Materials and Acoustics Handbook
Michel Bruneau and Catherine Potel
John Wiley & Sons, Hoboken, (2009) 918 pp. Hardback, 300 USD, ISBN 978-1-84821-074-5

The "Materials and Acoustics Handbook" is the English edition of the French book "Matériaux et Acoustique", first published in 2006. While the original comprised three volumes, this version is in a single volume. The Editors, Michel Bruneau and Catherine Potel, are both staff members of the Laboratoire d'Acoustique at the University of Le Mans (LAUM), France. More than 50 authors contributed to this publication, the majority of whom is from French universities and research institutions, with four non-French authors.

At the first glance, the book's title seems to imply that it is a collection of acoustic properties of materials and of acoustic phenomena in general. It is, however, not at all a conventional "handbook", but a state-of-the-art account of the sound propagation in a large variety of materials or media, in theory as well as in practice. The book consists of 35 chapters compiled in the following eight parts:

1 —linear propagation models for homogeneous and homogeneous stratified media
2 —linear propagation models for porous and stratified porous media
3 —experimental and numerical methods
4 —non-linear acoustics
5 —Green's function in anisotropic media
6 —linear methods of ultrasonic non-destructive testing and evaluation
7 —characterization of poroeleastic materials
8 —biomedical field

While the first five parts cover the contemporary theories of sound propagation in homogeneous, porous, and stratified media, the last three parts address the application of those theories with regard to ultrasonic material testing and medical diagnosis and imaging. Some keywords from the theoretical parts, raising no claim to completeness, are: fluid-solid interaction, propagation in multi-layered and stratified media, scattering in porous media, transfer matrix formalism for stratified porous media, equivalent fluid model, Biot's theory of elasticity, viscoelasticity models with fractional derivatives, time reverse methods, inverse scattering, and nonlinear acoustics in granular media. The parts 6 and 7 cover industrial and medical applications such as: ultrasonic fields in composite plates, flaw detection by Lamb waves, ultrasonic methods for concrete testing and for health monitoring, characterization of poroelastic materials, and nearfield acoustical holography. The entire part 8, covering 150 pages, is dedicated to the application of the theories and methods in the biomedical field. This includes the use of ultrasonics for the diagnosis and the imaging of bones and bone tissues, of the brain and for the vascular study of the heart and the blood circulation, but also for the therapy of kidney stones. The last chapter deals with the new field of acoustic and ultrasonic tomography, thus avoiding any x-ray exposure to patients.

With this large range of fundamental and practical topics discussed and also with the rigorous mathematics presented, there are no real drawbacks and shortcomings to this volume. It is hard to assess how this work will be judged by the "rest" of the scientific community outside France or the French-speaking countries. However, one could conclude that the English edition intends to present those theories and applications to a larger, worldwide acoustic community. And this, for sure, is an honorable approach and will hopefully encourage scientific discussion and exchange of experiences.

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