

Attachment 1 – Research Topic Template

RHIS-4

1. Research Title: Electrical and Optical Methods for Sensor Development

2. Individual Sponsor:

Joshua Hagen, Ph.D
711 HPW/RHXB
2510 Fifth St. Bldg 840
WPAFB, OH 45433-7913
Joshua.Hagen.1@us.af.mil

3. Academic Area/Field and Education Level

Electrical Engineering, Materials Science and Engineering (working toward MS and/or Ph.D.)

4. Objectives: Develop sensor platforms for a variety of molecular targets using biological and nano-technologies for increasing functionality and effectiveness

5. Description: The Air Force (AF) is investigating recent advances in biological and nanomaterial research as a way to address changes in AF operational environments. In order to build mission essential capabilities, several research programs have been established including genomics, bio-system signatures, and bio-sensor engineering. For example, our bio-sensor engineering team is developing tools based on known sensing elements in nature. We have shown that one can screen for highly specific recognition elements to unnatural, and furthermore, Department of Defense relevant chemical and biological targets. Our selection approach for recognition elements involves experimental screening of ligand binding and computational modeling. Once the ligands have been selected for the target of interest, they must be integrated into a sensor platform for proper signal transduction. This project will involve the design, fabrication, and testing of new sensor platforms (electrical and optical), as well as the integration of these platforms into bench top, handheld, and portable prototypes. In addition, these AF programs address the emerging field of biotronics which is a hybrid of the known fabrication of electronics and incorporation of biological elements. This research domain depends on understanding the abiotic and biotic interface. We are exploring different device platforms as well as modifications to the biological systems, in order to advance performance of these hybrid sensors. Overall the goal of our research is to answer the needs of the Air Force mission in human performance.

6. Research Classification/Restrictions: This research is considered Unclassified.

7. Eligible Research Institutions: Indicate to what organizations this topic should be provided



DAGSI (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati) NOTE: Topics submitted to DAGSI must be approved for public release. PA Approval # 88ABW-2014-2960, 711 HPW/XPO 17 June 2014

AFRL FY14 Research Topic Template -DAGSI -AFIT - USAFA

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