THE IEEE International Solid-State Circuits Conference (ISSCC) is the flagship conference of the IEEE Solid-State Circuits Society and the foremost global forum for presenting advances in solid-state circuits and systems-on-a-chip. Last year, the IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS highlighted select papers from the ISSCC 2010 on topics related to biological and healthcare applications, which was well received. This special issue once again features six select papers from the ISSCC 2011. This is a small set of examples that reflect the rapidly increasing efforts to use solid-state circuits for health-monitoring, and therapeutic/diagnostic applications. The selection of these papers, whose final decision was based on peer review, was coordinated with the editor-in-chief of the IEEE JOURNAL OF SOLID-STATE CIRCUITS, Prof. Un-Ku Moon, to avoid overlap with its ISSCC 2011 special issue, which will also include biomedical papers. We also acknowledge the ISSCC 2011 chair, Prof. Anantha Chandrakasan, and the editor-in-chief of this journal, Prof. Gert Cauwenberghs, for their support.

The paper by Domenico Zito et al., entitled “SoC CMOS UWB pulse radar sensor for contactless respiratory rate monitoring,” demonstrates a noninvasive, continuous-time monitoring of respiration activity of patients (both adult and infant) using ultra-wideband radar implemented in 90-nm CMOS technology with sub-centimeter spatial resolution.

Shuenn-Yuh Lee et al. writes a paper entitled, “A programmable implantable micro-stimulator SoC with wireless telemetry: Application in closed-loop endocardial stimulation for cardiac pacemaker.” A wirelessly powered CMOS chip with power management scheme (and power consumption of 48 μW) is reported and aimed as an implantable micro-stimulator system on a chip. It can be used, for instance, in rat’s intracardiac stimulation.

The paper by Maja Vidojkovic et al. entitled, “A 2.4 GHz ULP OOK single-chip transceiver for healthcare applications” describes a transceiver in 90-nm CMOS, which operated in the 2.36–2.485 GHz band for wireless body area network applications. The direct modulated transmitter consumes 2.59 mW with 0 dBm peak power and enables digital pulse-shaping to improve spectrum efficiency. The sub-mW super-regenerative receiver supports up to 5 Mbps with −75 dBm sensitivity. The transceiver has been used in an ECG necklace to monitor ambulatory heart activity.

The paper by Suat U. Ay entitled, “A CMOS energy harvesting and imaging (EHI) active pixel sensor (APS) imager for retinal prosthesis” is about an image sensor that is capable of energy harvesting. This 54 × 50 array has been implemented in a 0.5-μm CMOS process and includes a 10-bit supply boosted SAR ADC, a supply boosting circuit, and a charge pump with better than 70% efficiency. The energy harvesting imager consumes only 14.25 μW from 1.2 V when it runs at frame capturing speed of 7.4 Hz.

The paper by Maryam Ashouei et al., entitled “An ultra low energy biomedical signal processing system operating at near-threshold” reports on a digital signal processing system, which is intended for the use in a wireless sensor node for ambulatory monitoring of vital signals. To maximize the battery life, the system’s power usage and performance are adjusted continuously according to events. This leads to, for example, a very low measured energy per sample for ECG detection.

The paper by Jiawei Xu et al. entitled, “A 160 μW 8-channel active electrode system for EEG monitoring” presents a system for EEG signal acquisition with dry-electrodes. It uses AC-coupled chopper amplifiers with input impedance boosting and digitally-assisted offset trimming. The active electrode system, which achieves an impressive input referred noise of 0.8 μVrms (0.5–100 Hz) has been implemented in a 0.18-μm CMOS process and consumes only 88 μA from a 1.8 V supply. It can reduce the system sensitivity to cable motion artifacts and power line interference.

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Dr. Ham’s work experiences include Caltech-MIT Laser Interferometer Gravitational Wave Observatory (LIGO), IBM T. J. Watson Research, Consulting Visiting Professorship at Pohang University of Science and Technology (POSTECH), IEEE conference technical program committees including the IEEE International Solid-State Circuits Conference (ISSCC) and the IEEE Asian Solid-State Circuits Conference (ASSCC), advisory board for the IEEE International Symposium on Circuits and Systems (ISCAS), international advisory board for the Institute for Nanodevice and Biosystems, and various U.S., Korea, and Japan industry, government, and academic technical advisory positions on subjects including ultrafast electronics, science and technology at the nanoscale, and convergence of information technology and biotechnology. He served as a Guest Editor for IEEE JOURNAL OF SOLID-STATE CIRCUITS (January 2009 special issue) and was a coeditor of CMOS Biotechnology with Springer (2007). He is an Associate Editor of IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS.