

“Panel on Strategies for Cross-Cutting Research Ventures”

Kansas Statewide EPSCoR Conference
Cross-Cutting Research and Training
University of Kansas, Lawrence, KS
April 25, 2006

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What Makes a Successful Center? Step 1

- You should be aware of the NSF Mission and Strategic Goals as they form the context of everything the Foundation supports.
 - Know what NSF is looking for, not what you think NSF is looking for.
 - You can begin to acquire this knowledge from NSF’s mission, strategic plan, the center program solicitation, and other materials from the Foundation.
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The NSF Mission (1950 NSF Organic Act)

- To promote the progress of science;
 - To advance the national health, prosperity and welfare;
 - To secure the national defense;
 - And other purposes.
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The NSF Strategic Goals

- **PEOPLE** – A diverse, internationally competitive and globally engaged workforce of scientists, engineers and well-prepared citizens.
 - **IDEAS** – Discovery across the frontier of science and engineering, connected to learning, innovation, and service to society.
 - **TOOLS** – Broadly accessible, state-of-the-art S&E facilities, tools, and other infrastructure that enable discovery, learning and innovation.
 - **ORGANIZATIONAL EXCELLENCE** – An agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices.
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What Makes a Successful Center? Step 2

- Before you begin thinking about how to develop a center or submitting a center proposal, you should first be aware of what NSF expects of its center programs and centers.
 - Knowing what NSF expects will help you formulate your ideas so you can begin planning the steps you should take in putting together the many elements that comprise a center. Your center cannot be successful unless it addresses NSF's expectations.
 - In June 2005, NSF Senior Management set forth "Principles of NSF Research Centers."
 - I will walk you through these principles and comment on what you should consider with respect to each of the principles.
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Principles of NSF Research Centers - I

- The "centers" mode of support has been validated as appropriate for basic research by the National Science Board, the National Academy of Sciences, the National Academy of Engineering, and the National Academy of Public Administration.
 - NSF's vision for NSF Centers is based on the NSF Strategic Plan, and uses multiple core NSF Strategies in order to foster knowledge creation, knowledge integration, and knowledge transfer.
 - All NSF Centers are merit-reviewed, with one of the review criteria being the added value of supporting frontier research using the center mode of support versus the individual investigator mode.
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Principles of NSF Research Centers - II

- Critical elements of major NSF Centers have evolved over time and these Centers embrace the following principles:
 - Centers exploit opportunities in science, engineering and technology in which the complexity of the research problem(s) require the advantages of scope, scale, change, duration, equipment, facilities, and students that can only be provided by an academic research center.
 - Centers focus on investigations at the frontiers of knowledge, at interfaces of disciplines and/or incorporate fresh approaches to the core of disciplines. They are bold and transformative with an ambitious vision.
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Principles of NSF Research Centers - III

- Centers demonstrate leadership in broadening participation through focused investments in a diverse set of partner institutions and individuals, drawing upon, and contributing to the development of, the Nation's full intellectual talent.
 - Centers focus on integrative learning and discovery and the preparation of students for a diverse set of career paths by providing integrative learning environments at all levels, considering workforce development issues, and fostering the public understanding of science and engineering.
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Principles of NSF Research Centers - IV

- Centers incorporate global thinking about the research and education enterprise; have organizational connections and linkages within and between campuses, schools and other sectors (*i.e.*, public, private, international, national labs); and require a concerted management effort specified in a cooperative agreement that details both the institutions' commitment and the oversight commitment of NSF staff.
 - Centers create a legacy in people, ideas, promising new instrumentation and innovative technologies that transcend the life of the NSF support.
 - NSF's support for Centers is on the order of \$2-5M annually, for a maximum of 10 years, with a built-in phase out period.
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NSF Center Programs

- According to the Principles of NSF Research Centers articulated in June 2005, NSF now considers the following programs to be its centers programs:
 - Centers for Analysis and Synthesis
 - Chemistry Centers
 - Earthquake Engineering Research Centers
 - Engineering Research Centers and Groups
 - Materials Centers
 - Nanoscale Science and Engineering Centers
 - Science and Technology Centers
 - Science of Learning Centers
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What Makes a Successful Center? Steps 3-5

- There are certain steps you should take in formulating the idea for and structure of your center that you would take with any NSF proposal:
 - Step 3: Talk with your Program Officer
 - Step 4: Read the solicitation thoroughly so you know precisely what is required.
 - Step 5: Familiarize yourself with the review criteria. You should make sure your proposed center addresses the criteria being used to evaluate your center.

With respect to Step 5, I will use as an example the evaluation criteria used for Science and Technology Centers (STCs), beginning with the NSF Merit Review Criteria.

The NSF Merit Review Criteria

What is the intellectual merit of the proposed activity?

- How important is the proposed activity to advancing knowledge and understanding within its own field or across fields?
 - To what extent does the proposal suggest and explore creative and original concepts?
 - What will be the significant contribution of the project to the research and knowledge base of the field?
 - How well conceived and organized is the proposed activity?
 - Is there sufficient access to resources (equipment, facilities, *etc.*)?
 - How well qualified is the team (the Principal Investigator, co-PIs, sub-contracts, *etc.*) to conduct the proposed activity?
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The NSF Merit Review Criteria

What are the broader impacts of the proposed activity?

- How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
 - How well does the proposed activity broaden the participation of underrepresented groups (*e.g.*, gender, ethnicity, disability, geography, *etc.*)?
 - To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
 - Will the results be disseminated broadly to enhance scientific and technological understanding?
 - What may be the benefits of the proposed activity to society?
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STC Evaluation Criteria

- **NSB Approved Merit Review Criteria:**
 - What is the intellectual merit of the proposal activity?
 - What are the broader impacts of the proposed activity?
 - **Additional merit review criteria specific to the STC program:**
 - Integration of research and education
 - Integration of diversity into NSF programs, projects, and activities
 - Value of the center-mode to research, education, and knowledge transfer
 - Integrative nature of the proposed center
 - Leadership, management plan, impact of institutional support, and budget
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What Makes a Successful Center? Step 6

■ Vision and Leadership

- It takes a Principal Investigator with a vision, a person who realizes that the long-term, large budget support afforded by a center provides the resources that will help him/her realize his/her dream of finally solving a complex scientific problem.
 - The PI's vision usually translates into dynamic leadership by conveying this excitement to the members of the center! This is a vital element of a center.
 - It takes a great deal of time and energy to bring together the team of researchers and educators with different perspectives and values and from numerous institutions that is necessary for a successful center. A dynamic leader can do this.
 - But a plan is needed....
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What Makes a Successful Center? Step 7

■ Strategic Planning

- Most centers fail because they are not well managed, not because they fail to do good science and education.
 - A strategic plan, developed with input from all partners and significant participants, is a necessary and vital first step to good management.
 - Example: The STC Program requires that those centers about to receive awards must first conduct a strategic planning retreat. This process allows participants to really get to know one another so that the center can build individual strengths into a cohesive unit with a common vision and mission.
 - Beware: Don't assemble a group of individual research proposals and staple them together under a common title and call that a Center.
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What Makes a Successful Center? Step 8

- **Administrative and Educational Staffing**
 - The PI, the strong intellectual leader of the Center is often not the best person to be in charge of day-to-day operations, such as budget, personnel issues, logistics, purchasing, space, setting up an auditable system or records, *etc.*
 - Identify a manager with strengths in these areas. Note: The STC Program requires that each STC has a 100% administrator/manager for these duties.
 - The PI also is often a research luminary, not one who is on the leading-edge of educational and diversity-building issues.
 - Identify a good educational coordinator with understanding of program evaluation and broadening participation. The STC Program requires that each STC has a 100% educational coordinator.
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What Makes a Successful Center? Step 9

- **Broadening Participation – institutionalize education and diversity issues to broaden the reach and effectiveness of NSF’s programs. Don’t miss this one as NSF views it as VERY important!**
 - The NSF Strategic Plan
 - Provide the S&E workforce for the 21st Century
 - Individuals
 - Institutions
 - Collaborations
 - Catalyze the production of the S&E workforce
 - That includes Americans
 - That is globally competitive
 - That is diverse
 - That builds on and enhances the current and developing institutions
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What Makes a Successful Center? Steps 10-15

- Step 10: Don't be afraid to take risks. A Center provides significant time and money to solve complex problems. You can afford to have some projects that fail.
 - Risk in research outcomes
 - Risk in educational goals
 - Management risk
 - Step 11: Value-added. This is the essence of a successful center.
 - Step 12: Regional or national impact.
 - Step 13: Demonstrated commitment of lead and partner institutions.
 - Step 14: Think of the center as a small business.
 - Step 15: Seek sound external advice.
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What Makes a Successful Center? Steps 16-17

- Step 16: Partnerships
 - On campus, across departments and schools
 - Other institutions – academic, industry, public schools, national labs, international
 - Minority serving institutions, women's colleges
 - Remember: It takes dynamic leadership and planning to form a cohesive center from multiple institutions.
 - Step 17: Communication, communication, communication
 - Human relations, team-building – every participant should feel like a meaningful player in the center
 - Technology – Internet, teleconferencing, *etc.*
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What Does It All Mean?

A successful center will result in

- Research efforts never before possible
 - Involvement of researchers in education efforts at a different level
 - Not “feel good” education and outreach
 - Bring your creative juices to bear on the education systems of this Nation...with institutionalization of models in mind
 - Engagement of the Nation’s intellectual talent, robustly drawn from its full human diversity, in the conduct of research and educational activities
 - Meaningful linkages of science and education to societal needs
 - A cultural change agent on campuses
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