

FY15 Student Research Topic

1. **Research Title:** Develop, Test, and Validate Biomarker Sensors
2. **Individual Sponsor:**

Dr. Steve Kim
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3. **Academic Area/Field and Education Level:**

Electrical Engineering, Biomedical Engineering, or Chemical Engineering/Electronic, Electrochemical, Optical Biomarker Sensor Development and Platform Miniaturization
 BS Level
 Previous work with chem/bio sensors, microfluidics, and labview/C-coding are strongly desirable.

4. **Objectives:** 1) Develop chemical/biochemical sensing platform based on commercial off the shelf devices and/or their reengineered version, and/or newly designed receptors/materials; 2) Integrate microfluidics for evaluating the sensors at operation-relevant settings; 3) Interface the sensor to a variety of flexible/wearable electronic systems; 4) Evaluate and validate the sensors; and 5) Explore effective signal processing from multiplexed sensors.
5. **Description:** Molecular biomarkers indicative of human physiological and psychological status vary person-to-person and the measurement point of the time. Developing personal chemical and biochemical sensors that enable the profiling/reporting biomarker data throughout 8-24hr time frame of individual operators will greatly benefit USAF personnel health and performance. Zero footprint, noiseless, and low-powered sensing platform without the need for calibration and drift correction is highly desirable in developing a wearable or attachable personal sensor suite. Miniaturizing device size and increasing sensitivity and selectivity of chemical/biochemical/optical sensors are key elements in building such sensor suites. In this research, the structural interactions and functionalities of nano device platform and biomolecule hybrids are systematically probed by using both experiments and computations. The hybrid system is further explored for its capability as a sensor for the target of interest. The sample collection, delivery, signal processing, and device-to-device communication for the miniaturized sensors and devices are to be explored collaboratively with both internal and external partners.
6. **Research Classification/Restrictions:** Unclassified/Unrestricted
7. **Eligible Research Institutions (check all that apply):**

DAGSI (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati)

Topic can be submitted for public release

AFIT (only)

USAFA (only)

If you are submitting a topic for the USAFA, indicate if you are also interested in sponsoring a USAF Cadet in summer 2015 (Average cost for USAF Cadet for 33 days is \$5000)

Yes

No