

Attachment 1 – Research Topic Template

RH 15-6

1. **Research Title:** Synthetic Biology Approaches for Screening Nanoparticle Toxicity

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**

Materials Science and Engineering, Chemical Engineering (working toward M.S. or Ph.D.)

4. **Objectives:** Design and validate novel synthetic biology approaches for generating microstructure-based *in vitro* models to better replicate whole organs.

5. **Description:** Man-made nanoparticles (NPs) are being applied in many aerospace technologies, and the health risks associated with unintentional exposure remains a foremost concern of their pervasive use. Currently employed methods for investigating health risks due to NP exposure suffer many limitations. First, standard *in vitro* models do not represent the complexity of *in vivo* conditions (Hussain et al.; 2009). Second, toxicology studies using *in vivo* models often do not produce results that accurately predict human responses (Hartung et al. 2013). Therefore, dynamic *in vitro* models that better mimic whole organs are critical. Microstructure design, shear flow and mechanical flexure have been shown to facilitate the ability for synthetic devices to mimic whole organ responses (Huh et al., 2010). The key phases of the project will include a review of currently employed synthetic biology approaches, design of a novel synthetic biology approach for NP toxicity testing and validation of approach by testing the ability to generate meaningful toxicological data upon exposure to NPs.

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



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