



NATIONAL SCIENCE FOUNDATION
2415 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22314

NSF 18-018

Dear Colleague Letter: Joint NSF/ENG and AFOSR Funding Opportunity: Supporting Fundamental Research in the Quantitative Representation of Microstructures (QRM)

October 23, 2017

Dear Colleagues:

The Division of Civil, Mechanical and Manufacturing Innovation (CMMI) of the Engineering Directorate of the National Science Foundation, in collaboration with the Air Force Office of Scientific Research (AFOSR), seeks research proposals for multidisciplinary teams with the potential to transform fundamental understanding of structural Materials through the Quantitative Representation of Microstructures.

The adoption of Integrated Computational Materials Engineering (ICME) has advanced fundamental understanding of processing-property-performance relationships in critical materials systems, and advances in computation and visualization tools have led to important new capabilities. Much of the recent efforts have focused on developing the constitutive laws which govern Materials behavior, and developing computational tools for the simulation and prediction of materials behavior. While these tools have become more widespread, their accuracy and precision depends strongly on the input microstructures upon which these tools operate.

This letter serves as a call for proposals to address fundamental scientific questions related to Materials microstructure, properties and performance through the development of tools for the Quantitative Representation of Microstructures. NSF's and AFOSR's interest lies in innovative research projects which bring together members of the Materials Science and Engineering community with experts in computation and visualization, to address the challenges associated with accurate quantification and representation of the microstructures of Engineering Materials.

Proposals should address:

1. Fundamental scientific questions related to Materials Processing-Microstructure-Property relationships that can be addressed through experimental and computational approaches enabled by the Quantitative Representation of Microstructures
2. A multidisciplinary approach to developing the tools for accurate microstructure representation, to include (1) data collection tools (2) data processing and feature

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- identification algorithms (3) morphological descriptive metrics (4) virtual structure generators or renderers and (5) structural and/or functional material performance metrics
3. Efforts to identify and quantify sources of uncertainty in the microstructure representations
 4. Planned open access to the data and codes generated in the proposed work

PROPOSAL SUBMISSION REQUIREMENTS

This is not a new program. Interested proposers are encouraged to submit proposals to the Materials Engineering and Processing (MEP) program in the Division of Civil, Mechanical and Manufacturing Innovation (CMMI) during an open submission window. Proposals in response to this DCL must meet the requirements of the NSF Proposal and Award Policies and Procedures Guide (PAPPG) and the review criteria of the program to which they are submitted. Proposals in response to this DCL should have a title prefixed by "QRM:".

Proposals will be accepted from a Principal Investigator (PI) or group of investigators led by a PI at an eligible US Institution. It is anticipated that awards will range from \$300,000 to \$450,000 for a 36- to 48-month period. Interested parties are encouraged to contact the Program Directors prior to submission.

Technical Points of Contact:

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Sincerely,

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