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Book review

Leo Beranek, Concert Halls and Opera Houses; Music, Acoustics and Architecture, Springer, New York, ISBN 0-387-95524-0, 2004 (pp. xxii + 661, US $69).

In his book *Concert Halls and Opera Houses*, Leo Beranek offers us a comprehensive, clear guide to the acoustics of places for musical performance, as well as an illustrated compendium of 100 of the world's important concert halls and opera houses, from the point of view of a scientist with a passion for music. It is the result of half a century of research, and an indispensable reference for all those with an interest in music, acoustics and/or architecture. It is the revised and updated second edition of his classic *Concert and Opera Halls—How They Sound*. Although the contents remain essentially the same, they have been reorganised into fewer, but more articulated chapters.

In the first two chapters, 'Music and Acoustics' and 'The Language of Musical Acoustics', Beranek addresses questions such as 'what is understood by good acoustics?', 'what makes a hall acoustically better than another?' and 'why those built at the end of the 19th century are usually rated highest for their acoustics?'. He discusses some of the controversies surrounding the acoustical properties of concert halls. He also quotes directly some of the most influential conductors and musicians, offering us an insight into how acoustical quality is judged by the performers themselves, and into how composers and musicians adapt their style and playing to particular halls.

Places for musical performance include a wide range of different types, all with very different acoustics, so how can one single hall possibly be suitable for different repertoires? What criteria should be used when approaching the design and building of a new hall? If it is true that architectural committees prioritise concerns other than the acoustics, selecting architects who will come up with interesting and original ideas, with the hope, as Beranek puts it, ''that the halls will have excellent sound'', where does that leave the work of the acoustical consultant?

In order to answer these questions, the author first establishes a common vocabulary for musicians, acousticians and lay readers. The perceptive (i.e. subjective) and scientific definitions of terms such as reverberation, definition, brilliance and spaciousness are taken from questionnaires and interviews, as well as acoustic measurement data, and the interrelations between the audible factors of music and the acoustical factors of the halls are illustrated.

Like in his previous edition, the heart of the book, Chapter 3, is made up of write-ups, photographs, drawings and architectural details on 100 halls in 31 countries. About 30 of these are new to this edition, and some of the data regarding those that appeared in the earlier book have been updated. This chapter also provides performers and music lovers with the understanding of

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why certain venues are considered better than others, while architects and engineers are encouraged to consider the importance of sound quality in the designing or renovation of spaces for musical performance.

Finally, the last chapters, written more for architects, engineers and acousticians, illustrate the relation between a hall's acoustics and its size, shape, type of seats, and materials used for walls and ceilings. All known acoustical measurements on 100 halls are compared with the rank orders of 58 concert halls and 21 opera houses obtained from interviews and questionnaires. Finally, the optimal acoustical results are presented for concert halls and opera houses, bearing in mind today's repertoire, providing a reference for auditorium designers and engineers. The three appendices include the definitions of major acoustical and architectural terminology, and conversion factors, all the known acoustical data in tabular form for 100 concert halls and opera houses and equations and technical data regarding the halls.

Much as I think that the book's readability is one of its essential qualities, as an acoustician I believe it is the compendium of technical information regarding the one hundred halls, and in particular the rank ordering of the best 50 according to the subjective judgment of the performers and other experts, that classifies this book as essential references for anybody involved in the design and renovation of places for music.

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