belly-aching about truth in the laws of natural science" @ 77, and also @108-110); George W. Bush and the current Pope (@ 110n.68); sociologists (@ 164, for not appreciating the ideas of "socio-thermodynamics," one of IM's pet inventions; and physicist (and Nobelist) Charles Townes, who is referred to as an anonymous "electrical engineer" @ 213. Na, und wer sind Sie denn, Herr Prof. Dr. Dr. h.c.? [roughly: And you are...?]4. IM's disrespect extends to the reader, whose time is wasted by pointless multi-page digressions on (i) "E=mc2" (@35-44; IM never connects this to the development of thermodynamics, and also avers of the twin paradox "That is a genuine paradox, if ever there was one" (@40), before confessing in a footnote that he has "been told" it can be resolved by considering accelerations) and (ii) IM's 2006 paper on "socio-thermodynamics" (@159-164; aside from it being a bit too soon to judge this paper's place in history, IM is apparently unaware that the dominant theory of economics in the Western world has already been applying the TD metaphor to society for >100 years, q.v. A. Marshall, P. Samuelson, P. Mirowski and many others.).I don't have space to detail copious examples of bad editing (e.g. text box about Kelvin scale of temperature in Chapter 3 instead of Chapter 1, and inconsistent segregation of math into text boxes); typos in English; misspellings and Germanisms in Greek; chunks of untranslated French; and other elisions of Nobel laureates (e.g. J. Bardeen and F. Sanger @319n14). That the book lacks both a subject index and an integrated bibliography is shameful for the price. Please note that 's display of 3 stars is a glitch: actual computation is 1 star off for items A, at least 1.5 off for items B, and 1 more star off for the rest and the excessive price, for an upper bound of 1.5 stars.

I'm reading through this book now and finding it both entertaining and in the best sense scientifically provocative. The book is more than a history, though history is its main aim. It is also a polemic and is occasionally irreverent. As opposed to most histories of science written by professional historians, this author is an eminent light within the field of which he writes. His numerous seminal contributions have advanced the discipline. Indeed, his history would not pass muster on several fronts when compared to the best work of historians. This is more than made up for by the breadth and depth of understanding the author brings to his task. His insights have given me a deeper understanding of this subject, and I find myself in sympathy with his many barbs, atypical for books of this type. Yes, Asimov is cited too frequently. And though some of his pot shots miss the mark, many more hit; the author has earned the right to speak his mind and prod some sacred cows, e.g. thermodynamics of irreversible processes (TIP). For instance in other work (see, Mueller and Weiss, 2005, Entropy and Energy: A Universal Competition, Springer), the authors puncture the principle of minimum entropy production with a simple example from heat conduction. (see also Barbera, 1999, On the principle of minimal entropy production for Navier-Stokes-Fourier fluids, Continuum Mechanics and Thermodynamics, 11(5): 327-330). Read this book if you want to shake up your thinking about thermodynamics. It may not be perfect, but it is useful.

A History of Thermodynamics: The Doctrine of Energy and Entropy Engines, Energy and Entropy: A Thermodynamics Primer 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) Discover Entropy and the Second Law of Thermodynamics: A Playful Way of Discovering a Law of Nature Simulation with Entropy in Engineering Thermodynamics: Understanding Matter and Systems with Bondgraphs Reiki: The Healing Energy of Reiki - BeginnerÃ¢â ¬â„¢s Guide for Reiki Energy and Spiritual Healing: Reiki: Easy and Simple Energy Healing Techniques Using the ... Energy Healing for Beginners Book 1) The Rule of Thoughts (Mortality Doctrine, Book Two) (The Mortality Doctrine) The Doctrine of Human Beings & Sin (NGIM Guide to Bible Doctrine Book 6) The Doctrine of Creation (NGIM Guide to Bible Doctrine Book 4) Thermodynamics, Kinetic Theory, and Statistical Thermodynamics (3rd Edition) Thermodynamics, Statistical Thermodynamics, & Kinetics (3rd Edition) Entropy and Energy: A Universal Competition (Interaction of Mechanics and Mathematics) Thermal Physics: Energy and Entropy World History, Ancient History, Asian History, United States History, European History, Russian History, Indian History, African History. (world history) The Briefest History of Time: The History of Histories of Time and the Misconstrued Association between Entropy and Time Energy Harvesting: Solar, Wind, and Ocean Energy Conversion Systems (Energy, Power Electronics, and Machines) Renewable Energy Made Easy: Free Energy from Solar, Wind, Hydropower, and Other Alternative Energy Sources Crystals: The Ultimate Guide To: Energy Fields, Auras, Chakras and Emotional Healing (Aura, Healing Stones, Crystal Energy, Crystal Healing, Energy Fields, Emotional Healing, Gemstone) Maximum Entropy and Ecology: A Theory of Abundance, Distribution, and Energetics (Oxford Series in Ecology and Evolution)