NSF MME Program and Other Funding Opportunities for Manufacturing Faculty

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Thanks go to …

- Workshop organizer: Delcie
- Speakers
- NSF staff (Veronica, …)
- CMMI Advanced Manufacturing cluster
- All of you

We Want to Hear From You

- Feedbacks on the workshop
- Advice and suggestions on improving MME

National Attention on Advanced manufacturing

- Great time to be in manufacturing

- NSF – a great place to work

Science and Technology Priorities for the FY 2014 Budget

- **Advanced manufacturing**
- Clean energy
- Global climate change
- R&D for informed policy-making and management
- Information Technology Research and Development
- Nanotechnology
- Biological Innovation
- Science, technology, engineering, and mathematics (STEM) education
- Innovation and commercialization

Presentation Outline

- Faculty Development Needs for Advanced Manufacturing
- MME program
- Other NSF related programs
- Other NSF funding opportunities

Faculty Development Needs for Advanced Manufacturing

- Low number of MME proposals
- Lack of excellent proposals in MME
- Industry's needs for people with advanced degrees in advanced manufacturing

NSF CAREER Proposal Writing Workshop

University of Maryland (April 7 and 8, 2014)

- Presentations by NSF program directors
- Presentations by recent CAREER awardees
- Review successful and unsuccessful proposals
- Mock panel review session
- Panel review project summary of your own CAREER proposal
- Interactions with other participants, NSF program directors, and recent CAREER awardees

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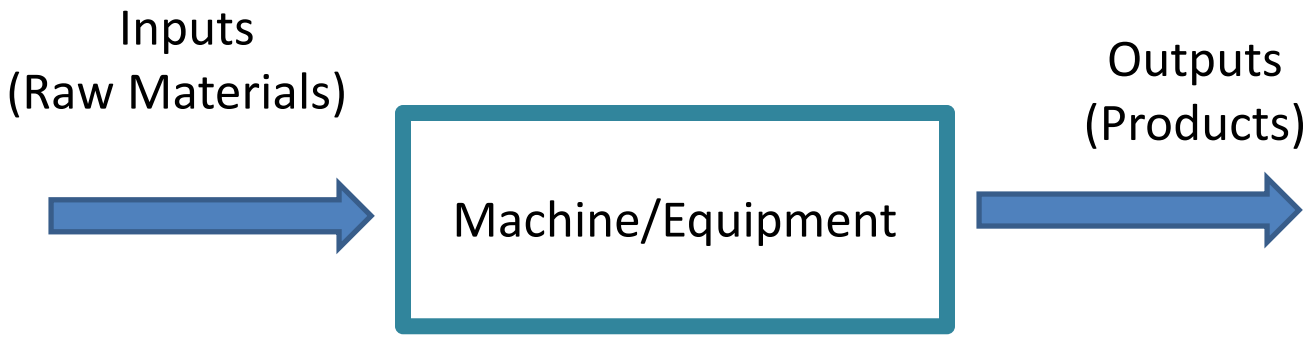
Manufacturing Machines and Equipment (MME)

- Supports fundamental research leading to improved manufacturing machines and equipment, and their application in manufacturing processes
- Key goals are to advance the transition of manufacturing from skill-based to knowledge-based activities, and to advance technologies that will enable the manufacturing sector to reduce its environmental impacts
- A focus is on the advancement of manufacturing machines and related systems engineering that will enable energy manufacturing on a large scale
- The program also supports research on laser processing, joining processes, and additive manufacturing machines and processes

Context of MME Supported Research



- Wind
- Sunlight
- Carbon dioxide
- Biomass
- Seawater
- Metal
- Ceramics
- Composite

- Wind turbine
- Solar panel
- Artificial photosynthesis device
- Additive manufacturing machine
- Grinder
- Drilling machine
- CMP polisher

- Electricity
- Biofuel
- Drinking water
- Aircraft
- Medical device
- On-demand organ
- Silicon wafer

Scope of MME Supported Research

- MME program supports fundamental research to generate knowledge that will be used to either design new or improve existing manufacturing machines and equipment.
- “Manufacturing” is defined as “the process of converting raw materials, components, or parts into finished goods that meet a customer's expectations or specifications” [BusinessDictionary.com].
- “(Renewable) Energy manufacturing” is referred to as the process of converting one form of energy from a renewable source (such as sunlight, wind, or biomass) into another form of energy that consumers can use directly (for example, electricity or transportation fuel).

NSF Funds Basic Research

- "The goal of a scientific inquiry is to obtain knowledge in the form of testable explanations that can predict the results of future experiments." -- Wikipedia
- Must make or enable a significant scientific contribution
- Applied research should not be funded by NSF, such as
  - develop, explore, evaluate, …
  - trial & error, look/see, …
  - process optimization, …

Difference between Fundamental Research and Development

"The output from a research project is knowledge. … The output from development is an artifact, such as an engineered system. Ergo, when we discuss the results of the research that we fund, I look for the new knowledge that has been obtained. It is not always the case that the creation of new artifacts is linked to the creation of new knowledge and, even if it were, that linkage would rarely be obvious."
– George Hazelrigg

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Partnerships for Innovation: Accelerating Innovation Research (PFI: AIR)

Choice 1: AIR Technology Translation

• Single Investigator and Small Groups of Faculty
– PI /co-PI (current or 4 –years prior to due date of solicitation) NSF research awardee

• Aim
–To complete the necessary research such as proof-of-concept, prototyping , scale-up, and/or feasibility tests
–To move more research discoveries on the path to becoming new technologies
– To create entrepreneurial small groups of faculty

• Award
–$150k/18-months per grant
–LOI required
–Full proposal (about two months later)

Choice 2: AIR Research Alliance

•Currently-funded NSF research alliance

•Others: another research entity, small business consortia, local/regional innovation entity

•Third-party investment (1:1): 75% cash match

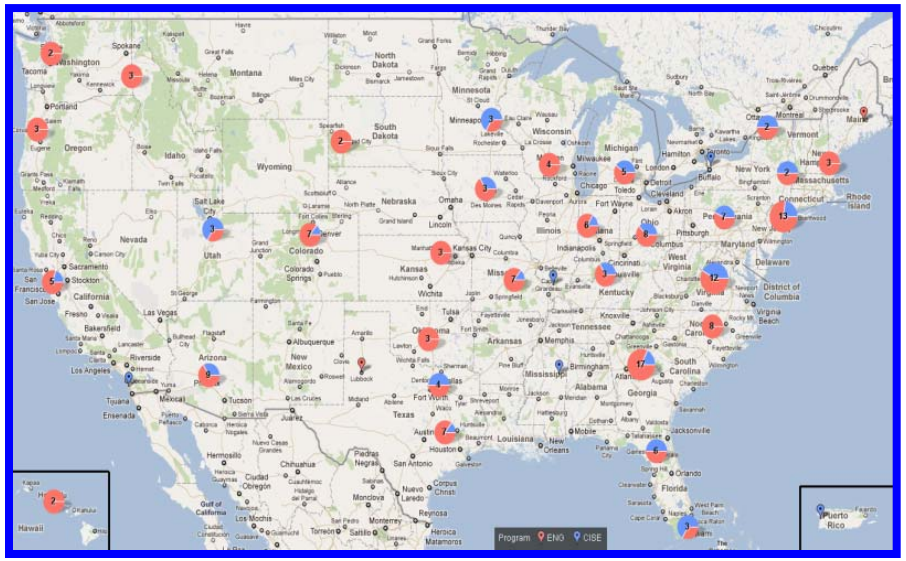
• Aim
–To create an innovation ecosystem
–To *translate and transfer* research discoveries to commercial reality and spinoffs
–To build new partnerships
– To develop an entrepreneurial culture

• Award
–$800k/24-months per grant
–LOI required
–Full proposal (about two months later)

Industry/University Cooperative Research Center (I/UCRC)

- NSF invests in these partnerships to encourage collaborative research driven by industry
- Helps increase the intellectual capacity of the engineering and science workforce
- Centers succeed based on the value they provide to industry and faculty

- 61 Centers (178 Sites) and over 1000 Memberships



Engineering Programs in Education

- **REE** – Research in Engineering Education

  Advance understanding in engineering education by grounding the proposed work in theory as well as relevant prior work in engineering education specifically and education generally

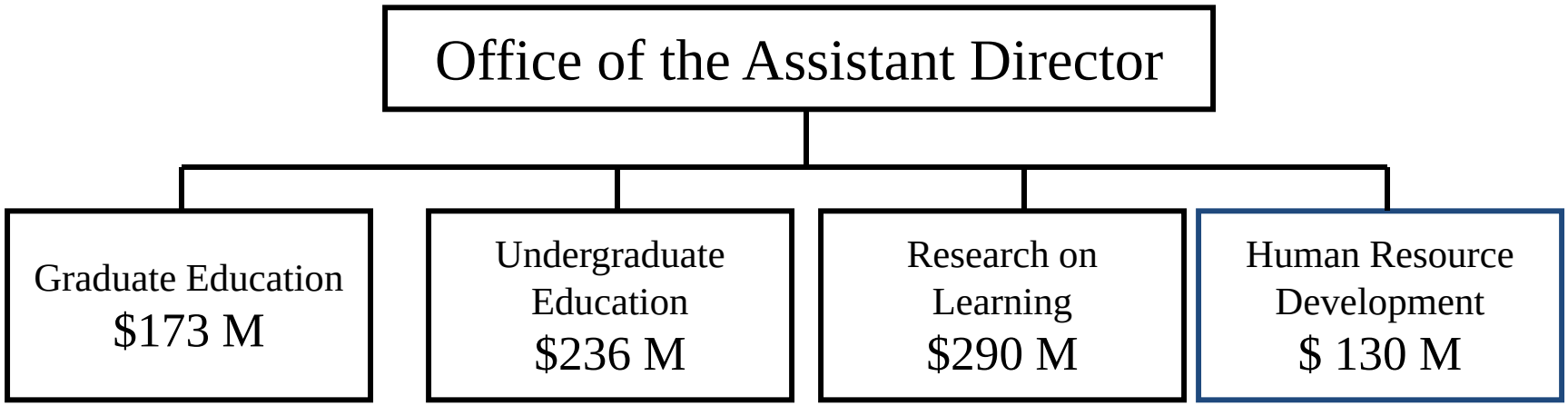
  - Diversifying pathways to and through engineering degree programs.
  - Exploring credentialing in engineering education.
  - Understanding how to scale engineering education innovations.
  - Advancing engineering learning in broader eco-systems such as innovation, globalization, or sustainability.
  - Developing engineering-specific learning theories.

- **RIGEE** – Research Initiation Grants in Engineering Education

  Enables engineering faculty to initiate collaborations with colleagues in the learning and cognitive sciences to address difficult, boundary-spanning problems in how we educate engineers.

Education and Human Resources Directorate

Mission: Support the development of a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians and educators and a well-informed citizenry



Source: NSF FY 2012

Transforming Undergraduate Education in Science, Technology, Engineering, and Mathematics (TUES)

Goal: To improve the quality of Science, Technology, Engineering, and Mathematics (STEM) education for all undergraduate students

2013 Program Budget: $61.46 million

Formerly, Course, Curriculum, and Laboratory Improvement (CCLI)

Now: IUSE

Improving Undergraduate STEM Education (IUSE)

- Program description (NSF 14-7513)
- Full Proposal Target Date: February 4, 2014

- More information:
  - IUSE homepage: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504976
  - IUSE Program Webinar: http://www.nsf.gov/events/event_summ.jsp?cntn_id=129669&org=NSF
  - Webinar Slides: http://www.nsf.gov/attachments/129669/public/IUSE_Webinar_Slides.pptx

Advanced Technological Education (ATE)

Goals: To produce more qualified science and engineering technicians for the high-technology fields that drive the nations economy, with emphasis on 2-year institutions.

Partnerships among academia and industry are prominent features.

2013 Program Budget: $64.0 Million

Historical Funding Rate: 30%

Anticipated # of 2013 Awards: 75 to 90

2013 Solicitation Deadline: October 17, 2013

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Other Funding Opportunities At NSF

- Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)
- Emerging Frontiers in Research and Innovation (EFRI)
- Broadening Participation Research Initiation Grants in Engineering (BRIGE)
- Major Research Instrumentation Program (MRI)
- Integrative Graduate Education and Research Traineeship Program (IGERT) → NSF Research Traineeship Program (NRT)
- Graduate Research Fellowship Program (GRFP)

For Your Attention