

“Bioelectronics: Its Future in your Health and Well Being”

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In this tutorial, I will present opportunities provided by ultra-low power wearable sensor systems for empowering patients and providers to manage wellness, assist in effective treatment of at-risk elderly, reinforce healthy lifestyles, and provide new tools for long-term environmental exposure health studies. Recent advances in nanomaterials, nanostructures, and nanodevices have increased efficiency of energy harvesters, lowered energy per computational bit, increased capacitor storage density, and enhanced nanosensor efficiency making autonomous operation realizable. Autonomous operation enables long-term sensing and effective management of chronic conditions, sensing of personal exposure to air pollutants and toxins and provide longitudinal studies that can enable new insight into correlation of various health and environmental parameters. I will discuss the challenges in technology development needed to realize these sensor systems. The sensors used in these systems must work robustly in contact with human skin with sweat, oils, and hair and must provide bioelectronic and biochemical information. Furthermore, sensors must operate in microclimates where the temperature and humidity vary widely depending on body location and clothing. Finally, to integrate and package the above components into systems, attention must be paid to social acceptance of technologies, their durability and wearability. Validation and management of data is critical in ensuring acceptance by the appropriate communities.



Veena Misra is the Director of the National Science Foundation Nanosystems Engineering Research Center on Advanced Self-Powered of Integrated Sensors and Technologies (ASSIST). She is a Professor of Electrical and Computer Engineering at North Carolina State University and an IEEE Fellow. She received the B.S., M.S., and Ph.D. degrees in electrical engineering from North Carolina State University, Raleigh, in 1990, 1992, and 1995, respectively. In January 1996, she joined the Advanced Products Research and Development Laboratories, Motorola Inc., Austin, TX, where developed high-performance and low-power front-end technology for microprocessors. In February 1998, she joined the faculty of North Carolina State University. She has authored or coauthored over 150 papers and has guided 23 Ph.D. student dissertations. She is the holder of 13 U.S. patents. Her current research is focused on investigating state-of-the-art low-power CMOS devices, power devices, alternative high-mobility substrates, nanoscale magnetics, and energy-harvesting devices. Dr. Misra was the recipient of the 2001 National Science Foundation Presidential Early CAREER Award, the 2011 Alcoa Distinguished Engineering Research Award, and 2007 Outstanding Alumni Research Award. She also served as the general chair of the 2012 IEEE International Electron Device Meeting.