High-Density Integrated Neural Interfaces

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The convergence of neurotechnology and adaptive machine intelligence onto low-power silicon integrated systems offers opportunities to advance the effectiveness, efficiency, affordability, and comfort of mobile brain-computer interfaces for human-machine communication and neural prosthetics.

I will highlight advances and current trends in the miniaturization and integration of neural interfaces with embedded active electronics, ranging from unobtrusive wearable systems for whole-brain electroencephalography to implantable silicon integrated circuits for probing and controlling neural activity at near-cellular resolution. These include a fully integrated brain-computer-interface-on-chip for neural stimulation and recording, combining 16 electrodes, control circuits, and power/data antenna on a single silicon die.

I will also discuss implications of these advances and related developments in body area networks to new and emerging applications of pervasive neural interfaces for closed-loop neurological monitoring and neurofeedback therapy.