1. Overview

The Department of Biomedical Engineering and Computational Science (BECS) of Aalto University School of Science organized a learning event titled *2nd TMS–EEG Summer School: Probing Brain Dynamics*, on 8–13 September 2014.

This event was one of several *Science Factories* funded by the Aalto Institute of Science (AScI). It took place mostly in Sannäs Manor; hands-on training was organized at Aalto University, University of Helsinki and the BioMag Laboratory (joint research center of Aalto, University of Helsinki and the Helsinki University Central Hospital).

The purpose was to clarify the present state of this research area, to brainstorm new ideas, to help integrate European and global efforts in the field, and to educate newcomers by bringing together leaders in the field as teachers and discussants.

Fig. 1: Introductory lecture at Helsinki University.
The organizing committee included:

- Prof. Risto Ilmoniemi, Aalto University, Finland
- Prof. Marcello Massimini, University of Milan, Italy
- Dr. Julio C. Hernandez-Pavon, Aalto University, Finland

Where the main coordinator and responsible for the planning and arrangements of the science factory was Dr. Julio C. Hernandez-Pavon, who did a tremendous work and organized a remarkable event.

Fig. 2: Organizing committee (left to right: Prof. Risto Ilmoniemi, Dr. Julio Hernandez-Pavon and Prof. Marcello Massimini).
2. Participants

The Science factory attracted 52 participants from 19 countries: 35 students and 17 teachers (all of them leading figures in the respective specialties). They gave lectures and instructed the students in different activities.

Fig. 3: Group photo in Sannäs Manor.

The faculty included:

- Prof. Jeff Daskalakis, University of Toronto, Canada
- Prof. Fabio Ferrarelli, University of Wisconsin-Madison, USA
- Prof. Gesa Hartwigsren, Christian-Albrechts-University Kiel, Germany
- Prof. Matti Hämäläinen, Aalto University, Finland
- Prof. Risto Ilmoniemi, Aalto University, Finland
- Prof. Jari Karhu, Nexstim Oy, Finland
- Prof. Vasilios Kimiskidis, Aristotle University of Thessaloniki, Greece
- Dr. Keiichi Kitajo, RIKEN Brain Science Institute, Japan
- Prof. Marcello Massimini, University of Milan, Italy
- Prof. Carlo Miniussi, University of Brescia, Italy
- Dr. Sara Määttä, University of Eastern Finland, Kuopio, Finland
- Prof. Hartwig R. Siebner, Copenhagen University Hospital Hvidovre, Denmark
- Prof. Ulf Ziemann, Tübingen University Hospital, Germany
The hands-on sessions were organized by Tommi Makkonen (Univ. Helsinki) and Pantelis Lioumis (BioMag Laboratory), whereas the signal analysis workshop was organized by Johanna Metsomaa (Aalto University), Silvia Casarotto (Univ. Milan) and Julio Cesar Hernandez-Pavon (Aalto University).

Fig. 4. Group photo in Porvoo.

3. Program

Students had to prepare in advance a mini-poster about their background and interests for the "handshake" session and they presented either a research poster or an oral presentation during the course. They read some preparatory material prior to the course.

Each teacher presented a 35-min lecture on his/her own research and perception of the field in an interactive manner: after each lecture, for about an hour, a group of 3–4 students led by a senior scientist acted as designated commentators, while the remaining students also participated in the discussion.

The event started on Monday, September 8 at 8:30 am and ended on Saturday, September 13 at 4 pm.
Fig. 5. Audience enjoying a session during the science factory.

Fig. 6. Discussion during a poster session.
The science factory consisted of the following activities:

1. Preparatory lectures of TMS basics and TMS–EEG methodology (Mon 8th September).
2. A 3-day intensive workshop (Tue–Thu, 9–11 September) where the leading researchers of the field presented their work and understanding, discussed the topics, and coached the students.
3. Presentations of the students summarizing the topics of the workshop and related literature (Friday, 12 September).
4. Hands-on TMS–EEG training (Mon, 8 and Fri, 12 September).
5. A data analysis hands-on workshop (Sat, 13 September).
6. Different social activities every evening.

Fig. 7. Discussion during a student’s presentation.
Fig. 8. Performance of the “Alpha-band” during the party.

Fig. 9. Participants enjoying the party (left to right: Vasilios Kimiskidis, Gesa Hartwigsen, Julio Hernandez-Pavon, Keiichii Kitajo and Risto Ilmoniemi).
Fig. 10. Participants enjoying the outdoor activities.
Fig. 11. Participants playing möllky.
4. Conclusion

Fig. 12. Scientific discussion during one dinner in Sannäs.

Fig. 13. Smiling participants after having dinner in Porvoo.
In summary, this event was unique since different aspects of TMS–EEG were tackled from different angles; high-level lectures were presented, a tremendous discussion was led by the interesting topics, the students had the chance to use state-of-the-art equipment, novel and efficient algorithms were taught in the data analysis workshop, but overall the interactive and friendly atmosphere among the participants during and after the event has motivate us to continue to organize events like this.
Fig. 14. Closing of the event in Sannäs.
Fig. 15. Summary of the science factory in about seven words:

TMS-EEG
Connectivity
Community
Interaction
Network
Food
Fun
That was great!
The feedback provided for the students and teachers was highly positive, therefore the science factory was a very successful event, not only scientifically but also socially, where neuroscientists, medical doctors, physicists, mathematicians, psychologists and engineers shared a unique experience and some collaborations have been strengthen and others have just started. We strongly believe that it would be very useful to organize similar science factories also in the future. In particular, the interactive format proved to be very successful.