DOD Releases FY 2014 MURI BAA

The Department of Defense (DOD) released its fiscal year (FY) 2014 Broad Agency Announcement (BAA) for the popular Multidisciplinary University Research Initiative (MURI) program. MURI is one of DOD’s cornerstone university research programs, supporting basic research projects at the intersection of multiple scientific disciplines in areas of interest to DOD. DOD indicates that it will award a total of up to $250 million for MURI projects in FY 2014.

**Deadline for White Papers is October 15, 2013 at 4:00 PM EDT**

For more information, see:

BAA is available at:
http://www.onr.navy.mil/~media/Files/Funding-Announcements/BAA/2013/13-022.ashx

Many topics involve research on computational modeling or data analyses. Examples include, but are not limited to:

**ARO FY2014 MURI TOPIC #2**

**Force-Activated Synthetic Biology**

**Research Concentration Areas:** Suggested research areas include, but are not limited to: 1) Elucidation of the mechanisms by which intracellular biological force-responsive molecules are activated and tuned to respond to highly specific forces (i.e., dependent upon duration, strength, frequency, etc.). 2) Coupled predictive modeling and comprehensive characterization of virtual and synthetic materials designed to reproduce biological mechanisms of force-activation. 3) Design and optimization of material substrates through which force can be targeted to anchored force-responsive biological and synthetic molecules. 4) Demonstration of force-activated control in optimized synthetic biological pathways and novel hybrid materials.

**ARO FY2014 MURI TOPIC #3**

**Nonlinear Dynamics of Energy Hypersurfaces Governing Reaction Networks**

**Research Concentration Areas:** Suggested research areas include, but are not limited to the following: (1) First-principles-based modeling from quantum molecular theory, (2) Modeling of hypersurface distortion in response to state and system changes, (3) Approaches to link movement along the hypersurface with complex systems theories, (4) Developing mathematical methods for the dynamics of states and/or operators, mixing, attractor formation, bifurcations, etc., upon very high-dimensional hypersurfaces, (5) Integration of dynamically evolving interactions across a complex network, (6) Evaluation of the stochastic dynamics and global uncertainty propagation, (7) Development of experimental techniques
for high spatial/temporal resolution, (8) Development of new computational methods for resultant theories.

AFOSR FY2014 MURI TOPIC #10
Computational Foundation of Mathematics and Information
Research Concentration Areas: Suggested research areas include but are not limited to: (1) Formulation and construction of expressive types for representing information; (2) Properties of new type theories and their computational implication; (3) Formalization of different areas of mathematics for computation; (4) Relations between the structures of types and those of mathematics; (5) New foundation for constructive mathematics.

AFOSR FY2014 MURI TOPIC #12
Design Rules for Biobased and Bioinspired Materials
Research Concentration Areas: Suggested research concentration areas include but are not limited to: 1) bioinformatics that relies on an evolutionary or systems biology approach to discover model biomaterial systems that can elucidate the basis and options for a particular biomaterial property, but also the basis for its absence and the trade-offs involved, 2) chemists, material scientists, and/or engineers who can fully examine the relationship between genetic information, physical structure, and material properties, 3) mathematical or computational models/theory that brings a predictive capability to biobased and bioinspired material design. The specific material properties examined in this study are less important than the use of model biological materials with enough diversity to provide a basis for the development of design rules. Note that this project should not focus on bioprospecting, though new organisms may be sought to fill gaps identified through bioinformatics.

AFOSRFY2014 MURI TOPIC #16
Goal-Driven, Multi-Source Algorithms for Complex Resilient Multi-Physics Systems
Research Concentration Areas: (1) Developing a mathematically rigorous information-theoretic framework for assessing variable-fidelity information across multiple scales and checking for compatibility of coupled multi-physics models with different fidelity; (2) Developing efficient and accurate algorithms for utilizing high-fidelity methods (e.g., PDE solvers) to construct low-fidelity models (e.g., reduced-order models) while maintaining accurate representation of underlying physics; conversely, utilizing low-fidelity models to determine when high-fidelity is needed, what is the underlying functional dependence of “fidelity” to variables contained in the model; (3) Designing with variable-fidelity possibly uncertain 54 numerical simulations, where requirements to choose level of fidelity are needed to account for dynamic system modeling; (4) Inclusion of data from tests and system operation as feedback into a robust design process featuring stable computations.

ONR FY2014 MURI TOPIC #19
Role of Bidirectional Computation in Visual Scene Analysis
**Research Concentration Areas:** Suggested research areas include but are not restricted to: (1) Developing a deeper neurobiological understanding of the functionality and specific mechanisms underlying the ubiquitous interplay of bidirectional projections critical to object recognition and FGO; (2) Explicating and computationally modeling the neural processes enabling biological vision to exploit the full range of cues available for FGO; (3) Implementing computational algorithms that capture the functionality and robustness of the learning mechanisms by which FGO is achieved in biological vision; and (4) Understanding, and implementing the mechanisms by which top-down projections from non-visual brain regions (e.g., pre-frontal regions representing context-based expectations derived from prior experience) shape processing across the visual system.

**ONR FY2014 MURI TOPI #20**
**Exploring the Atomic and Electronic Structure of Materials to Predict Functional Material Properties**

**Research Concentration Areas:** Suggested research areas include but are not limited to: (1) Quantum mechanical modeling and computations to explore lowest atomic and electron energy states that will lead to basic principles for creating new materials, (2) create and validate hierarchical thermo-chemical/mechanical property models that predict bulk and bulk to surface layer material responses (as a function of environment, temperature, loading, defects, etc.) that relate theoretical calculations and simulations with materials processing, (3) correlate microstructure and grain size features with bonding electron distributions, (4) explore composition and hierarchical stability as function of temperature, stress and environment, (5) correlate through modeling and experiment disordered and ordered structures with electron distribution, (6) establish 2D, 3D, and 4D characterization schemes for validating the theoretical calculations and process simulations, and (7) link atomic-scale predictions to surface chemistry kinetics and meso-scale structural properties for both homogenous and heterogeneous bulk surfaces.