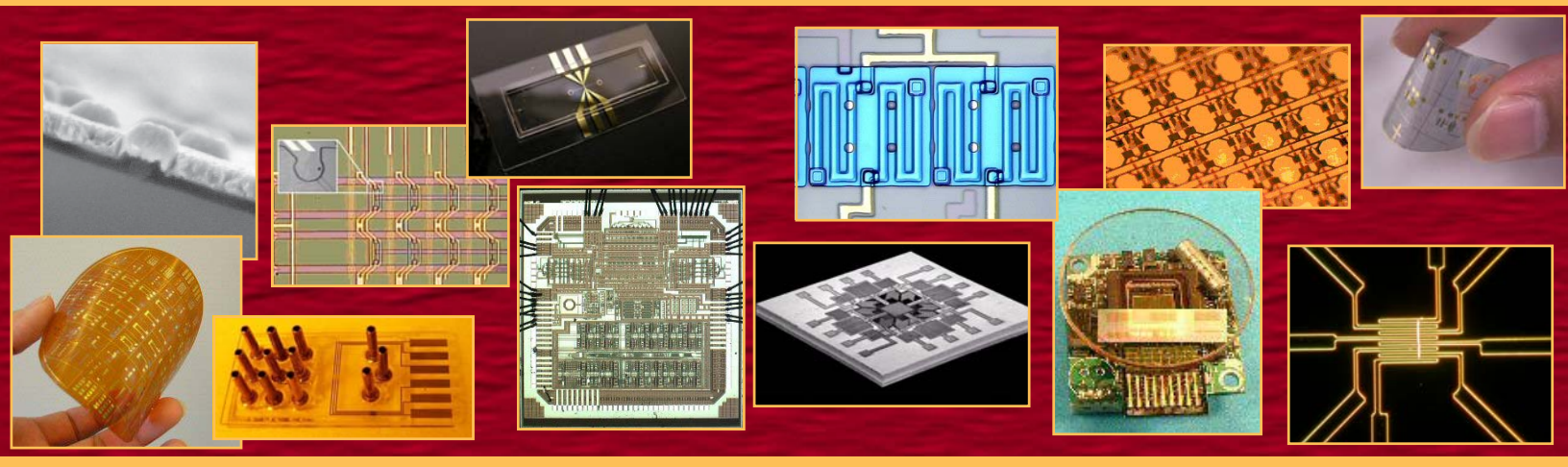
University of Minnesota

NMAC

NANO & MICROSYSTEMS APPLICATIONS CENTER

NMAC carries out basic and applied research focused on advanced nano & microsystems development through interdisciplinary partnerships between academic faculty and industrial/government researchers.



http://nmac.umn.edu

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NMAC Mission

The Nano and Microsystems Applications Center (NMAC) has been established to integrate interdisciplinary faculty, graduate students, and visiting researchers from academia, industry, and government. The common denominator between these participants is their applied and basic research in advanced integrated nano & microsystems design, implementation, characterization, and application technologies. NMAC's integration role is in supporting research with industrial, government, and academic funding and state-of-the-art research equipment. The Center aims to provide graduate education through research, courses, and seminars on topics related to integrated nano & microsystems and their applications. NMAC also works to transfer technologies related

NMAC Research

INTEGRATED MEMS/NEMS AND NANO-ENABLED DEVICES

Value added NEMS/MEMS solutions for mechanical, optical, thermal, wireless, bio, medical applications. Integrated RF MEMS passives, RF MEMS antennas, optical MEMS devices, uncooled infrared detectors, CMOS integration with NEMS/MEMS microstructures. Integration of new nanostructures such as nanowires, CNTs, nanoparticles, magnetic particles, DNA scaffolding on microelectronics or microscale platforms for functional controls and interfaces.

S. Campbell, T. Cui, R. Drayton, H. Jacobs, J. Leger, D. Odde, S. Oh, D. Polla, B. Stadler, J. Talghader, E. Yoon

BioMEMS, MICROFLUIDICS AND BIOSENSORS

Polymer NEMS/MEMS microdevices for bio-interfaces. Biomedical devices. Cell-microsystem interfaces. Microfluidic components including microvalves, micropumps, microchannels, etc. Understanding liquid flow in micro- and nano-size fluidic channels. Bio-photonics, bio-magnetics, and optical/electrical/magnetic biosensing. Various biosensors for DNA, proteins, enzymes, pH, ions, chemical, pathogens, food, odor, environmental and health monitoring, especially focused on all-electrical label-free detection.

T. Cui, H. Jacobs, S. Kumar, J. Leger, D. Odde, S. Oh, D. Polla, R. Rajamani, S. Saliterman, J. Talghader, E. Yoon

FLEXIBLE ELECTRONICS AND PACKAGING

Disposable polymer circuits and low-cost plastic electronics using flexible substrates. Silicon chips embedded on polymer substrates. Flexible PCB. 3D stacking of multi-layer packaging. RF/microwave signal integrity in flexible 3D packages. Wearable electronics. Bio-compatible hermetic packaging for biomedical devices. Reliable low-cost NEMS/MEMS packaging. Hybrid packaging for SiP and SoP solutions. 3D packaging and integration techniques. Mixed technology (electrical and optical) packaging techniques. Isolation design techniques for planar and 3D design. NEMS/MEMS based packaging solutions. Self-assembly packaging.

S. Campbell, T. Cui, R. Drayton, H. Jacobs, S. Kumar, E. Yoon

WIRELESS SENSOR NETWORKS

Distributed sensor deployment with wireless communications. Low-power implementation of network architectures. Adaptable and self-reconfigurable ad hoc networks. Low-power wireless solutions for implanted biomedical devices. Wireless communication through body networks. Wind, solar and vibration energy harvesting for wireless sensor nodes.

R. Harjani, C. Kim, R. Rajamani, W. Robbins, E. Yoon

LOW-POWER MIXED-SIGNAL DESIGN

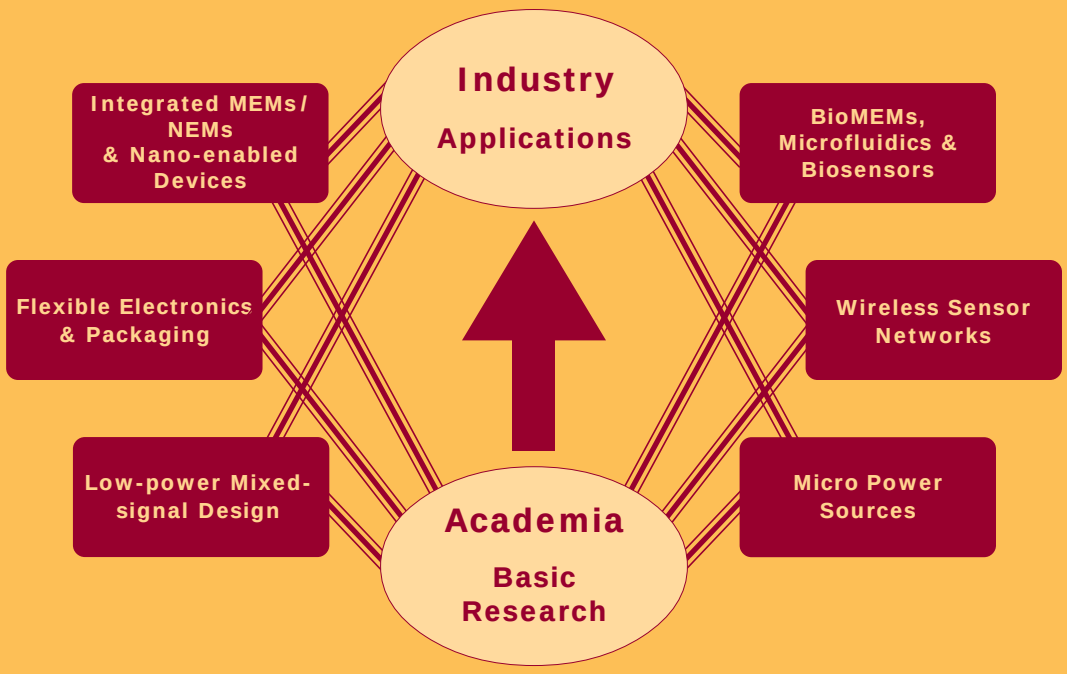
Extremely low-power circuit design and chip implementation. Subthreshold analog and digital circuits. Energy recovery logic. Low-power RF CMOS circuit design. Low-noise instrumentation amplifiers. Low-power data converters. Variation-tolerant leakage-suppression circuits. Sensor peripheral and driving/readout circuits. Organic FET circuits. Efficient on-chip power conditioning circuits.

R. Harjani, C. Kim, E. Yoon

MICRO POWER SOURCES

Next-generation power generation. Energy scavenging devices. Bio-energy harvesting cells. Micro fuel cells including DMFC, PEMFC, etc. Micro solar cells. Micro nuclear reactors. Micro electrothermal heat exchangers. Micro reformers, Micro combustors, Micro hydrogen incubators. Battery-less wireless actuation.

T. Cui, R. Rajamani, W. Robbins, E. Yoon



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