

## NEWS FROM IFESS

The year 2016 was a very active year for the society. Both the 20<sup>th</sup> IFESS conference in La Grande Motte, France and the 12<sup>th</sup> triannual IFESS Vienna Workshop have been very successful events in our calendar. A short report with highlights from the 20<sup>th</sup> IFESS anniversary conference can be found below. Another noteworthy event for the IFESS community was the FES challenge at the Cybathlon in Zurich. Robert Riener, the Cybathlon initiator and long-time IFESS member and BoD presents here a short after event report. Also, I would like to remind you that the Abstract submission deadline for this year's IFESS conference at the Rehabweek 2017 in London has been extended to Feb. 20, 2017. Stay active and submit your latest FES results. After the Chicago workshop in 2015 the BoD continued its work on reorienting IFESS in several working meetings and decided on new vision and mission statements that I just recently presented in the [Letter from the President](#). We believe these statements serve as starting pillars for the renewal of our activities and services. Leaves me to thank you for your confidence in the newly and re-elected BoD and Officers of IFESS!

*Thierry Keller, President IFESS*

## MEMBERS' CORNER

Any IFESS member can contribute by sending a message (150 words max) to [christine.azevedo@inria.fr](mailto:christine.azevedo@inria.fr)

## NEWS

🕒 **Prof. Dr. Nozomu Hoshimiya** (75 years old) who was a longtime member of IFESS was fighting with malignant lymphoma, but passed away on January 25th. Prof. Hoshimiya was born in Japan in 1941. He received the Ph.D. degree in electronic engineering from Tohoku University, Sendai, Japan, in 1969. From 1982 to 1988, he was a Professor in the Research Institute of Applied Electricity, Hokkaido University. Starting in 1988, he was a Professor in Graduate School of Engineering, Tohoku University (Chair of Biomedical Electronics). Then, he acted as a Vice-President of Tohoku University in 2001-2002 and the President of Tohoku Gakuin University in 2004–2013. Prof. Hoshimiya in the IFESS Board of Directors from 1999 to 2000 and President of Japan FES Society from 2003 to 2007. He had made pioneering research on FES control of paralyzed upper limbs, making medical engineering collaboration team with Professor Yasunobu Handa of Tohoku University School of Medicine. Especially it is noteworthy that this team under leadership by Prof. Hoshimiya and Handa succeeded firstly to control the completely paralyzed upper limbs including the shoulder in C4 quadriplegic patients. IFESS society offers its sincere heartfelt condolences to his wife Mrs Tomiko Hoshimiya.

*Prof. Yasunobu Handa*



🕒 **Cybathlon - Moving people and Technology.** On Saturday, 8 October 2016 a world premiere happened in the SWISS Arena in Kloten: ETH Zurich organised the very first Cybathlon! Individuals with physical disabilities competed side by side in six demanding disciplines, using the latest assistive technologies. You could watch the athletes as they tackled flights of stairs in the new wheel chairs and proved their speed and skill using the most up-to-date modern prostheses. The various races tested how the competitors cope with specific challenges and activities from everyday life. There were races for athletes with powered arm and leg prostheses, for those wearing a robotic exoskeleton, powered wheelchairs and brain computer interface digital race. There was also a race for cyclists using electrical muscle stimulation. 12 teams participated in this FES-bike race [www.cybathlon.ethz.ch/fuer-medien/fotogalerie.html](http://www.cybathlon.ethz.ch/fuer-medien/fotogalerie.html) and [www.skyfish.com/p/cybathlon](http://www.skyfish.com/p/cybathlon)

*Prof. Robert Riener*

🕒 **20th IFESS conference, Montpellier, France.** The **20th Anniversary IFESS conference** took place in La Grande Motte, close to Montpellier last June <https://ifess2016.inria.fr/>. The conference was a great success. Abstracts are available in Vol.26, No2-4 of [European Journal of Translational Myology](#). Best papers have been selected for publication in an extended version in Artificial Organs Journal special issue to be published soon.

### Conferences announcement

🕒 **IFESS at RehabWeek 2017, QEII Center, London July 17-20, 2017**

**REHAB  
WEEK  
2017**  
17-20 JULY 2017  
LONDON, UK



A number of great FES conference workshops have been selected from the [Rehabweek](#) Scientific Committee. The competition was extremely high. For the 28 available workshop slots we received more than 40 applications, filling 94 slots. 11 workshop

applications have been made with topics around FES or from active IFESS members. 8 FES related workshops have been selected:

- 1) P. Taylor: Future Directions for Functional Electrical Stimulation and Foot Drop
- 2) G. Davis: FES Exercise for Health and Fitness Benefits: The State of the Art
- 3) G. Alon: Functional Electrical Stimulation (FES): On the Road to Personalized Intervention
- 4) A. Vuckovic: BCI and Functional Electrical Stimulation for Rehabilitation of Movement
- 5) Ning Lan: Neurorehabilitation Based on Novel Electromyographic Metrics for FES and AT
- 6) W. Jensen: Novel technologies & natural sensory feedback for phantom limb pain modulation and therapy
- 7) F. Tomaszuk: Case studies in Neurorehabilitation using Functional Electrical Stimulation
- 8) N. Donaldson: Do the medical device regulations limit innovation in rehabilitation?

The RehabWeek Workshop program and more details to the workshops can be found [here](#). So, in 2017 the RehabWeek will be the number 1 event to send your students or collaborators to learn about the latest FES technologies or knowledge in interactive workshops.

### Selection of new publications in the field of FES

🕒 **Assessing kinematics and kinetics of functional electrical stimulation rowing.** Draghici AE, Picard G, Taylor JA, Shefelbine SJ. *J Biomech.* 2017.

🕒 **Functional Electrical Stimulation for foot drop in Multiple Sclerosis: A Systematic Review and Meta-Analysis of the impact on gait speed.** Miller L, McFadyen A, Lord AC, Hunter R, Paul L, Rafferty D, Bowers R, Mattison P. *Arch Phys Med Rehabil.* 2017.

🕒 **Role of Functional Electrical Stimulation in Tetraplegia Hand Surgery.** Ines Bersch, Jan Fridén. *Archives of Physical Medicine and Rehabilitation* Volume 97, Issue 6, Supplement, Pages A1-A8, 2016.

🕒 **FES in Europe and beyond: Current Translational Research,** Christine Azevedo Coste, Winfried Mayr, Manfred Bijak, Antonio Musarò, Ugo Carraro. *Eur J Transl Myol.* 2016;26(4).

🕒 **Distinctive Steady-State Heart Rate and Blood Pressure Responses to Passive Robotic Leg Exercise and Functional Electrical Stimulation during Head-Up Tilt.** Sarabadani Tafreshi A, Riener R, Klamroth-Marganska V. *Front Physiol.* 2016.

🕒 **Application of Empirical Mode Decomposition Combined with Notch Filtering for Interpretation of Surface Electromyograms during Functional Electrical Stimulation.** Pilkar R, Yarossi M, Ramanujam A, Rajagopalan V, Bayram MB, Mitchell M, Canton S, Forrest G. *IEEE Trans Neural Syst Rehabil Eng.* 2016.

🕒 **Effects of Functional Electrical Stimulation on Reducing Falls and Improving Gait Parameters in Multiple Sclerosis and Stroke.** Gervasoni E, Parelli R, Uszynski M, Crippa A, Marzegan A, Montesano A, Cattaneo D. *PM R.* 2016 Nov 4. pii: S1934-1482(16)31094-2. doi: 10.1016/j.pmrj.2016.10.019.

- ⊙ The LION Procedure to the Pelvic Nerves for Recovery of Locomotion in 18 Spinal Cord Injured Peoples - A Case Series. Possover M. Surg Technol Int. 2016 Oct 26;XXIX:19-25.
- ⊙ Correction of Footdrop Due to Multiple Sclerosis Using the STIMuSTEP Implanted Dropped Foot Stimulator. Taylor PN, Wilkinson Hart IA, Khan MS, Slade-Sharman DE. Int J MS Care. 2016 Sep-Oct;18(5):239-247.
- ⊙ Clinical usefulness of brain-computer interface-controlled functional electrical stimulation for improving brain activity in children with spastic cerebral palsy: a pilot randomized controlled trial. Kim TW, Lee BH. J Phys Ther Sci. 2016 Sep;28(9):2491-2494.
- ⊙ Hybrid robotic systems for upper limb rehabilitation after stroke: A review. Resquín F, Cuesta Gómez A, Gonzalez-Vargas J, Brunetti F, Torricelli D, Molina Rueda F, Cano de la Cuerda R, Miangolarra JC, Pons JL. Med Eng Phys. 2016 Nov;38(11):1279-1288.
- ⊙ A review of the design and clinical evaluation of the ShefStim array-based functional electrical stimulation system. Kenney LP, Heller BW, Barker AT, Reeves ML, Healey J, Good TR, Cooper G, Sha N, Prenton S, Liu A, Howard D. Med Eng Phys. 2016 Nov;38(11):1159-1165.
- ⊙ Functional electrical stimulation (FES): The science is strong, the clinical practice not yet - A review of evidence. Alon G. Ann Phys Rehabil Med. 2016 Sep;59S:e26-e27.
- ⊙ Evolution of Surface Motor Activation Zones in Hemiplegic Patients During 20 Sessions of FES Therapy with Multi-pad Electrodes. Malešević J, Štrbac M, Isaković M, Kojić V, Konstantinović L, Vidaković A, Dediđer S, Kostić M, Keller T. Eur J Transl Myol. 2016 Jun 13;26(2).
- ⊙ Advances in selective activation of muscles for non-invasive motor neuroprostheses. Koutsou AD, Moreno JC, Del Ama AJ, Rocon E, Pons JL. J Neuroeng Rehabil. 2016 Jun 13;13(1):56. Review.
- ⊙ Electrical Stimulation for Hemiplegic Shoulder Function: A Systematic Review and Meta-Analysis of 15 Randomized Controlled Trials. Gu P, Ran JJ. Arch Phys Med Rehabil. 2016 Sep;97(9):1588-94. Review.
- ⊙ Abdominal functional electrical stimulation to improve respiratory function after spinal cord injury: a systematic review and meta-analysis. McCaughey EJ, Borotkanics RJ, Gollee H, Folz RJ, McLachlan AJ. Spinal Cord. 2016 Sep;54(9):628-39. Review.

## New projects

- ⊙ **European Project RETRAINER** The European Project RETRAINER [www.retrainer.eu](http://www.retrainer.eu), (grant agreement No

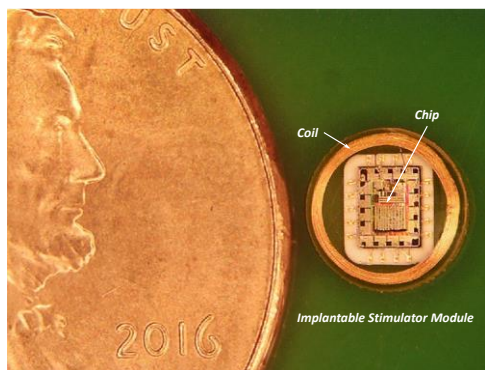
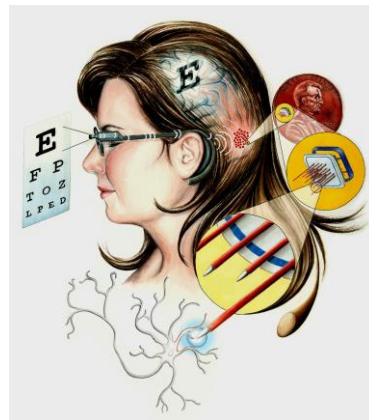


64472) is aimed at tuning and validating advanced, robot-based technologies supported by FES to facilitate recovery of arm and hand function in stroke survivors. RETRAINER includes two subsystems: S1 is a 3 degrees of freedom exoskeleton combined with FES triggered by EMG to provide additional support to the weakest

muscles; S2 exploits a wearable FES system with arrays of electrodes for supporting hand grasping. The RETRAINER graphical user interface drives the patient into a set of occupational therapy exercises monitoring patients' involvement and accomplishment of tasks step by step within each exercise. The pilot test validation was successfully finished. All of the patients were able to use the system and judged positively its wearability and the provided support. A multicenter randomized controlled trial involving about 136 stroke patients aimed at evaluating the superiority of the RETRAINER system with respect to the usual care is just started in two rehabilitation centres: Villa Beretta rehab. centre in Italy, and Asklepios Neurologische Klinik Falkenstein in Germany.

🕒 **The Intra-Cortical Visual Prosthesis Research.** The number of people, world-wide, with vision loss is rising rapidly due to the aging of the population and the increase in diabetes and macular degeneration. Since there is no cure for blindness, artificial vision systems are the best alternative for treating individuals with blindness. 70% of persons with blindness will not be gainfully employed in their lifetime. People with blindness often suffer from depression and social disconnection with others.

Illinois Institute of Technology (IIT) in partnership with seven institutions, including University of Chicago, Johns Hopkins University, University of



Texas, Dallas, Sigenics, Inc, MicroProbes for Life Science (MLS), and the Chicago Lighthouse.

has recently received an \$11.8M award, funded by the National Institutes of Health under the BRAIN Initiative, to test the Intracortical Visual Prosthesis (ICVP) system in a clinical trial. The ICVP system captures an image with a camera and then directly stimulates the visual cortex of the brain, via intracortical electrodes that are contained within numerous implanted wireless modules called wireless floating microelectrode arrays (WFMA). The goal is to produce artificial vision within the brain, bypassing

the eyes entirely. IFESS member Philip Troyk is the project leader. The project plan includes a 2-year pre-clinical phase, for obtaining FDA approval, and a 3-year clinical phase in which five volunteers who have little to no light perception will be implanted.

Following the pioneering work of Giles Brindley, the origins of the ICVP project date back to the early 1970s during which the NIH began funding numerous fundamental studies towards the goal of implanting a multichannel intracortical visual prosthesis system. This program culminated in the short-term implantation of a human volunteer to test the basic concept. In 2000 Troyk's team was formed with the goal of bringing the ICVP system to human testing through a clinical trial. Over the past 17 years, the ICVP team has methodically developed technology, surgical methods, visual testing methods, performed safety testing, and devised structured volunteer support services. Previously funded by a 5-year NIH Bioengineering Research Partnership of \$3.5M, a \$1M, 2-year, Telemedicine & Advanced Technology Research Center (TATRC) grant from the US Army, as well by private foundations and donors, the ICVP technology has reached a point of readiness for this clinical trial. The IIT team has started the preclinical testing phase of the Early Feasibility Clinical Trial, needed to obtain FDA approval, with the first ICVP system planned for implantation in early 2019.

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Next IFESS Newsletter will be issued in **June**. Any member can send contributions before **May 15th** (150 words max). Contributions can include: conferences announcement, special issues call for papers, phd thesis defense announcement, new publications, new projects, job offers. If you have suggestions to improve IFESS-NL please let us know as well. [christine.azevedo@inria.fr](mailto:christine.azevedo@inria.fr)