This issue of the Journal of Rehabilitation Research and Development focuses on the evaluation of modern hearing aids, related devices and other technological developments. Recent technological advances have brought about substantial changes in the design of these instruments. Many modern hearing aids use digital techniques for controlling and processing the signals being amplified. These instruments have significant new capabilities in terms of both their signal-processing capabilities and the flexibility with which they can be prescribed and fitted. Similarly, the test instruments used for hearing-aid evaluation and audiological testing, in general, have improved substantially over the past few years with the increasing use of digital signal processing technology. The scope of these technological advances and their potential for providing improved amplification for veterans with hearing loss were addressed in Vol. 30, No. 1, 1993, of the Journal, a special issue entitled Part I: Advanced Hearing Aid Technology. This issue, Part II: Clinical Evaluation of New Generation Hearing Aids is concerned with the evaluation of modern hearing aids embodying this new technology as well as with related issues involving hearing aids and modern test instruments.

The first paper in this collection, by R.M. Cox, addresses a growing problem in the prescriptive fitting of modern hearing aids. Traditional evaluation and fitting procedures are not adequate for many modern hearing aids because of differences in the way signals are amplified and concomitant differences in the way these instruments need to be adjusted. This paper reviews the issues involved and identifies new techniques which can be used to make full use of the new capabilities of such devices.

Increasing use is being made of more than one channel of amplification in the new generation of hearing aids. This basic change in hearing-aid design results in instruments of considerably greater flexibility which can be prescribed more accurately and which can deal more effectively with unfriendly acoustic environments, such as speech produced in a noisy room. The increased flexibility and the many different adjustments that are needed, however, also add to the audiologist’s task in evaluating and fitting these devices. The second paper, by D. Dirks, J. Ahlstrom, and P.D. Noffsinger, is concerned with the specific problem of determining the preferred frequency-gain response of a hearing aid with two or three channels of amplification, this being the most common form of multichannel amplification being used in modern hearing aids. The results of this investigation provide a scientific basis for the development of practical prescriptive fitting strategies for hearing aids of this type.

One of the most common complaints of hearing-aid users is that speech is particularly difficult to understand in the presence of background noise. Reducing the effects of background noise is a major problem in many scientific fields and a variety of techniques have been developed for this purpose, many of which require extensive signal processing. There are, however, inherent limitations on how much noise can be eliminated even with the most advanced signal processing techniques. The third paper, by D.A. Fabry, M.R. Leek, B.E. Walden, and M. Cord, evaluates a form of noise reduction that has been incorporated in several modern hearing aids. The method employed is to filter out low-frequency components of the signals being amplified when intense low-frequency noise is present. Since this filtering operation also eliminates low-frequency components of the speech signal, it is only used when low-frequency noise is present. The results of the investigation showed that for hearing losses that increase rapidly above 1,000 Hz, some improvement in speech recognition was obtained when intense (85dB SPL) rather than moderate (70dB SPL) low-frequency noise was present.

Although hearing aids are among the most widely used forms of assistive technology, only a small proportion of people (including veterans) who would benefit from acoustic amplification actually use hearing aids. The fourth paper by S. Silman, C.A. Silverman, M.B. Emmer, and S.A. Gelfand, shows that for an impaired ear, lack of amplification over prolonged periods of time can result in a deterioration in speech recognition ability when amplification is finally provided. There is also evidence that speech recognition ability improves to some extent with long-term use of a
hearing aid. This is a particularly important finding with significant implications for veterans who have a hearing loss but do not use hearing aids.

There have been many dramatic advances in modern medicine; these include the development of potent antibiotic drugs and new methods of intervention such as chemotherapy, which have saved many lives. Unfortunately, some of these therapeutic drugs and chemotherapeutic agents can have adverse side effects, such as ototoxicity resulting in severe hearing damage. It is thus crucial to develop efficient techniques for the early detection of hearing loss resulting from medication of this type. The fifth paper, by S.A. Fausti, R.H. Frey, J.A. Henry, D.J. Olson, and H.I. Schaffer, describes the use of high-frequency audiometry and computerized measurement of the auditory brainstem response as a means of monitoring hearing in patients at risk for hearing loss. Hearing thresholds were measured over a wide frequency range and the predictive power of these measurements in detecting possible hearing damage was evaluated. Efficient procedures for monitoring the hearing of patients receiving potentially ototoxic medication were then developed based on the results of this study.

The field of automatic speech recognition has made dramatic advances in the past few years and it is hoped that the technology developed for this purpose will also be of benefit to veterans and others with severe hearing losses.

The last paper in this issue falls in the Clinical Report section of the Journal dedicated to recent clinical advances. The clinical report, by R.H. Wilson, describes the development of a set of test materials on compact disc designed for use in VA Audiology Clinics. Two sets of test materials have been prepared, one for basic auditory evaluations and one for a more detailed assessment of central auditory processing. The compact disc is perhaps the most well-known product resulting from the application of digital techniques to audio engineering. The quality of a digital audio recording on compact disc is far superior to a traditional analog recording (e.g., a long-playing record), in terms of bandwidth, low distortion, and wide dynamic range. In addition, a large number of recordings can be stored on a single compact disc and individual recordings can be retrieved for playback efficiently, conveniently and, if necessary, automatically.

The papers in this collection provide substantive new information that will do much to improve the quality of life of veterans with hearing loss, or at risk for hearing loss. These research results will also fill important gaps in our knowledge and be of value to the field of acoustic amplification in general. It is with some pride that we note that five of the six papers in this important collection were supported by funds from the Rehabilitation Research and Development Service of the Department of Veterans Affairs.

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Guest Editors