Introduction

The thirteen articles included in this special issue of *ORL* bring together basic research and clinical applications of the mechanics of the ear. Therefore, the reader finds articles which could be written in a textbook on applied mathematics as well as descriptions of surgical procedures in otolaryngology. Both are matters of the mechanics of the ear and part of biomedical engineering.

We subdivide the issue into *Middle Ear Mechanics*, *The Mechanics of the Vestibular Organ* and *Cochlear Mechanics and Otoacoustic Emissions*.

Middle Ear Mechanics is covered by two articles from our colleagues in Bochum (Germany), who developed a complete model of the human head and are able to study effects of bone conduction with it (Taschke and Hudde). Their second article (by Hudde and Weistenhöfer) is about middle ear mechanics examined by a generalized circuit model which is an alternative approach to the usual finite element approximation and permits extensive conclusions including middle ear prosthesis design.

We are glad to have the *Mechanics of the Vestibular Organ* included by an article of Hamann. He presents elementary fluid mechanical principles and draws conclusions for the therapy of the benign paroxysmal positioning vertigo.

Ten articles on *Cochlear Mechanics and Otoacoustic Emissions* build up the main focus of the issue.

The clinical application report of distortion product otoacoustic emissions by Janssen, Niedermeyer and Arnold can be a motivation for further engagement with the principles of the generation of otoacoustic emissions. These are discussed extensively by the following two articles of Duifhuis and Vetesnik, Nobili and Gummer, tak-

ing into account the frequency and time domain. If the reader is prepared to work through these admittedly demanding articles, he is awarded with the state-of-the-art knowledge in this fascinating area.

The next block consisting of three articles is about nonlinear displacement and pressure distributions inside the cochlea which are measured by Cooper and Olson and Dong and calculated by Yoon, Puria and Steele. Olson and Dong show that not only the basilar membrane behaves nonlinearly but also the pressure in the lymph.

Inside the cochlea, we find biomechatronical elements (outer hair cells) whose role in the acoustic amplification process is discussed controversially. Ospeck, Dong, Fang and Iwasa report on difficult experiments concerning the change of electromotility of outer hair cells along the cochlea.

The two articles by Kiefer, Arnold and Staudenmaier and Plontke and Salt bring up topics of clinically extremely high actuality and importance. The first is a case report on an implantable hearing aid device with a surprisingly good postoperative result. The second describes the physical process of drug delivery to the inner ear, which is important for the local therapy of inner ear structures.

Finally, an article on bone conduction (Böhnke and Arnold) shows the potentialities which finite element calculations offer. In this case, the effect of the opened cochlea during stapes surgery and psychoacoustic air-bone conduction cancellation experiments are computed.

Elizabeth S. Olson, New York, N.Y.

Frank Böhnke, Munich