

REPORT ON THE CONFERENCE OF THE ORGANIZATION FOR HUMAN BRAIN MAPPING (OHBM), JUNE 16–20, 2013, SEATTLE, USA

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Annual conferences of the Organization for Human Brain Mapping are the most important meetings of scientists conducting research on human brain associated in OHBM. 2474 persons from 42 countries (including 9 persons from Poland) participated in this year's meeting and the World Hearing Center was represented by dr inż. Tomasz Wolak and mgr inż. Mateusz Rusiniak (Figure 1). About 120 lectures were given at the conference, with seven as the so-called "keynote lectures". However, it is worth mentioning that lectures are not the most important part of these conferences. Due to a great number of participants, majority of works are presented on posters and this year there were almost two and a half thousand posters. Scientists from Poland submitted only 12 works, three of which came from the Bioimaging Research Center of the World Hearing Center: "Is the EEG alpha rhythm reflected in the fMRI resting state network?", "Alpha rhythm hemispheric dominance – an EEG-fMRI study (preliminary results)" and "Altered resting EEG activity in children with dyslexia and central auditory processing disorders". They met with a great deal of interest and positive feedback. Additionally, dr. T. Wolak was a co-author of the work submitted by the Nencki Institute of Experimental Biology entitled "Plasticity induced by long-term sensory training – an fMRI&DTI study" and the work submitted by the Maria Curie-Skłodowska University in Gdańsk entitled "Attention control and language lateralization – evidence from fMRI and dichotic listening task".

This year's conference was dominated by issues related to the Connectom project (www.humanconnectomeproject.org). This is a very large, multi-center scientific project, which aims at detailed research of neural connections in the brain and creation of a comprehensive map reflecting both structural as well as functional connections. The project started at the end of 2010 and it is supposed to last for five years. Although the results presented at the conference are particularly impressive and detailed, it turned out that they are very difficult to interpret and require developing a completely different approach to human brain. The issue was also raised at the conference opening lecture given by prof. M.E. Raichle. He stressed that the evolutionary development of the brain is extremely mysterious. Spatial organization of human brain (the main object of research was the structure of white matter – neural connections) is to a great extent divergent from that of animals. Inasmuch as there are certain analogies in organization of white matter in animals, both highly developed



Figure 1. Employees of the World Hearing Center at the OHBM conference



Figure 2. Distribution of key words for the OHBM conference 2013 (M. Corbetta, lecture summarizing the conference)

(e.g. dolphins) as well as those poorly developed (amphibians), the structure of connections in human brain has certain features which are not encountered in other creatures.

In the works presented it could be noticed that the approach to analysis of functional imaging data with regard to neuronal connections (the so-called "Connectivity Analysis") is becoming more and more popular and it can also be considered as part of the above described project. The significant role of this topic is reflected by the distribution of key words appearing at the conference, which was presented by M. Corbetta (Figure 2) at the lecture closing the meeting.

Another widely discussed issue was linking the research of brain functions with their genetic background. This trend appears to gain importance in research. Two years ago and also one year ago these topics were raised at conferences devoted to exploration of human brain during round table debates and key lectures. At this year's OHBM meeting associating gene expression with research, both anatomical and functional, was discussed at symposiums, lectures and was also presented on posters. In light of the above, it may be predicted that in the following years this trend in research will be still intensively developed and it may be expected that one of the leading centers will publish a standardized atlas of gene distribution in human brain. The results of this kind may be expected of the Max Planck Institute in Leipzig among others (the host of the European Society for Magnetic Resonance in Medicine and Biology meeting two years ago, at which the representation of the World Hearing Institute was also present), which in 2011 as one of the first emphasized the need to conduct such research. Considerable achievements in this scope has also the Allen Institute for Brain Science from Seattle, the host of this year's OHBM meeting – with E. Lein's lecture "An Anatomical Comprehensive Atlas of Gene Expression in Adult Human Brain" being a good example of this.

Nevertheless, the main field of research conducted in the Institute of Seattle, co-financed by DARPA (Defense Advanced Research Project Agency of the United States), is creating BMI interfaces (Brain-Machine Interface). This year the researchers from Seattle presented particularly promising results of transmitting information to and from an artificial limb. The protagonist of the movie presented by them was able to drink coffee from a paper cup on her own using her artificial hand. Earlier, due to the lack of feedback, this paper cup was crushed each time by a robot arm. The further plans of the team of this center were also a surprise. Namely, they are planning to create a "prosthesis" of a damaged fragment of white matter. In some cases a brain area responsible for connecting certain functional areas of the brain is damaged as a result of an injury or stroke, whereas the functions themselves remain intact. This happens very often in the case of post-stroke aphasia, when the connection between Broca's and Wernicke's areas (responsible for generating and understanding speech) is broken. The communication between these centers is essential to maintain this basic human function and the new aim of the Allen Institute is electronic reconstruction of this connection. Although it was stressed during the lecture that these are plans for the future, the scientific potential and financial

possibilities of this center suggest that the first results are to be expected soon.

Finally, it should be emphasized that at this year's conference particular attention was paid to two international projects which are about to start – the European Human Brain Project and the American BRAIN (Brain Research through Advancing Innovative Neurotechnologies – www.nih.gov/science/brain). Due to the fact that the OHBM meeting took place in the United States, the council of conference participants was completely devoted to the latter project. The meeting was led by Thomas R. Insel, the Director of NIMH (National Institute of Mental Health) at NIH (National Institute of Health). The main aims of this project are the following: fast development and implementation of innovative techniques for creating dynamic imaging of brain functions, which integrate activity of neural system both in time and in space, as well as development of scientific funds focused on neuroscience, genetics, physics, engineering, computer science, nanoscience, chemistry, mathematics and others in order to develop interdisciplinary cooperation on a previously unprecedented scale. It was stressed that although it is an American project, it is open for cooperation and ideas from all over the world. In the context of this project the issue of processing a huge amount of data present in such kind of programs was raised. A vast majority of research is conducted on groups involving about 20–30 persons. In this case, a cohort of the examined persons will be greater by a few orders of magnitude and more diversified with respect to group parameters as well as tasks performed and research sequence. One of the participants to the conference noticed that scientists must become open to other industries in which "our" problems are trivial and solved long ago. As an example, he named the Google company, which handles gigantic and diversified databases in an impressive way.

The conferences of the Organization for Human Brain Mapping are extremely important for scientists devoted to brain research due to enormous possibilities of exchanging information and knowledge. The most accurate sentence summarizing this year's meeting with regard to current directions of development of neuroscience is the statement of Thomas R. Insel, who said that he honestly envies the beginning scientists and young doctors, because the next 10 years will be the best period for brain research. They have thus a particular chance to participate in something unique and develop themselves rapidly, taking into consideration the fact that now the only limitation in brain research are the abilities of our own mind.