

DAGSI Research Topic Template

1. **Research Title:** 3D-Bioprinted Living System for Sensor Development
2. **Individual Sponsor:** List the AFRL research topic sponsor's contact information

Dr. Saber Hussain, AFRL/711HPW/RH
 AFRL/RHXB Bldg 840,
 2510, 5th Street
 WPAFB, OH 45433-7333
 Tel: 937-904-9517; saber.hussain@us.af.mil

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

Bioengineering/molecular biology/ (BS, MS or PhD level)

4. **Objectives:** 1. To develop a three dimensional (3D) bioprinted tissue or organ that recapitulates and simulates human-level architectures, microstructures, and physiological conditions. 2. To create integrated real-time biosensors for sensing and analysis of kinetic biological signals of stress and resiliency. 3. To provide a capability to respond in a physiologically-relevant manner and continually monitor unique biosignatures from physical stressors

5. **Description:** Provide a brief background and/or description of the proposed research topic

Bioprinting has emerged as a novel approach for creating macroscale tissue constructs. The development of microfluidic technologies has catalyzed the merging of sensors, fabrication, and tissue engineering on the micro- and nanometer size regime. Over the last 5 years, the prevalence of microfluidic manuscripts have sky-rocketed, mainly for the purpose of developing sensing applications. One aspect of photolithography constructed microdevices is that they are prepared layer-by-layer and require sealing, interfacing, and aligning small channels to create passages for cell and matrix seeding, perfusion, and solution delivery. Therefore, due to this planar development process, the configuration of 3D features or cellular structures has been traditionally more difficult. However, using a bioprinter, complex 3D highly organized tissue structures can be rapidly created and integrated with precisely sized channels. The key component of this integrated platform will involve a sensor system that provides "real-time," physiologically relevant alerts due to threats from various physiological & environmental stressors.

6. **Research Classification/Restrictions:** NA

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

Stanford University

Dr Utkan Demirci

utkan@stanford.edu

University of California, LA

Dr Ali Khademhosseini

khademh@g.ucla.edu

Ohio State Univ

Dr Brent Toto- Brent.Toto@osumc.edu

NOTE: Topics submitted to DAGSI must be approved for public release. Need PA Approval #