Opportunities in Manufacturing at NSF

Chris Paredis
Georgia Institute of Technology
George W. Woodruff School of Mechanical Engineering
H. Milton Stewart School of Industrial and Systems Engineering
Director, Model-Based Systems Engineering Center
chris.paredis@me.gatech.edu
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- Although the presenter used to work at NSF, he does not currently have any affiliation with NSF, and does not claim to represent NSF in any way.

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Overview

- Quick overview of the NSF organization
- Some manufacturing-related NSF programs, solicitations and initiatives
- Key characteristics of a winning NSF proposal
- Q&A
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Overview

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MME supports fundamental research that enables the development of new and/or improved manufacturing machines and equipment, and optimization of their use.

Proposals relating to a wide range of manufacturing operations are encouraged, including both subtractive and additive processes, forming, bonding/joining, and laser processing.

Of particular interest are proposals that relate to the manufacture of equipment and facilities that enable the production of energy products.

For more details google: “nsf mme”

Deadlines: Jan 13 (typically, Feb 15) and Sep 15
Manufacturing Machines and Equipment
PD: Steven Schmid

- AM/3DP: 25%
- Machining: 22%
- Metrology: 10%
- Assembly: 2%
- Bio/medical: 13%
- Laser processing: 7%
- Machine: 4%
- Joining: 5%
- Forming: 5%
- Casting: 1%
- Energy manufacturing: 6%
Manufacturing Machines and Equipment
PD: Steven Schmid
Manufacturing Machines and Equipment
PD: Steven Schmid
Materials Engineering and Processing
PDs: Mary Toney, Alexis Lewis, Tom Kuech

- MEP supports fundamental research addressing the processing and performance of engineering materials by investigating the interrelationship of materials processing, structure, properties and/or life-cycle performance for targeted applications.
- Manufacturing processes that convert material into a useful form as either intermediate or final composition: extrusion, molding, casting, forming, deposition, sintering and printing.
- For more details, google “nsf mep”
Nanomanufacturing
PD: Kershed Cooper

- **Focus**: production of useful nano-scale materials, structures, devices and systems in an economically viable manner

- NM supports fundamental research in:
  - Novel methods and techniques for batch and continuous processes
  - Top-down (addition/subtraction) and bottom-up (directed self-assembly) processes leading to the formation of complex heterogeneous nanosystems.
  - Nanostructure and process design principles
  - Integration across length-scales, and system-level integration
  - Address quality, efficiency, scalability, reliability, safety and affordability issues relevant to manufacturing.
  - Processes and production systems based on computation, modeling and simulation, use of process metrology, sensing, monitoring, and control, and assessment of product (nanomaterial, nanostructure, nanodevice or nanosystem) quality and performance.

- For more details, google “nsf nanomanufacturing”
CM supports fundamental research to enable the evolution of a wide range of network-accessed manufacturing services that:

- employ applications (or “apps”) that reside in the “cloud” and plug into an expansible, interactive architecture;
- are broadly accessible, guarantee reliable execution and have capabilities that are transparent to users; and
- are accessible at low cost to innovators and entrepreneurs, including both users and providers.

Main idea: cybermanufacturing service layer

For more details, google: “nsf cybermanufacturing”

Important: No submission deadline. Send one-pager to PD to start the submission process.
SMOR supports research leading to the creation of models, analyses, and algorithms that link data with decisions related to the design, planning, and operation of service and manufacturing systems

- Advances in general-purpose optimization, stochastic modeling, and decision and game-theory methodology
- Advances in customized methods (analytical and computational) required for the relevant applications

Application areas of interest include

- Supply chains and logistics; risk management; healthcare; environment; energy production and distribution; mechanism design and incentives; production planning, maintenance, and quality control; and national security.

For more details, google: “nsf smor”
Other Related Solicitations and Initiatives

- ERC: Engineering Research Centers
- STC: Science and Technology Centers
- I/UCRC: Industry/University Cooperative Research Centers
- PFI: BIC: Partnerships for Innovation: Building Innovation Capacity
- INSPIRE: Integrated NSF Support Promoting Interdisciplinary Research and Education
- EFRI: Emerging Frontiers in Research and Innovation
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What Makes a Good Proposal?

- NSF is all about basic research — *advancing the state of knowledge*
- Be clear, explicit and up-front about what the new knowledge will be
  - First sentence of summary: “The research objective of this proposal is…”
- Ideally: Novel, innovative, transformative — with broad impact
- A proposal is a plan for what you will do — provide sufficient detail
- The “project summary” (i.e., abstract) is crucial
- Convince the reviewers you are qualified and will deliver
  - Good literature review
  - Some initial results
- Keep your audience in mind — the review panel
- Letters of collaboration (no recommendation letters!)
Example: From MME Program Briefing
(provided by ZJ Pei)

- Competitive projects will propose hypothesis-driven research that advances the frontiers of knowledge in relevant areas.
- Proposals submitted to the MME program should include a clearly articulated research (not developmental) objective and a coherent plan to accomplish the stated objective.
- Both experimental and theoretical work are supported.
- All proposals must include a statement outlining the societal benefits of the proposed activities.
Steps to Increase your Chances Further

- Get to know the NSF “system”
- Volunteer to serve on review panel for the program you plan to submit to
  - Send e-mail to PD with your areas of expertise and experience
- Get to know your PD
  - Interact at conferences
  - Get feedback on your proposal ideas — send 1-pager
  - Try to understand the PD’s perspective on the field
  - Get additional feedback in case your proposal is declined
- Read the GPG (Grant Proposal Guide) and stick to the guidelines & deadlines
Summary

- Quick overview of the NSF organization
  - NSF / ENG / CMMI / Advanced Manufacturing Cluster
- Some manufacturing-related NSF programs, solicitations and initiatives
  - MME, MEP, NM, CM, SMOR
- Key characteristics of a winning NSF proposal
  - Clearly articulate the contribution to new knowledge

Q&A