T HIS SPECIAL ISSUE of the IEEE JOURNAL ON EMERGING AND SELECTED TOPICS IN CIRCUITS AND SYSTEMS (JETCAS), sponsored by the IEEE Circuits and Systems Society (CASS), is devoted to the emerging field of brain–machine/computer interface (BMI/BCI). This special issue was organized following the 2nd Circuits and Systems Forum on Emerging and Selected Topics (CASFEST) workshop, which was held in Rio de Janeiro, Brazil, on May 15, 2011 in conjunction with the IEEE International Symposium on Circuits and Systems.

BMI/BCI topics cover many disciplines related to several IEEE societies. The resulting devices and algorithms translate physiological activity into machine control, which can be used to restore or enhance, either partially or completely, human perception or sensory-motor function. The multidisciplinary nature of BMI/BCI has made it one of the most dynamic and interesting topics in the IEEE society. The implementation of a complete BMI/BCI offers many circuits and systems design challenges, which include neural and chemical sensors, signal processing activities, low-power and low-voltage circuits, wireless transmission, harvesting energy, material sciences, and biocompatibility issues. The research community is now especially focused on the implementation of wireless sensors and biosignal processing.

The CASFEST workshop as well as this JETCAS special issue are led by the IEEE Circuits and Systems Society and organized jointly with the IEEE Engineering in Medicine and Biology Society (EMBS) and the IEEE Systems, Man and Cybernetics Society (SMCS). The CASFEST event attracted 18 submissions and six invited speakers, while the Call for Papers to publish the present special issue attracted more than 80 full paper submissions.

The selected papers reflect continuing trends toward higher levels of circuits and systems techniques covering a wide variety of subjects within the analog and RF integrated circuits and signal processing fields, ranging from basic analog building blocks to system applications in several related domains such as telecommunications and biomedical technology.

The major areas of circuits and systems, covering the present BMI/BCI special issue, drew submissions from several countries spanning the globe. Among the submitted contributions, a preselection of 40 papers was completed, and finally 19 contributions were selected by the reviewers and have been accepted for publication in this special issue. These selected contributions cover a variety of BMIs/BCIs and include: 1) monitoring and data recording methods, 2) spike-based detection techniques, 3) adaptive/automatic biosignal processing approaches, 4) bioamplifiers implementation and validation, 5) ambulatory/implantable electronics, 6) electronics for brain science, and vision-based interfaces, 7) electrical stimulation, and 8) experimental and clinical case studies.

The paper review process for this interdisciplinary topic involved multiple societies within the IEEE and required the cooperation of international experts. Selecting only 19 manuscripts out of 82 submitted papers was a difficult and critical task. We strived to assemble a comprehensive overview of the best papers covering the circuits and systems aspects of BMI/BCI. We are very much indebted to the leadership of our respective IEEE societies for their invaluable support to make this joint JETCAS special issue happen. We wish to thank our co-researchers from all around the world for choosing to submit their contributions to this BMI/BCI special issue for publication. Due to their many and important contributions, we managed to edit an issue of high scientific quality. In fact, it has been gratifying to learn more about the advances in this emerging field. We would like to thank the numerous volunteers that helped review the submitted manuscripts. We wish to thank Gianluca Setti, José del R. Millán, and Bin He, the presidents of the three IEEE societies at the time of the BMI/BCI CASFEST workshop, and the JETCAS board for giving us the opportunity to organize this joint prestigious IEEE CASFEST event and to lead this JETCAS special issue. We also wish to express our deepest gratitude for the efforts of the CASS personnel. This special issue is only possible with their expert help.

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Dr. Sawan received several awards, among them the Bombardier Award for technology transfer, the medal of merit from the President of Lebanon for his outstanding contributions, and the Barbara Turnbull Award for spinal cord research in Canada. He is Fellow of the Canadian Academy of Engineering, Fellow of the Engineering Institute of Canada, and Officer of the Quebec’s National Order. He is founder and cofounder of several international conferences such as the IEEE New Circuits and Systems Conference (NEWCAS), the IEEE International Conference on Electronics, Circuits and Systems (ICECS), and the IEEE International Conference on Biomedical Circuits and Systems (BIOCAS). He is also cofounder and Associate Editor of the IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS, he is Deputy Editor-in Chief of the IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS–PART II.

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Dr. Sajda has received several awards for his research including an NSF CAREER Award (2002), the Sarnoff Technical Achievement Award (1996), The Pollack Award for outstanding dissertation research in Bioengineering (UPenn, 1994), The Flexner Award for outstanding thesis research in the Neurosciences (UPenn, 1993) and the Adler Award for outstanding undergraduate research in Electrical Engineering (MIT, 1989). He is a Fellow of the American Institute of Medical and Biological Engineering (AIMBE). He is the Editor-in-Chief for the IEEE TRANSACTIONS IN NEURAL SYSTEMS AND REHABILITATION ENGINEERING, Associate Editor for IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, a member of the IEEE Technical Committee on Neuroengineering.
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Dr. Sanchez is an elected member of the Administrative Committee of the IEEE Engineering in Medicine and Biology Society. He is a recipient of the American Epilepsy Society Young Investigator Award, the IEEE Excellence in Neural Engineering Award, and Eliahu I. Jury Early Career Research Award. He has mentored over 20 Ph.D. students, Masters students, and Postdoctoral Associates in the field of neuroprosthetics as applied to animals and humans. Funding from the NIH, NSF, and DARPA have supported this work.