Special Issue on Selected Papers from BiOCAS 2008 Guest Editors' Introduction

THIS special issue of the IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS contains a selection of the top papers from the 2008 IEEE Biomedical Circuits and Systems Conference (BiOCAS 2008) held during November 20-22, 2008 in Baltimore, MD. This conference was organized by Ralph Etienne-Cummings and Andreas Andreou (General Co-Chairs), with Shih-Chii Liu, Shuvra Bhattacharyya, and Yong Lian acting as the Program Co-Chairs.

Three papers in this special issue are concerned with circuits and systems for monitoring and stimulation of neural signals. The paper entitled *NeuralWISP: A Wirelessly Powered Neural Interface With 1-m Range*, by D. J. Yeager, J. Holleman, R. Prasad, J. R. Smith, and B. P. Otis, presents a wireless neural interface system that harvests its power using far-field RF energy. It has the circuits for monitoring and detecting neural signals and for wireless signal transmission. This form of power harvesting is useful since it is compatible with pervasive RF technology.

The paper *A Wireless Integrated Circuit for 100-Channel Charge-Balanced Neural Stimulation* by B. K. Thurgood, D. J. Warren, N. M. Ledbetter, G. A. Clark, and R. R. Harrison, describes a system which can stimulate 100 individual electrodes. The system includes both telemetry and power modules with minimal external components. This is ongoing work from this group to develop a low-power, wireless interface to implantable electrodes.

The paper *Wireless Micropower Instrumentation for Multimodal Acquisition of Electrical and Chemical Neural Activity* by M. Mollazadeh, K. Murari, G. Cauwenberghs, and V. Thakor describes a system that integrates circuits for simultaneous monitoring of two different data modalities, neurochemical, and neuropotential signals. In addition, it has a wireless interface telemetry and power-harvesting module thus making it suitable for body implants.

Two papers are focused on the development of novel models and methods for prosthetic devices. The paper *A Micropower Tilt-Processing Circuit*, by T. G. Constandinou and J. Georgiou, describes circuits for an implantable vestibular prosthesis. The low-power circuits output a tilt angle by using the output of a linear microelectromechanical-system (MEMS) accelerometer.

The paper *Conveying Tactile Feedback in Sensorized Hand Neuroprostheses Using a Biofidelic Model of Mechanotransduction* by S. S. Kim, A. P. Sripati, R. J. Vogelstein, R. S. Armiger, A. F. Russell, and S J Bensmaia develops a model for the neural activity that results from dynamic stimulation of mechanoreceptive fibers that supply nerves to the hand. The authors demonstrate the accuracy of this model and discuss its application to a sensorized prosthesis.

The remaining three papers present novel devices for biomedical sensing, actuation, and power delivery, respectively. The paper *A Cantilever Sensor With an Integrated Optical Readout for Detection of Enzymatically Produced Homocysteine*, by S. T. Koev, R. Fernandes,W. E. Bentley, and R. Ghodssi, presents the first optical cantilever sensor that is capable of detecting liquid samples. The device is demonstrated through detection of homocysteine, which is a compound that is found in bacterial signaling pathways.

The paper *Optoelectronic Tweezers as a Tool for Parallel Single-Cell Manipulation and Stimulation* by J. K. Valley, A. T. Ohta, H.-Y. Hsu, S. L. Neale, A. Jamshidi, and M. C. Wu, presents advances related to optoelectronic tweezers (OET), and their application to single-cell movement, observation, and stimulation. The authors present case studies of devices that are integrated with OET to electroporate/lyse cells using a conventional microelectrode approach, selectively lyse cells using lateral-field optoelectronic tweezers (LOET), and electroporate cells using a light-induced technique.

The paper *Experimental Study of a TET System for Implantable Biomedical Devices* by T. D. Dissanayake, A. P. Hu, S. Malpas, L. Bennet, A. Taberner, L. Booth, and D. Budgett, presents a system for transcutaneous energy transfer that can be used to drive implantable biomedical devices without having to pass cables through the skin. The system is demonstrated on adult sheep, and evaluated in terms of power efficiency and temperature elevation due to power loss in the implanted circuitry.

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Dr. Salama was elected to the Institute of Electrical and Electronics Engineers (IEEE) Sensory Systems and the IEEE BioCircuits technical committees in 2006 and to the IEEE VLSI systems and applications committee in 2007. He is currently the tutorials chair at the IEEE BioCircuits Conference (BioCAS 2008) and Association for Computing Machinery's Great Lakes VLSI Symposium (GLVLSI 2009).

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