SECOND EDITION

ACOUSTICAL FACTORS AFFECTING HEARING AID PERFORMANCE

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Preface

More than ten years have passed since the convocation of the original "Acoustical Factors Affecting Hearing Aid Performance" conference in New York City in 1978. Much of the information presented at that conference was new and not widely known. In order to help distribute this important information more widely, the first edition of this book was published in 1980. Since then, much of the then-new information has become common coin. It has been incorporated into many laboratory procedures and clinical and sales office fitting practices. In fact, the extent of that knowledge in some areas has been sufficient to prompt Killion to state in Chapter 3 of this edition that transducer and coupling issues are "(mostly) solved." Thus, it would seem that, at least in the case of purely acoustical matters, a very great deal of progress has been made and that two primary tasks remain: the refinement of quantitative values and the generation of research and clinical procedures that incorporate these findings into methods that are more reliable, valid, efficient, and easier to use. Many of the chapters in this volume reflect these developments.

With the fundamental acoustical issues under good control, researchers during the past ten years have been better able to investigate other issues. One of the most important was the inherently more difficult problem of determining what characteristics the acoustical signal at the ear should have in order to best meet the needs of the hearing-impaired person. As these pages will reveal, digital hearing aids, and the signal processing they make possible, have opened up new and potentially fruitful avenues of research and development in this area. Noise reduction, multi-channel aids, phonemic feature enhancement, adaptive filtering, and more precisely fitted gain curves have all been put forward as techniques with great promise. But, early investigations suggest that none of these techniques is going to provide the dramatic breakthrough that will quickly solve the problems of the hearing impaired. Nevertheless, it seems likely that digital hearing aids will, one day, be the dominant type of hearing aid for the reason that they do offer significant advantages. However, it now appears that the gains they will provide will be incremental rather than dramatic.

Digital hearing aids increase the need for theoretical structure and basic research, precisely because these hearing aids open up so many new possibilities that the "cut-and-try" procedures of the past are less defensible than ever. Increased complexity calls for the guidance of unifying theory. Theoretical structure suggests what information is needed in order to use or test the theory and provides a framework within which to interpret the results. At present there are only a very small number of theoretical constructs that are broad enough to encompass most of the matters relevant to hearing aid selection and performance. Those that do exist are similar in that they all have fundamental features in common with classical Articulation Theory. Interest in theories of this type has increased over the past ten years, spurred on by the landmark paper by Dugal, Braida, and Durlach (1980), which appeared in the first edition of this book. As a reflection of that fact, five of the chapters included in this edition are either about articulation theory-like concepts or use those concepts to assist in the interpretation of their results. It seems probable to us that such theories will receive substantially increased attention in the immediate future.

As a final note, we want to thank those who helped us in the preparation of this book. Especially, we want to thank the authors who so unselfishly devoted their time and effort to this project. In addition, we want to thank April V. Powel for her dedicated service in helping to prepare the manuscripts for publication. Her exceptional efforts are greatly appreciated.

Gerald A. Studebaker
Irving Hochberg

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PART ONE

THE ENVIRONMENT