

## **World Environment and Life Science Engineered Nano Sensors for Economical Diagnostics (WELSENSED) Engineering Research Center**

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Human health and the environment are national and global concerns where technology has a critical impact. Low cost, rapid, portable diagnostics for infectious disease will transform human health, saving lives and preventing disease. Miniature, portable, low cost environmental sensors will revolutionize air and water quality studies, transforming environmental monitoring.

The research vision of the World Environment and Life Sciences Engineered Nano Sensors for Economical Diagnostics (WELSENSED) Engineering Research Center is to create miniaturized, portable, customizable, low cost sensor systems for rapid health diagnostics and environmental monitoring that will enable a transformation in global health and environmental diagnostics. The proposed postage stamp-sized sensor systems are composed of arrays of nano-scaled sensors that are individually customized and integrated together with Si CMOS electronics to collect multivariate data localized in time and space. Two prototype sensor-array testbeds will be developed for applications in health diagnostics and environmental monitoring. A recipe of infectious agents and environmental contaminants have been identified for the initial testbed development activities. The testbeds will integrate multiple sensing devices. Five sensing devices, including chemical, acoustic, optical, and biological sensors are proposed for the initial activity.

Key to the WELSENSED vision is the leveraging of silicon integrated circuit micro- and nano- fabrication technologies, enabling these systems to be miniature, customizable, and inexpensive. The proposed sensor arrays will drive fundamental research on materials, devices, soft/hard interfaces, optimization algorithms, multivariate processing, and sensor co-integration. The end result will be transformative gains in each of these areas.

WELSENSED is a collaborative activity involving Norfolk State University, Duke University, Georgia Tech, Northwestern, and the University of Wisconsin-Madison. The full WELSENSED vision also includes an innovative education plan that will initiate sensor-based education including all college and graduate levels, and lifelong learning. Diversity programs are also a focus, with 45% of the WELSENSED faculty from underrepresented groups. Moreover, industrial collaboration and technology transfer focus is used to integrate entrepreneurial education, corporate participation, and licensing into a cohesive program for a common partnered vision. The potential benefits to society are profound, affecting US and global health from both diagnostic and preventative perspectives.

