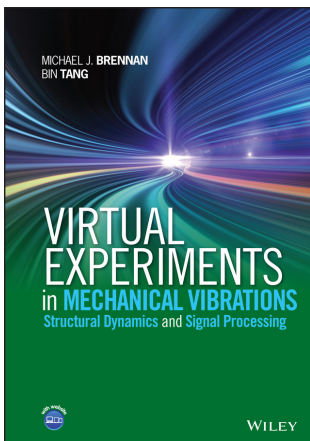
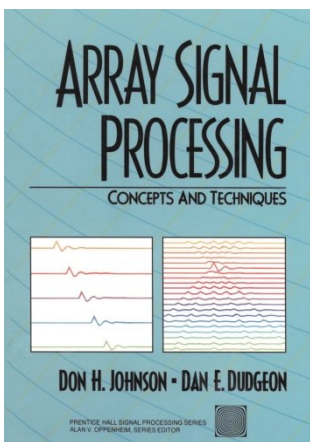


Reviews A&V n. 54



## Book Reviews

No. 54 receives four reviews, including novelties and classics

In this issue, this section presents four book reviews, with the first and the last being written by the authors themselves. A novelty is that all of them are also available in [English language](#)<sup>a</sup> (Portuguese versions are also available on page 101).

We remind you that the reviews are written in an abbreviated and concise way to summarize the content of the books (on subjects related to the various sciences involving acoustics, vibrations, and audio) and to bring information about the authors (to further contextualize the works).

We present reviews of the following books in this issue:

- [Room Acoustics: Design and Modeling](#) (*Acústica de Salas: Projeto e Modelagem*)  
**Author:** Eric Brandão | Blucher, 2016
- [Array Signal Processing: Concepts and Techniques](#)  
**Authors:** Don H. Johnson and Dan E. Dudgeon | Prentice Hall, 1993.
- [Acoustics in Building Rehabilitation](#) (*A Acústica na Reabilitação de Edifícios*)  
**Author:** Jorge Patrício | Engebook, 2018 (4 ed.)
- [Virtual Experiments in Mechanical Vibrations: Structural Dynamics and Signal Processing](#)  
**Authors:** Bin Tang and Michael J. Brennan | Wiley, 2022

Eric Brandão, professor of the Acoustical Engineering Program (EAC) at the Federal University of Santa Maria (UFSM, Brazil), presents his book on Room Acoustics (a subject he teaches in the program) — the book was technically revised by William D’Andrea Fonseca (who is an EAC professor as well). The work won the Jabuti Prize (2017) and is in its first *revised* edition.

Next, we have a classic, “Array Signal Processing”, by American professors Don H. Johnson and Dan E. Dudgeon, a must-read for studies on the subject that deal with mechanical or electromagnetic waves. The third book is authored by Jorge Patrício (professor in Portugal), who is a reference in Building Acoustics. Finally, we have the book “Virtual Experiments in Mechanical Vibrations: Structural Dynamics and Signal Processing”, by Bin Tang and Michael J. Brennan, who write the review of their own book (an international collaboration).

We hope that reading the reviews offers an initial understanding and good impression about the studies and awakens the desire to know them in their entirety: an excellent way to expand knowledge and keep up to date in the field.

<sup>a</sup>Versões em português começam na página 101.

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@eac.ufsm.br**Author:** Eric Brandão**Publisher:** Blucher**Year:** 2016 (rev.)**Language:** Portuguese**ISBN:** 978-8521210061**Link:** [publisher](#)

## Room Acoustics: Design and Modeling

*A reference (in Portuguese) for every acoustician*

This book deals with the subject of indoor sound propagation and the techniques employed to achieve *good* acoustic quality in enclosures (and rooms). This is a multidisciplinary area that encompasses engineering, architecture, arts, etc. The book was written to serve as a basis for the subject Room Acoustics, taught in the Acoustical Engineering Program at the Federal University of Santa Maria (UFSM, RS, south Brazil). However, the work took a dimension that went beyond the classroom, receiving national recognition and obtaining the 59° Jabuti Prize in 2017 (Engineering, Technology, and Informatics).

From examining the literature on room acoustics it is clear that it is difficult to find a single book that concentrates subjects on recommendations for the acoustical design of various enclosures, that deals with the mathematical modeling of sound propagation in rooms, and that addresses the various acoustic treatment devices used. The intent of this work was to provide a relatively complete tool for the proper development of acoustical projects (it is written in Brazilian Portuguese).

The 8th chapter organization presents a logical sequence of the basics of room acoustics for the development of a quality project. Chapter 1 explains the fundamental physical and subjective aspects of sound (discussion of the auditory-cognitive process, main physical concepts of sound, analysis of acoustic signals, etc.). Chapters 2 and 3 deal with the modeling and design of absorbers and diffusers. This enables the designer to understand the difference between the various types of acoustical treatment and how to use the different devices to compose a balanced design. In the chapters that follow, the emphasis shifts to modeling the acoustic field for a room. In Chapter 4, modeling and treatment of low frequencies are covered. Chapter 5 describes computational methods based on geometric acoustics, which require complex three-dimensional models of the room where the treatment devices, discussed in Chapters 2 and 3, are used as input data for the CAD/CAE models. Chapter 6 discusses statistical theory, which is mathematically simpler but provides a good initial direction for design. Chapter 7 provides information on how we can measure the acoustical characteristics of a room and also how we quantify our auditory-subjective experience in an environment. Design guidelines for various room types are covered in Chapter 8, which concludes the book. A wide variety of room types are covered (e.g., concert halls, studios, restaurants, cinemas, churches, classrooms, etc.).

Besides providing quality technical content, the author intended to raise awareness about the significant impact of acoustical quality on human well-being. Considering that we spend a considerable amount of time indoors, it's crucial to invest in creating optimal acoustical environments.

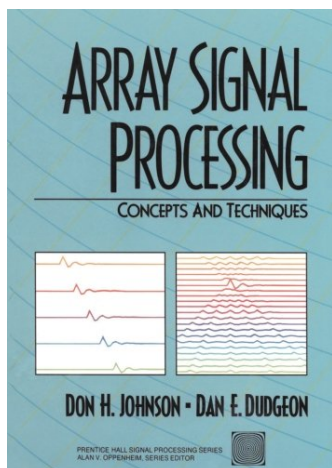
On the publisher's website [Blucher](#) you can see a small preview of the book as well as buy it (in electronic and printed versions).

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**Authors:** Don H. Johnson  
and Dan E. Dudgeon

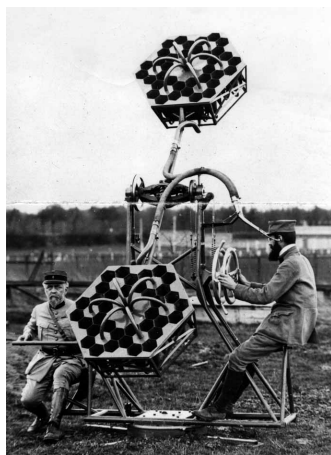
**Publisher:** Prentice Hall

**Year:** 1993

**Language:** English

**ISBN:** 978-0130485137

**Link:** [Amazon](#)



**Figure 1:** Classic photo of  
Jean Baptiste Perrin and his  
*telesitemeter*, principle of  
acquisition via arrays  
(Figure 1.1, page 2  
of the book).

## Array Signal Processing: Concepts and Techniques

*The fundamentals for techniques with arrays of receivers*

The book *Array Signal Processing: Concepts and Techniques* is an all-time classic for researchers dealing with sensor arrays, whether for mechanical (acoustic, for example) or electromagnetic waves. First published in 1993 by Prentice Hall/Pearson, it is a must-read for those who wish to deal with and understand the effects of spatial sampling. The authors<sup>a</sup>, Don H. Johnson and Dan E. Dudgeon, are important researchers in the fields of array and digital signal processing (DSP), with PhDs from MIT and dozens of [published works](#) in these areas. Both have made significant contributions to IEEE and belong to the prestigious lists of *Distinguished Lecturers* and *Life Fellows*.


As the authors note, the book is directed to graduate students and engineers in applied fields related to its subject matter. In fact, most works that address arrays cite it, whether articles, dissertations, or theses (thus obtaining [many citations](#)). The differentiating feature of this single-volume resource is its comprehensive coverage of signal acquisition and processing by arrays (or discrete receivers). While the authors are concise on certain detailed topics, they provide an extensive list of references for readers to pursue further study. Although the book does not explicitly cover the topic of acoustics, it serves as a valuable reference for the beamforming community as it applies to both mechanical and electromagnetic domains.

The book consists of eight chapters and three appendices (which improve the understanding of the contents). The book begins with the basics, with the wave equation and the characteristics of its solutions — there is also a brief historical context, see Figure 1. Subsequently, the text is grounded upon the frequency-wavenumber portrayal of space-time signals, serving as a cornerstone for a fundamental understanding of its topics. That is, it elaborates and constructs knowledge from basic to advanced — thus, an understanding of mathematical and technical language is necessary. For acoustics, in particular, complementary readings are recommended so that the nomenclature is fully understood. The next chapters develop upon topics such as aperture (of the array), beamforming, detection and estimation theories, adaptive processing, and source tracking. For the book's advanced topics, prior knowledge of DSP, matrix operations, and spatial geometry will facilitate understanding.

Although the book is celebrating 30 years since publication, the concepts remain and form the basis for more modern techniques that have been created since. As such, its reading is recommended. It can be purchased in physical form at [Amazon](#), or (free) rented in digital form at [Archive.org](#). Additionally, a short errata list can be found at [Johnson's site](#).

<sup>a</sup>Johnson is a Professor Emeritus at Rice University (USA), and his [publications](#) can be found on his [website](#) (or [RG](#)). Dudgeon worked on target detection algorithms for synthetic aperture radar at the MIT Lincoln Laboratory and was also a visiting scientist at the prestigious [DSPG group](#) (currently retired).



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**Author:** Jorge Patrício  
**Publisher:** Engebook  
**Year:** 2018 (4 ed.)  
**Language:** Portuguese  
**ISBN:** 978-9897232756  
**Link:** [publisher](#)

## Acoustics in Building Rehabilitation 4th Edition, Revised and Enlarged

*With details of constructive solutions*

Motivated by the need to reopen, recover, reuse, and revitalize old buildings located in central areas of cities, currently depopulated or deserted due to new centralities in other regions, Jorge Patrício's book intends to serve as a guide of acoustics protocols in rehabilitating old buildings for professionals in the field.

The first four chapters are introductory, presenting the current situation of Portugal's building stock, relevant parameters, and requirements in building acoustics. The fifth chapter addresses general principles for the process of acoustic rehabilitation of a building and the sixth brings guidelines, considering the diagnosis, evaluation, and proposal of corrective solutions. The seventh chapter deals with the external environment and the importance of urban planning, and the eighth, with complementary aspects.

The ninth chapter presents and comments upon two Portuguese laws. The first is the General Noise Regulation, which establishes the prevention and control regime of noise pollution in Portugal, dealing with definitions and fundamental principles, through municipal planning to the regulation of noise production with the establishment of exposure limit values according to zoning. The second is the Regulation of Acoustic Requirements for Buildings (RRAE), which establishes limits of sound pressure levels, sound insulation and reverberation time for environments in different types of buildings, such as residential and mixed housing; hotel units; commercial and service buildings, and similar parts in industrial buildings; school and research buildings; hospital buildings; sports venues; passenger transport stations; auditoriums; and halls. Buildings undergoing licensing, reconstruction, extension, or alteration processes are contemplated, with the objective of improving their acoustic quality conditions.

The tenth and last chapter presents several constructive solutions for rehabilitation, based upon the application of simple measures of light elements, without structural changes, and some constructive details relevant to the acoustic performance, essential in the construction stage, since the incorrect application of constructive solutions can considerably reduce expected acoustic performance. Finally, the three typical construction solutions most commonly used in old buildings in Portugal are presented: rammed earth, adobe, and stone masonry.

Recommended reading, considering the need for building rehabilitation in Brazil as well, the book can be found on the publisher's website [Engebook](#), where you can see a small preview of the book and buy it (in electronic and printed versions). The printed version can also be purchased from the website of [Amazon](#). Moreover, as the author himself describes, the book does not dispense with consulting his work "Acoustics in Buildings", presented in the *book reviews* of Issue 53 of the A&V.

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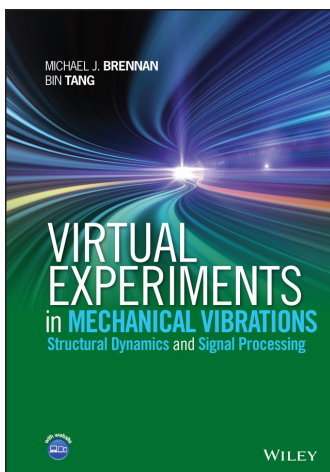
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**Authors:** Bin Tang and

Michael J. Brennan

**Publisher:** Wiley

**Year:** 2022

**Language:** English

**ISBN:** 978-1118307977

**Link:** [publisher](#)

## Virtual Experiments in Mechanical Vibrations: Structural Dynamics and Signal Processing

*Bridging the gap between theory and practical work*

This book was developed from lecture notes for a course that Michael Brennan gave to graduate students in the Department of Mechanical Engineering, Unesp - São Paulo State University, Ilha Solteira in Brazil, from 2010 to 2022. His co-author, Bin Tang, came to Brazil for two years as a visiting academic from 2013 to 2014, during which time the ideas and concepts for the book were developed and honed. However, it was not until 2020, during the Covid-19 pandemic, that its writing began in earnest.

The book aims to bridge the gap between theoretical studies in mechanical vibrations and associated practical laboratory work. It is targeted at graduate students and researchers in vibrations, and is 311 pages long, consisting of 9 chapters and 8 appendices. There are three main topics covered in the book — vibration theory, vibration experiments, and signal processing. It is written in a heuristic way with an emphasis on “learning by doing”. Every chapter contains some Matlab programs to illustrate the theory developed by carrying out “virtual” experiments, and in some cases, the programs provide animations to enhance understanding.

In a real experiment, both force input and vibration response are measured, but in a virtual experiment, the output vibration data is generated using a model of the system. A virtual experiment has a major advantage as a learning tool, in that estimated system responses (in terms of impulse response or frequency response functions) can be compared with the original model. This means that any artifacts due to signal processing can be clearly identified, which is not always possible in a real experiment.

The book is designed for the reader to progress through it chapter by chapter. The reader will be exposed to fundamental aspects of vibrations and signal processing by carrying out “virtual” experiments using simulated data. Through the theoretical development and exercises in the book, the reader will gain improved physical insight into both vibration theory and the rationale between the choices made in the signal processing procedures. Having read the book, the reader should be in a position to carry out an experiment in the laboratory and process the measured signals provided that they have been given some additional tuition on the practical aspects of how to set up an experiment and how to handle the transducers correctly.

An electronic copy of the book can be obtained from the [Wiley website](#). A hard copy can be purchased on the [Amazon do Brasil website](#).