
Preface

*T*he first question any lover of classical music usually asks an acoustician is, “Which are the best halls in the world?” The response—the three halls rated highest by world-praised conductors and music critics of the largest newspapers were built in 1870, 1888, and 1900—always prompts the next query: “Why are those so good while many halls built after 1950 seem to be mediocre or failures?” You will find answers to these questions in this book, the result of a half-century’s research into the very complex field of acoustics of halls for music.

The dialog re-enacted above bears a close resemblance to another illustration that typically troubles music lovers. They frequently ask, “Why is a Stradivarius violin so good and so many built since then not in the same league?” In this case, we know that Antonio Stradivari, working at the turn of the eighteenth century, employed the utmost skill, a good ear, and perhaps a little luck to capture the dozens of details that make up a great violin. Subsequent violinmakers have learned that only by producing close copies of his masterpieces can they expect their instruments to be highly acceptable.

Indisputably, the acoustics of halls for music are more diverse than those of violins. As this book will explain in depth, halls for music encompass a broader range of different types with very different acoustics, and one should always remember that composers often wrote music for a particular concert hall or opera house. Consequently, a given composition usually sounds best when performed in its intended acoustics. For instance, Gregorian chants were written for performance in large churches with high reverberance; a small, quiet church never comes close to doing it justice. As Chapter 1 discusses, compositions of different musical periods—Baroque, Classical, or Romantic, for example—sound best in halls whose reverberation times vary from medium low to relatively high. Can one hall serve all purposes? Halls with variable acoustics are among those treated here.

Since we can, today, identify the acoustical characteristics of the finest halls in existence, we could create an unerring duplicate of any one of the several best and thus reproduce its acoustics exactly. Why not do so? Because building committees generally select architects not to make exact copies of a great hall but to do something original and visually inspiring, *with the hope that the halls will have excellent sound*. Most architects will not argue with that approach. Who would be awarded an architectural prize for the construction of an exact copy? Consequently, the acoustical consultant is faced with a dilemma. To have the best acoustics, the hall should be close in design to one of the great halls—and should yield similar electroacoustic data when measured. So the consultant usually follows a subtle path, pushing for as many similarities as possible and making recommendations, where differences occur, of features—often novel—that *may* salvage the new design.

For every new hall, with its untried acoustics, opening night may become a trial by fire. Of course, the local orchestra and conductor may do all in their power to adapt their playing style to the new acoustics, as the history of the Philadelphia Academy of Music in Chapter 1 illustrates. But well-traveled music critics, often in attendance only this once, may judge the acoustics of the new venue against those of the four or five top-ranked old halls, and opening night reviews may set the reputation of the hall, negatively, for years to come. On occasion, these assessments turn out to be unjust, failing to account for how a hall's acoustics may be adjusted over time or the possible misuse of the hall that first night. Such bad fortune befell one important hall that was designed for a standard-sized orchestra playing the kinds of compositions that make up the bulk of the repertoire of today's symphonic concerts. For the opening night, however, the conductor chose a new composition, with a double-sized orchestra and a chorus of several hundred. The stage had to be extended to over twice its normal size, and the choristers in the back row stood on bleachers so high that their heads threatened to touch the stage ceiling, thus amplifying their voices unevenly. In some parts of the composition, the musicians created unusually loud sound effects, in one case by hitting a suspended three-meter section of railroad track with a sledge hammer. Nearly everybody in the audience went home with a headache. The music critic's response? The hall was at fault.

Following the first chapters, which establish a base for understanding the effects of acoustics on composers, performers, and listeners, and guiding the reader to a common vocabulary, the bulk of this book, Chapter 3, contains the write-ups, photographs, drawings, and architectural details on 100 existing halls in 31 countries. Thirty of the halls are completely new. Although the remainder appeared in earlier books by the author, the materials have been updated wherever necessary. The later chapters present the relation of a hall's acoustics to its age, shape, type

of seats, and the materials used for the walls and ceiling. The sequence of events that led to Boston Symphony Hall's excellent acoustics, which opened in 1900, is covered in detail—although it went through a troubled first few years because the leading local music critic considered the predecessor hall as better. Detailed discussions also appear for balcony, box, stage, and pit designs. All the known electro-acoustical measurements on 100 existing halls are examined and compared with the rank orders of 58 concert halls and 21 opera houses that were obtained from interviews and questionnaires. Finally, the optimal electro-acoustical results are presented for concert halls and opera houses used for today's repertoires.

Three appendices supplement the chapters: the first gives definitions of all of the major acoustical and architectural terms and symbols used in the book; the second provides the electro-acoustical data available on the 100 halls; and the third presents in tabular form much of the dimensional and electro-acoustical data for the 100 halls.

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LEO BERANEK

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