Preface to the Revised Edition

The original German edition of this book appeared in 1974. At that time, digital signal processing in industry and university laboratories was performed almost exclusively on mainframe computers. To execute a simple fast-Fourier transform, a researcher may well have had to wait a couple of days: he punched a stack of cards, took them to the computer center, and waited for the output – maybe only to discover that he had punched a few holes wrong and had to do the job all over again. Nevertheless, many of the basic concepts of spatial hearing were already known at that time, and some key applications were possible, mainly by using mechanical (acoustic) hardware and analog electric circuitry.

About a decade later minicomputers had made their way into the laboratories, and researchers and developers were now able to do digital signal processing on the spot. As a result, it became possible to carry the old concepts of spatial hearing further and test them rigorously via computer simulations – though not in real time. The minicomputer as a laboratory tool made the field of spatial hearing an attractive research ground for many, and the number of publications on the subject increased considerably. Feeling the necessity to amend the original body of the book for the 1983 American edition, I had to give up the idea of completely covering the field – as I had attempted to do in the original edition – in favor of elaborating on general progress and prominent trends. I had a presentiment, however, that progress in signal processing – especially through miniaturization and increase in computer speed – would soon pave the way for a great variety of novel applications of the principles of spatial hearing in science and industry.

Today, another decade later, this notion has become true and a new industry has evolved under the general label of "binaural technology." Binaural technology has established itself as an important enabling technology in fields such as information and communication systems, measurement technology, hearing aids, speech technology, multimedia systems, and virtual reality. The field of spatial hearing has virtually

exploded over the last 10 years, and it would be futile to try to cover it all in a single book.

Nevertheless, it seems appropriate to use the occasion of the preparation of this revised edition to at least comment on a recent dramatic evolution in the field of spatial hearing. To this end, a new chapter, namely chapter 5, has been added. After the introduction (section 5.1), section 5.2 deals with "auditory virtual reality," an important field of application which is mainly based on the physics of spatial hearing. Section 5.3 is devoted to signal processing in the peripheral auditory system and deals with modeling speech enhancement by binaural hearing (the so-called cocktail-party effect). This topic is also of great technological interest. Finally, section 5.4 discusses new research concerning the precedence effect – formerly known as the law of the first wavefront (see section 3.1). Recent research in the precedence effect provides clear experimental evidence that cognition plays a significant role in spatial hearing.

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The new chapter provides examples of progress with respect to the three basic aspects of spatial hearing, namely, the physical, the psychophysical, and the psychological. It is hoped that the book, in its new form, will find its way to the desk of everybody interested in the fascinating field of spatial hearing.

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