

Expeditions in Computing PI Meeting



Farnam Jahanian
CISE Directorate
National Science Foundation

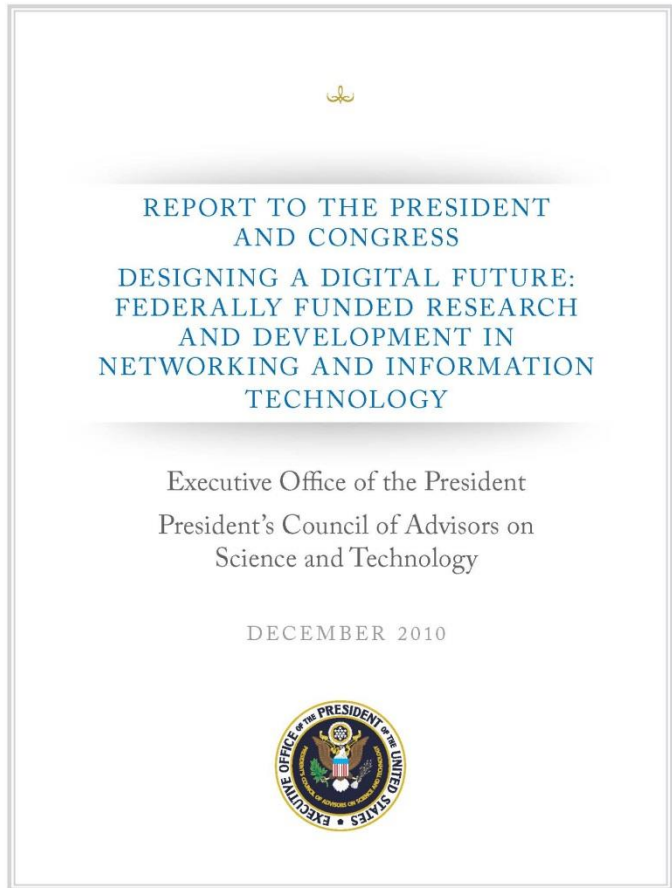
May 14, 2013

Pervasive Impact

- CISE is at the center of an ongoing societal transformation and will be for decades to come.
- Advances in computing, communications and information technologies:
 - underpin **our economic prosperity** and **national security**;
 - are key drivers of U.S. competitiveness and sustainable **economic growth** in an increasingly global market;
 - **accelerate the pace of discovery and innovation** in nearly all other fields of inquiry; and
 - are crucial to achieving our **national and societal priorities**.

A National Imperative

“Recent technological and societal trends place the further advancement and application of networking and information technology squarely at the center of our Nation’s ability to achieve essentially all of our priorities and to address essentially all of our challenges.”



<http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-nitrd-report-2010.pdf>

Source: PCAST (2010). Designing a Digital Future: Federally Funded Research and Development in Networking and Information Technology. – A periodic congressionally-mandated review of the Federal Networking and Information Technology Research and Development (NITRD) Program.

CISE and National Priorities

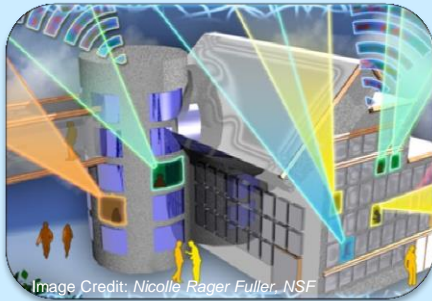


Image Credit: Nicolle Rager Fuller, NSF

**Broadband &
Universal Connectivity**

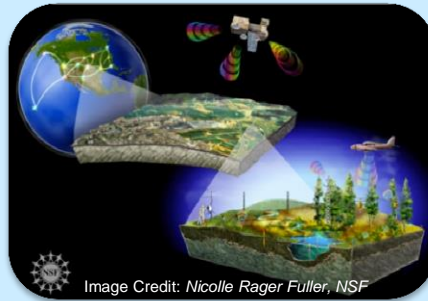


Image Credit: Nicolle Rager Fuller, NSF

**Environment &
Sustainability**



Image Credits: Texas A&M University

**Emergency Response
& Disaster Resiliency**



Health & Wellbeing



Image Credit: MicroStrain, Inc.

**Manufacturing,
Robotics, & Smart
Systems**



Image Credit: ThinkStock

Secure Cyberspace



Image Credit: Cisco, Inc.

**Transportation &
Energy**

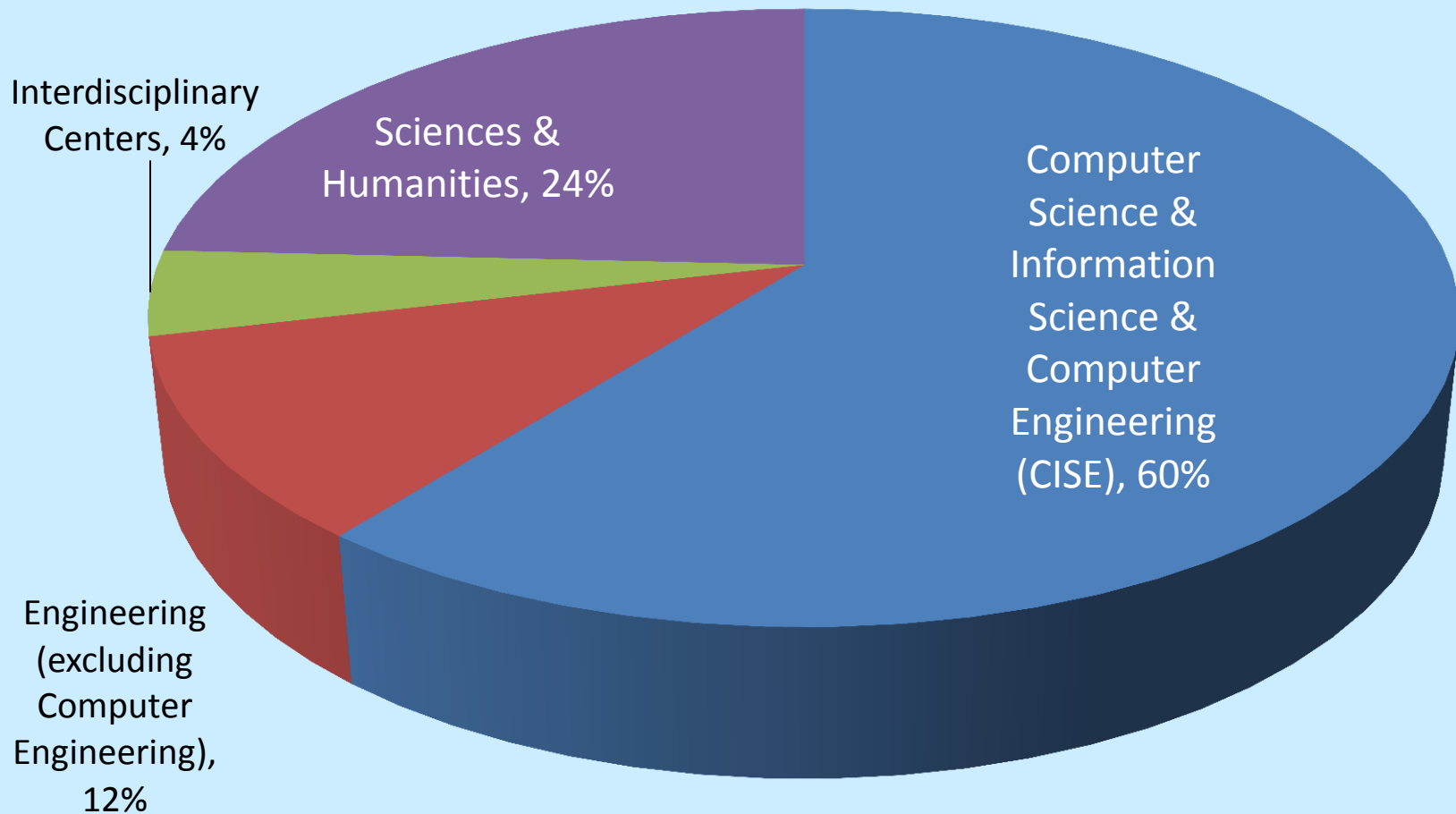


Image Credit: Georgia Computing | Georgia Tech

**Education and
Workforce
Development**

Who is the CISE community?

PI and Co-PI Departments for FY 2012 Awarded by NSF CISE



Snapshot of CISE FY 2012 Activities

	CISE
Research Budget	\$865M
Number of Proposals	7,695
Number of Awards	1,741
Success Rate	~22%
Average Annualized Award Size	\$200K
Number of Panels Held	316
Number of People Supported	18,460



	CISE
Senior Researchers	8,417
Other Professionals	943
Postdoctoral Associates	371
Graduate Students	6,131
Undergraduate Students	2,513

Budget Process Brief Overview



Community Input

- Societies and Academies
- CCC and CRA visioning activities
 - CSTB Studies
- CISE Advisory Committee and Industry
- Workshops and direct engagement of PIs

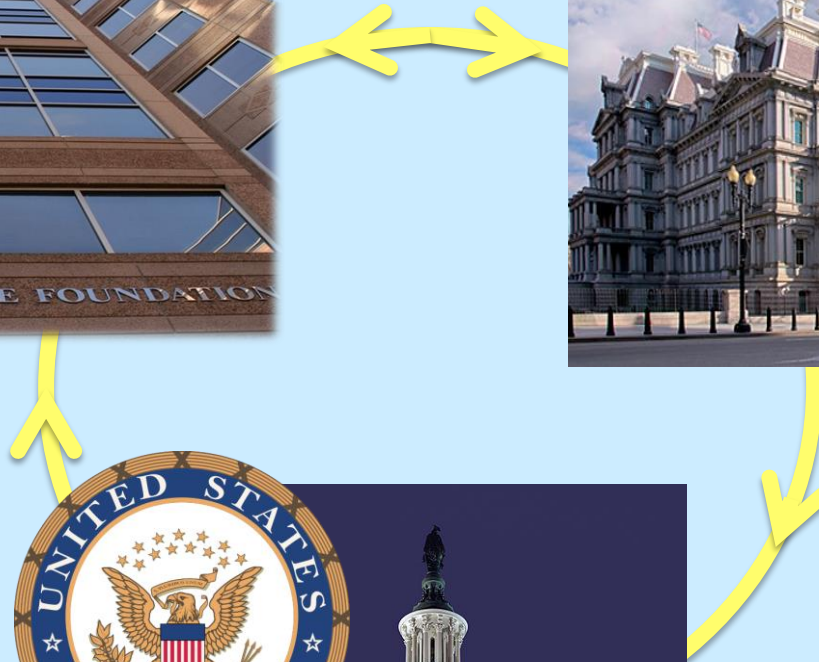
Internal Deliberation and Negotiation

- within directorate
- cross-foundation
- cross-agency

Administration Priorities

- Office of Science and Technology Policy (OSTP)
- Office of Management and Budget (OMB)

Budget Process (Brief) Overview



FY 2014 Budget Request

- **NSF**
 - FY 2014 Budget Request -- \$7,625.78M
 - Increase over FY 2012 Enacted -- \$592.69M or 8.4%
- **CISE**
 - FY 2014 Budget Request -- \$950.25M
 - Increase over FY 2012 Enacted -- \$85.02M or 9.8%
- CISE FY 2014 request is shaped by investments in core research, education, and infrastructure programs as well as investments in NSF cross-foundation priorities and programs



Emerging Frontiers



Data Explosion



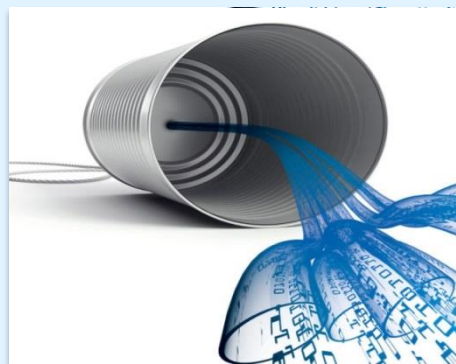
Smart Systems:
Sensing, Analysis and
Decision



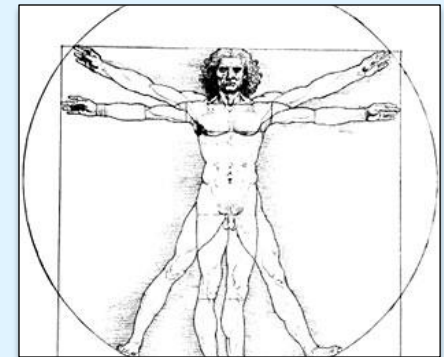
Expanding the Limits
of Computation



Secure Cyberspace



Universal
Connectivity



Augmenting Human
Capabilities


New Programs and Initiatives

- Big Data Initiative (NSF 12-499)
- Exploiting Parallelism and Scalability, XPS (NSF 13-507)
- CyberSEES (NSF 13-500)
- Hazards SEES (NSF 12-610)
- Campus Cyberinfrastructure – Network Infrastructure and Engineering Program, CCNIE (NSF 13-530) – 2nd year
- Failure-Resistant Systems, jointly with SRC (NSF 12-566)
- US Ignite
- Data Infrastructure Building Blocks (12-557)
- US-Finland Wireless Innovation
- United States-Israel Collaboration in Computer Science, USICCS (NSF 12-603)
- Future Internet Architectures – Next Phase, FIA-NP (NSF 13-538)
- Computing Education for the 21st Century, CE21 (NSF 12-609)
- National Robotics Initiative, NRI (NSF 12-607) – 2nd year
- Secure and Trustworthy Cyberspace, SaTC (NSF 12-596) – 2nd year
- CISE-MPS Interdisciplinary Faculty Program in Quantum Information Science (NSF 12-540)

Campus Cyberinfrastructure - Network Infrastructure and Engineering Program (CC-NIE)

PROGRAM SOLICITATION
NSF 13-530

REPLACES DOCUMENT(S):
NSF 12-541

 **National Science Foundation**
Office of Cyberinfrastructure
Directorate for Computer & Information Science & Engineering
Division of Computer and Network Systems

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):
April 03, 2013

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide (PAPPG)*, *NSF 13-1*, was issued on October 4, 2012 and is effective for proposals submitted, or due, on or after January 14, 2013. Please be advised that the guidelines contained in *NSF 13-1* apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 14, 2013, must also follow the guidelines contained in *NSF 13-1*.

Please be aware that significant changes have been made to the PAPPG to implement revised merit review criteria based on the National Science Board (NSB) report, *National Science Foundation's Merit Review Criteria: Review and Revisions*. While the two merit review criteria remain unchanged (Intellectual Merit and Broader Impacts), guidance has been provided to clarify and improve the function of the criteria. Changes will affect the project summary and project description sections of proposals. Annual and final reports also will be affected.

A by-chapter summary of this and other significant changes is provided at the beginning of both the *Grant Proposal Guide* and the *Award & Administration Guide*.

Please note that this program solicitation may contain supplemental proposal preparation guidance and/or guidance that deviates from the guidelines established in the *Grant Proposal Guide*.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:
Campus Cyberinfrastructure - Network Infrastructure and Engineering Program (CC-NIE)

Synopsis of Program:
The "Campus Cyberinfrastructure - Network Infrastructure and Engineering (CC-NIE)" program invests in improvements and re-engineering at the campus level to support a range of data transfers supporting computational science and computer networks and systems research. The program also supports Network Integration activities tied to achieving higher levels of performance, reliability and predictability for science applications and distributed research projects. Two types of CC-NIE awards will be made. Data Driven Networking and Infrastructure for the Campus and Researcher awards will be supported at up to \$500,000 total for up to 2 years. Network Integration and Applied Innovation awards will be supported at up to \$1,000,000 total for up to 2 years.

Cognizant Program Officer(s):
Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Kevin Thompson, OCI Program Director, telephone: (703) 292-4220, email: kthompso@nsf.gov
- Joseph B. Lyles, CNS Program Director, telephone: (703) 292-7152, email: jlyles@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number:
• 47.070 --- Computer and Information Science and Engineering
• 47.080 --- Office of Cyberinfrastructure

Expeditions in Computing

- CISE's largest, long-term research investments
→ up to \$10 million over five years
- Promotes *bold, ambitious, transformative* research that promises to help define the future of computing
- Drives far-reaching research motivated by deep scientific questions



Image Credit: Harvard University



Image Credit: Jason
Dorfman, CSAIL/MIT

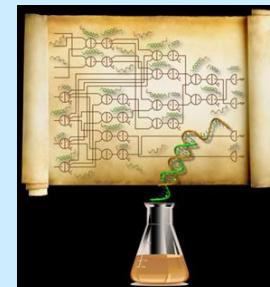


Image Credit: CalTech

Expeditions in Computing

14 awards made so far (each award is for 5 years, \$2M/year)

Year	Awards	Pre-projects	PI, Co-PI & SP	Institutions
2008	4	75	1000	166
2009	3	48	650	161
2010	3	23	232	76
2012	4	36	328	69

Expeditions in Computing

Beyond Moore's Law

- *Variability-aware Software for Efficient Computing with Nanoscale Devices*, UCSD, UCLA, UIUC, Stanford, Michigan, 2010
- *Customizable Domain-Specific Computing*, UCLA, UCSB, Rice, Ohio State, 2009
- *The Molecular Programming Project*, CalTech, U Washington, 2008

Sustainability & Environment

- *Understanding Climate Change: A Data Driven Approach*, Minnesota, Northwestern, NC State, NC A&T State, 2010
- *Computational Sustainability: Computational Methods for a Sustainable Environment, Economy, and Society*, Cornell, Oregon State, Bowdoin, 2008

Wireless & Internet

- *Open Programmable Mobile Internet 2020*, Stanford, 2008

Healthcare & Wellbeing

- *Computational Behavioral Science: Modeling, Analysis, and Visualization of Social and Communicative Behavior*, Georgia Tech, MIT, Boston U, UIUC, USC, Carnegie Mellon, 2010
- *Socially Assistive Robots*, Yale, USC, MIT, Stanford, Willow Garage, 2011

Robotics

- *RoboBees: A Convergence of Body, Brain and Colony*, Harvard, Northeastern, 2009
- *An Expedition in Computing for Compiling Printable Programmable Machines*, MIT, U Penn, Harvard, 2011

Limits of Computation

- *Understanding, Coping with, and Benefiting from Intractability*, Princeton, Rutgers, NYU, Institute for Advanced Study, 2008

Formal Modeling and Verification

- *Next-Generation Model Checking and Abstract Interpretation with a Focus on Embedded Control and Systems Biology*, Carnegie Mellon, Stony Brook, NYU, UMD, Pitt, Lehman College, JPL, 2009
- *Expeditions in Computer Augmented Program Engineering*, U Penn, UC Berkeley, UMD, Rice, Cornell, U of Michigan, U of Illinois-UC, UCLA, MIT, 2011

Big Data

- *Algorithms, Machines, and People*, UC Berkeley, UC San Francisco, 2011
- *(Understanding Climate Change: A Data Driven Approach*, Minnesota, Northwestern, NC State, NC A&T State, 2010)

The Future of the Expeditions Program: Roundtable Discussion Topics

- 1. CISE portfolio balance – small, medium, and large-scale awards**
- 1. Project collaboration and coordination – incentives and best practices**
- 2. Project self-assessment – what works and what doesn't**
- 3. Program assessment – ideas for improvement in NSF oversight**
- 4. Life after Expeditions – follow-on programs and funding mechanisms**

We need your help!

Nurture and Support a Culture of Engagement and Service

- Help shape the future directions of the field, priorities for the nation, and formulate a research and education agenda to address societal challenges.

Embrace a Collaborative Culture Enabled by Foundational Research

- Advances in CISE are pushed by long-term investment in foundational research and cross- and inter-disciplinary research and pulled by expanding complexity, scope, and scale of global priorities.

Educate and Empower the Next Generation

- Lead a cyber- and technology-enabled transformation in education and learning to develop the next generation IT workforce and contribute to universal, transparent, and affordable participation in a knowledge-based society.

The Growing Imperative of Research and Education in Computing

- Our investments in **research and education** have returned exceptional dividends to our nation.
- A thriving basic research community is the foundation for long-term **discovery** and **innovation**, **economic prosperity**, and **national security**.
- As a field of inquiry, computer, communication and information science and engineering has a **rich intellectual agenda** – highly creative, highly interactive, with enormous possibilities for changing the world!
- To keep those benefits flowing, we need to constantly **replenish** the wellspring of **new ideas** and train **new talent**.



Thanks!

fjahania@nsf.gov

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