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Shantanu Chakrabartty, assistant professor of electrical and computer engineering and director of the Adaptive Integrated Microsystems (AIM) Laboratory, has received an NSF CAREER Award for his research in energy harvesting sensors and processors.

During the past four years, the (AIM) Laboratory has been working on a revolutionary sensing paradigm that could change the way engineers monitor the health of any mechanical structure. This innovation, called piezoelectricity driven hot electron injection (p-IHEI), enables energy harvesting sensors to be miniaturized to the size of a micropebble, which can be embedded inside structures like wind turbines or rotor blades. It can even be embedded inside the human body – for instance, in a knee implant or a heart valve. Without the aid of any external powering source, a network of these micropebbles can continuously monitor the health of the structure, allowing it to self-diagnose any catastrophic failure. This research has already spawned two pending U.S. and international patents and is currently being marketed by the MSU Technologies office.

Funding from this five-year $400,000 grant, which begins April 1, will support the study of these novel battery-less, self-powered microsensors. Chakrabartty plans to investigate the fundamental limits of energy harvesting, which will allow further miniaturization and long-range communication with this sensor. The hope is that once fully packaged, the sensor will become an integral part of any “smart” structure, whether it be civil, mechanical, or biomechanical.

Chakrabartty earned his B. Tech in electrical engineering from the Indian Institute of Technology, Delhi, India; and his MS and PhD degrees in electrical and computer engineering from Johns Hopkins University.

To learn more about the AIM Laboratory, visit http://www.egr.msu.edu/aimlab

View Chakrabartty’s NSF award abstract at http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0954752

During the past year, six faculty in the college have received NSF CAREER awards.