RH17-15

FY15 Student Research Topic

1. **Research Title:** Flexible Plasmonic Nanoparticle Arrays for Selective Sensing
2. **Individual Sponsor:**

Dr. Jorge L. Chavez
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3. **Academic Area/Field and Education Level:**

Chemistry, Chemical Engineering/Optics, plasmonics
BS/BA, MS or PhD Level
Experience in nanomaterials fabrication is desirable.

4. **Objectives:** The objectives of this research include; 1) investigate the use of plasmonic materials on flexible substrates for sensing biomarkers in biofluids; 2) optimization of the incorporation of metal nanoparticles for optimal electronic and optical properties; 3) functionalize the colloidal arrays with biorecognition elements (antibodies, peptides and aptamers) for selective sensing of biomarkers related to stress and cognition; 4) optimize fabrication parameters to control these properties through stretching and bending of the materials.

5. **Description:** Plasmonic nanomaterials offer many advantages for sensing challenging biomarkers in biofluids: they offer fast response times, great sensitivity and the ability to use simple instrumentation for signal detection, including mobile devices. However, these materials do not provide a means for selective detection. Therefore, approaches that integrate biorecognition elements into these nanoparticle systems are critical to improve the design of biosensors. The proposed work should optimize the design of highly selective bionanomaterials and combine them with recently reported approches to integrate nanomaterials into flexible plastic substrates to create stretchable sensors. Moreover, the obtained materials should be tested for performance in biofluids and methodologies for tuning their optical and electronic properties to allow detection of biomarkers related to stress and cognition should be explored.

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