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MEMRO 2009 – Middle-ear science and technology

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The Middle-Ear Mechanics in Research and Otology (MEMRO) meetings are targeted to basic scientists, otolaryngologists, engineers, as well as residents and students. Collaborations between these different groups of researchers and practitioners, as has been shown to be the case in the past, can lead to a greater understanding of how to improve the diagnosis and treatment of middle-ear diseases. Even within the narrow confines of basic research, there has tended to be a separation between those investigating the biology of middle-ear disease and those attempting to understand the underlying biophysics and acousto-mechanical transformations of middle-ear structures. Basic scientists are not generally familiar with the pathogenesis and hearing outcome of middle-ear diseases, while clinicians often do not understand the mechanical and acoustical constraints on the ear that result from middle-ear disease and its treatment.

Recognizing the need for collaboration between surgeons and scientist-engineers working on middle-ear mechanics, Dr. Karl-Bernd Hüttenbrink, an otologist, initiated the first MEMRO symposium in Dresden, Germany in 1996. After the success of this first meeting, subsequent meetings were held in Boston in 1999, Matsuyama, Japan in 2003, and Zurich, Switzerland in 2006. The 2009 MEMRO symposium at Stanford University was the fifth meeting, with about 165 registered attendees.

At the beginning of the 2009 meeting there were two tutorial talks. The first was *Introduction to Otology: A surgical perspective*, intended for the scientists and engineers, while the second tutorial *Mechanics for the middle ear* was intended for ear surgeons. There was a keynote talk followed by 8 categories of plenary sessions consisting of 63 oral presentations, 2 panel discussions, and 28 poster presentations. The speakers for the oral presentations were given the choice of a normal 12-min time slot or a longer 20-min time slot. About 75% of the presenters chose the normal length while 25% chose to have the extra time.

The *Middle-ear physiology* plenary session highlighted the continued importance of basic measurements that provide insights into sound transmission from the ear canal to the cochlea.

The *Passive prostheses* category, consisting of two sessions, featured various improvements to the design of implantable middle-ear prostheses as well as methods of improving surgical outcomes.

The *Diagnostics* category, also consisting of two sessions, covered measurements of middle-ear impedance and reflectance, laser Doppler vibrometry responses, stroboscopic holography, and new bone-conduction transducers.

A major category of the presentations, consisting of two sessions, was *Middle-ear hearing aids*, which covered the use of transducers to vibrate the middle ear directly rather than indirectly through sound in the ear canal. A popular thrust in this direction was stimulation of the round window, as evident by numerous talks. Another area of enthusiasm was the idea of encoding photonic energy to wirelessly transmit audio energy to a non-surgical photonic transducer contacting the tympanic membrane.

The *Imaging Technologies* section featured new and improved technologies for visualizing structures of the middle ear.

Imaging, physiology, and biomechanics came together in the *Computational models* session, where finite-element and analytic methods for codifying our understanding of middle-ear structure and function were presented.

The *Bone conduction & high noise* session was somewhat unique to MEMRO 2009. An important route of hearing in high noise environments is through bone conduction, and several talks described the interaction of the middle ear and bone conduction for this important application.

The exchange of gases by the middle-ear cavity was the topic in the *Pressure regulation* session.

All authors of posters and oral presentations were given the opportunity to submit a corresponding manuscript for publication in the MEMRO 2009 special issue of Hearing Research. A total of 41 manuscripts were submitted and all of the manuscripts went through the normal review process for Hearing Research, as handled by Section Editor Dr. Anthony Gummer. Of the submitted manuscripts, 27 were accepted for publication in this issue, with an average of 2.7 revision stages per accepted manuscript, 9 were rejected, and 5 were not resubmitted or the authors withdrew their submission. The manuscripts became available online through the Hearing Research website at the time of acceptance.

In addition to the scientific program, attendees of the meeting had a significant amount of time to interact with one another through various social events. The opening reception at the beautiful home and gardens of Dr. Rodney and Sherry Perkins set a congenial tone for the meeting. For the second evening, attendees were given a map of local Palo Alto restaurants

for a night on the town. On the third evening, we took a short bus ride to the Fogarty Winery for a mountain-top dinner banquet with fabulous views overlooking the San Francisco Bay and Stanford University. The meeting ended with an American-style barbeque and steel drum band in the New Guinea garden on Stanford campus.

As Dr. Robert Jackler stated in his opening remarks, “Stanford University is a place where invention and discovery are deeply woven into the fabric of the institutional culture”. Thus it was a fitting location for the interdisciplinary exchange of ideas about middle-ear research, surgery, and related technologies that took place during the MEMRO 2009 meeting.

We look forward to the next MEMRO meeting in Daegu, South Korea in 2012!