

**SPECIAL ISSUE**

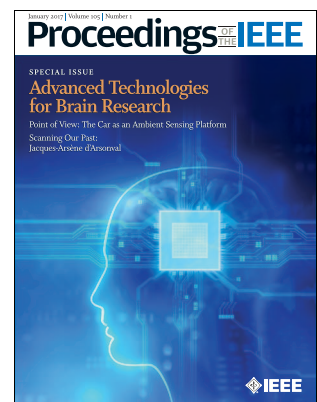
**ADVANCED TECHNOLOGIES FOR BRAIN RESEARCH**

*Edited by M. Akay, P. Sajda, S. Micera, and J. M. Carmena*

- 11 Silicon-Integrated High-Density Electro cortical Interfaces**  
*By S. Ha, A. Akinin, J. Park, C. Kim, H. Wang, C. Maier, P. P. Mercier, and G. Cauwenberghs*  
**|INVITED PAPER|** This paper examines the state of the art of chronically implantable electrocorticography (ECoG) interface systems and introduces a novel modular ECoG system using an encapsulated neural interfacing acquisition chip (ENIAC) that allows for improved, broad coverage in an area of high spatiotemporal resolution.
- 34 Framework for the Development of Neuroprostheses: From Basic Understanding by Sciatic and Median Nerves Models to Bionic Legs and Hands**  
*By S. Raspopovic, F. M. Petrini, M. Zelechowski, and G. Valle*  
**|INVITED PAPER|** This paper focuses on a novel, less invasive or intrusive neural prosthesis design by optimizing the neural interface geometry and the number of stimulating contacts for any specific nerve.
- 50 Stable Detection of Movement Intent From Peripheral Nerves: Chronic Study in Dogs**  
*By Y. M. Dweiri, T. E. Eggers, L. E. Gonzalez-Reyes, J. Drain, G. A. McCallum, and D. M. Durand*  
**|INVITED PAPER|** This paper emphasizes the need for intuitive control of high-degree-of-freedom prosthetic limbs and proposes a detection method for fascicular-level neural activity under freely moving conditions that avoids compromising the peripheral nerves by using flat interface nerve electrodes (FINE).
- 66 A Nonhuman Primate Brain-Computer Typing Interface**  
*By P. Nuyujukian, J. C. Kao, S. I. Ryu, and K. V. Shenoy*  
**|INVITED PAPER|** This paper discusses the feasibility of using brain-computer interfaces (BCIs) as communication interfaces for communication neural prostheses, and compares two high-performing BCI decoders in a typing task simulation.
- 73 Reliable Next-Generation Cortical Interfaces for Chronic Brain-Machine Interfaces and Neuroscience**  
*By M. M. Maharbiz, R. Muller, E. Alon, J. M. Rabaey, and J. M. Carmena*  
**|INVITED PAPER|** This paper discusses recent advances in neurotechnology developed at Berkeley, including ultrasmall, ultracompliant implantable recording technology, as well as active devices which enable RF coupling, front-end amplification, and transcranial communication.
- 83 Fusing Multiple Neuroimaging Modalities to Assess Group Differences in Perception-Action Coupling**  
*By J. Muraskin, J. Sherwin, G. Lieberman, J. O. Garcia, T. Verstynen, J. M. Vettel, and P. Sajda*  
**|INVITED PAPER|** This paper investigates brain behavior relationships using novel machine learning methodologies and neuroimaging technologies.

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**On the Cover:** Our cover image captures the essence of this month's focus on revolutionary neurotechnologies for experimentally probing, stimulating, and mapping the structure and function of the brain.

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## SPECIAL ISSUE: Advanced Technologies for Brain Research

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By *M. T. Alt, E. Fiedler, L. Rudmann, J. S. Ordonez, P. Ruther, and T. Stieglitz*  
**|INVITED PAPER|** This paper provides an overview of optoprobe technology and its application to chronic neural implants. It also provides a previously undefined context of the state of the art of customized optoprobes for optical neural interfaces.
- 139 Advances in Two-Photon Scanning and Scanless Microscopy Technologies for Functional Neural Circuit Imaging**  
By *S. R. Schultz, C. S. Copeland, A. J. Foust, P. Quicke, and R. Schuck*  
**|INVITED PAPER|** This paper provides an overview of recent advances in neural circuit imaging technologies, including the resulting technical challenges of signal processing and data analysis tools.
- 158 Implantable Microimaging Device for Observing Brain Activities of Rodents**  
By *J. Ohta, Y. Ohta, H. Takehara, T. Noda, K. Sasagawa, T. Tokuda, M. Haruta, T. Kobayashi, Y. M. Akay, and M. Akay*  
**|INVITED PAPER|** This paper discusses three categories of implantable microimaging devices for observing small animal brain activity and highlights the ultrasmall image sensor category for its ability to explore deep brain activity under freely moving conditions.

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