

Preface

Acoustics is a most fascinating subject. Music reproduction, sound systems, telephone systems, measuring equipment, cell phones, underwater sound, hearing aids, and medical ultrasound all seek from acoustics answers pertinent to their fields. The annual meetings of the audio and acoustical societies are veritable five-ring shows, with papers and symposia on subjects in all the above-named fields.

This text is planned as a textbook for students of acoustics in engineering departments. It assumes knowledge of electrical circuit theory. It should be of particular value to experimenters, acoustical consultants, and to those who anticipate being engineering designers of audio equipment. To practicing acoustical engineers, this is a basic reference book.

This text begins with the basics of sound fields in free space and in simple enclosures.

The particular vocabulary of acoustics is treated early. Next follows the very basis for the subject, the laws governing sound generation, radiation, and propagation, which are expressed both mathematically and graphically. Then follow chapters dealing with microphones, loudspeakers, earphones and horns. Following next is the performance of loudspeakers either in baffles or attached to waveguides. Directed toward the design of miniature systems, i-pods and cell phones for example, the next sections deal with squeezing the most sound out of tiny radiating surfaces. Then comes sound in enclosures of all sizes, including such spaces as school rooms, offices, auditoriums, and living rooms. Throughout the text, numerical examples and summary charts are given to facilitate application of the material to practical design.

Fortunately, the behavior of most transducers can be analyzed with the aid of electro-mechano-acoustical circuits that are analogous to the circuits used in electronics. These analogous circuits, which were first introduced in the 1954 version of this book, *Acoustics*, were cited by a large number of the leading writers on loudspeaker system design, including Villchur, Thiele, Small, Ashley, Broadhurst, Morita, Kyouno, Karminsky, Merhaut, Allison, Berkovitz, and others. Knowledge of these principles has led to the high quality of audio reproduction that we enjoy today.

When *Acoustics* was first published, the subject was already in the process of diversification, a trend which has continued unabated to this day. There are now over 300 sub-categories of acoustics under the Physics and Astronomy Classification Scheme (PACS). Hence, it is no longer possible to produce such an all-encompassing book in any useful depth, so the current text has been limited to the subject of electroacoustics and can be considered as an updated and extended version of the first half of *Acoustics*. Chapter 11, part XXIV, through Chapter 13 of the original book have been largely superseded by *Concert Halls and Opera Houses: Music, Acoustics, and Architecture* (Beranek, Springer, 2004), *Noise and Vibration Control Engineering* (Ver and Beranek, John Wiley & Sons, Inc., 2006), and *Handbook of Noise and Vibration Control* (Crocker, John Wiley & Sons, 2007). Therefore, these sections have been omitted so that the remaining part of the book can be expanded to include more recent developments in the theory of electro-mechano-acoustic transducers and sound radiation. Hence the new title.

In 1954, there were only a handful of electronic computers in the world, so it would not have made sense to include formulas for everything. Hence *Acoustics* relied on graphical information for some of the more complicated concepts such as sound radiation from a loudspeaker diaphragm in free space. In this new text, we have provided formulas for everything so that interested readers can recreate the graphical results and use them in their simulations.

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