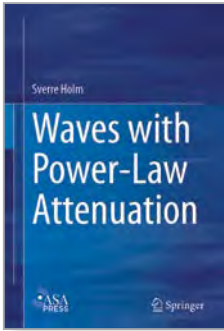


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# Waves with Power-Law Attenuation



**Author:** Sverre Holm  
**Copyright:** 2019  
**Publisher:** Springer International Publishing  
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**Hardcover:** ISBN 978-3-030-14926-0  
**Edition Number:** 1  
**Number of Pages:** XXXVII, 312  
**Number of Illustrations and Tables:**

60 b/w illustrations, 82 color illustrations

**Topics:** [Acoustics](#)

- Couples fractional derivatives and power laws and gives their multiple relaxation process interpretation
- Investigates causes of power law attenuation and dispersion such as interaction with hierarchical models of polymer chains and non-Newtonian viscosity
- Shows how fractional and multiple relaxation models are inherent in the grain shearing and extended Biot descriptions of sediment acoustics
- Contains historical vignettes and side notes about the formulation of some of the concepts discussed

This book integrates concepts from physical acoustics with those from linear viscoelasticity and fractional linear viscoelasticity. Compressional waves and shear waves in applications such as medical ultrasound, elastography, and sediment acoustics often follow power law attenuation and dispersion laws that cannot be described with classical viscous and relaxation models. This is accompanied by temporal power laws rather than the temporal exponential responses of classical models.

The book starts by reformulating the classical models of acoustics in terms of standard models from linear elasticity. Then, non-classical loss models that follow power laws and which are expressed via convolution models and fractional derivatives are covered in depth. In addition, parallels are drawn to electromagnetic waves in complex dielectric media. The book also contains historical vignettes and important side notes about the validity of central questions. While addressed primarily to physicists and engineers working in the field of acoustics, this expert monograph will also be of interest to mathematicians, mathematical physicists, and geophysicists.

**About the Author** | Sverre Holm was born in Oslo, Norway, in 1954. He received M.S. and Ph.D. degrees in electrical engineering from the Norwegian Institute of Technology (NTNU), Trondheim in 1978 and 1982, respectively.

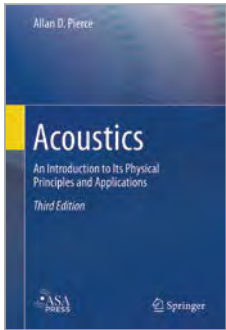
He has academic experience from NTNU and Yarmouk University in Jordan (1984–86). Since 1995 he has been a professor of signal processing and acoustic imaging at the University of Oslo. In 2002 he was elected a member of the Norwegian Academy of Technological Sciences.

His industry experience includes GE Vingmed Ultrasound (1990–94), working on digital ultrasound imaging, and Sonitor Technologies (2000–05), where he developed ultrasonic indoor positioning. He is currently involved with several startups in the Oslo area working in the areas of acoustics and ultrasonics.

Dr. Holm has authored or co-authored around 220 publications and holds 12 patents. He has spent sabbaticals at GE Global Research, NY (1998), Institut Langevin, ESPCI, Paris (2008–09), and King's College London (2014). His research interests include medical ultrasound imaging, elastography, modeling of waves in complex media, and ultrasonic positioning.

# Acoustics

## *An Introduction to Its Physical Principles and Application*



**Author:** Allan D. Pierce  
**Copyright:** 2019  
**Publisher:** Springer International Publishing  
**Copyright Holder:** Springer Nature Switzerland AG  
**Hardcover ISBN:** 978-3-030-11213-4  
**Edition Number:** 3  
**Number of Pages:** XLI, 768  
**Number of Illustrations and Tables:**

218 b/w illustrations

**Topics:** [Acoustics](#)

- Features a wealth of end-of-chapter problems and answers
- Written by the former Editor-in-Chief of the Acoustical Society of America
- Represents essential reading for all practicing and aspiring acousticians
- Facilitates instructional flexibility regarding topics covered, length of course, and interests of students
- Includes a new foreword and preface speaking to the book's continuing importance

This corrected version of the landmark 1981 textbook introduces the physical principles and theoretical basis of acoustics with deep mathematical rigor, concentrating on concepts and points of view that have proven useful in applications such as noise control, underwater sound, architectural acoustics, audio engineering, nondestructive testing, remote sensing, and medical ultrasonics.

Since its publication, this text has been used as part of numerous acoustics-related courses across the world, and continues to be used widely today. During its writing, the book was fine-tuned according to insights gleaned from a broad range of classroom settings. Its careful design supports students in their pursuit of a firm foundation while allowing flexibility in course structure. The book can easily be used in single-term or full-year graduate courses and includes problems and answers. This rigorous and essential text is a must-have for any practicing or aspiring acoustician.

**About the Author** | Allan D. Pierce was born in 1936 and spent his early years in Iowa, Kansas, and New Mexico. After receiving a Ph.D. in Physics from MIT, he was employed by RAND (1961–1963) and Avco (1963–1966). His work during these years was concerned primarily with the analysis of infrasonic waveforms generated by thermonuclear explosions, and this broadened into a life-long interest in all aspects of physical acoustics, applied mechanics, vibrations, and wave physics. From 1966 to 2012 he held a succession of professorial appointments — at MIT (1966–1973), Georgia Tech (1973–1988), Penn State (1988–1993), and Boston University (1993–2012). He retired from BU in 2012, and founded the Cape Cod Institute for Science and Engineering in 2017. He is a Fellow of the Acoustical Society of America and of the American Society of Mechanical Engineers, and is a recipient of the ASA Silver Medal in Physical Acoustics and the ASA Gold Medal, the ASME Per Bruel Gold Medal, the Rossing Prize for Acoustics Education, and the Gold Medal of the Acoustical Foundation of India. Over the years he has had many editorial positions, including being the founding co-Editor-in-Chief of the *Journal of Computational Acoustics* and the Editor-in-Chief of the Acoustical Society of America. He was the founding editor of *Proceedings of Meetings in Acoustics*.

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