

# REPORT ON THE 37<sup>TH</sup> ANNUAL MIDWINTER MEETING OF THE ASSOCIATION FOR RESEARCH IN OTOLARYNGOLOGY (ARO), SAN DIEGO 2014

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The annual conferences on otolaryngology organized by the Association for Research in Otolaryngology are one of the most important science events. So far there have been 37 annual midwinter meetings. The most recent was held in San Diego, California, USA, from 22<sup>nd</sup> to 26<sup>th</sup> February 2014. About 1500 people from all continents participated.

The conference was opened by the ARO President, Professor Jay Rubinstein of the University of Washington. During the first session, “First-in-human trials of neurotechnology: past, present and future”, prominent speakers talked about historic milestones in the development of implants for the organs of vision, hearing, and balance.

Jim Patrick outlined the beginnings of cochlear implants and the Cochlear company, notably the turning points in the development of a multi-channel device. He touched upon the difficulties in marketing an implantable device, problems in the clinic, and high costs. The second speaker, Robert Greenberg, summarised the achievements of the Second Sight company in developing the Argus II retinal prosthesis. He illustrated technical breakthroughs and results of specific patient cases.

Extremely interesting was the work of Jim Phillips on implantable vestibular prostheses. He described the complexity of stimulating specific elements of the balance organ, and the effect of current intensity and impulse frequency on the final results. He demonstrated that the balance organ can be effectively stimulated electrically, although it is still early days to see the long-term effects of this form of therapy. He drew our attention to the complex reaction of the labyrinth, particularly in the case of Ménière’s disease, and the largely unknown effects of bilateral stimulation.

The following lecture was devoted to the subject of tinnitus. Steven Cheung from the University of California presented the concept of tinnitus treatment using the technique of deep brain stimulation (DBS), based on direct, electric stimulation of the auditory cortex and its associated structures. The first phase of clinical treatment in humans started only in April 2014. The meeting was also an occasion to unveil an interesting questionnaire called the “Tinnitus Functional Index” (Oregon Health and Science). Its aim is to allow researchers to better differentiate possible disorders that may impinge on tinnitus.

“Learning and feedback for a sensorimotor brain–computer interface” was the last lecture of the session. Jeff Ojemann gave clinical arguments for the use of devices by people with motor disorders which can simultaneously involve learning



and feedback. He showed how the learning process could be monitored by measuring brain activity while asleep, and showed that the appearance of certain structures in the recorded signal (i.e., the sleep spindle) may be associated with learning effects. He discussed problems to do with how information from the motor cortex was analysed, relating it to functional reorganization of the motor cortex while learning.

The conference was divided into poster and oral sessions. Unlike some other conferences, the poster sessions during the ARO meetings attracted a lot of interest and discussion. This year there were 800 posters. Their subject matter changed each day of the conference, corresponding



to the oral sessions. The topics were genetics, auditory nerve, cochlear implants, recovery, auditory hair cells and transduction, otoacoustic emissions, psychoacoustics, clinical pathologies of the inner ear, techniques to deliver drugs to the inner ear, anatomy and physiology of the inner ear, aging, ototoxicity, damage and protection of the inner ear, and its mechanics and structure. Participants could also engage in symposiums on the structural and physiological development of auditory synapses, bone conduction hearing, central vestibular control of essential autonomic functions, auditory neural remodeling by environmental noise and other background sounds, neurotrophins and their function in survival, neurite growth, functional diversification and maintenance, recent development in cochlear implant research, cochlear

neurodegeneration in noise and aging, the dynamics of attention and learning in the auditory system, and central consequences of deafness.

The symposium on neurodegeneration, moderated by Michael McKenna, attracted a lot of attention. Charles Liberman and Sharon Kujawa, speakers at this session, demonstrated that temporary threshold shift (TTS) and a patient's age have strong effects on hearing.

A lecture was delivered by Shi-Ming Yang, who presented results from 55 patients implanted with the Nuo Erkang cochlear implant manufactured in China.

A session on otoacoustic emissions focused on new methods of sound reception and its analysis. Anders Christensen talked about the reception of low-frequency distortion product otoacoustic emissions (DPOAEs). He explained that the acquisition of DPOAE measures at low frequencies is easier than so far believed, provided that conditions other than the standard ratio of two stimulus frequencies were used. The next speaker, Wiktor Jędrzejczak, continued the subject, in this case referring mainly to tone burst evoked otoacoustic emissions.

The conference gathered together a large number of scientists interested in basic hearing. Major topics, starting with genetic tests and ending with cochlear implantation, were covered in many presentations. However, what was especially noticeable this year was a return to objective methods of hearing testing such as evoked potentials and otoacoustic emissions.