he and Rose would have a long and happy marriage, although Anna almost wrecked that marriage, too, when she came to live with them from October 1939 to January 1941.

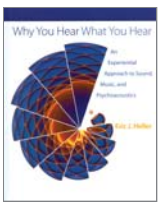
The book's main narrative ends in late 1939. By then the discovery of nuclear fission had opened the door to the atomic age, to which Bethe subsequently made crucial contributions at both Los Alamos and Cornell. It is urgent that Schweber arrange to complete a concluding volume of this biography; that promises to be as fascinating and as important as the first.

Why You Hear What You Hear

An Experiential Approach to Sound, Music, and Psychoacoustics

Eric J. Heller
Princeton U. Press, Princeton, NJ, 2013. $99.50 (624 pp.).
ISBN 978-0-691-14859-5

There's a good reason Harvard University's Eric Heller titled his book *Why You Hear What You Hear: An Experiential Approach to Sound, Music, and Psychoacoustics*. He hopes the reader will learn from doing. Much of those three areas of acoustics can be experienced via the ears or can be shown in animations, which can often make those topics accessible to students without much math or physics background. Consequently, the book frequently directs readers to its extensive supporting website, http://www.whyyouhearwhatyouhear.com. For several decades now, books on acoustics have been supplemented with sound recordings, and the use of the Web is an important next step. This book's website contains suggestions on using a variety of readily available software for sound analysis and synthesis and for creating wave-behavior animations. It also links to many other animations and sound media.



Heller's combined topic order is somewhat unusual. For that reason, *Why You Hear What You Hear* tells you "how to use this book": Because of the extensive cross-referencing, readers are encouraged to abandon the traditional linear approach and to navigate to chapters—and also to the website—according to interest and need.

The book grew from a course called The Physics of Music and Sound that Heller taught at Harvard, first as a core curriculum course in physics, and later as a general education course. For non-physics majors taking music or any of the many other courses that involve sound, this book is a fresh alternative to some other texts. It's also deeper than most. However, for the nonspecialist audience, depth might not always be an advantage.

The first 15 of the book's 28 chapters develop the science of acoustics in logical and often novel ways. They're followed by five chapters on musical instruments and the voice; six on psychoacoustics, with an emphasis on pitch perception and consonance; one on room acoustics; and another on outdoor sound. For some humanities students, the book's equations and some serious physics discussion may trigger an allergic reaction. However, derivations for equations relating to topics such as the exponential horn or Sabine's reverberation are often sequestered in colored boxes, an organization that indicates to readers with a distaste for that aspect of physics that they can get by without those sections.

Why You Hear What You Hear also has much to interest physicists and physics students. As with many other excellent acousticians, Heller's primary specialty is not acoustics—his other research areas include chemical physics, surface waves, and quantum scattering. In general, a good physicist can bring novel insights to a new field and an understanding of the standard approach. This book contains a lot of physical insight, and I think it will be the rare acoustician who does not enjoy reading it. I particularly liked the use of color coding to introduce (with a minimum of math) a graphical algorithm to represent autocorrelation. Also interesting are the author's diversions into history, including a story in which John William Strutt (Lord Rayleigh) and William Henry Bragg seem to have been mistaken about an echo transposed in pitch.

I enjoy and applaud the book's experiential approach, although the experimentalist in me would like to have seen more suggestions for experiments that go beyond the computer keyboard. Also, I should declare a bias. Instead of writing a book, I publish educational acoustics material extensively on the Web, precisely because it's so easy to include sound files and other resources.

The successful integration of the associated website invites the question: Why not an entirely electronic or web-based package? One answer is that some discussions are long and have beautiful, still graphics; those work well as a book chapter. Another reason may be the business model: A pay wall would be unpopular on the Web, but in this case the hard-copy book could possibly subsidize an extensive website. Heller's experiment deserves to work.

The author specifically addresses musicians in the introduction. Many will read the book: Musicians are often passionate enough to undertake deep study of things related to their art and have usually accepted that excellence requires a significant investment of effort. I think, though, that quite a few sales will also be to people from the other end of the music–physics spectrum and beyond: Acousticians will enjoy its interesting perspectives, and physicists and engineers outside of acoustics will find it an attractive introduction to some important parts of the discipline.

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Extreme States of Matter in Strong Interaction Physics

An Introduction

Helmut Satz
Springer, New York, 2012. $59.95 paper (239 pp.). ISBN 978-3-642-23907-6

The statistical mechanics of systems with strongly interacting constituents has recently emerged as a focal point of interest in many areas of physics. Quarks and gluons take strongly interacting dynamics to the extreme; the interactions of those constituents are so strong that the particles could not exist in isolation.

Extreme States of Matter in Strong Interaction Physics: An Introduction offers a tempting invitation to explore the mysteries of quark–gluon matter. Written by Helmut Satz, a patriarch of statistical quantum chromodynamics (QCD), the book describes the physics of nuclear matter that is heated or compressed to extremes of temperature and density. After reading it, a young researcher will be equipped with the concepts and basic tools necessary to begin working in the field. For a seasoned physicist, the book will serve both as a trusted and valuable reference and as a source of inspiration: The author, who does not shy away from open and unsolved problems, offers deep insights and outlines possible future research directions.

The first chapter, a review of critical behavior in thermodynamics, uses the simplest spin system, the Ising model, as an explicit example. The next chapter touches on the geometric critical behavior that arises from the formation of clusters of diverging size, as described by percolation theory. Discussions of geometric critical behavior are not common in introductory textbooks on statistical mechanics. In his explanation of why the hadron resonance gas cannot exist beyond a certain temperature, Satz introduces the concepts of bootstrap and duality and makes a beautiful and unexpected connection to the integer partitioning problem.

Satz begins his discussion of the quark–gluon plasma with simple and intuitive arguments based on the bag model of confinement developed at MIT. He then introduces modern statistical QCD, its formulation on a Euclidean spacetime lattice, and the concepts of symmetry breaking and restoration. He also provides a comprehensive summary of what we know about QCD phase transitions based on first-principles lattice calculations.

Current experiments at the Relativistic Heavy Ion Collider at Brookhaven National Laboratory and at the Large Hadron Collider at CERN have provided detailed and precise information about the real-time dynamics of quark–gluon fireballs. Naturally, a description of the experimental probes of quark–gluon matter is a major ingredient of the book. An emphasis is put on the key "hard probes": electromagnetic radiation, jet quenching, and the suppression of heavy quarkonia, mesons comprising a quark and its antiquark. (The suppression was originally proposed by Satz and Tetsuo Matsui as a signature of deconfinement.)

The book's final chapter, which details the attempts to describe the rapid thermalization of quark–gluon matter produced in high-energy collisions, offers an intriguing analogy to the Hawking radiation of black holes. The pulse of a strong color field that accompanies the collision and the resulting acceleration of colored quarks and gluons leads to the formation of an event horizon, which in turn produces thermal radiation. A signal transmitted from inside a horizon cannot contain information and must thus be thermal. The idea is an interesting and provocative one that deserves further investigation.

Throughout the book, Satz emphasizes simple physical pictures and basic concepts, as opposed to technical details and formal derivations. In addition, the presentation is vivid and elegant; in particular, inspiring epigraphs stand out, including the fitting "But who are you, if you do not know that Phantasia has no limits?" taken from the book *The Neverending Story* (Puffin Books, 1997) by Michael Ende.

Inevitably, the book's shortcomings are counterparts of its strengths. Being compact in size, it leaves out some topics that have become a part of the modern theoretical toolbox—for example, hydrodynamics, transport, and the holographic correspondence. That means graduate students who are inspired by the book to become theorists will have to supplement it with more specialized manuscripts. Nonetheless, *Extreme States of Matter in Strong Interaction Physics* provides an insightful and succinct introduction into what has become an active area of research. I highly recommend it.

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