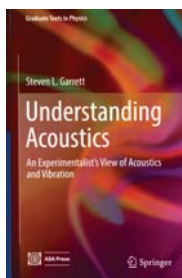


Understanding Acoustics

An Experimentalist's View of Acoustics and Vibration

Steven L. Garrett

Springer, 2017. \$129.00 (896 pp.). ISBN 978-3-319-49976-5



Steven Garrett's new book *Understanding Acoustics: An Experimentalist's View of Acoustics and Vibration* is a substantial, highly readable graduate textbook on sound and vibration. The title indicates that the book is written from an experimentalist's perspective, and it certainly has that feel. The author's experience studying sound, vibration, and related topics shines through. Nearly every page contains a new insight or anecdote. *Understanding Acoustics* bears similarities to the classic 1950 textbook *Fundamentals of Acoustics* by Lawrence Kinsler and Austin Frey, now in its fourth edition. Both works contain a mix of physical acoustics, electroacoustics, and subjective acoustics. However, Garrett's book is more coherent, accessible, and in my view, better.

Understanding Acoustics covers most of the essential material one would expect in a graduate textbook on acoustics and is liberally illustrated with high-quality diagrams and photographs. The book is divided roughly equally between vibration and acoustics and hardly mentions, for example, aero-, psycho-, and underwater acoustics. It also stops short of more advanced concepts such as Green's functions and the Helmholtz-Kirchhoff integral equations linking structural vibration to sound radiation. Surprisingly, there is also not much on signal processing and spectral-analysis methods, which are the bread and butter of all experimental acousticians.

On the positive side, the book contains much valuable material that is often missing from conventional texts on sound and vibration. Chapter 1, for example, is a survey of five important mathematical techniques: linearity, Fourier principles, dimensionless groups, forms of error, and least-squares estimation. These are tools for experienced researchers, yet they are rarely found together in a single text.

The book is written in a clear, uncluttered style. However, some, including myself, may be irritated by the occa-

sional lapse into idiosyncratic language, such as the title of the first chapter, "Comfort for the computationally crippled," or the sentences aimed at illustrating equilibrium: "Close your eyes, count to ten, and then open your eyes. Probably not much around you has changed." Those are relatively minor quibbles, however, about a book that is mostly formal in style.

Professors considering *Understanding Acoustics* for their courses may appreciate a quick overview of the book's contents. After the first chapter on mathematical techniques, Garrett covers the simple harmonic oscillator and wave propagation along a string. From there, he moves on to the elasticity of solids; modes in bars; and membranes, plates, and the response of condenser microphones—this last a somewhat unusual topic in a textbook. The general presentation of the material is very clear, although the types and mechanisms of structural damping appear not to be treated extensively. Chapter 7 deals with waves in fluids; it also covers energy-conservation equations. Chapter 8 discusses lumped element modelling, including information about using DeltaEC software to predict how a given thermoacoustic apparatus

will perform, and instructions for downloading and running the code. I found this to be the strangest inclusion in the book, and I'm not sure what purpose it serves. It interrupts the book's flow and could date it in a few years.

The book then moves on to dissipative hydrodynamics, which deals with loss mechanisms in fluids, and to the essential elements of one-dimensional wave propagation, including energy density, sound intensity, and impedance. Later chapters cover plane-wave transmission and reflection across a planar fluid interface, sound radiation and source models, sound fields in 3D enclosures, and sound attenuation in gases. Chapter 15 concludes the main text with a discussion of nonlinear acoustics.

The danger with a book of this size and ambition is that the central principles of sound and vibration will become lost in the sheer quantity of material. That comprehensiveness will not be an issue for graduate students and more experienced researchers, but could be daunting for those at the undergraduate level. However, Garrett has managed to cover his material in a fresh and easy-to-follow way. The quirky aspects could annoy some readers, but overall I really liked this book for its attention to detail, its readability, and the frequent asides and footnotes. I have been teaching acoustics to second-year undergraduate students for many years. *Understanding Acoustics* is now my recommended text.

Phillip Joseph

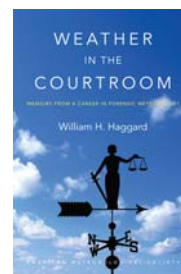
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Weather in the Courtroom

Memoirs from a Career in Forensic Meteorology

William H. Haggard

American Meteorological Society, 2016. \$30.00 paper (201 pp.). ISBN 978-1-940033-95-2



As a historian of US climate politics, I spend a lot of time documenting the activities and views of a large network of historical actors who sought to assess and respond to the hazards of climate change. Part of that work involves thinking about environmental law, so I was eager to review William Haggard's book *Weather in the Courtroom: Memoirs*

from a Career in Forensic Meteorology. A former director of NOAA's National Climatic Data Center, Haggard started the Climatological Consulting Corp in 1976 and has served for decades as a professional forensic meteorologist. *Weather in the Courtroom* is an informative account of 12 court cases in which he was called as an expert witness.

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**ALL APPLICATION
MATERIALS MUST BE
SUBMITTED ONLINE BY
CLOSE OF BUSINESS
ON JANUARY 15, 2018
(5:00 PM EST).**

BOOKS

Perhaps the most thought-provoking court cases Haggard discusses involve the delicate issue of whether a hazardous weather event constitutes, legally speaking, an "act of God." Meeting that standard means that a weather event was so unprecedented, unforeseeable, and overwhelming that it erased human error as legally relevant to an accident or disaster. In a nutshell: Could defendants have anticipated the factors that led to a given weather-related hazard and implemented procedures or safeguards to mitigate damages? Predictably, defendants often claim acts of God to absolve themselves of legal responsibility. Less predictable is how such tactics are translated into debates about, for example, the likelihood that a given bridge or roadway can withstand a 50- or 500-year storm. In those terms, guilt becomes a matter of defining risk, and the chaos that usually accompanies a disaster is boiled down to charts, statistics, and graphs.

Credibility is another interesting issue that Haggard explores in his book. What makes a good forensic meteorologist? How do trained meteorologists convince a jury and a judge that they are credible authorities on past meteorological conditions? Three factors were fundamental to Haggard's success, at least according to his account. First, he, his wife Martina Haggard, and his staff produced accessible and visual representations of atmospheric conditions, and they made sure the presentations were directly relevant to the case. Second, while on the stand, Haggard succeeded in convincing the jury that the data themselves were officially certified by relevant government agencies, which itself is a curious but underdeveloped side story of forensic meteorology. Third, and perhaps most importantly, Haggard was certified by the American Meteorological Society through a process that estab-

lished his "high ethical standards and technical competence."

Haggard's consulting work certainly leads to interesting questions about the role of meteorologists in contemporary society. But one of the drawbacks of his book is the cursory attention he pays to the business or competitive side of the forensic meteorology profession. The author occasionally alludes to the slow growth of his business, which is primarily based on word of mouth. He graciously acknowledges the artistic talents of his wife and the work of other colleagues who assisted him as he expanded his business during the 1980s and 1990s.

Even so, the reader is left with little understanding of the challenges and hurdles Haggard faced as he sought to bridge the gap between science and business. Indeed, he writes in his conclusion that being a forensic meteorologist was "exciting, challenging, and filled with the fun of meteorological detective work." But what were the challenges? Did he have competition? What it meant to him to develop a career in forensic meteorology, and to presumably have competed with others who were equally committed to developing a career, remains relatively opaque.

Ultimately, Haggard has produced a volume that gives us valuable insight into forensic meteorology in the courtroom—both how it operates in practice and the legal issues it confronts. However, much remains to be discussed about the profession of forensic meteorology outside the courtroom, including not only the business side but also the historical forces that have created and sustained the field. Hopefully, Haggard's book will inspire others to explore this fascinating field from new angles.

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Statistical Physics

A Prelude and Fugue for Engineers

Roberto Piazza

Springer, 2017. \$79.99 (453 pp.). ISBN 978-3-319-44536-6

Upon receiving a copy of Roberto Piazza's new book, I was immediately intrigued by the title, *Statistical Physics: A Prelude and Fugue for Engineers*. I

have to admit that the whimsy of the title evinced a slight suspicion that Piazza's treatment of a deep

