

# I/UCRC: Consortium for Embedded Systems

## I/UCRC IAB Meeting

May 14-15, 2014

Rita Rodriguez and Alex Schwarzkopf

I/UCRC, IIP Division

Craig Scott, Center Evaluator



# CES: Starting Phase II

**Start Date: April 15, 2014**

**Lead Site:** Arizona State University (#1361926); Sarma Vrudhula, vrudhula@asu.edu

**Participant Site –**

**Southern Illinois University at Carbondale (#1361847); Spyros Tragoudas, spyros@engr.siu.edu**

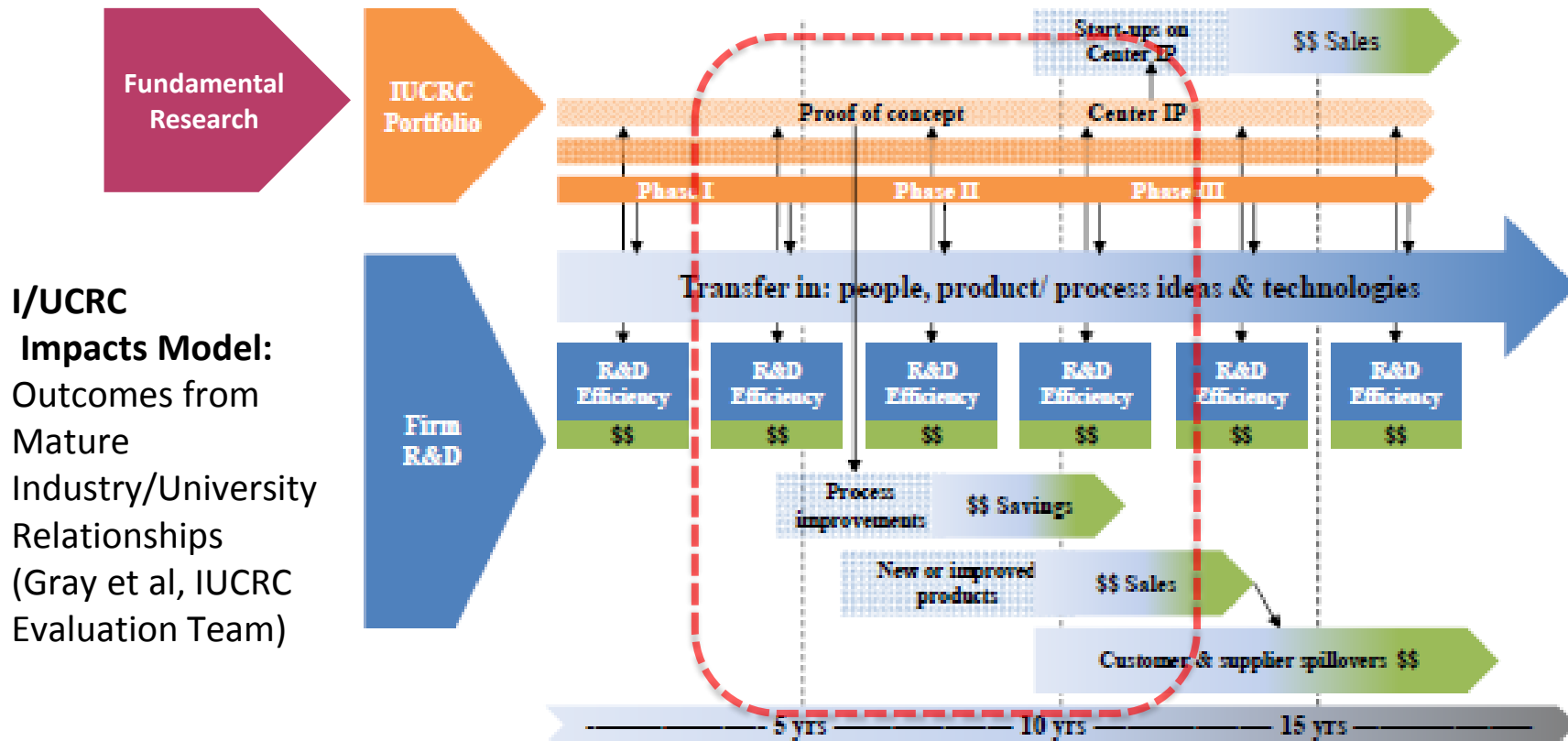
*..... both ASU and SIUC have successfully inducted outstanding female faculty, and CES will continue this effort in Phase II. In Phase II it is expected that at least one new site (Northeastern University) will be added to CES and continued efforts will be made to expand CES's industrial membership following a strong marketing plan that has been developed to achieve set targets. In addition, CES will explore the possibility of adding one or possibly two international sites: the University of Patras (UoP) in Greece, and the Indian Institute of Science (IISc), Bangalore, India. UoP officials are expected to attend the January 2014 meeting of CES, and IISc has expressed interest in exploring ways to become a I/UCRC site, through their recently established Robert Bosch Center for Cyberphysical Systems.....*



# I/UCRC Phase II Foundation

I/UCRCs, through their trusted Industry/University relationships

- Continuously translate research advances to industry;
- Train students as industry's next generation of innovators;
- Provide value to all partners – universities & industry; and
- Grow US Innovation capacity



# I/UCRC Start-ups Spun Out in 2013

- **Berkeley Sensors and Actuators (BSAC)**
  - Berkeley Lights, Imprint Energy, Chirp (Pending)
- **Intelligent Maintenance Systems (IMS)**
  - Predictronics
- **E-Design**
  - Innovation Accelerator
- **Hybrid Multicore(CHMPR)**
  - JAK Tec
- **Identification Technology Research (CITeR)**
  - EyeVerify
- **Agricultural, Biomed, and Pharmaceutical Nanotech (CABPN)**
  - Mobisense, Exalt Diagnostics, Daktari
- **Biophotonic Sensors and Systems (CBSS)**
  - Next Gen Array
- **Tire Research (CenTiRe)**
  - Virginia Triad Transport Technologies


 IMPRINT  
energy


 predictronics


 JAKtec


 EyeVerify


 EXALT  
DIAGNOSTICS


 NGA  
NexGen Arrays




## I/UCRC Awards in 2013

- Brian Korgel, NGPV, UT Austin
- Magdy Iskander, C1, U Hawaii
- Yelena Yesha, CHMPR, UMBC
- Robert Baier, SUNY, BSS (graduated), SUNY Buffalo

## 2012

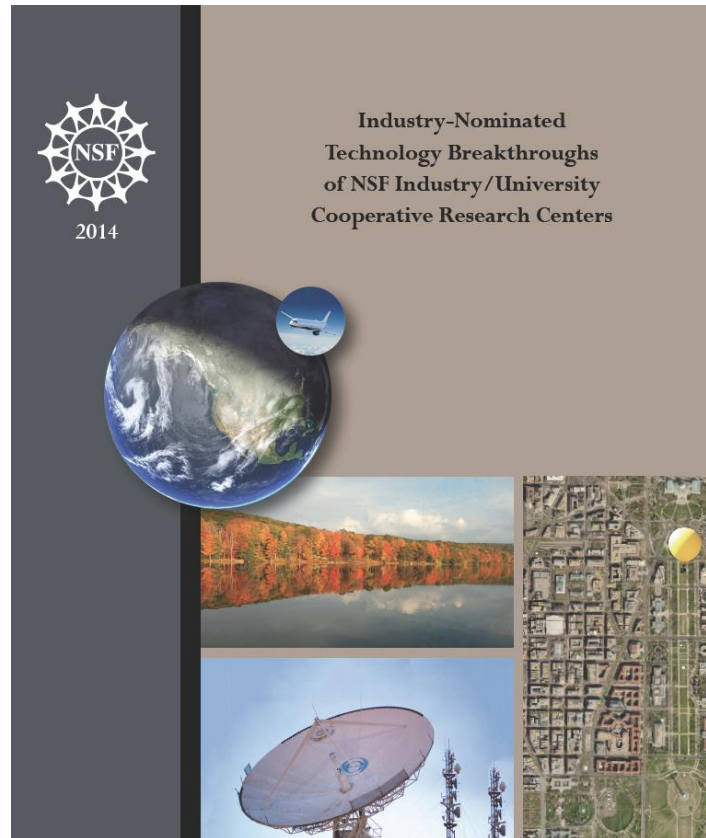
- Jay Lee, IMS, U Cinn
- Sundar Krishnamurty, e-Design, UMass-Amherst
- Shashank Priya, CEHMS, VT

## 2011

- Mool Gupta, LPAM, UVa
- Michael Shur, C1, RPI



# 2014 Compendium of Industry-Nominated I/UCRC Technology Breakthroughs



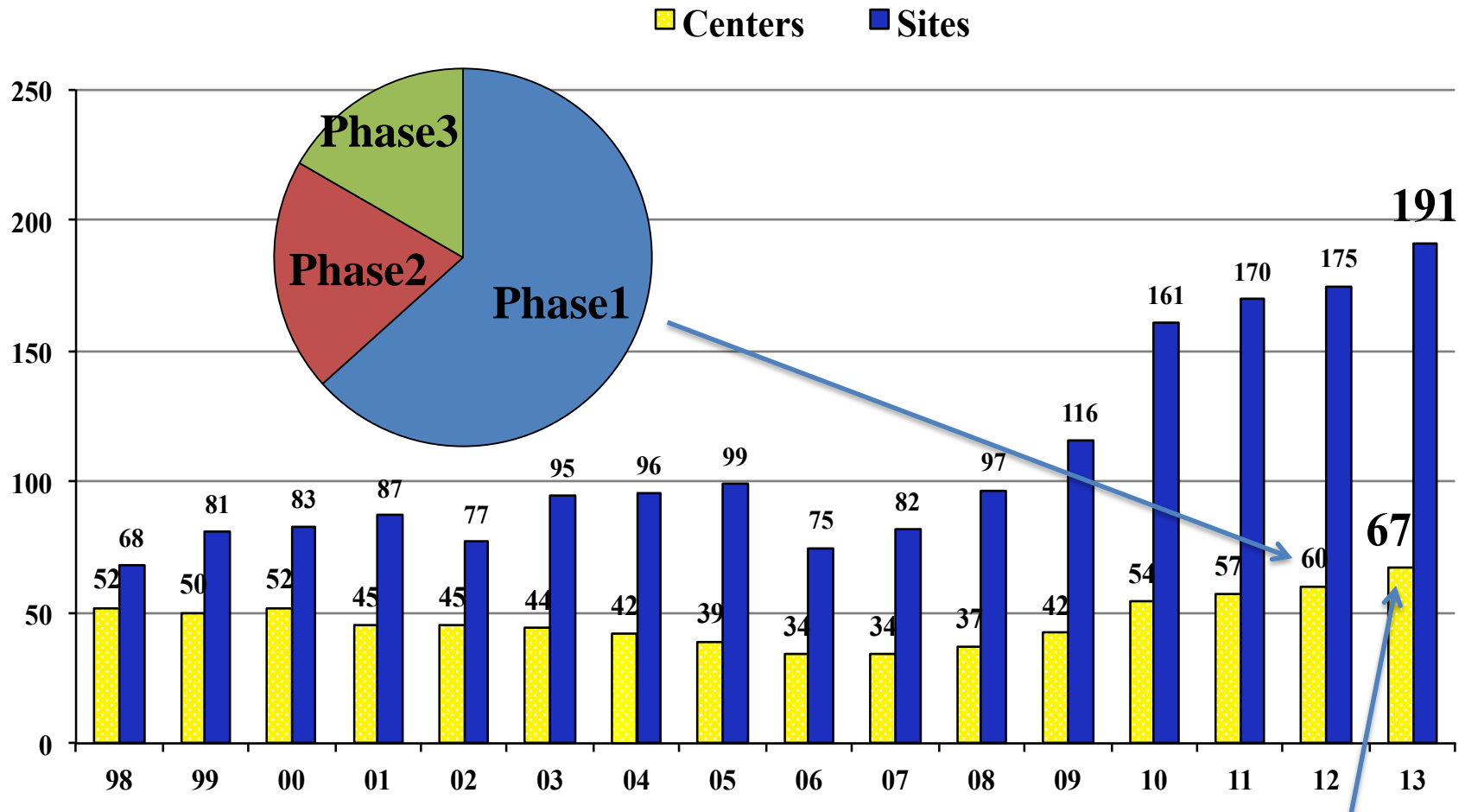
**Over 1400 Publications in '13, 248 co-authored w/Members**



# ACTIVE CENTERS AND SITES BY YEAR\*



Industry/University  
Cooperative Research  
Centers



**CISE 22 Centers**  
**ENG 45 Centers**

\*Data Current for FY2013

NSF-IUCRC Center Structure Database



# I/UCRC Fast Facts – FY13 Snapshot



## National Scope of I/UCRCs

**ENG** – Engineering

**CISE** – Computer and Info. Sci and Eng.

### Program Funding

- \$14.5M in Program Funding (ENG, CISE)
- \$119.5M in Total Center Funding,
- 8:1 Leveraging of NSF funds.

### Centers Nationally:

- 67 Centers with 191 Sites
- 1119 Memberships held by over 700 Member organizations

- 58% Large Business, 21% SB, 14% Federal Members

### Students

- 2077 students engaged
- 820 graduated in 2012, over 28% hired by members
- 285 PhDs, 322 MS & 213 UGs graduated in 2012, trained in Center research

### Sustainability

- Over 40 Graduated I/UCRCs remain in operation true to model





# 67 Centers Across the Nation in FY 13

Reach: 42 of 50 States



## 4 Formal International Sites



# New I/UCRCs Awarded in 2013

- **Arthropod Management** (CAMTech) – Iowa State(L), Kentucky
- **Broadband Wireless Access & Apps** (BWAC)– ASU(L), UVa, VaTech, Auburn
- **Configuration Analytics and Automation** (CCAA) – UNCC, GMU
- **Cyber-Phys, Systems for the Hosp. Operating Rm** – UH, UF
- **Freeform Optics** (CeFO) – U of Rochester, UNCC
- **Research in Storage Systems** (CRSS) – UC - Santa Cruz
- **Science Center for Marine Fisheries** – USM, W&M
- **Spatiotemporal Thinking, Computing & Apps** – GMU, Harvard, UC-SB
- **Wheat Genetics** (WGRC) – KSU, CSU



# Planning Grants for New Centers Awarded in 2013

- **Advanced Drying** – WPI(L), Illinois
- **Assistive Technologies** – UT-Arlington(L), UT-Dallas
- **Bioplastics and Biocomposites** – ISU(L), UM-Lowell
- **Disruptive Musculoskeletal Innovations** – UC-San Francisco(L), Toledo
- **Electrochemical Processes and Technology** – Ohio U. (L), Washington U.
- **Integrated Microfluidics** – UC-Irvine(L), Cincinnati
- **Mid-Infrared Medical Systems** – Princeton
- **Multifunctional Integrated Sys. Tech.** – UF(L), UCF
- **Semantic Computing** – UC-Irvine(L), UCSD, UCLA
- **Social Technologies and Analytics** – Clemson(L), UC-Irvine, Minnesota, NYU
- **Solidification Processing** – Purdue(L), Illinois





Existing I/UCRC's having discussions with –

England

Japan

India

Korea



See the current I/UCRC  
Solicitation for required documentation



US site receives \$25K for every international site added to the center.

# I/UCRC Innovation Fellows (IIF)

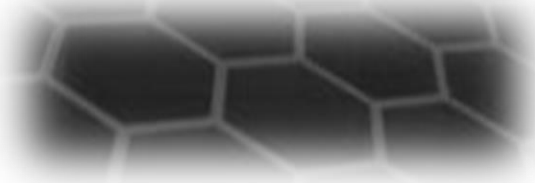
Apply for supplement after forming the site.

**Anticipated Funding Amount:** \$20,000 per award.

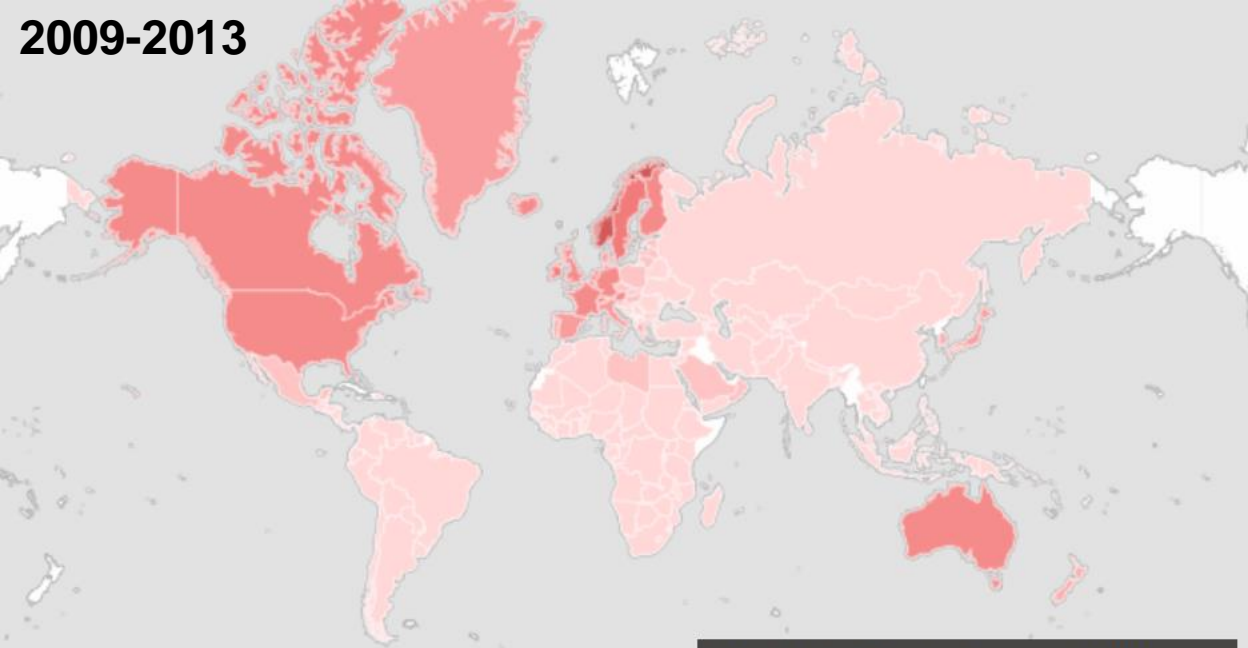
**Award Duration:** 3 months to 1 year.

**FUNDING** for U.S. students to conduct high-quality, industrially relevant research abroad:

- ❑ Supports the objectives of an I/UCRC's research roadmap
- ❑ Leads to the creation of new international site

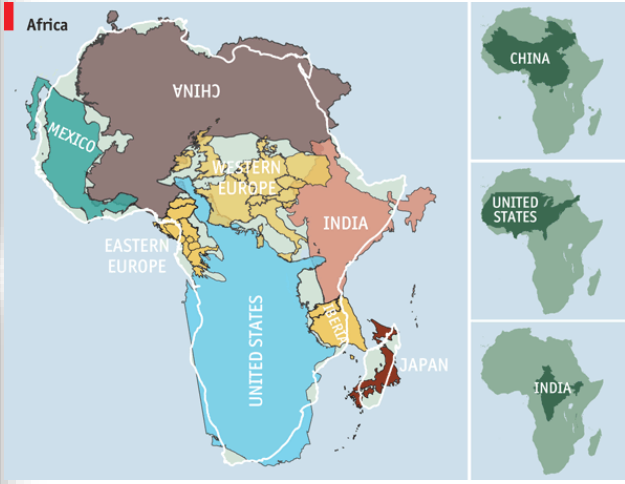
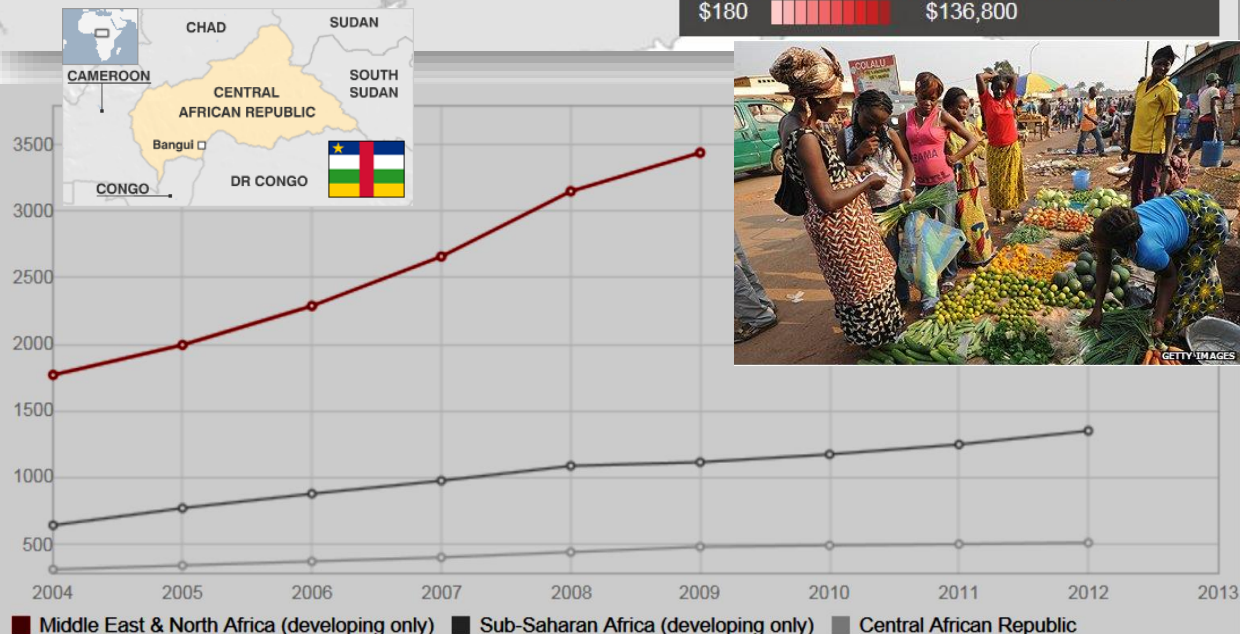


2009-2013



GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.

GNI per capita, Atlas method (current US\$)  
 \$180 [color scale] \$136,800



600 million people,  
**70%**  
 of the population of sub-Saharan Africa are without electricity

Imagine the possibilities...  
 Increasing access and reliability of electricity will:



National Science Foundation

WHERE DISCOVERIES BEGIN

## Base Funding

Collaborative Research Between I/UCRCs (CORBI)

Fundamental Research Program (FRP)

Accelerating Innovation Research (AIR)

Innovation Managing Director (IMD)

I/UCRC Innovation Fellows (IIF)

Research Experience for Undergraduates (REU)

Research Experience for Teachers (RET)

Veterans Research Supplement (VRS)

SBIR / STTR Phase II



# Partnerships for Innovation: Accelerating Innovation Research (PFI:AIR) – Research Alliance (NSF 13-591)

## Overview

### Goals:

- Leverage NSF investments in research alliances to accelerate the translation and transfer of research discoveries into commercial realities.
- Catalyze an academic-based innovation ecosystem.
- Engage students and faculty in entrepreneurial/innovative thinking.

### Funding:

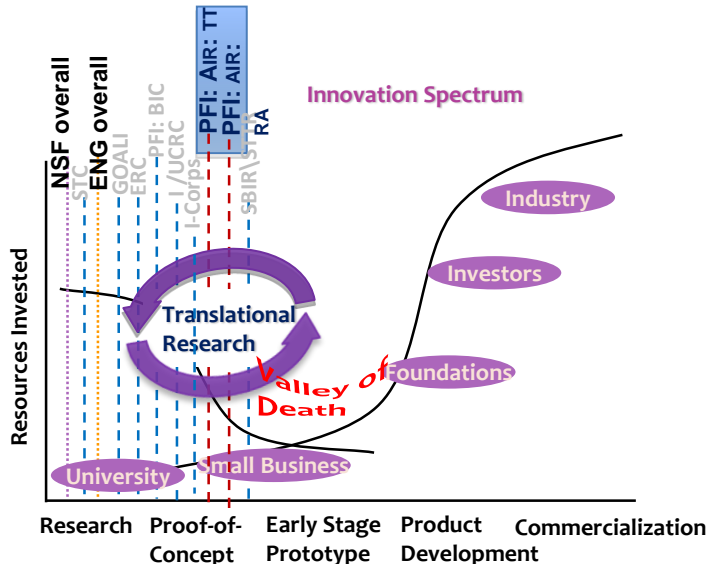
- Up to \$800,000 for up to 3 years (requires 1:1 third party match; 25% can be “in-kind”).

### Post-Award:

- 3<sup>rd</sup> yr. funding contingent on positive 18 month review including 3<sup>rd</sup> party investor(s) & research partner(s).

## Proposal Requirements

- PI is a faculty member active within an NSF-funded Research Alliance.
  - A “Research Alliance” includes centers and other multi-institutional NSF-funded consortia.
  - Research Alliance must be current or within 3 years of NSF support.
- Research partner(s) and 3<sup>rd</sup> party investor(s) required.
- Work proposed must leverage the core mission of the NSF-funded Research Alliance
- Must develop an assessment plan and corresponding metrics



## Expected Accomplishments

- Translation and transfer of research results / innovative technologies into new start-ups or existing firms.
- Development of a sustainable academic-based innovation ecosystem.
- Students who understand innovation and technology translation.

## Contact Information

ENG/IIP: Barbara Kenny, 703-292-4667

[bkenny@nsf.gov](mailto:bkenny@nsf.gov)

Donald Senich, 703-292-7082

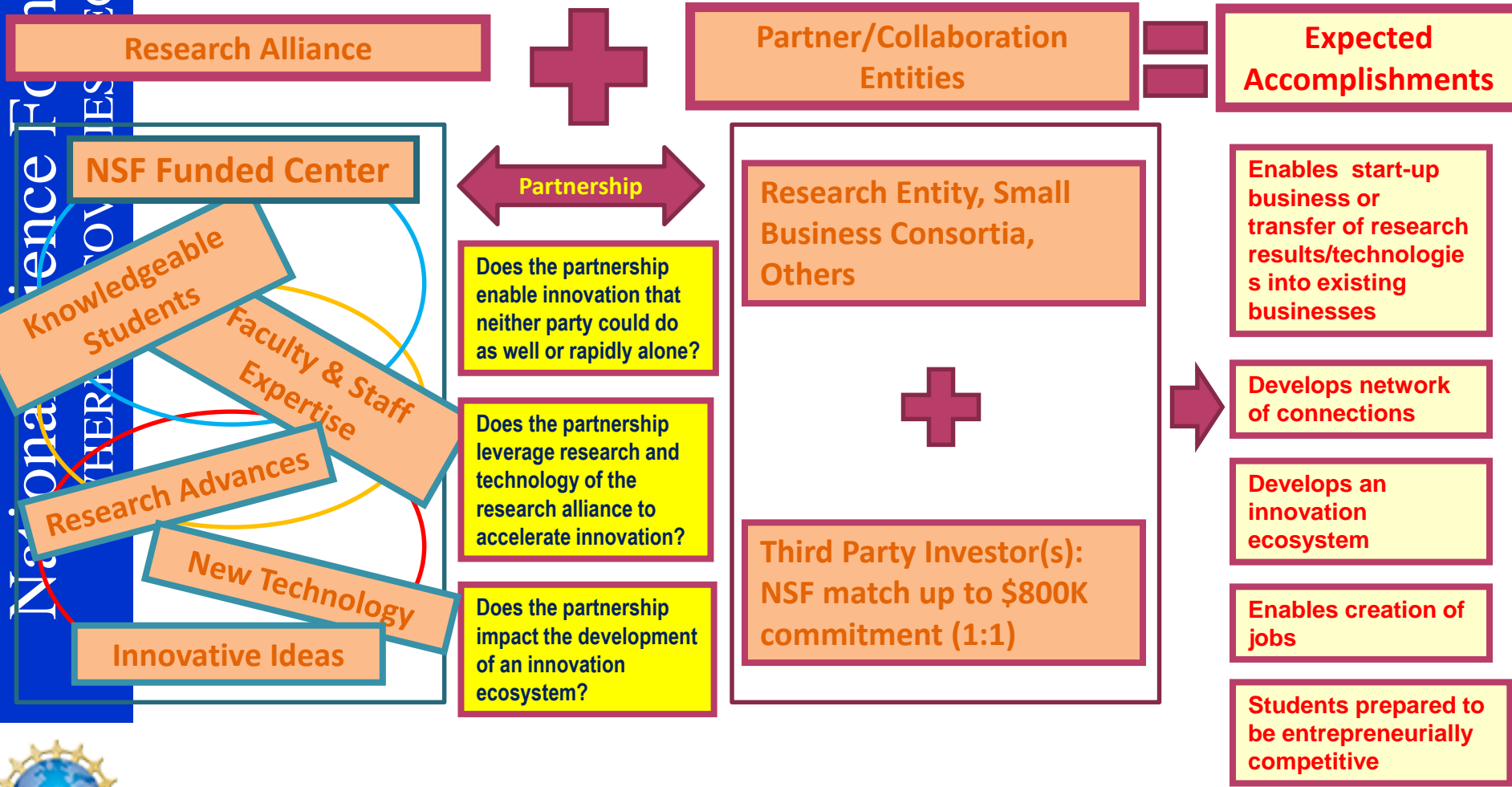
[dsenich@nsf.gov](mailto:dsenich@nsf.gov)

<http://www.nsf.gov/eng/iip/pfi/air-ra.jsp>



# Accelerating Innovation Research- Research Alliance Partnerships

National Science Foundation  
 Industrial Innovation & Partnerships Program  
 Accelerating Innovation Research-  
 Research Alliance Partnerships



# Partnerships for Innovation: Accelerating Innovation Research (PFI:AIR) – Technology Translation (NSF 13-575)

## Goals, Eligibility & Funding

### Goal:

- Accelerate the translation of technologically-promising NSF-funded research discoveries toward commercial reality.
- Engage students and faculty in entrepreneurial/innovative thinking.

### Eligibility:

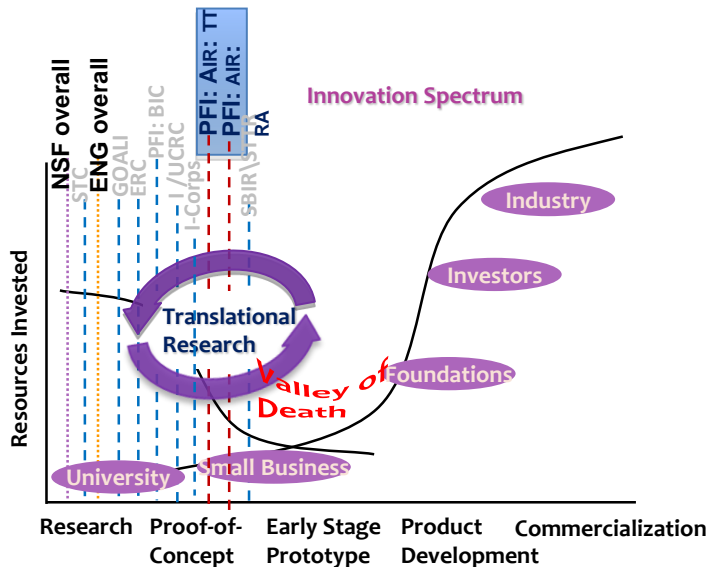
- Lineage to an NSF Research Award.
  - <6 years since end of underlying NSF research award.
- PI is a faculty member at U.S. academic institution.
- Co-PI has business experience (required).

### Funding:

- Up to \$200,000 for up to 18 months.

## Proposal Submission Requirements

- Identification of the technology gap to be filled, research needs and tasks, and the output.
- Overview of lineage (NSF research award) of proposed technology.
- Preliminary patent search and IP discussion.
- Preliminary market study and discussion of competitive advantage.
- Commercialization strategy beyond the duration of the award.
- Plan for student experiences in entrepreneurial and innovation activities.



## Project Output Requirements

- Development and demonstration of a *proof-of-concept, prototype, or scale-up design* that addresses real-world constraints and market-valued solutions.
- Technology Translation plan for *prototype / scale-up*.
- Presentation of *prototype or scale-up* projects at an NSF technology showcase meeting.

## Contact Information

ENG/IIP: Barbara Kenny, 703-292-466 [bkenny@nsf.gov](mailto:bkenny@nsf.gov)  
 Donald Senich, 703-292-7082 [dsenich@nsf.gov](mailto:dsenich@nsf.gov)  
<http://www.nsf.gov/eng/iip/pfi/air-tt.jsp>





# DCL: Managing Director

## 1 Expectation

Full time responsibilities for the CMD position may include:

- **Prospective member recruitment**
- **Nurturing and maintaining industry relationships & operations**
- **Project management oversight of the center's portfolio**
- **Communication with the center's stakeholders**

## 2

## Criterion

- Innovative model to be used for implementing the CMD position
- Roles, responsibilities, and interactions of this position relative to others in the center leadership team
- Current status of the center and the value derived from this position in terms of key aspects of center performance that will be impacted
- Milestones reflecting the expectations for the position during the proposed supplemental funding period (including timelines for the institutional personnel actions required to fill the position)
- Metrics with baseline and annual targets for the supplemental period: membership growth, growth in the leveraging of both member and NSF funds, a quantifiable increase in the value of the center to its constituencies

# IMD Award Recipients

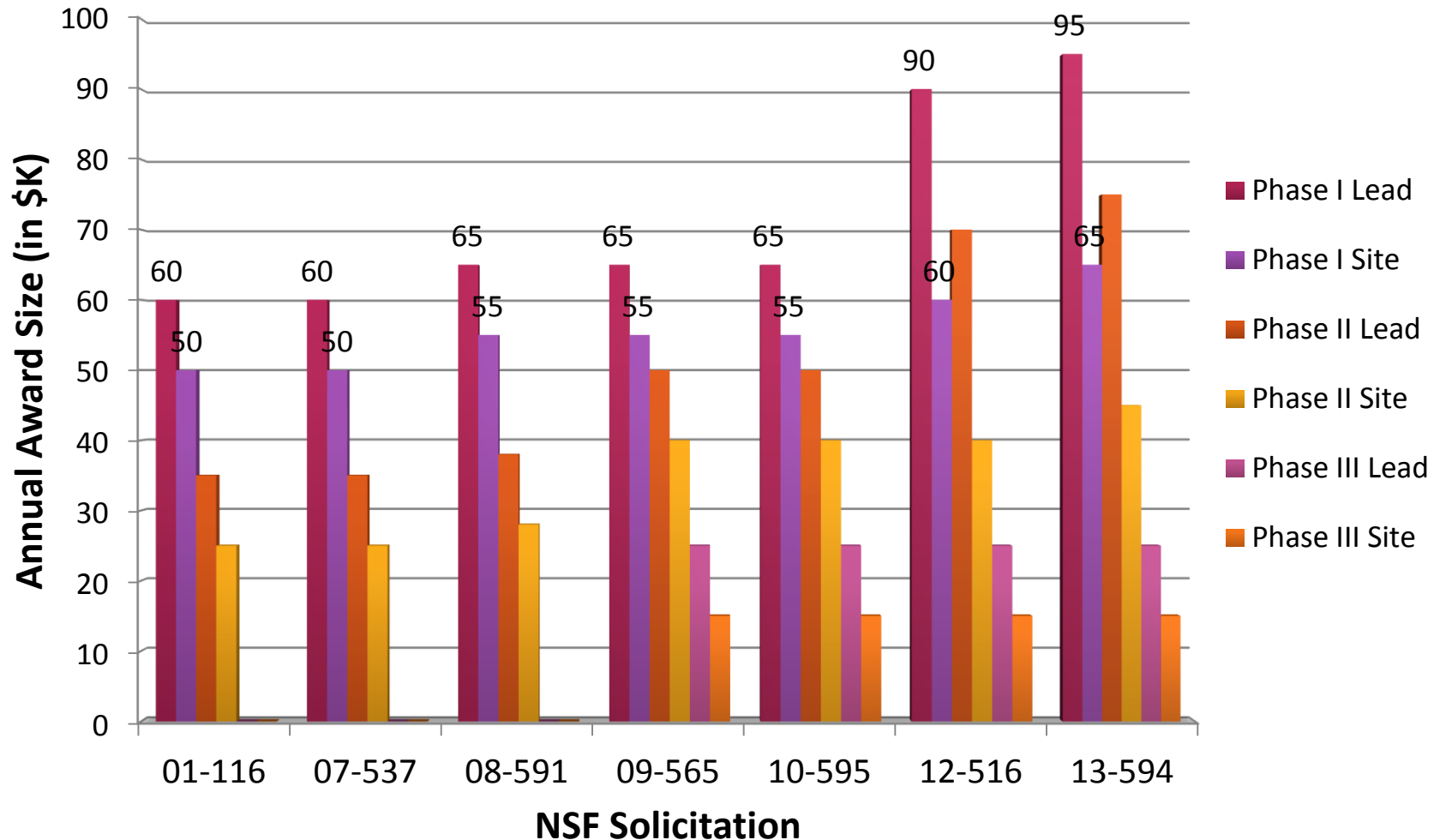
1. Advanced Knowledge Enablement
2. Advanced Non-Ferrous Structural Alloys
3. Child Injury Prevention Studies
4. Dynamic Data Analytics
5. E-Design
6. Grid Power Electronics
7. Identification Technology Research
8. Net-Centric Software & Systems
9. Next-Gen Photovoltaics
10. Safety Security and Rescue Research
11. Security and Software Engineering Research
12. Unmanned Aircraft Systems
13. Water Equipment and Policy
14. Wood-Based Composites

Ist Cohort / 2013





## I/UCRC Site Awards\* (Solicitations 2001-2014)



\*Lead site award for minimum multi-university center of 2 Universities.  
Evaluator award component not included.



# Potential Funding Scenario

Example - Center with TWO sites, International Site added in Year 3 and more than \$300K in membership fees per site.

Total 5 yr NSF Funding Potential - \$2.03 M

Total 10 yr NSF Funding Potential - \$4.11 M + IDC on evaluator cost

Total 15 yr NSF Funding Potential - \$5.64 M + IDC on evaluator cost

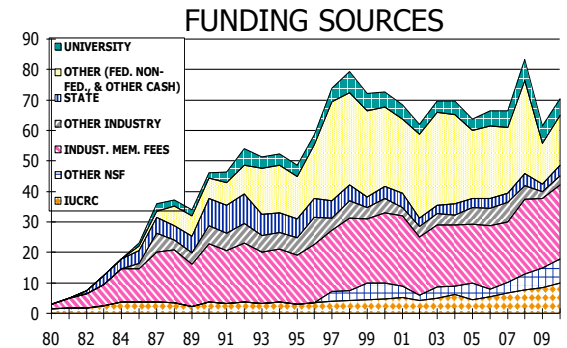
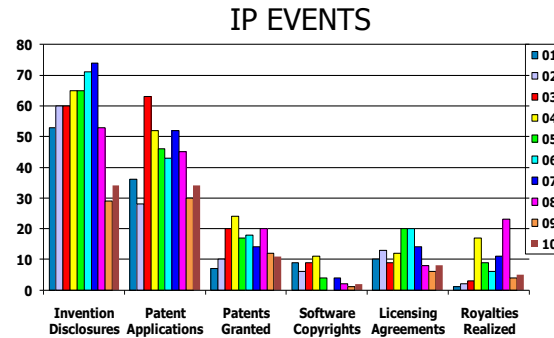
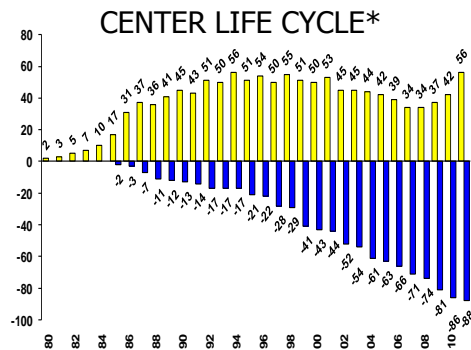
**These numbers do not include the University contribution.**



# I/UCRC Evaluation & Assessment

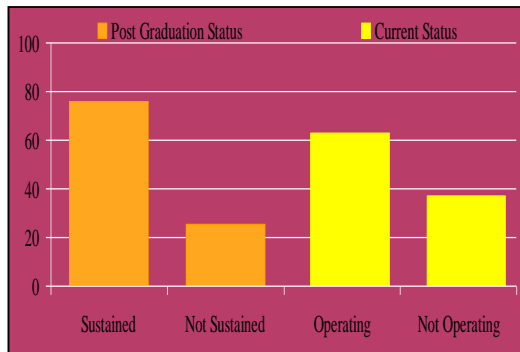
25+ year commitment to integrating evaluation with program planning, implementation and operation . *Local Evaluation – Global Assessment*

## CENTER INPUTS AND OUTPUTS ASSESSMENTS

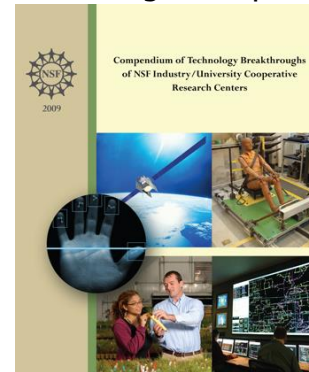


## TARGETED ASSESSMENTS AND RELATED WORK PRODUCTS

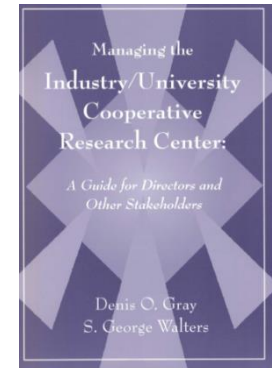
### IUCRC GRADUATION STATUS



### Breakthrough Compendium



### Gray & Walters Director's Guide

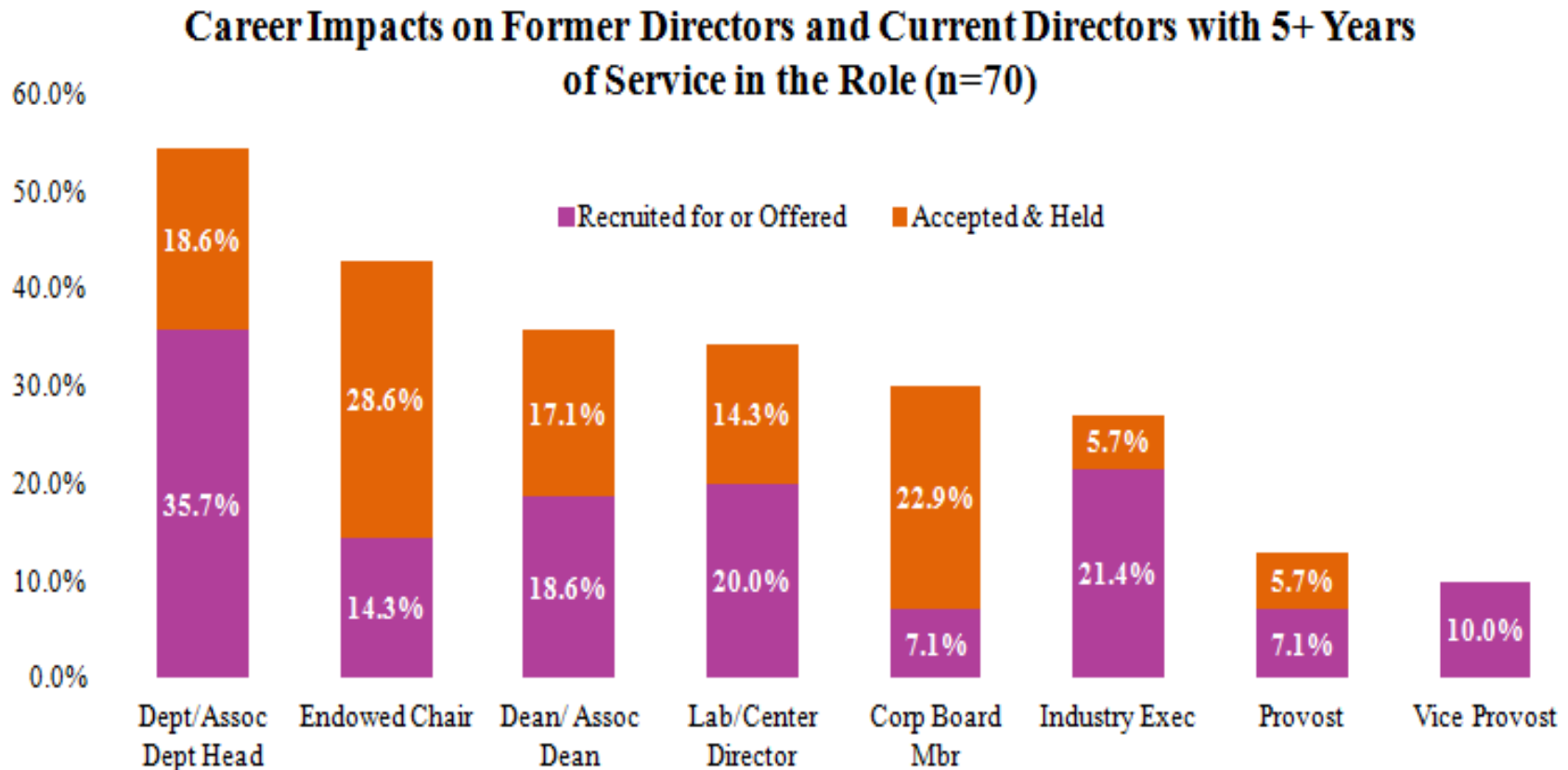


Plus publication in open literature: > 80 publications in journals, national & international conferences: *Research Policy*; *AAAS*; *Journal of Technology Transfer*; *Sc. Public Policy*; *New Directions in Evaluation*



# Career Opportunities

Since beginning your role as IUCRC director, what positions were you recruited for or offered, and what positions did you accept?



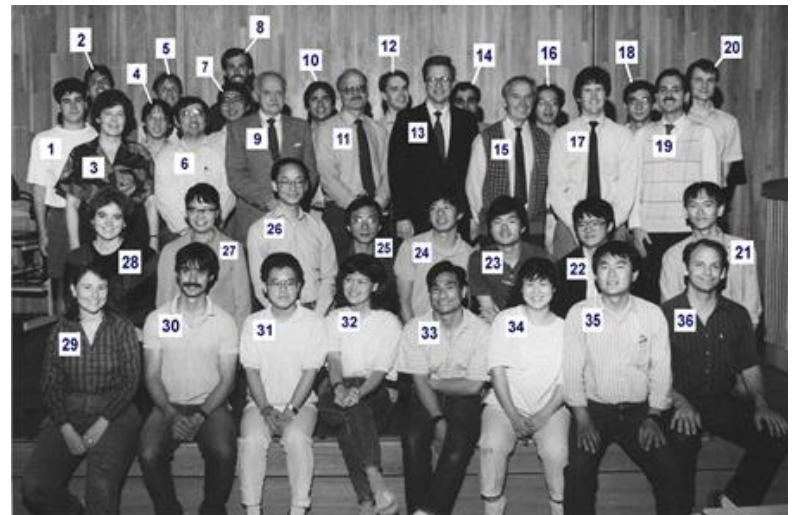
Track the career path for the faculty / senior researchers involved in the center.



## *Legacy Example: Student Successes from BSAC 37 Person Class of 1990*

- Students **went on to become industry and academic leaders and entrepreneurs** in MEMS, **helping to launch a multi-billion dollar industry** that did not previously exist.
- Three of the class eventually returned to UC Berkeley faculty appointments and to BSAC as current co-Directors.
- **The NSF I/UCRC program itself can be described as an “innovation ecosystem”**

**Our students create lasting  
networks bridging  
industry and academic  
cultures**



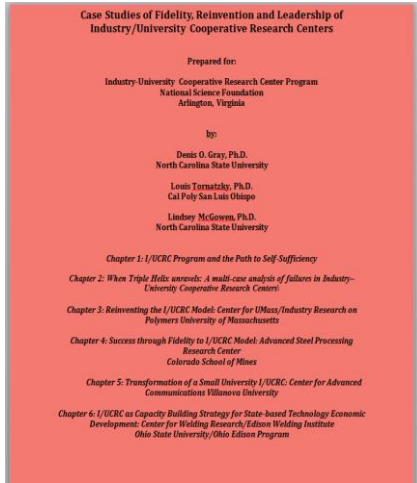


Track the career path for the students involved in the center.

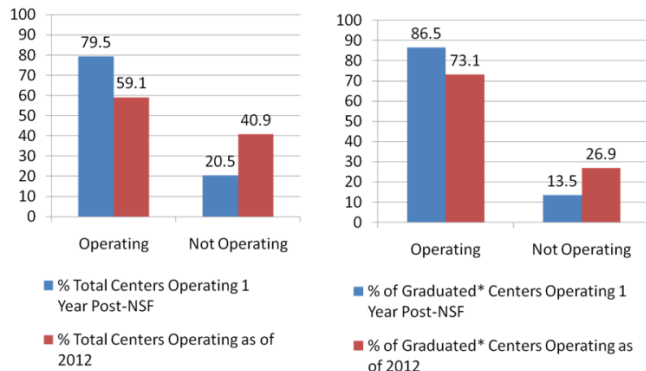


# Recent Evaluation Work Products

I/UCRC Evaluation Project [www.ncsu.edu/iucrc](http://www.ncsu.edu/iucrc)

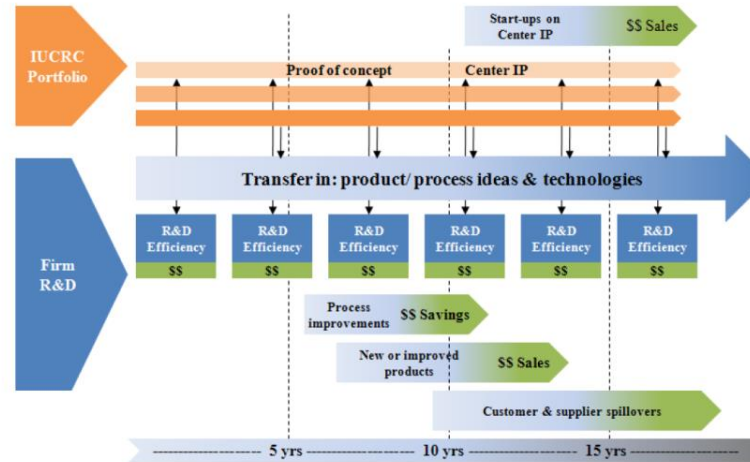


## Graduated Center Case Studies



## Sustainability Study

Figure 8: Model of the Types of IUCRC Impacts



## IUCRC Economic Impacts

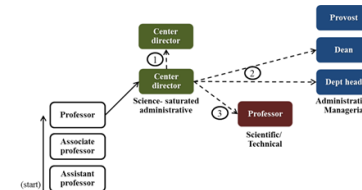


## CRCs and Technical Innovation

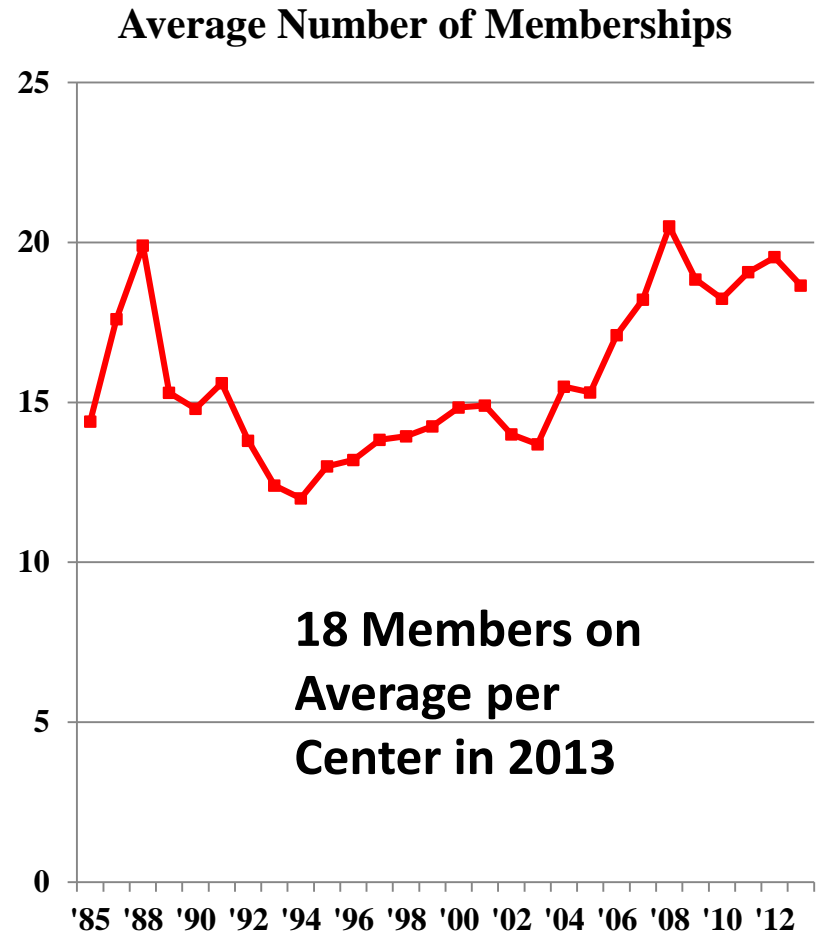
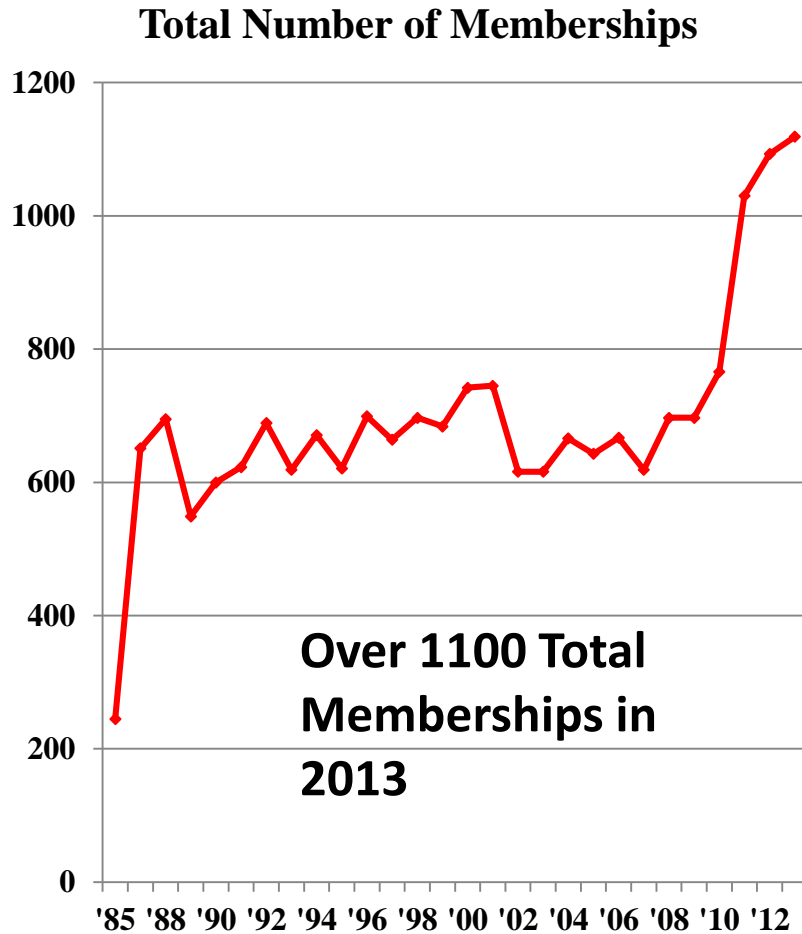
Supplemental study: Social and Human Capital Impacts of the I/UCRC Program on Faculty Directors



- Focus: Career paths of faculty directors and the role of the I/UCRC program
- Explored human and social capital benefits of the program, as well as contextual factors influencing career outcomes
- Full report available at: [www.ncsu.edu/iucrc](http://www.ncsu.edu/iucrc)



## Directors & Human Capital Report



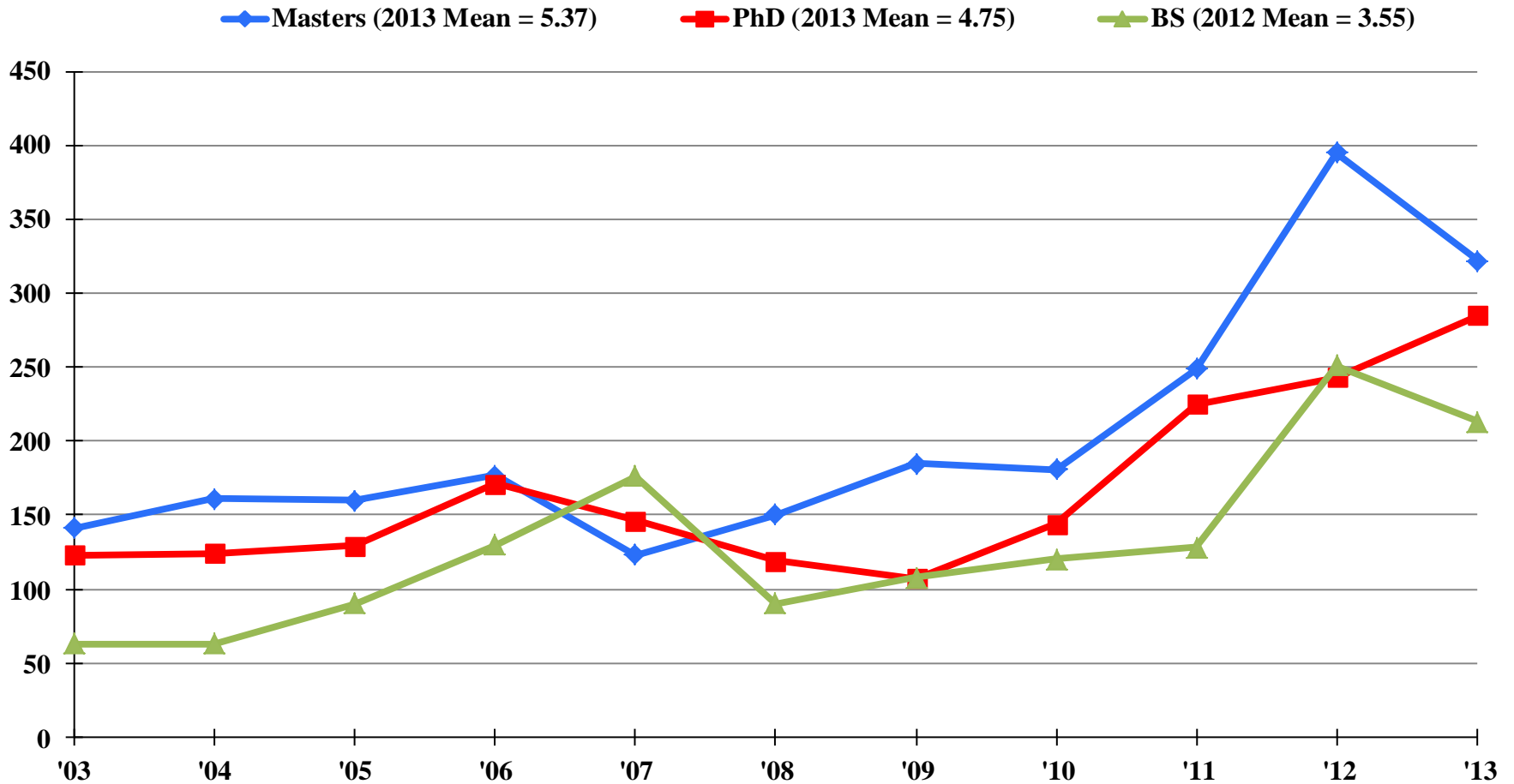
- **8:1 Leveraging of Program funds Reported by Centers Nationally in '13**
- **Leveraging of each membership calculated by Centers: 20:1 to 30:1 !**



# Total Students Graduated



Industry/University  
Cooperative Research  
Centers



# I/UCRC Membership Agreement

- **Parties to Agreement, University and Center**
  - **Annual membership fee structure**
  - Patent rights held by university, with royalty free, non-exclusive rights to center members
  - Companies wishing to exercise rights to a royalty-free license pay for the costs of patent application
  - If only one company seeks a license, that company may obtain an exclusive fee-bearing license
  - March-in Rights
  - Publication delay policy
  - Industrial Advisory Board – one representative from each company per membership
  - **Indemnification clause(s)**
- All Members sign the agreement upon Center Award
  - ONE center, and ONE membership agreement form



## Additional Options in Membership Agreement

**Option 2: Open Source Software.** *Sample Membership Agreement* (below) with copyright Clause I replaced with the following Language: All software created under this Agreement will be released as open source under the Apache X.Y license (“Center Software”). The parties agree that they will not pursue patent protection for such software.

.....

**Option 3: Public Domain Operation.** *Sample Agreement* (below) with Clauses G, H, I, and J removed and Clause F replaced with the following clause:

F. Activity of the center funded all or in part by center membership fees will be in the public domain upon completion and publication review by members.





# IAB Elected Roles

---

<b>IAB Chair</b>	Runs the closed door IAB session at the semi-annual meetings and represents the IAB interests between semi-annual meetings
<b>Chair-elect</b>	Assumes the IAB Chair duties when the chair is absent, and assists the Chair with Center matters between semi-annual IAB meetings
<b>Secretary</b>	Coordinates with the Chair on the closed door IAB session agenda and records key decisions and action items during the session

- Terms and duties should be outlined in the by-laws
- Terms typically range from 1-2 years [Example – Each year, current secretary assumes the Chair-elect role and the current Chair-elect becomes the IAB Chair. In this model, a new Secretary is elected at each annual meeting.]
- Overview of Chair duties:
  - Leads the closed door IAB session at the semi-annual Center meetings
  - Advises on Center activities and governance
  - Represents IAB interests during and between semi-annual Center meetings
  - Advocates for the Center to outside parties





# Scouting for Small companies at NSF

- **Share a non confidential presentation on your company and your key immediate and intermediate term focus areas**
- **NSF will try to connect interested and pertinent grantees with you**
- **Interaction between you and the grantee is private and confidential without NSF involvement**



**Division of Industrial  
Innovation and Partnerships**

**Prakash G. Balan, Ph.D**

**Program Director**

**703-292-5341 (office)**

**302-893-4056 (cell)**

**[pbalan@nsf.gov](mailto:pbalan@nsf.gov)**

**National Science Foundation**  
**WHERE DISCOVERIES BEGIN**



# National Science Foundation I/UCRC Contacts

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Shashank Priya, Program Director, [spriya@nsf.gov](mailto:spriya@nsf.gov)

Rita Rodriguez, CISE Program Director – [rrodrigu@nsf.gov](mailto:rrodrigu@nsf.gov)

Alex Schwarzkopf, Consultant – [aschwarz@nsf.gov](mailto:aschwarz@nsf.gov)

Mary Konjevoda, Program Assistant, [mkonjevoda@nsf.gov](mailto:mkonjevoda@nsf.gov)

*for more information:*

<http://www.nsf.gov>

*and:*

<http://www.nsf.gov/eng/iip/iucrc>

Program phone:

(703) 292-8383

Note: The best way to contact us is via e-mail.





Partnerships for Innovation:  
Building Innovation Capacity  
PFI:BIC Solicitation: NSF 13-587  
"Smart" Service Systems

.....looking for academia-industry partnerships that enable innovative technology insertions into a service system to create or transform a platform making a "smart" or "smarter" service system that is customer-centered and has potential for significant economic/societal impact.....

**Components To Be Addressed**

**Engineering component**

- Clear understanding of system design and integration issues

**Computer science / information technology component**

- Field of knowledge of discovery itself and/or
- Considerations involving data transfer, communication and/or data processing needed for successful integration of the platform technology into a "smart" service system

**Social/behavioral and/or cognitive science component**

- Understanding of the effects of potential human factors could influence potential users.

**Illustrative capabilities of a "smart" service system**

- Learning and decision making based upon data received, transmitted, and/or processed
- Self-diagnostic, self-correcting, self-monitoring, self-organizing, self-replicating, self-control
- Characterized by a sequence of features such as detection, classification, and localization leading to an outcome
- Dynamic adaptation

**Academic Institution**



**Partners**



**Expected Outcomes**



**Minimal Primary Collaboration:**  
1 Industrial Partner (Required)

E.g., Small, Large, Non-Profit Businesses, Other Entities.

**Broader Context Partners**

Letter of Intent (LOI) required: **November 18, 2013**

Full proposal: **January 27, 2014**

Awards: up to \$800,000/3-year duration

Submission restrictions: Two (2) proposals per institution

**Sara B. Nerlove, Ph.D., Program Director**  
**Industrial Innovation and Partnerships**

**Email:** [snerlove@nsf.gov](mailto:snerlove@nsf.gov)