Guest Editorial
13th Body Sensor Networks Symposium

Wearable and implantable sensor systems have been a unifying theme for the annual Body Sensors Network (BSN) symposium since its conception by Guang-Zhong Yang at Imperial College in 2004. However, each year the meeting takes on the unique character and specialization of the local venue; the BSN 2016 meeting in the University of California at San Francisco (UCSF) Mission Bay conference center focused on neuroscience applications including stress and behavior monitoring and chronic disease management. Keynote presentations highlighted the use of pattern analysis and "smart shoes" to manage Parkinson's disease [1], and bioengineering advances in detecting electrodermal activity at the wrist associated with epilepsy and psychologically stressful events [2]. One of the papers in this special issue addresses clinical gait analyses in multiple sclerosis, demonstrating how technology developments for one chronic disease model (Parkinson's) benefit management of other diseases. A workshop sponsored and organized by Friedrich Alexander University, Erlangen, previewed this theme of automated sensor-based mobility analysis for chronic disease management.

The neuroscience theme also extended to wearable solutions for behavioral monitoring. Assessing food intake is the greatest challenge to monitoring human energy balance in the fight against the global obesity epidemic. The best paper presented at the meeting provides a bioengineering solution in the form of "smart eyeglasses" and is part of this special supplement. This food intake monitoring strategy is based on chewing patterns detected by unobtrusive electromyography.

Human performance enhancement was a key theme. This included the concept of technological doping to optimize performance during a sports competition, as described in a keynote talk that described individual monitoring and micrometeorological predictions from IBM Watson for a Race-Across-America cyclist, continuously updating optimal solutions to work-rest opportunities [3]. One thematic session described systems worn by animals that sense stress and behavior in police horses and military working dogs during training. Monitoring individuals in extreme environments to enhance safety and performance was also a theme, including assessment of peripheral vasoconstriction and falling skin temperatures during Norwegian Army ski patrol, fatigue with heavy workload in Swiss recruits during training, and single channel EEG monitoring of alertness and attentional lapses in French air force pilots.

In another line of effort, the symposium highlighted the bioengineering challenges of body sensor technology development that ultimately will meet user needs, including communications security and power management. In this meeting, emerging wearable device developments were summarized by a keynote presentation on next generation body-powered systems [4] and ultralow power management strategies for continuous wearable operations are represented in two of the invited conference student papers in this special issue. Another keynote presentation presented the draft recommendations for wearable cybersecurity standards to address an emerging threat to safety and privacy that has been recognized in the diabetes technology community and by others involved in personal physiological monitoring systems [5]. The modern challenges of transition to implementation and practice were highlighted by a sixth keynoter representing medical technology venture capitalists, followed by an industry panel comprised of three key industry leaders in wearable physiological monitoring and flexible electronics providing examples of products in development and substantive discussion about the engineering challenges involved in each of their systems.

Cultivating interest in wearable bioengineering research is a key function of the BSN meetings, with each meeting providing opportunities to grow the bench with new researchers who have been

encouraged and inspired by their involvement in the conference program. The 13th BSN provided opportunities for new investigators through student presentations including a special student colloquium where ten students gave oral presentations based on their conference poster presentations; one of the papers in this special issue was solicited on the basis of these presentations. Another student paper selected from the poster presentations is featured in this issue; the adaptive NIR-based continuous sensing system for myocutaneous flap viability addresses an important need in post-surgical monitoring.

Imperial College, in collaboration with Intel, continued their sponsorship of a Hack-a-Thon for student teams to produce novel prototype wearable systems during the conference. The team CO-UP (F Parisi, D Huen, and R Brugarolas) who developed a wearable system for Chronic Obstructive Pulmonary Disease (COPD) patients won the first prize in the Hack-a-Thon. Another student competition, the "Ice House Challenge," was organized and conducted by MIT Lincoln Laboratories, with semifinalist student teams demonstrating first responder monitoring prototype systems for evaluation in a set of live exercises. Student teams from University of New Mexico and FAU-Erlangen University shared the first prize for developing two unique and potentially patentable solutions to the problem. The enthusiasm of student participants at BSN 2016 and the innovative concepts they presented offer a very positive outlook for the future of wearables bioengineering.

Acknowledgement.
This 13th BSN symposium was the first year that the conference fell under the management of the IEEE, and we are grateful for their wholehearted support in this new venture. Most notably, we would like to thank Scott Woodhouse (IEEE Senior Society Administrator for Technical Activities) and the uncompensated keynote speakers for a successful meeting.

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