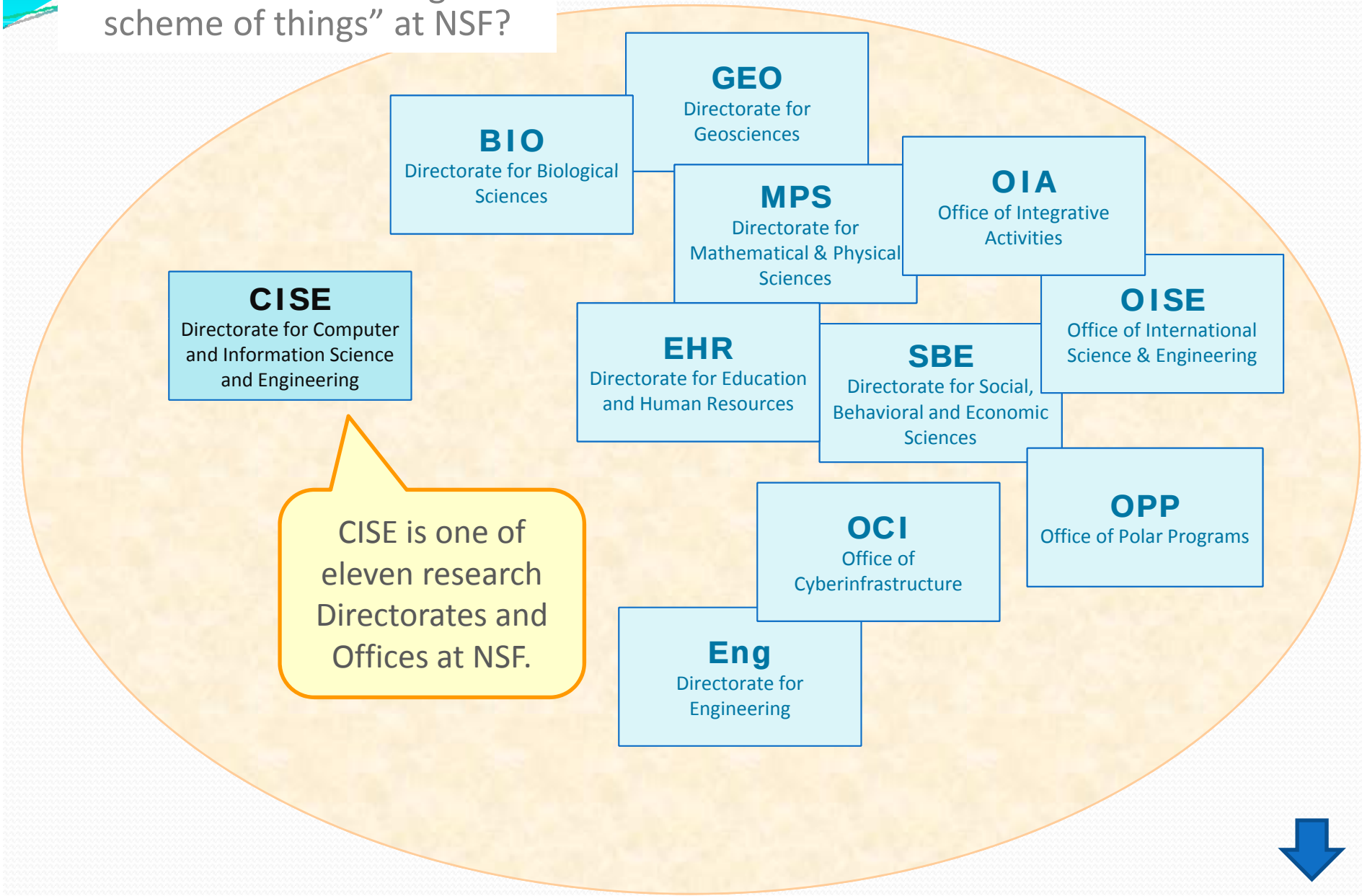
National Science Foundation
Directorate for Computer & Information Science & Engineering (CISE)

Tracy Kimbrel
Program Director

Division of Computing and Communications Foundations (CCF)

Revised 07/07/2010

Where does CISE-centric research fit into the "grand scheme of things" at NSF?



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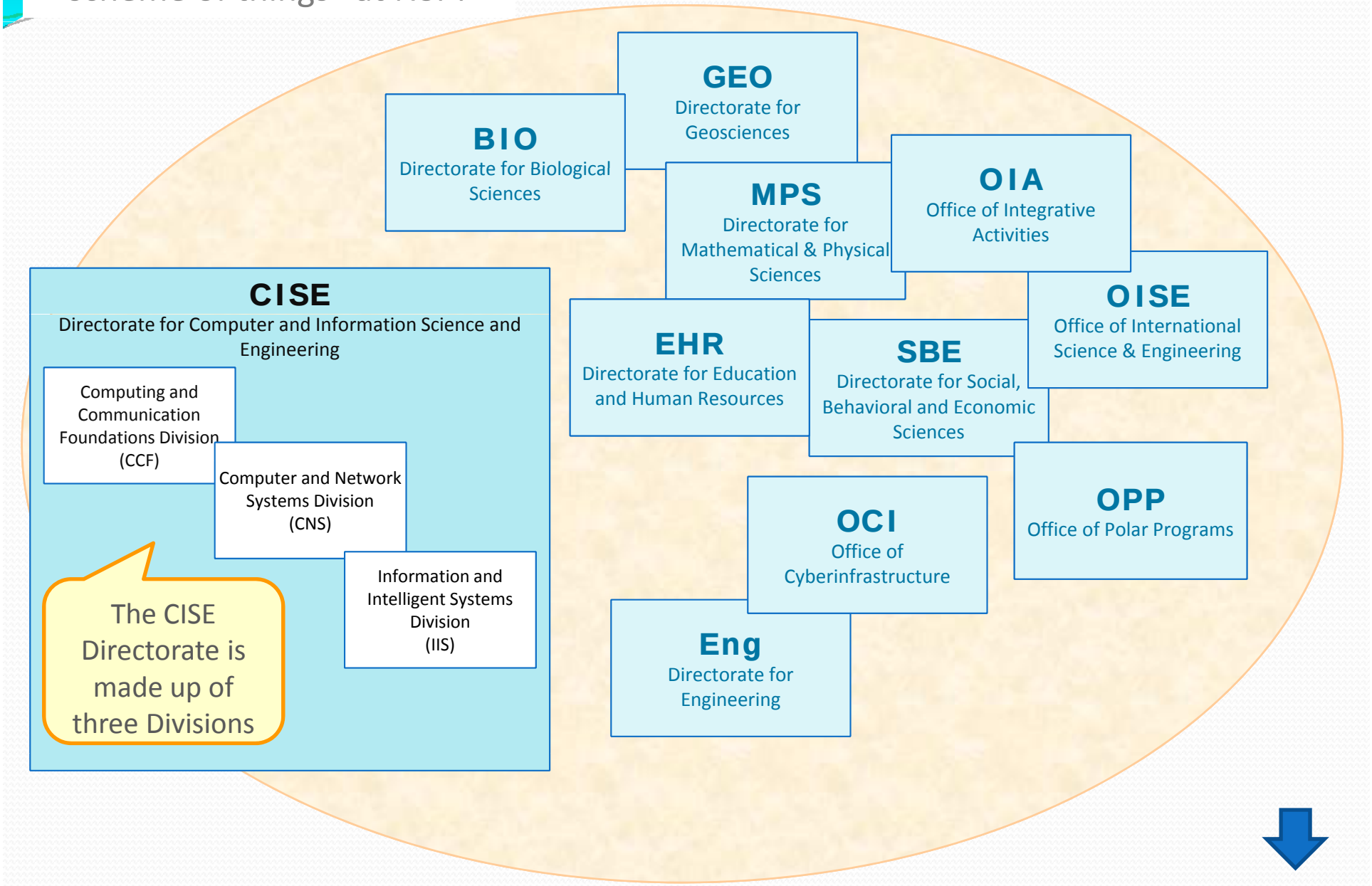

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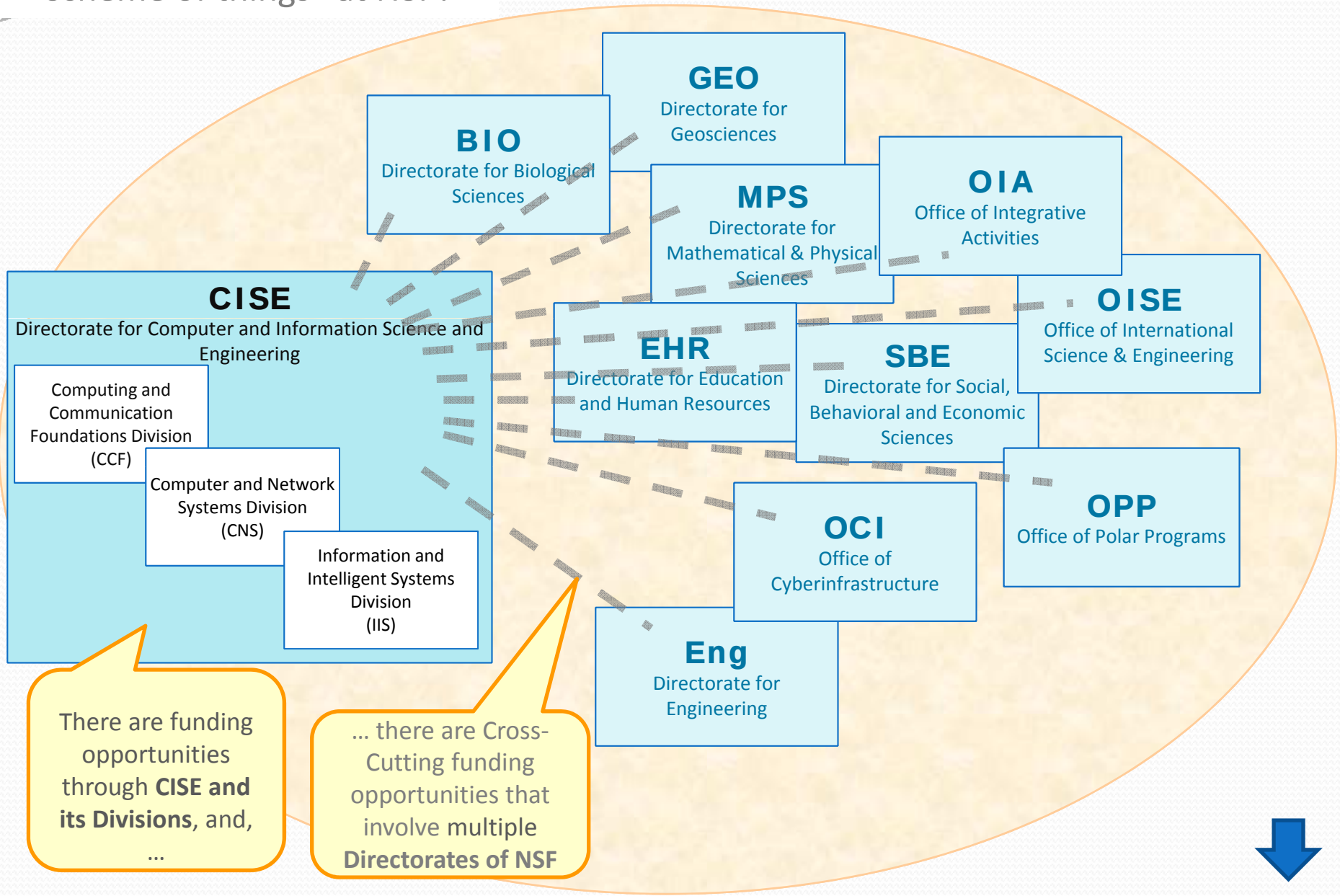

What are the research foci of CISE's three Divisions?

CISE

Directorate for Computer and Information Science and Engineering

Computing and Communication Foundations Division (CCF)
CCF Division Director – Susanne Hambrusch

CCF supports research and education projects that explore the foundations of computing including:

- advances in computing and communication theory,
- algorithms for computer and computational sciences,
- architecture and design of computers and software,
- revolutionary computing models and technologies based on emerging scientific ideas, and
- the integration of research and education activities to prepare future generations of computer science and engineering workers.

Computer and Network Systems Division (CNS)

Information and Intelligent Systems Division (IIS)

CISE

Directorate for Computer and Information Science and Engineering

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Computer and Network Systems Division (CNS)
CNS Division Director – Keith Marzullo

CNS supports research and education activities that:
•invent new computing and networking technologies,
•explore new ways to make use of existing technologies
•seek to develop a better understanding of the fundamental properties of computer and network systems
•create better abstractions and tools for designing, building, analyzing, and measuring future systems.
The Division also supports the computing infrastructure that is required for experimental computer science, and it coordinates cross-divisional activities that foster the integration of research, education, and workforce development.

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Systems Division
(IIS)

CISE

Directorate for Computer and Information Science and Engineering

Computing and Communication Foundations Division (CCF)

Information and Intelligent Systems Division (IIS)
CNS Division Director – Howard Wactler

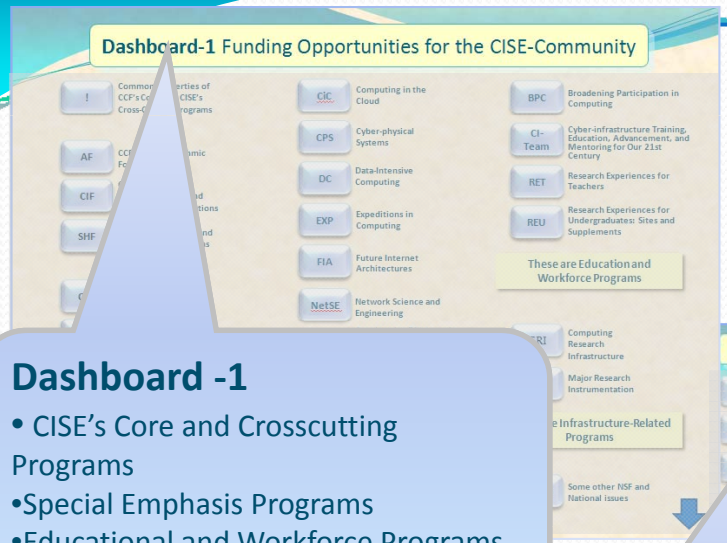
IIS supports the study of the inter-related roles of people, computers, and information, including research and education activities that:

•develop new knowledge about the role of people in the design and use of information technology,

•increase our capability to create, manage, and understand data and information in circumstances ranging from personal computers to globally-distributed systems, and

•advance our understanding of how computational systems can exhibit the hallmarks of intelligence.

How can we navigate our way through all of the funding opportunities that are available to the CISE Community?



Dashboard -1

- CISE's Core and Crosscutting Programs
- Special Emphasis Programs
- Educational and Workforce Programs
- Infrastructure-related Programs

Dashboard-2

- Multidisciplinary and Large-scale Programs
- Targeted Programs:
  - Education
  - Career Advancement
  - Broader Representation
  - Collaboration with Industry
  - International

Dashboard-3

- NSF Programs with substantial computational components

Dashboard-1 Funding Opportunities for the CISE Community

! — Common properties of CISE's Core and Cross-Cutting Programs

Computing and Communication Foundations Division (CCF)

- **AF** — CCF Core: Algorithmic Foundations
- **CIF** — CCF Core: Communications and Information Foundations
- **SHF** — CCF Core: Software and Hardware Foundations

Computer and Network Systems Division (CNS)

- **CSR** — CNS Core: Computer Systems Research
- **NeTS** — CNS Core: Networking Technology and Sys.

Information and Intelligent Systems Division (IIS)

- **HCC** — IIS Core: Human-Centered Computing
- **III** — IIS Core: Information Integration & Informatics
- **RI** — IIS Core: Robust Intelligence

These are the Core Programs in CISE's CCF, CNS and IIS Divisions

These are CISE's Crosscutting Programs for 2011

- **NetSE** — Network Science and Engineering
- **SHB** — Smart Health and Wellbeing
- **TC** — Trustworthy Computing
- **CDI** — Cyber Enabled Discovery and Innovation
- **CiC** — Computing in the Cloud
- **CPS** — Cyber-Physical Systems
- **EXP** — Expeditions in Computing
- **FIA** — Future Internet Architectures
- **FODAVA** — Foundations of Data & Visual Analytics
- **HECURA** — High-End Computing Univ. Res Activity
- **ICES** — Interface between Computer Science and Economic and Social Science
- **SEBML** — Science & Engineering Beyond Moore's Law
- **SI²** — Software Infrastructure for Sustained Innovation
- **SoCS** — Social-Computational Systems
- **STC** — Science and Tech. Centers: Integrative Partnerships

These are Special Emphasis and Multidisciplinary Programs

- **BPC** — Broadening Participation in Computing
- **CE21** — TBA
- **CI-Team** — Cyber-infrastructure Training, Educ., Advancement, and Mentoring for Our 21st Century
- **RET** — Research Experiences for Teachers
- **REU** — Research Experiences for Undergraduates: Sites and Supplements

These are Education and Workforce Programs

- **CRI** — Computing Research Infrastructure
- **MRI** — Major Research Instrumentation

These are Infrastructure-Related Programs

Other

Some other NSF and National issues

Dashboard-2 Additional Funding Opportunities for the CISE Community

These are Targeted Programs:

- Education
- Career Advancement
- Broader Representation
- Collaboration with Industry
- International

ADVANCE	Increasing the Participation and Advancement of Women in Acad. Science and Eng. Careers
CAREER	Faculty Early Career Development Program
EAPSI	East Asia and Pacific Summer Institutes for U.S. Graduate Students
EESE	Ethics Education in Science and Engineering
Ethics Resource	Science, Mathematics, and Engineering Online Resource Center
FASED	Facilitation Awards for Scientists and Engineers with Disabilities
FRP	Fundamental Research Program for Industry/University Cooperative Research Centers
GK-12	NSF Graduate Teaching Fellows in GK-12 Education
GOALI	Grant Opportunities for Academic Liaison with Industry
GRF	Graduate Research Fellowship Program
IGERT	Integrative Graduate Education and Research Trainees
Int'l Visits	International Research and Education: Planning Visits & Workshops
IRES & DDEP	Intl Research Experiences for Students and Doctoral Dissertation Enhancement Projects
IRFP	International Research Fellowship Program
I/UCRC	Industry & University Cooperative Research Program
NSF-FDA	Scholar in Residence at FDA
PASI	Pan-American Advanced Studies Institutes Program
PIRE	Partnership for Int'l Research and Education
RUI	Research in Undergraduate Institutions
SLC	Science of Learning Centers

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Dashboard-3 Additional Funding Opportunities for the CISE Community

- **ARI** — Domestic Nuclear Detection Office-NSF Academic Research Initiative
- **ATOL** — Assembling the Tree of Life
- **CNH** — Dynamics of Coupled Natural & Human Systems
- **CRCNS** — Collaborative Research In Computational Neurosciences
- **EaSM** — Decadal and Regional Climate Prediction using Earth System Models
- **EFRI** — Emerging Frontiers in Research & Innovation
- **EPS** — Experimental Program to Stimulate Competitive Research: Workshop Opportunities

These are NSF Programs with substantial computational components

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Common Properties of all of CISE's Core and Cross-Cutting Programs

The same for all CISE Core and Cross-cutting Programs

Budget

Proposals submitted to CISE's Core and Cross-Cutting Programs must be consistent with one of three project classes. Proposals will be considered for funding within their project classes.

- **Small Projects:**
  Total budgets up to $500,000 for durations of up to three years.
  Well suited to one or two investigators (PI and one co-PI or other Senior Personnel) and at least one student and/or post-doc.

- **Medium Projects:**
  Total budgets ranging from $500,001 to $1,200,000 for durations up to four years.
  Well suited to one or more investigators (PI, co-PI and/or other Senior Personnel) and several students and/or post-docs.

- **Large Projects:**
  Total budgets ranging from $1,200,001 to $3,000,000 for durations of up to five years.
  Well suited to two or more investigators (PI, co-PI(s), or other Senior Personnel), and a team of students and/or post-docs.

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Common Properties of all of CISE's Core and Cross-Cutting Programs

The same for all CISE Core and Cross-cutting Programs

Due Dates: **For NSF's FY 2011**

Submission Window Date(s) (due by 5 p.m. proposer's local time)

- MEDIUM Projects:
  - September 1 - September 15, 2010
  - Annually thereafter: September 1 - September 15
- LARGE Projects:
  - November 01, 2010 - November 28, 2010
  - Annually thereafter: November 1 - November 28
- SMALL Projects:
  - December 01, 2010 - December 17, 2010
  - Annually thereafter: December 1 - December 17

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AF - Algorithmic Foundations

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AF Program Overall Vision

The Algorithmic Foundations (AF) program focuses on:

- algorithmic thinking and algorithms for problems that are central to computer science
- new techniques for rigorous mathematical analysis of algorithms
- theoretical work to determine the measures of complexity in formal models of computation
- fundamental limits of resource-bounded computation and optimal solutions within those limits
- research on models of computing such as, parallel and distributed models
- experimental algorithmics

The current challenges in AF are:

- algorithmic research in databases, networks, communications, operating systems, languages and compilers and machine abstractions
- new techniques for the design and analysis of algorithms in areas such as cryptography, computational geometry, computational biology, numerical, symbolic, algebraic, and scientific computing are appropriate for the program
- hybrid numeric-symbolic-algebraic methods in support of multi-scale, multi-grid methods and computation on peta-scale machines
- computing economic equilibria, mechanism design, graphical economic models and other topics in computational game theory and economics

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AF Program Scope

Disciplinary topics addressed by AF include:

- Algorithms
- Complexity and Cryptography
- Quantum Computing
- Computational Geometry
- Computational Biology
- Computational Game Theory and Economics
- Symbolic and Algebraic Computation
- Parallel and Distributed Algorithms

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AF Program Scope

Examples of recent topics addressed by AF projects include:

- Novel algorithmic techniques for protein structure, gene and protein network discovery, sequence analysis, simulation and analysis of biological systems
- Algorithms for areas such as: artificial intelligence, databases, languages and compilers, networks and operating systems, Biology, Physics, Chemistry, and Engineering and other scientific computation
- Combinatorial and Graph-Theoretic Algorithms
- Computational and Communication Complexity
- Data structures – abstract data types, analysis of classical and new data structures, distributed data structures
- Machine learning algorithms
- Models of computation – automata, bounded-action devices, distributed, hybrid, online, parallel, probabilistic, quantum, reactive, sequential, streaming
- Algorithms for linear, convex, and non-linear programming; applications of optimization techniques to combinatorial problems
- New models for computation on heterogeneous multi-core and many core processors

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AF Contact Information

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http://www.nsf.gov/pubs/2010/nsf10572/nsf10572.pdf

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CIF – Communications and Information Foundations

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CIF Program Overall Vision

The Communications and Information Foundations (CIF) program focuses on:

- theoretical underpinnings and enabling technologies for information acquisition, transmission, and processing
- fundamental research in networking including network information theory, network coding, cross-layer research at the lower layers, as well as foundational research at higher layers
- intellectual foundations of communications and information theory and signal processing
- wireless communications, coding, and networking
- reliable transmission of information, in both analog and digital form
- theoretical performance limits for various communication systems
- the intersections of communications and information theory, signal processing, and networking
- signal and information processing from the domain of the linear to the realm of the nonlinear
- efficient-power aware and hardware-friendly algorithms

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CIF Program Overall Vision

CIF Disciplinary Topics include:

- Communication and Information Theory
- Signal Processing
- Network Coding and Information Theory
- Sensor Networks
- Wireless Communication and Signal Processing

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CIF Program Scope

Examples of topics addressed by recent AF projects include:

- Link-layer wireless communications
- Adaptive communication systems and cognitive radio
- New techniques to exploit cognition in wireless systems
- Biological and quantum communication systems
- Information theory and coding
- Fundamental performance limits for wireless systems
- Data representation and compression
- Collaborative/Distributed Signal Processing for Sensor Networks
- Sensor networks and Multi-sensor data fusion, Anomaly detection, and distributed control
- Signal and pattern extraction from massive spatio-temporal data
- Novel integrated sensing and processing systems Impact of the “glass-wired world”
- Application-specific signal processing
- Monitoring the Nation’s critical infrastructure especially the power grid
- Network information theory and network coding
- Cross-layer network optimization, especially at the lower layers
- Impact of physical-layer impairments at the higher layers and techniques for mitigating the impact of physical-layer impairments at the network levels

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CIF Future Directions

Grand Challenges include:

- Sensor networks that monitor and increase the reliability of the Nation's critical infrastructure and environment, especially the power grid
- Universal language translation in real time, both spoken and written
- Non-invasive and minimally-invasive medicine and health care
- Energy efficient, reliable and safe personal transportation systems with automated navigation
- Transparent, secure, inexpensive communications with a full range of "tele-presence" as facilities permit
- Broadening Scope and Cross-Disciplinary Research:
  - Control – distributed control, control over networks
  - Biology – bioinformatics, genomics, inter- and intra-organism communication
  - Materials – "smart materials" that respond to sensor measurements
  - Network tomography
- New approaches to manage massive datasets, such as compressive sampling/sensing, also promises advances in the field,
- Application of signal/information processing in complex systems such as monitoring the Nation's critical infrastructures, signal processing in biological systems, and biomedical signal and image processing.

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CIF Contact Information

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http://www.nsf.gov/pubs/2010/nsf10572/nsf10572.pdf

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SHF – Software and Hardware Foundations

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SHF Program Overall Vision

The Communications and Information Foundations (CIF) program focuses on:

- design, verification, operation, utilization, understanding and evaluation of hardware and software
- all aspects of the science and engineering of software,
- programming language and compiler research from principles and semantics to compiling for multi-threaded and multi-core architectures.
- models of computation and architectures that exploit biological processes and biological and nano-materials.
- design automation for micro and nano-systems
- uni-processor, multiprocessor/multi-core/CMP and system-on-chip (SoC) architectures.

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SHF Program Overall Vision

Disciplinary topics addressed by SHF include:

- Compilers
- Computer Architecture
- High Performance Computing
- Programming Languages
- Software Engineering and Formal Methods
- Design Automation for Micro and Nano Systems
- Bio Computing
- Nano Computing

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SHF Program Scope

Examples of topics addressed by AF projects include:

- science and engineering of software, hardware and computer systems
- use of ideas developed in other fields, e.g., logics and agent-based approaches from AI, experimental computer science, economics
- formal languages, logics, models and methods
- programming language principles, semantics, design and implementation
- scientific and engineering basis for usable formal methods
- empirical investigations of hypotheses about software development processes
- foundations for software science and engineering in new environments such as cloud computing, web services, and ubiquitous/pervasive computing
- computational limits and their consequences to software synthesis, verification, adaptability
- new perspectives on requirements, specifications, architectures, composition, evolution
- new paradigms and frameworks for designing asynchronous circuits/architectures
- designing for device heterogeneity and fault tolerance
- designing on- and off- chip interconnects.
- hybrid systems.
- high performance, power-aware, and fault-tolerant micro architectures, memory and storage systems.
- scalable multi-core architectures.
- hardware-software co-design.
- power-aware design, and power management
- workload characteristics.
- high-performance hardware and software.
- software and hardware processes and artifacts
- compilers for enabling robust high-performance computer systems.
- exploiting parallelism at multiple levels and programming models.
- compiler techniques for managing on-chip communication, power consumption, temperature and fault tolerance in multi-core architectures.
- exploring complex computing and communication processes in biological systems and bio-inspired ideas in computing and communication systems

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SHF Future Directions

Current challenges in CIF are:

- software development, compilation, debugging, visualization tools, and platforms and test-beds for parallel architectures and scientific computing
- new formalisms and logics for reasoning about properties of software and hardware systems
- parallel programming models, abstractions, languages and algorithms
- proposals that transcend traditional areas, import ideas from other fields, or capture the dynamic interactions between the architecture, language, compiler, systems software, and applications layers

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SHF Contact Information

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http://www.nsf.gov/pubs/2010/nsf10572/nsf10572.pdf

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CSR - Computer Systems Research

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CSR Program Overall Vision

The Computer Systems Research (CSR) program focuses on:

- computer and software systems
- hardware platforms
- compute-intensive applications and hardware.

The current challenges in CSR are:

- distributed and Internet scale computing,
- massively parallel and data intensive computing, and
- pervasive and ubiquitous computing.

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CSR Program Scope

Examples of recent disciplinary topics that were addressed by CSR projects include:

- multi-core systems
- reconfigurable architectures and systems
- operating systems
- architecture and system performance
- embedded systems
- hybrid systems and control
- real-time systems
- parallel, distributed, coordinated and co-operative systems
- grid computing
- high-confidence and critical systems
- middleware
- systems frameworks
- assurance technologies
- cluster and cloud computing
- performance
- power and thermal issues
- autonomous systems
- sensor systems
- systems simulation and modeling
- pervasive and ubiquitous systems
- systems software and tools for E-science

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CSR Future Directions

- "thinking" in parallel
- survivability
- large-scale distributed systems
- autonomic systems and their control
- operating systems, languages and compilers for parallel systems
- storage, searching and retrieval from massive data sets
- configuration, modeling, and design tools for developing large-scale, embedded, distributed systems
- science of power management
- environmental monitoring under stress conditions
- high-confidence systems for critical applications
- ...

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CSR Contact Information

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http://www.nsf.gov/pubs/2010/nsf10573/nsf10573.pdf

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TC – Trustworthy Computing

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TC Program Overall Vision

The Trustworthy Computing Program (TC) envisions a future pervasive cyber infrastructure that supports a wide range of requirements for **trustworthy operation, despite known and future threats and an increasingly complex operating environment.**

Trustworthy operation requires security, reliability, privacy, and usability. Striving for those properties will lead to the levels of **availability, dependability, confidentiality and manageability** that our systems, software and services must achieve in order to overcome the lack of trust people currently feel about computing and what computing enables.

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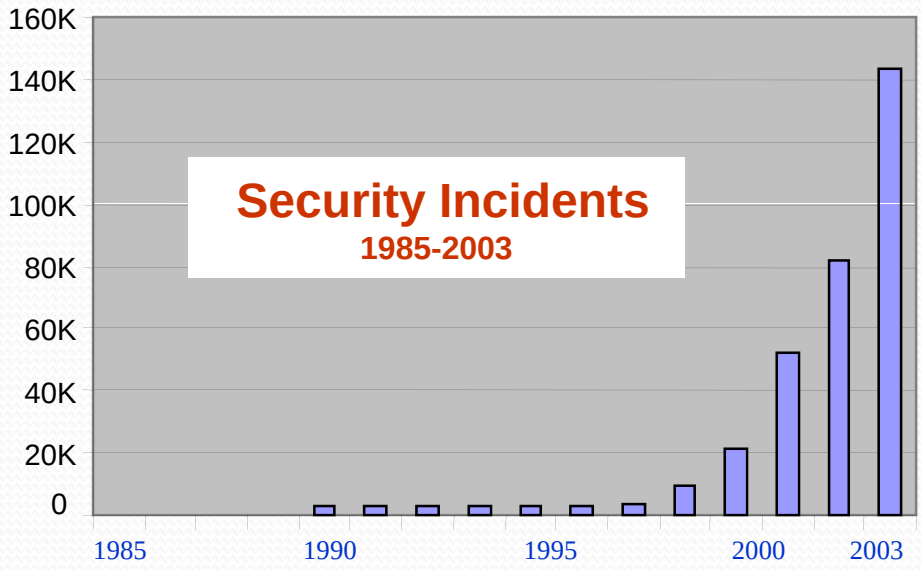
TC Program Motivation

- Threat of **cyber terrorism** on our nation
- **On-line crime** is reputed to cost $200B/year
- Ubiquitous/Pervasive computing, *despite its many advantages,* poses a threat to citizens' **privacy**
- The **future of electronic voting** and, even, Internet voting poses threats to our nation's democratic institutions
- Cyber attacks on our nation's **critical infrastructures** are increasing and having cascading effects
- Our systems and networks have a plethora of **vulnerabilities that enable attacks**



Accelerating Disruptions and Covert Attacks on Critical Information Infrastructures

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TC Program Scope

TC supports all research approaches:

- theoretical to experimental to human-centric
- theories, models, cryptography, algorithms, methods, architectures, languages, tools, systems and evaluation frameworks

Of particular interest are proposals that address:

- foundations of trustworthy computing (e.g., "science of security" and privacy-preserving algorithms), privacy, and usability

TC welcomes projects that study:

- tradeoffs among trustworthy computing properties, e.g., security and privacy, or usability and privacy
- the tension between security and human values such as openness and transparency
- methods to assess, reason and predict system trustworthiness
- observable metrics, analytical methods, simulation, experimental deployment
- and, where possible, deployment on live test-beds for experimentation at scale

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TC Program Scope:

Many Topics of Security funded by Cyber Trust (over 500 ongoing projects, 700 PIs and Co-PIs)

- **Cryptography:** provable security, key management, lightweight cryptographic systems, conditional and revocable anonymity, improved hash functions
- **Formal methods:** access control rule analysis, analysis of policy, verification of composable-systems, lightweight analysis, on-line program disassembly
- **Formal models**: access control, artificial diversity and obfuscation, deception
- **Defense** against large scale attacks: worms, distributed denial of service, phishing, spam, adware, spyware, stepping stone and botnets
- **Applications**: critical infrastructures, health records, voice over IP, geospatial databases, sensor networks, digital media, e-voting, federated systems
- **Privacy:** models, privacy-preserving data-mining, location privacy, RFID networks
- **Hardware enhancements** for security: virtualization, encryption of data in memory, high performance IDS, TPM
- **Network defense:** trace-back, forensics, intrusion detection and response
- **Wireless & Sensor networks:** security, privacy, pervasive computing
- **New challenges:** spam in VoIP, "Google-like" everywhere, virtualization, quantum computing, service oriented architecture
- **Metrics:** Comparing systems wrt security, risk-based measurement
- **Testbeds and Testing Methodology:** DETER. WAIL, Orbit and GENI, scalable experiments, anonymized background data

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TC Contact Information

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http://www.nsf.gov/pubs/2010/nsf10575/nsf10575.pdf

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CRI – Computing Research Infrastructure

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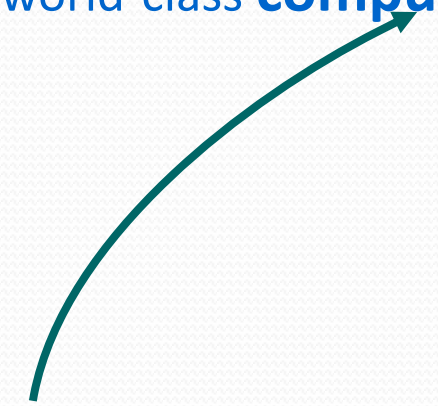
CRI Program Overall Vision

CISE's CRI Program:

- supports the creation, enhancement and operation of world-class **computing research infrastructure.**



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CRI -- Program Scope

Two classes of CRI awards:

- **Institutional Infrastructure (II)**
- **Community Infrastructure (CI)**

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CRI -- Program Scope

Institutional Infrastructure (II) awards:

- support the creation of **new** computing research infrastructure, or
- the **enhancement of existing** computing research infrastructure

CRI II research infrastructure

- enables compelling **new research** and education opportunities
- can involve **multiple investigators** from one or more departments and/or institutions
- can be led by or include 2-year, predominantly undergraduate, and/or minority-serving institutions
- *may request up to $1.5M total for project durations not to exceed 3 years*

II awards focus on the awardee and collaborating institutions.

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CRI -- Program Scope

Community Infrastructure (CI) awards:

CI awards enable world-class research and education opportunities ***for broadly-based communities of researchers and educators that extend well beyond the awardee institutions***

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CRI -- Program Scope

Community Infrastructure (CI) awards:

- support **planning** for computing research infrastructure, or
- creation of **new** computing infrastructure, or
- **enhancement of existing** computing research infrastructure and/or
- **operation** of such infrastructure

CRI CI Infrastructure

- provide compelling **new research** and education opportunities supported by infrastructure
- ensure a high quality of **service to community researchers** and educators expected to use the infrastructure

Since *CI awards serve communities of researchers and educators, CI proposals must provide compelling evidence that a diverse community of investigators will find the proposed infrastructure valuable to their research and education endeavors.*

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12810&org=CISE

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CPS – Cyber-Physical Systems

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CPS Program Vision

What are Cyber-Physical Systems?

- CPS deeply integrate **computation, communication, and control** into **physical** systems
- CPS exploit pervasive, networked computation, sensing, and control, i.e., "Internet of [**controlled]** things"
- "CPS will transform how we interact with the physical world just like the Internet transformed how we interact with one another."*

CPS Summit Website: http://varma.ece.cmu.edu/summit/index.html

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CPS Program Vision

What CPS are **not**:

- not desktop computing
- not traditional embedded/real-time systems
- not today's sensor nets

Some hallmark characteristics of CPS:

- cyber capability in every physical component
- networked at multiple and extreme scales
- complex at multiple temporal and spatial scales
- dynamically reorganizing/reconfiguring
- high degrees of automation, control loops closed at many scales
- operation must be dependable, certified in some cases

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CPS Program Motivation

A Few Example Opportunities*

Transportation	▪ Faster and more energy efficient aircraft ▪ Improved use of airspace ▪ Safer, more efficient cars	
Energy and Industrial Automation	▪ Homes and offices that are more energy efficient and cheaper to operate ▪ Distributed micro-generation for the grid	
Healthcare and Biomedical	▪ Increased use of effective in-home care ▪ More capable devices for diagnosis ▪ New internal and external prosthetics	
Critical Infrastructure	▪ More reliable and efficient power grid ▪ Highways that allow denser traffic with increased safety	

* Cyber-Physical Systems Executive Summary, CPS Steering Group, March 6, 2008. Available on-line: http://varma.ece.cmu.edu/summit/

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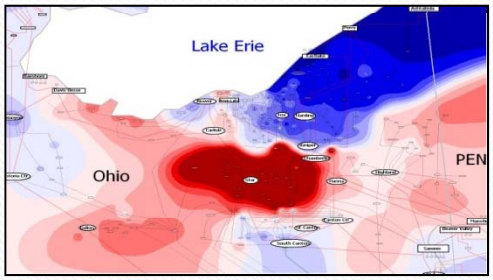
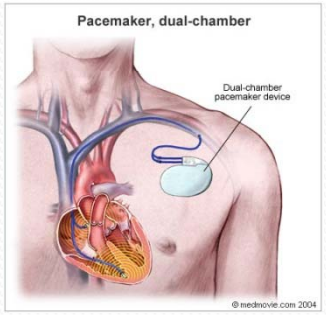
CPS Program Motivation
Similar Problems in Many Sectors

- **Energy**:
- smart appliances,
- buildings, power grid
  - net-zero energy buildings
  - minimize peak system usage
  - no cascading failures



Kindly donated by Stewart Johnston

- **Healthcare**:
- embedded medical devices and smart prosthetics; operating room of the future; integrated health care delivery
  - patient records available at every point of care
  - 24/7 monitoring and treatment



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Program Scope – CPS Challenges

Societal challenge – How can we provide people and society with cyber-physical systems they can *bet their lives on*?

Technical challenge -- How can we build systems that interface between the cyber world and the physical world, with *predictable*, or at least *adaptable*, behavior?

- We cannot easily draw the boundaries.
- Boundaries are always changing.
- There are limits to digitizing the continuous world by abstractions.
- Complex systems are unpredictable.

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Program Scope
CPS Research Challenges

- We need systems that are compositional, scalable, and evolvable
  - big and small components
  - one component to billions of components
  - new and old technology co-exist

- We need ways to measure and certify the "performance" of cyber-physical systems
  - time and space, but multiple degrees of resolution
  - new metrics, e.g., energy use
  - new properties, e.g., security, privacy-preserving

- We need new engineering processes for developing, maintaining, and monitoring CPS
  - traditional methods will not work or are too costly

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Program Scope
CPS Research Challenges

- We need new notions of "correctness"
  - factor in context of use, unpredictable environment, emergent properties, dynamism
  - what are the desired properties of and metrics for software (e.g., weak compositionality), hardware (e.g., power), and systems?

- We need new formal models and logics for reasoning about cyber-physical systems
  - such as hybrid automata, probabilistic real-time temporal logic
  - for verification, simulation, prediction

- We need new verification tools usable by domain engineers
  - push-button, lightweight
  - integrated with rest of system development process

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CPS Program Vision

- Enable a research community and workforce that will be prepared to address the challenges of next generation systems.

- Bridge previously separated areas of research to develop a unified systems science for cyber-physical systems.

- Develop new educational strategies for a 21st century CPS workforce that is conversant in both cyber and physical aspects of systems.

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CPS Solicitation Highlights

Budget

Proposals submitted to this solicitation must be consistent with one of three project classes. Proposals will be considered for funding within their project classes.

- ***Small Projects*** – individual or small-team efforts that focus on one or more of the three defined CPS themes (up to $200,000/year for up to three years)
- ***Medium Projects*** – span one or more CPS themes and may include one or more PIs and a research team of students and/or post-docs (up to $500,000/year for up to three years)
- ***Large Projects*** – multi-investigator projects addressing a coherent set of research issues that cut across multiple themes or that explore a particular theme in great depth (up to $1,000,000/year for up to five years)

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CPS Solicitation Highlights

Three CPS Themes:

- ***Foundations*** – develop new scientific and engineering principles, algorithms, models, and theories for the analysis and design of cyber-physical systems
- ***Methods and Tools*** – bridge the gaps between approaches to the cyber and physical elements of systems through innovations such as novel support for multiple views, new programming languages, and algorithms for reasoning about and formally verifying properties of complex integrations of cyber and physical resources
- ***Components, Run-time Substrates, and Systems*** – new hardware and software infrastructure and platforms and engineered systems motivated by grand challenge applications

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CPS Contact Information

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http://www.nsf.gov/crssprgm/cdi/

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NeTS – Networking Technology and Systems

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NeTS Program Overall Vision

Focus

Technological and theoretical advances leading to the development of a **new generation of networks** and bringing the network closer to autonomy.

Topics

- **resource discovery**, naming, addressing, routing and congestion control
- **mobility** of a massive number of network/mobile devices
- **network control** and management
- scalable, non-intrusive mechanisms, tools and methodologies for **measurement**
- scalability, robustness and network **extensibility**

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CISE Cross-Cutting vs. CISE Core

Network Science and Engineering (NetSE): ***cross-cutting***

Network Technology and System (NeTS): ***core***

NetSE

Encourages all communities to engage in integrative thinking to advance, seed and sustain the transformation of networking research to enable the socio-technical networks of the future.

NeTS

Supports the exploration of innovative and possibly radical network architectures, protocols, and technologies – for wired and/or environment – that are responsive to the evolving requirements of large-scale, heterogeneous networks and applications

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NeTS Program Scope

Examples of recent disciplinary topics from NeTS projects:

- routing protocols
- MAC and physical layer design
- cognitive radio and dynamic spectrum
- cross-layer design
- integrating access networks with the Internet
- mobility control
- test-beds and performance analysis tools
- adaptive and efficient resource management
- network management
- network and service architecture
- scalable and robust design
- network virtualization
- network security and privacy
- networking in extreme environments
- wireless, sensor, and optical networks
- in-network data processing
- self-organizing, self-healing large-scale networks

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NeTS Future Directions

- Scalable and robust design
- Dynamic network resource management
- Mobility management
- Trustworthy networking
- Power-aware networking
- Service-oriented network design
- Cross-layer design and optimization
- Network management
- Network architecture
- …

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http://www.nsf.gov/pubs/2010/nsf10573/nsf10573.pdf

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NetSE – Network Science and Engineering

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NetSE Program Overall Vision

The Network Science and Engineering (NetSE) program focuses on:

- Encouraging members of all network science and engineering communities to **transform networking research and enable future socio-technical networks.**
- The NetSE program seeks to develop science and engineering knowledge about networks, **yielding new scientific understanding about their complexity and informing their future design**.
- The program specifically challenges individuals and teams with **different perspectives and with different domain expertise** to come together to develop this understanding.

PLEASE NOTE THAT THE NETSE PROGRAM WILL ACCEPT PROPOSALS IN ONLY THE MEDIUM AND LARGE PROJECT CLASSES.

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NetSE Program Motivation

The scope of the kinds of projects funded by the NetSE program is motivated by existing and emerging **challenges**:

- In the past few decades the **Internet has undergone radical changes**, evolving from a small number of interconnected computer networks to a global socio-technical infrastructure.
- As we have become increasingly dependent upon the Internet to perform critical societal functions, we have come to recognize that its **design must evolve to embody key societal values such as security and privacy** and to provide for economic sustainability.
- Future networks must be designed to provide users with timely and coherent **access to massive quantities of highly distributed information**.
- Networks must demonstrate critical systems characteristics such as **resiliency, manageability and evolvability**, including the ability to support as yet unforeseen technologies, applications and services.
- To design socio-technical networks of the future effectively requires that we develop a **deeper understanding of the dynamics and behav**iors of such networks.

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NeTSE Program Scope

NeTSA supports research on:

- •Internet-scale, topologically-aware models for accessing, processing and aggregating multiple high-volume information flows
- •cognitive capabilities, context-awareness, and architectures that enable the discovery, invocation and composition of globally distributed, highly evolving services and information systems.
- •the exploration of new applications that provide information based on both content and context, and the improvement of existing classes of applications, such as telemedicine, gaming, virtual worlds, augmented reality and telepresence
- •network models that incorporate human values at multiple levels and scale and give coherence to the highly diverse ways users might create and access information in the future.

NetSE also encourages research proposals focused on exploring "clean slate" approaches to innovations in network architecture and rethinking network functions, layers and abstractions in the context of a range of scientific, technical and social challenges and opportunities.

NetSE emphasizes integrative activities focused on creating and synthesizing network components into theoretically grounded architectures that address fundamental policy and design trade-offs, support sound economic models, and promote societal benefits.

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http://www.nsf.gov/pubs/2010/nsf10575/nsf10575.pdf

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BPC – Broadening Participation in Computing

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BPC Program Overall Vision

To have all of our diverse population fully participating in computing research and education.

Initial Focus: Increasing the participation of women, African Americans, Native Americans, Hispanics, and persons with disabilities

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BPC Program Motivation

- NSF is **committed to broadening participation in** science, technology, engineering and mathematics **(STEM)** disciplines. One of NSF's core values is to be broadly inclusive, reaching out especially to groups that have been underrepresented in the sciences and engineering.

- NSF's Strategic Plan highlights its intentions to **prepare** a diverse, globally engaged STEM workforce and to **build capacity** while integrating research with education.

- CISE's Broadening Participation in Computing (BPC) program aims to **significantly increase the number of U.S. citizens and permanent residents receiving post secondary degrees** in the computing disciplines, with an emphasis on students from communities with longstanding underrepresentation in computing. Those underrepresented groups are women, persons with disabilities, African Americans, Hispanics, American Indians, Alaska Natives, Native Hawaiians, and Pacific Islanders.

- CISE's BPC program seeks to engage the computing community to develop and implement innovative methods, frameworks, and strategies to improve **recruitment and retention** of these students through undergraduate and graduate degrees. Projects that target stages of the academic pipeline from middle school through the early faculty ranks are encouraged.

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BPC Program Goals

- Build a national community around BP
- Achieve a better engagement of hard to reach groups
- Scale existing effective practices for maximum impact
- Building a public/private coalition that could fund the “10,000 teachers for 10,000 schools project”

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BPC Program Scope

BPC runs programs from middle school through the early career faculty ranks

BPC is spearheading a "clean slate" approach to high school computing that aims to:

- Create a new 3 course sequence for high schools
  - Introductory (preAP) course
  - New, Gold-Standard AP course
  - Existing (maybe modified) AP CS A
- Prepare 10,000 teachers nationwide to teach that course and provide them with ongoing support
- Gain entrée into 10,000 schools (especially under-resourced schools)

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BPC Solicitation Highlights

The BPC program will support three categories of awards:

- Alliances,
- Demonstration Projects, and
- Leveraging, Scaling, or Adapting Projects.

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BPC Contact Information

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13510

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SHB - Smart Health and Wellbeing

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SHB Program Overall Vision

The goal of the Smart Health and Wellbeing program is to **seek improvements in safe, effective, efficient, equitable, and patient-centered health and wellness services** through innovations in computer and information science and engineering.

Doing so requires **leveraging the scientific methods and knowledge bases** of a broad range of computing and communication research perspectives.

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SHB Program Motivation

Information and communications technologies are poised to transform our access to and participation in our own health and well-being.

The complexity of this challenge is being shaped by concomitant transformations to the fundamental nature of what it means to be healthy.

Having good health increasingly means **managing our long-term care** rather than sporadic treatment of acute conditions; it places greater emphasis on the **management of wellness** rather than healing illness; it acknowledges the **role of home, family, and community** as significant contributors to individual health and wellbeing as well as the changing demographics of an increasingly aging population; and it recognizes the **technical feasibility of diagnosis, treatment, and care** based on an individual's genetic makeup and lifestyle.

The substrate of 21st century healthcare will be computing and networking concepts and technologies whose transformative potential is tempered by unresolved core challenges in designing and optimizing them for applicability in this domain.

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SHB Program Scope

Smart Health and Wellbeing especially encourages the research community to pursue bold ideas that go beyond and/or combine traditional areas of computer and information science and engineering.

Projects submitted to this program should be motivated by specific challenges in health and wellbeing.

The Smart Health and Wellbeing program aims to facilitate large-scale discoveries that yield long-term, transformative impact in how we treat illness and maintain our health.

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SHB Program Future Directions

- new security and cryptographic solutions to protect patient privacy while providing legitimate anytime, anywhere access to health services will require
- information retrieval, data mining, and decision support software systems to support personalized medicine
- remote and networked sensors and actuators, mobile platforms, novel interactive displays, and computing and networking infrastructure that support continuous monitoring and real-time, customized feedback on health and behavior
- anonymized and aggregated data for community-wide health awareness and maintenance
- better and more efficient delivery of health services enabled by virtual worlds, robotics, image, and natural language understanding
- safe critical care provided by software-controlled and interoperable medical devices
- healthcare systems and applications that are usable (to preclude or minimize failures due to human error) and that are useful (matching the mental model of users, from provider to patient, so people make appropriate decisions and choices)

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SHB Contact Information

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http://www.nsf.gov/pubs/2010/nsf10575/nsf10575.pdf

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DC – Data-Intensive Computing

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Data-Intensive Computing: Some background

- Enormous **digital datasets** abound in all facets of our lives

- The **pace of data production** will only accelerate with increasing digitization of communication and entertainment and the continuing assimilation of computing into everyday life.

- Data will arise from many sources, will require **complex processing**, may be **highly dynamic**, be subject to **high demand.**

- Data production and collection are outstripping our **ability to process and store data.**

This compels us to rethink how we will manage –store, retrieve, explore, analyze, and communicate – this abundance of data.

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Data-Intensive Computing: Scope

- Solicitation responds to urgent need to **support computation on data of far larger scales** than ever previously contemplated. Data centers are instances of data-intensive computing environments, the target of this solicitation.

- Massive data is the dominant issue with emphasis placed on the data-intensive nature of the computation -- demanding a **fundamentally different set of principles** than mainstream computing.

- Many data-intensive applications admit to **large-scale parallelism** over the data and are well-suited to specifications via high-level programming primitives in which the **run-time system manages parallelism and data access** – they may also require extremely high degrees of **fault-tolerance, reliability, and availability.**

- Applications also often face real-time **responsiveness requirements** and must confront heterogeneous data types and noise and uncertainty in the data.

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Data-Intensive Computing: Goals

Data-intensive computing issues:

- How can we best program data-intensive computing platforms to exploit massive parallelism and to serve best the varied tasks that may be executed on them?
- How can we express high-level parallelism at this scale in a natural way for users?
- What new programming abstractions (including models, languages and algorithms) can accentuate these fundamental capabilities?
- How can data-intensive computing platforms be designed to support extremely high levels of reliability, efficiency, and availability?
- How can they be designed in ways that reflect desirable resource sensibilities, such as in power consumption, human maintainability, environmental footprint, and economic feasibility?
- What (new) applications can best exploit this computing paradigm,and how must this computing paradigm evolve to best support the data-intensive applications we may seek?

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Data-Intensive Computing

The program will fund:

•Projects in all areas of computer and information science and engineering that increase our ability to:

- build and use data-intensive computing systems and applications,
- help us understand their limitations, and
- create a knowledgeable workforce capable of operating and using these systems as they increasingly become a major force in our economy and society.

•Research previously supported separately by the Cluster Exploratory (CluE) program, which made available for data-intensive computing projects a massively scaled highly distributed computing resource supported by Google and IBM and a similar resource at the University of Illinois in partnership with Hewlett-Packard, Intel, and Yahoo!.

•Requests for use of any such resources available to or accessible by the proposer(s), in order to pursue innovative research ideas in data-intensive computing.

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Data-Intensive Computing

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Expeditions – Expeditions in Computing

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Expeditions in Computing

- pursue ambitious, fundamental research that promises to **define the future of computing**
- investigators collaborate across disciplinary and institutional boundaries
- **catalyze far-reaching research** explorations motivated by deep scientific questions
- **inspire** current and future generations of Americans, especially those from under-represented groups
- stimulate significant research and education outcomes that promise scientific, economic and/or other societal benefits

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Expeditions in Computing

- Bold, creative, visionary, high-risk ideas
- Whole >> ∑ parts
- Solicitation is deliberately under constrained
  - Tell us what YOU want to do!
  - Response to community
- FY08: 4 awards, each at about $10M for 5 years

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Expeditions Contacts

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503169

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CDI – Cyber-enabled Discovery and Innovation

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Cyber-Enabled Discovery and Innovation (CDI)

- Cross-NSF
- Paradigm-changing trans-disciplinary projects
- Innovation in or innovative use of computational models, methods and tools
- Advances two or more fields

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CDI's Themes

1. **From Data to Knowledge**

   Enhancing human cognition and generating new knowledge from a wealth of heterogeneous data

2. **Understanding Complexity in Natural, Built, and Social Systems**

   Discovering fundamental insights on systems composed of multiple interacting elements

3. **Building Virtual Organizations**

   Enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries

CDI Project Types

Type I:

Roughly:

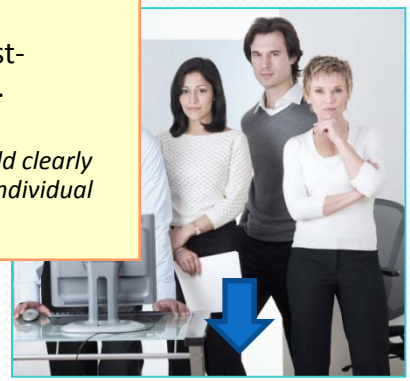
- two investigators with complementary expertise
- two graduate students
- three years.

Type II:

Roughly:

- three investigators with complementary expertise;
- three graduate students;
- one or two senior personnel (including post-doctoral researchers and staff) for four years.

The integrative contributions of the Type II team should clearly be greater than the sum of the contributions of each individual member of the team.



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CDI Contact Information

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Please volunteer to review!

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MRI – Major Research Instrumentation

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MRI – Major Research Instrumentation

The Major Research Instrumentation Program (MRI) catalyzes new knowledge and discoveries by empowering the Nation's scientists and engineers with **state-of-the-art research instrumentation.**

The MRI Program enables **research-intensive learning environments** that promote the development of a diverse workforce and next generation instrumentation, as well as facilitates academic/private sector partnerships.

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MRI – Major Research Instrumentation

Among the goals of the MRI Program are to:

- Support the **acquisition** of major state-of-the-art instrumentation, thereby improving **access to, and increased use** of, modern research and research training instrumentation by a diverse workforce of scientists, engineers, and graduate and undergraduate students;
- Foster the **development of the next generation of instrumentation**, resulting in new instruments that are more widely used, and/or open up new areas of research and research training;
- Enable academic departments, disciplinary and cross-disciplinary units, and multi-organization collaborations to create well-equipped research environments that **integrate research with education**;
- Support the acquisition and development of instrumentation that contributes to, or takes advantage of, existing investments in cyber-infrastructure, while **avoiding duplication of services** already provisioned by NSF investments;
- Promote substantive and meaningful **partnerships for instrument development between the academic and private sectors**. Such partnerships have the potential to build capacity for instrument development in academic settings and to create new products with wide scientific and commercial impact.

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MRI – Major Research Instrumentation

Instrument Acquisition

MRI acquisition proposals are characterized by a demonstrated need for the purchase or upgrade of generally available, yet sophisticated, instruments with little or no modification for shared use among a group of researchers.

Instrument Development

Development proposals are characterized by a demonstrated need for new or upgraded instruments that can provide enhanced or potentially transformative use and performance, open up new areas of research and research training, and/or have potential as commercial products.

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MRI – Major Research Instrumentation

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http://www.nsf.gov/od/oia/programs/mri/

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CiC -- Computing in the Cloud

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CiC -- Computing in the Cloud

Purpose:

To provide the science and engineering communities with the opportunity to leverage highly-scalable cloud computing platforms to conduct research and education activities in cloud computing and data-intensive computing, and their applications. This solicitation specifically focuses on the use of Microsoft's Windows Azure platform as a complement to the computational platforms that NSF has made available to the research community to date.

Highlight(s):

•Research projects that benefit from the Azure Services Platform are sought in four categories: *Foundational Research in Cloud Computing; Research in Data-Centric and Data-Intensive Computing; Computational Science and Engineering Applications; and Workforce and Education Applications.*

•Principal Investigators (PIs) interested in submitting CiC projects may also submit a request for supplemental funding to an existing NSF award.

•Investigators may also submit CiC EAGER proposals to the CCF division or to OCI

Award Size(s):

Proposals may request budgets of up to $500,000 total for up to 2 years. CiC EAGER proposals may request no more than $300,000 total for up to 2 years.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503291

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Some other NSF and National issues

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Additional CISE/NSF Foci

Broadening Participation

- diversity of sciences and engineering, academic departments
- underrepresented minorities in STEM
- collaborations with industry in order to match
  - scientific insights with
  - technical insights

International* Collaboration

- involve true intellectual partnership
- engage junior researchers and students in the collaboration
- take advantage of cyber environments
- create more systematic knowledge about the intertwined social and technical issues of effective organizations

**NSF awards are, in principle, limited to support of the U.S. side of an international collaboration. In almost all cases, international partners should obtain their own funding for participation.*

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A Message About Future Practitioners

- The education and training of future practitioners in fields addressed by NSF programs is of great concern to NSF.
- The nation's global competitiveness relies on a strong workforce in computing and on a pool of future researchers in the fields addressed by NSF programs.
- PIs (and their departments and institutions) should keep in mind that every proposal should include an education component that contributes to the preparation of practitioners [in computing systems].
- Aligned with the need to prepare the future USA workforce is the need to broaden the participation of underrepresented groups in computing at all levels.

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HCC – Human Centered Computing

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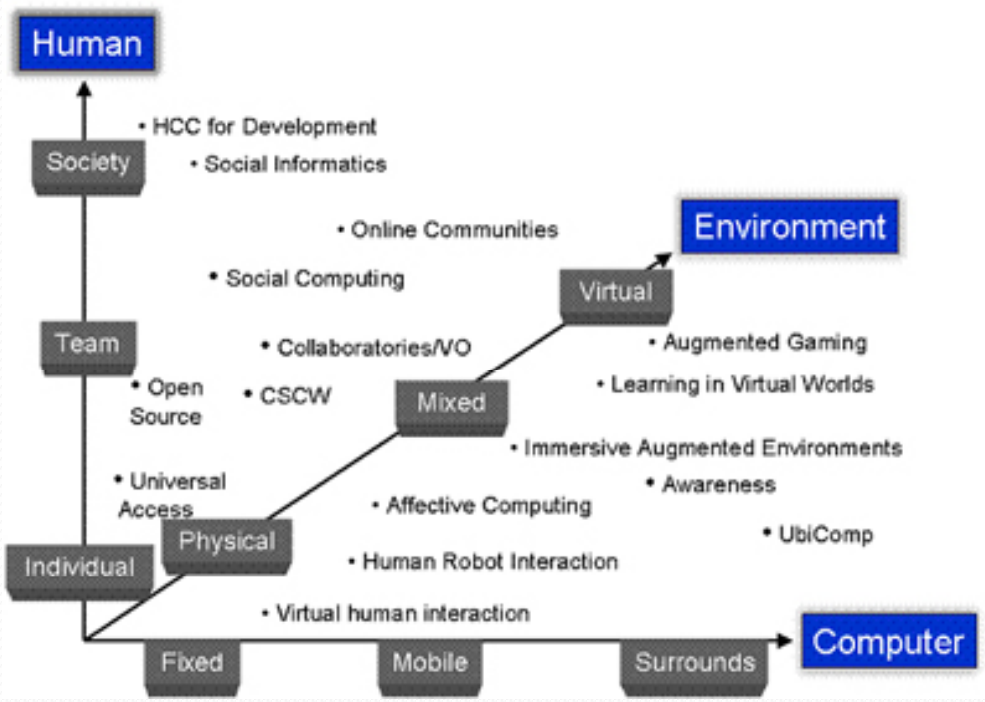
HCC Program Overall Vision

The Human-Centered Computing (HCC) program focuses on:



The human dimension ranges from research that supports, extends the capability of and responds to the needs of individuals through teams as coherent goal-oriented groups through society as an unstructured collection of connected people.

The computer dimension ranges from fixed computing devices to which the human has to be proximal, through mobile devices that go anywhere with the human, to computational systems of sensors and visual/audio devices that are embedded in the surrounding physical environment.

The environment dimension ranges from discrete physical computational devices to immersive virtual environments, with mixed reality systems in the middle of this range.

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HCC Program Scope

The HCC program encourages research on how humans, in various roles and domains, perceive computing artifacts as they design and use them, and on the wider social implications of those artifacts. HCC supports scholars in a highly diverse range of disciplines including the behavioral, computer, design, digital humanities, information, and social sciences.

Through partnerships and engagements with disciplines in the digital humanities and design HCC research increases our understanding and support of creativity and innovation as it pertains to computing; brings new perspectives and new models of inquiry, practice, and scholarship to computing research and education; and extends the reach of computing to new communities. HCC research outcomes are expected to transform the human-computer interaction experience, so that the computer is no longer a distraction or worse yet an obstacle, but rather a device or environment that empowers the user at work, in school, at home and at play, and that facilitates natural and productive human-computing integration.

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HCC Program Scope

HCC targets diverse areas such as:

•traditional computers, handheld and mobile devices, robots, and wearable computers, at scales ranging from an individual device with a single user to large, evolving, heterogeneous socio-technical systems that are emerging from the increasingly pervasive availability of networking technologies

•physical interaction with a single device to systems in which places and people, both physical and virtual, merge. As all electronic communications media become digital and interconnected, computing is also playing a central role in how humans communicate, work, learn, and play, dramatically transcending traditional geographical and cultural boundaries.

•improving our understanding of new human-computer and human-human interactions, collaboration, and competition, developing systems that are aware of their social surroundings and of the conceptualizations, values, preferences, abilities, special needs, and diverse ranges of capability of the people that use them.

•systems that interact with people using various and possibly multiple modalities such as innovative computer graphics, and haptic, audio, and brain-machine interfaces.

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HCC Program Scope

Examples of recent disciplinary topics addressed by HCC projects include:

- physical interaction with a single device to systems in which places and people, both physical and virtual, merge.
- how humans communicate, work, learn, and play, dramatically transcending traditional geographical and cultural boundaries.
- new human-computer and human-human interactions, collaboration, and competition, developing systems that are aware of their social surroundings and of the conceptualizations, values, preferences, abilities, special needs, and diverse ranges of capability of the people that use them.
- systems that interact with people using various and possibly multiple modalities such as innovative computer graphics, and haptic, audio, and brain-machine interfaces.

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HCC Future Directions

Grand Challenges in HCC include:

•creative ideas, novel theories, and innovative technologies that advance our understanding of the complex and increasingly coupled relationships between people and computing.

•diverse computing platforms (including handheld and mobile devices, robots, and wearable computers) at scales ranging from an individual device with a single user to large, evolving, heterogeneous socio-technical systems that are emerging from the increasingly pervasive availability of networking technologies.

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http://www.nsf.gov/pubs/2010/nsf10571/nsf10571.pdf

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III – Information Integration & Informatics

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III Program Overall Vision

The Information Integration and Informatics (III)program focuses on:

- processes and technologies involved in creating, managing, visualizing, and understanding diverse digital content in circumstances ranging from individuals through groups, organizations, and societies, and from individual devices to globally-distributed systems

- innovative information technology research that can transform all stages of the “knowledge life cycle”

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III Program Scope

Examples of recent disciplinary topics addressed by III projects include:

- transformation of raw data into information and knowledge
- creation of new forms of digital content, representations of digital content, access frameworks, delivery services and presentation and analysis tools
- long-term preservation and archiving of valuable data assets
- models of information structures in application areas relying on incomplete data, such as is required to reconstruct past events, cultures, objects and places in the fields of archeology, history, paleontology, geology, and ecology
- storage, organization, retrieval, updating and mining of data, text, speech, multimedia, multidimensional structures, and streams
- extraction of structured information from unstructured sources
- information/knowledge discovery, fusion, summarization, and visualization
- algorithms for personalizing, organizing, navigating, searching, interpreting, and presenting information of different types, using various modalities
- design, management, and governance for information infrastructures, including information flow, adaptive evolution and interoperability
- knowledge environments for science and engineering
- information integration research that leads to a uniform interface to a multitude of heterogeneous independently developed data sources
- information visualization and visual analytics
- information integration research in issues arising in natural disaster recovery, such as telecommunications, message passing, and data loss

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III Future Directions

Grand Challenges in III include:

- advances that are driven by specific information-technology challenges.
- theoretical investigations grounded in multi-disciplinary collaborations where data are central to the III-area research.
- creating, managing, visualizing, and understanding diverse digital content

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http://www.nsf.gov/pubs/2010/nsf10571/nsf10571.pdf

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RI – Robust Intelligence

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RI Program Overall Vision

The Robust Intelligence (RI) Program focuses on:

•all aspects of the computational understanding and modeling of intelligence in complex, realistic contexts. In contrast to systems that use limited reasoning strategies or address problems in narrow contexts, robust intelligence may be characterized by a system's flexibility, resourcefulness, use of a variety of modeling or reasoning approaches, and use of real-world data in real time, demonstrating a level of intelligence and adaptability seen in humans and animals

•artificial intelligence, computer vision, human language research, robotics, machine learning, computational neuroscience, cognitive science, and related areas

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RI Program Scope

Examples of recent disciplinary topics addressed by RI projects include:

- richer environments, larger-scale data, and more sophisticated computational and statistical approaches
- looking to nature to model cognitive and computational processes
- interactions across traditional
- speech and dialogue research to understand the cognitive psychological underpinnings of conversation that contribute to the robustness of human speech perception and intention understanding
- Computer vision exploring approaches developed in language processing to represent the semantic information in images and video in ways useful for mining, navigation, and robotic interaction, and working with ideas developed in computer graphics and physics-based modeling to understand and depict collections of images
- cognitive architecture to bridge sophisticated planning and problem solving modules with perception and action modules, perhaps accounting for certain human or animal behaviors
- Robotic systems that understand and interact with humans in unfamiliar and unstructured environments
- Computational understanding of neurons, networks, and the brain that draws on computer vision, robotics, and machine learning, and provides insights into the coding, representations, and learning underlying intelligent behavior in nature

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RI Future Directions

Grand Challenges in RI include:

- problem solving and hybrid architectures
- computational models of human cognition, perception, and communication
- advances in and integration across areas of artificial intelligence
- novel approaches to longstanding problems in computer vision
- vision systems that capture biological components and capabilities
- advances in computer graphics and computational imaging
- emerging technologies to improve the intelligence, mobility, autonomy, manipulability, adaptability, and interactivity of robotic systems operating in unstructured and uncertain environments
- research on intelligent and assistive robotics
- computational approaches and architectures for analyzing, understanding, generating and summarizing speech, text and other communicative forms
- computational models of meaning, intent, and realization
- novel approaches to longstanding language processing
- computational approaches to language processing for underrepresented groups such as minority language groups and aging and disabled population groups
- functional modeling, theory, and analysis of the computational, representational, and coding strategies of neurons and neural systems
- neurally-grounded computational approaches to computer vision, robotics, communication, and reasoning, and systems that combine them and embody empirically derived neural strategies

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http://www.nsf.gov/pubs/2010/nsf10571/nsf10571.pdf

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CreativeIT

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CreativeIT

An Interdisciplinary Research Program – seeks synergies between creativity and IT.

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CreativeIT Program

The CreativeIT program solicits proposals that bring creative practice and creativity research to play a role in transformative research in specific contexts of

- computer information science and engineering,
- cognitive science,
- education,
- engineering design and
- science.

This program encourages new ways of thinking about one discipline in terms of another, so that the interdisciplinary nature of the project is a means to an end rather than an end in itself.

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What is Creativity?

"popular" definition:

- the use of imagination or original ideas especially in the production of artistic work. (Wikipedia)
- is a mental process involving the generation of new ideas or concepts, or new associations of the creative mind between existing ideas or concepts. (Dictionary)

creative person, creative artifact, creative process, ...

"operational" definition derived from psychology, computer science, and psychology research :

- **Novel**
- **useful**
- **unexpected**

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Goals of CreativeIT

- Understand creativity as cognitive and computational processes
- Understand information technology as a means for enhancing human creative thinking and vice versa
- Understand how design (creative) thinking develops new products, methods, organizations in the context of a perceived need or problem

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CreativeIT Research Areas

Understanding Creative Cognition and Computation. *The development of new models of cognition and computation that explain or simulate creativity.*

Creativity to Stimulate Breakthroughs in Science and Engineering. *Understanding the role and performance of artists in developing new technologies, discovering new patterns in information, and in finding new ways of seeing, knowing, and doing computer and information science and engineering.*

Educational Approaches that Encourage Creativity. *Approaches to teaching that encourage creativity: multi-disciplinary teaching and learning, design studio teaching, and open-ended problem-based learning.*

Supporting Creativity with Information Technology. *Develops new software and user interfaces to support users in being more creative and evaluates their performance.*

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Research in CreativeIT

- Generally occurs in a specific context, although it can start with a theoretical claim
- Claim:
  - X is a creative process (in context C)
  - X is a research process that results from combining creativity and computing perspectives (in context C)
  - X is an educational approach that rewards creativity (in context C)
  - X will enhance human creativity (in context C)
- Develop, build, make X
- Evaluate X
  - perception: do people perceive the claim to be true
  - behavior: are people's behavior consistent with the claim
  - cognition: does the cognitive model match experimental results from cognitive studies

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CreativeIT Proposals

- Two types of proposals:
  - Pilot Projects typically have a single PI and a single undergraduate or graduate student for a duration of one to three years. A pilot project identifies a synergy from understanding creativity in a specific context in which a computing environment has the potential to lead to innovative and creative advances in one or more disciplines.
  - Major Projects have one or more PIs and multiple undergraduate and graduate students for a duration of three years with a maximum budget of $800,000. A Major project brings together a group of people to develop a synergistic effect that can transform our understanding of models, computing environments or education relevant to CreativeIT.

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Conclusions

- Creativity is a highly valued process that can be incorporated into computing research.
- A focus on creativity can lead to new computing technologies, new modes of research, and new educational environments.

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CreativeIT Proposal Due Date

October 13, 2009

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HECURA – High-End Computing University Research Activity

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HECURA – High-End Computing University Research Activity

- High-performance computing is increasingly essential to progress in science and engineering.
- Contemporary high-end computing (HEC) systems often comprising of tens- to hundreds-of-thousands of processors allow researchers to study complex problems that were previously intractable.
- Emerging data-intensive scientific challenges and opportunities demand more of HEC systems.
- Data-management challenges also include the need to access large volumes of data produced by different applications, in numerous locations, and in various formats.

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HECURA – High-End Computing University Research Activity

Research areas of interest include, but are not limited to:

- I/O architectures and I/O middleware;
- archives/backups as extensions to file systems;
- file systems research and file systems-related protocols;
- metadata research;
- access methods;
- data management systems;
- security;
- novel storage devices for the I/O stack;
- Quality of Service;
- management, and reliability and availability at scale (RAS);
- hardware and software tools for design and simulation of I/O, file and storage systems; and
- efficient benchmarking, tracing, performance measurement and tuning tools of I/O, file and storage systems.

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HECURA – High-End Computing University Research Activity

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13645

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CI-Team

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CI-Team

Purpose:

Supports projects that position the national science and engineering community to engage in integrated research and education activities promoting, leveraging and utilizing cyber-infrastructure systems, tools and services.

Highlight(s):

This solicitation seeks three types of project proposals, all aimed at the preparation of a diverse, cyber-infrastructure-savvy science and engineering workforce:

- Demonstration Project,: is exploratory in nature and may be somewhat limited in scope and scale. Demonstration Projects have the potential to serve as exemplars to effective larger-scale implementation and diffusion activities in the future.
- Implementation Project: is generally larger in scope or scale and draws on prior experience with the activities or the teams proposed.
- Diffusion Project, is expected to engage broad national audiences with research results, resources, models, and/or technologies.

Implementation or Diffusion Projects are expected to deliver sustainable learning and workforce development activities that complement ongoing NSF investment in cyber-infrastructure.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12782&org=CISE&sel_org=CISE&from=fund

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SoCS – Social Computational Systems

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SoCS – Vision

A joint Program with NSF's Directorate for for Social, Behavioral and Economic Sciences

The Social-Computational Systems (SoCS) program seeks to reveal new understanding about the properties that systems of people and computers together possess, and to develop a practical understanding of the purposeful design of systems to facilitate *socially intelligent computing*.

By better characterizing, understanding, and eventually designing for desired behaviors arising from computationally mediated groups of people at all scales, new forms of knowledge creation, new models of computation, new forms of culture, and new types of interaction will result.

Further, the investigation of such systems and their emergent behaviors and desired properties will inform the design of future systems.

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SoCS – Program Motivation

Representative questions and research challenges of interest to the SoCS program are:

- What design techniques and computational, technical, and social substrates and abstractions enable and facilitate the design of and fullest breadth of behaviors from socially intelligent computing systems?
- How can we design socially intelligent computing systems for desirable properties and values?
- What methods are effective in studying socially intelligent computing, and how can we effectively compare various types of socially intelligent computing?
- How can we better understand what types of behaviors and what new affordances can emerge or be demonstrated by socially intelligent computing?

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SoCS – Program Motivation

- Can we model or parameterize such systems, helping us understand what is "computable“ or what behaviors are achievable or unachievable by socially intelligent computing?
- How does socially intelligent computing arise in scales ranging from a single person and computer to an Internet-scale cloud of machines and people?
- Can we model or parameterize such systems, helping us to understand what is "intelligence" when humans and computers are most effectively or integrally connected?
- Can greater capabilities be achieved if our computational creations - whether as mediators between people, as tools wielded by people, or as equal or complementary participants with people - were explicitly designed with knowledge of the cognitive, social, cultural, and emotional factors that impact our behaviors?
- How can we leverage unexpected behaviors of socially intelligent computing systems?

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SoCS – Program Motivation

- Can we build systems that are robust to the vagary of motivations, calculation, and communication?
- How are value systems embedded in the algorithms and collective participations and what form do they take? For example, volunteerism is a well-established and studied behavior among people, but what distinctive aspects feature strongly in socially intelligent computing where encyclopedia entries, software elements, and product reviews are created by millions of often anonymous, uncompensated people?
- Communities are central to the lives of people as social creatures, but what distinctive aspects feature strongly in people playing together in virtual world games or socializing through the myriad Internet communities and social networking resources?
- Are there general ways to harness those capabilities in which people currently outperform computers - such as image understanding - with complementary capabilities of computing to achieve behaviors that transcend those of people or computers in isolation?

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SoCS – Program Scope

•The SoCS program will support research in socially intelligent computing arising from human-computer partnerships that range in scale from a single person and computer to an Internet-scale array of machines and people.

•The program seeks to create new knowledge about the capabilities these partnerships can demonstrate - new affordances and new emergent behaviors, as well as unanticipated consequences and fundamental limits.

•The program also seeks to foster new ideas that support even greater capabilities for socially intelligent computing, such as the design and development of systems reflecting explicit knowledge about people's cognitive and social abilities, new models of collective, social, and participatory computing, and new algorithms that leverage the specific abilities of massive numbers of human participants.

•The SoCS program seeks to capitalize upon the collaborative knowledge and research methods of investigators in the computational and human sciences, recognizing that researchers in computer science and related disciplines often focus on the limits and capabilities of computation in isolation from the people that use computation, while researchers in the social sciences often focus on the use of technology or the capabilities of people with limited impact on how such knowledge can influence the design of new technologies.

•*Proposals that reflect collaborative efforts spanning computational and human centered approaches and perspectives are specifically encouraged.*

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SoCS – Contact Information

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SLC – Science of Learning Centers

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SLC – Science of Learning Centers

•The Science of Learning Centers program (SLC) offers awards for large-scale, long-term Centers that create the intellectual, organizational and physical infrastructure needed for the long-term advancement of Science of Learning research.

•SLC supports research that harnesses and integrates knowledge across multiple disciplines to create a common groundwork of conceptualization, experimentation and explanation that anchor new lines of thinking and inquiry towards a deeper understanding of learning.

•The goals of the Science of Learning Centers Program are to advance the frontiers of all the sciences of learning through integrated research; to connect the research to specific scientific, technological, educational, and workforce challenges; to enable research communities to capitalize on new opportunities and discoveries; and to respond to new challenges.

•The SLC Program construes learning broadly, including that of animals, humans and machines.

•SLC is open to many possible approaches and topics that can be brought to examine what learning is, how it is affected, how it works at different levels, how biologically-derived learning principles can inform artificial systems and vice versa.

•The Program places high value on creativity, integration of theoretical and empirical work, innovative models of research and research transfer, and inventive uses of technology.

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SLC – Science of Learning Centers

•Science of Learning Centers are built around a unifying research focus and incorporate a diverse, multidisciplinary environment involving appropriate partnerships with academia, industry, all levels of education, and other public and private entities.

•Catalyst awards were made during the initial years of the program. Catalyst awards are designed to enable partnership-building and research activities that facilitate interdisciplinary approaches to questions that require multiple areas of expertise.

•There are currently no SLC Centers or Catalyst competitions. However, the Science of Learning Centers Program is currently accepting proposals for Workshops, EArly-concept Grants for Exploratory Research (EAGER), Rapid Response Grants (RAPID), and Supplements to NSF awards (including those funded by other programs).

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STC – Science and Technology Centers: Integrative Partnerships

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STC – Science and Technology Centers: Integrative Partnerships

The Science and Technology Centers (STC): Integrative Partnerships program supports innovative, potentially transformative, complex research and education projects that require large-scale, long-term awards.

STCs conduct world-class research through partnerships among academic institutions, national laboratories, industrial organizations, and/or other public/private entities**,** and via international collaborations, as appropriate. They provide a means to undertake important investigations at the interfaces of disciplines and/or fresh approaches within disciplines.

STC investments support the NSF vision of advancing discovery, innovation and education beyond the frontiers of current knowledge, and empowering future generations in science and engineering.

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STC – Science and Technology Centers: Integrative Partnerships

•Support research and education of the highest quality in a Center-based environment in which the whole is greater than the sum of its parts.

•Exploit opportunities in science, engineering and technology where the complexity of the research agenda requires the advantages of scope, scale, flexibility, duration, equipment, and facilities that a Center can provide.

•Support innovative frontier investigations at the interfaces of disciplines and/or investigations that will lead to fresh approaches within disciplines.

•Engage and develop the Nation's intellectual talent, including groups underrepresented in the sciences, mathematics and engineering disciplines, in the conduct of research and education activities.

•Promote organizational connections and linkages within and between campuses, schools or the world beyond (state, local, federal agencies, national labs, industry, international collaborations), capitalizing upon cyber-infrastructure to facilitate these linkages.

•Focus on integrative learning and discovery and the preparation of U.S. students for a broad set of career paths.

•Foster science and engineering in service to society especially with respect to new research areas, promising new instrumentation and potential new technologies.

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5541

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FODAVA – Foundations of Data & Visual Analytics

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FODAVA – Foundations of Data & Visual Analytics

FODAVA is directed towards individuals working in areas as diverse as:

science, engineering, finance, medicine, and national security who face the challenge of synthesizing information and deriving insight from massive, dynamic, ambiguous and possibly conflicting digital data -- examining these data sets not to merely acquire information, but to derive increased understanding from them and to facilitate effective decision-making.

FODAVA seeks to facilitate analytical reasoning through the use of:

interactive visual interfaces that extend beyond traditional scientific and information visualization to include statistics, mathematics, knowledge representation, management and discovery technologies, cognitive and perceptual sciences, decision sciences, and more.

With this solicitation, the National Science Foundation (NSF) and the Department of Homeland Security (DHS) invite research proposals whose outcomes will enable data stakeholders to detect the expected and discover the unexpected in massive data sets for broad application areas, establishing a solid scientific foundation for visual analytics systems of the future.

FODAVA focuses on fundamental research advances that will be widely applicable across scientific, engineering, commercial, and governmental domains that utilize visualization and analytics to gain insight and derive knowledge from massive, often streaming, dynamic, ambiguous and possibly conflicting, data sets, emphasizing novel data transformations, while also demonstrating research relevance to visual analytics systems by including a research component in areas such as, but not limited to, visualization, human-computer interaction, and cognitive psychology.

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FODAVA – Foundations of Data & Visual Analytics

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Advance --
Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers

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Advance -- Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers

Purpose:

Develop systemic approaches to increase the representation and advancement of women in academic science, technology, engineering and mathematics (STEM) careers

Highlight(s):

Institutional Transformation (IT)

Innovative systemic organizational approaches to transform institutions of higher education in ways that will increase the participation and advancement of women in STEM academic careers.

Institutional Transformation Catalyst (IT-Catalyst)

Institutional self-assessment activities, such as basic data collection and analysis and policy review, in order to identify specific issues in the recruitment, retention and promotion of women faculty in STEM academics within their institution of higher education.

Partnerships for Adaptation, Implementation, and Dissemination (PAID)

May focus on one institution or organization, or they may be a partnership between several institutions and/or organizations. Projects may have an international, national, state or local scope.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383

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ARI - Domestic Nuclear Detection Office-NSF Academic Research Initiative

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ARI - Domestic Nuclear Detection Office-NSF Academic Research Initiative

Purpose:

The Domestic Nuclear Detection Office (DNDO) within the Department of Homeland Security (DHS) will invest, in partnership with the National Science Foundation (NSF), in frontier research at academic institutions. This transformational research effort will be focused on detection systems, individual sensors or other research that is potentially relevant to the detection of nuclear weapons, special nuclear material, radiation dispersal devices and related threats. The joint DNDO-NSF effort, in coordination with the efforts of other agencies, seeks to advance fundamental knowledge in new technologies for the detection of nuclear threats and to develop intellectual capacity in fields relevant to long-term advances in nuclear detection capability. This research and the research community that will be built under the ARI are seen as critical to our nation's ability to deploy effective nuclear detection measures to counter the serious threat of a nuclear terrorist attack.

Highlight(s):

This Academic Research Initiative (ARI) seeks to advance fundamental knowledge in areas relevant to nuclear and radiological detection and interdiction. The DNDO-NSF investment will coordinate with and leverage on research currently underway in other areas of the federal government. The Department of Homeland Security, the Department of Energy, the Department of Defense, and others each fund active research into developing nuclear detection technology and systems. By making a long-term commitment to frontier research in the field, effective technologies and systems to counter such threats can best be developed and eventually implemented. This research and the research community that will be developed under the ARI are seen as critical to our nation's ability to deploy increasingly effective homeland security measures.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503223

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ATOL – Assembling the Tree of Life

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ATOL – Assembling the Tree of Life

Purpose:

Support of creative and innovative research that will resolve evolutionary relationships for large groups of organisms throughout the history of life. Investigators also will be supported for projects in data acquisition, analysis, algorithm development and dissemination in computational phylogenetics and phyloinformatics.

Highlight(s):

Projects for Assembling the Tree of Life are expected to be ambitious and large scale, and to include training, outreach, and dissemination components. Tree of Life projects that are taxon-oriented will focus on phylogenetic resolution of large lineages or clades. This taxon focus is not intended to deflect interest in or attention to theoretical or analytical issues, particularly when the clade under study raises critical questions about the suitability or power of current phylogenetic methods of analysis, such as complexities caused by reticulate evolution and lateral gene transfer. Major taxonomic groups that have not yet been addressed by current or previous AToL projects are now an emphasis of this program. In addition to hypothesis-driven work, Tree of Life projects may also be method or theory-oriented, in which case they will address major analytical or computational problems in phylogenetic research and phyloinformatics. Tree of Life projects may also synthesis-oriented, in which case they will address integration of current and future knowledge pertaining to the Tree of Life, and accessibility to that knowledge.

Award Size(s):

Each award, whether single-institution or collaborative project, may range up to $3 million total, for durations up to five years.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5129

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Career --
Faculty Early Career Development Program

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Career -- Faculty Early Career Development Program

Purpose:

NSF's most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. Each year NSF selects nominees for the Presidential Early Career Awards for Scientists and Engineers(PECASE) from among the most meritorious new CAREER awardees.

Highlight(s):

The CAREER program embodies NSF's commitment to encourage faculty and academic institutions to value and support the integration of research and education. Successful PIs will propose creative, integrative and effective research and education plans, developed within the context of the mission, goals and resources of their organizations, and which will build a firm foundation for a lifetime of contributions to research, education and their integration. All proposals must have an integrated research and education plan at their core.

Award Size(s):

$400,000 for a five-year period for all directorates except BIO. For proposals submitted to the BIO directorate, the minimum award size is $500,000 over five years.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214

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EAPSI – East Asia and Pacific Summer Institutes for U.S. Graduate Students

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EAPSI – East Asia and Pacific Summer Institutes for U.S. Graduate Students

Purpose:

The EAPSI program is designed for U.S. graduate students wishing to conduct research in a foreign setting and to experience the culture(s) of the participating locations.

Highlight(s):

The East Asia and Pacific Summer Institutes (EAPSI) provide U.S. graduate students in science and engineering: 1) first-hand research experiences in Australia, China, Japan, Korea, New Zealand, Singapore or Taiwan; 2) an introduction to the science, science policy, and scientific infrastructure of the respective location; and 3) an orientation to the society, culture and language. The primary goals of EAPSI are to introduce students to East Asia and Pacific science and engineering in the context of a research setting, and to help students initiate scientific relationships that will better enable future collaboration with foreign counterparts. All institutes, except Japan, last approximately eight weeks from June to August. Japan lasts approximately ten weeks from June to August (specific dates are available and updated at www.nsf.gov/eapsi).

Award Size(s):

Awardees will receive a $5,000 stipend, a roundtrip international airline ticket, and will be supported to attend a pre-departure orientation in the Washington, D.C. area. Foreign co-sponsoring organizations will provide additional support to cover EAPSI students' living expenses abroad during the period of the summer institutes, and will provide an in-country orientation to the science environment and culture(s) of each location.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5284

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CNH – Dynamics of Coupled Natural & Human Systems

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CNH – Dynamics of Coupled Natural & Human Systems

Purpose:

The Dynamics of Coupled Natural and Human Systems competition promotes quantitative, interdisciplinary analyses of relevant human and natural system processes and complex interactions among human and natural systems at diverse scales.

Highlight(s):

The Dynamics of Coupled Natural and Human Systems (CNH) Program supports basic research and related activities that enhance fundamental understanding of the complex interactions within and among natural and human systems. CNH focuses on the complex interactions among human and natural systems at diverse spatial, temporal, and organizational scales. CNH seeks to advance basic knowledge about the system **dynamics** -- the processes through which systems function and interact with other systems. CNH-supported projects must examine relevant **natural AND human systems**. Proposals cannot focus solely or largely on either human systems or on natural systems. Projects also must examine the full range of **coupled** interactions and feedbacks among relevant systems.

Award Size(s):

Support provided through this competition for awards across a range of sizes from roughly $500,000 to no more than $1,500,000.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13681

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CRCNS – Collaborative Research In Computational Neurosciences

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CRCNS – Collaborative Res. In Computational Neurosciences

Purpose:

Through the CRCNS program, participating NSF Directorates and NIH Institutes support innovative interdisciplinary collaborative research to make significant advances in the understanding of nervous system function, mechanisms underlying nervous system disorders, and computational strategies used by the nervous system.

Highlight(s):

Two classes of proposals will be considered in response to this solicitation: **research proposals** describing new collaborative research projects, and **data sharing proposals** to enable sharing of data and other resources.
In general, appropriate scientific areas of investigations may be related to any of the participating funding organizations.
Each of the funding organizations participating in this program has a commitment to developing and supporting computational neuroscience research for the purpose of advancing the understanding of the questions relevant to the missions of the organizations. Proposals selected for funding must be responsive to the mission of a participating funding organization.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5147&org=IIS

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EaSM – Decadal and Regional Climate Prediction using Earth System Models

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EaSM – Decadal and Regional Climate Prediction using Earth System Models

Purpose:

Development of next-generation Earth System Models that include coupled and interactive representations of ecosystems, agricultural working lands and forests, urban environments, biogeochemistry, atmospheric chemistry, ocean and atmospheric currents, the water cycle, land ice, and human activities. The realization of these goals demands the engagement of diverse interdisciplinary teams of experimental, theoretical, modeling and computational researchers, including but not limited to, biologists, chemists, computer scientists, geoscientists, material scientists, mathematicians, physicists, cyberinfrastucture specialists, and social scientists.

Highlight(s):

Type 1 Proposals: Type 1 proposals should describe incubator and capacity/community building activities that focus on specific outcomes that address one or more goals of the solicitation. Efforts might include the formation of new interdisciplinary partnerships that formulate and explore fresh, innovative research strategies that could be developed into Type 2 projects. Type 1 projects may also include exploratory pilot research projects aligned with the program goals.

Type 2 Proposals: Type 2 proposals should describe large, ambitious, collaborative, inter/multidisciplinary efforts that advance the state of Earth System Modeling on regional and decadal scales.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503399

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EESE – Ethics Education in Science and Engineering

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EESE -- Ethics Education in Science and Engineering

Purpose:

Improve ethics education in all of the fields of science and engineering that NSF supports, especially in inter-disciplinary or inter-institutional contexts. Proposals must focus on improving ethics education for graduate students in those fields, although the proposed programs may benefit advanced undergraduates in addition to graduate students.

Highlight(s):

Proposals must focus on improving ethics education for graduate students or on developing summer post-baccalaureate ethics-education activities or other activities that transition students from undergraduate to graduate education. The program will entertain proposals in graduate ethics education in science and engineering generally. However, the program is particularly interested in proposals addressing issues of cultural relativity in research that is conducted in an international context and those addressing intellectual property issues, including scientific publishing.

Award Size(s):

The maximum award amount is expected to be $300,000. Collaborative proposals for the purpose of disseminating best practices in graduate ethics education will be eligible for a maximum award amount of $400,000

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13338

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Ethics Resources – Ethics in Science, Mathematics, and Engineering Online Resource Center

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Ethics Resources -- Ethics in Science, Mathematics, and Engineering Online Resource Center

Purpose:

One award to support a multidisciplinary team of researchers who will create an online resource center that develops, compiles, and maintains resources related to ethics in science, mathematics, and engineering. The research team's focus will be to gather existing information, generate new knowledge, and create interactive tools that will help scientists and engineers incorporate ethical issues and reasoning into their pedagogy and research.

Highlight(s):

NSF seeks proposals to create and maintain online center for responsible and ethical conduct of research [RCR]r. The center will serve a stewardship role for the educational content and/or the services needed by a broad community of scholars, including instructors who want to incorporate ethics in science, mathematics, and engineering modules into their courses; scholars who research ethics in science, mathematics, and engineering; or scientists and engineers as they negotiate active research agendas and encounter ethical dilemmas.

Award Size(s):

One award up to $ 5,000,000

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503490

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EPS -- Experimental Program to Stimulate Competitive Research: Workshop Opportunities

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EPS -- Experimental Program to Stimulate Competitive Research: Workshop Opportunities

Purpose:

The Experimental Program to Stimulate Competitive Research (EPSCoR) is a program designed to fulfill the National Science Foundation's (NSF) mandate to promote scientific progress nationwide. The EPSCoR program is directed at those jurisdictions that have historically received lesser amounts of NSF Research and Development (R&D) funding. Twenty-five states, the Commonwealth of Puerto Rico and the U. S. Virgin Islands currently participate.

Highlight(s):

Through this program, NSF establishes partnerships with government, higher education and industry that are designed to effect lasting improvements in a region/jurisdiction's research infrastructure, R&D capacity and hence, its national R&D competitiveness. In response to the community's interest in implementing a more proactive outreach program, the Experimental Program to Stimulate Competitive Research (EPSCoR) will welcome unsolicited proposals from the EPSCoR jurisdictions for community workshops. These workshops will explore innovative ways to address multi-jurisdictional efforts on themes of regional to national importance with relevance to EPSCoR's goals/objectives and NSF's mission.

Award Size(s):

Proposal budgets for such workshops should request up to $100,000 for a project period not to exceed one year.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503341

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EFRI -- Emerging Frontiers in Research & Innovation

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EFRI -- Emerging Frontiers in Research & Innovation

Purpose:

Supports proposals that aim to investigate emerging frontiers in the following two specific research areas: (1) Renewable Energy Storage (RESTOR), and (2) Science in Energy and Environmental Design (SEED): Engineering Sustainable Buildings.

Highlight(s):

NSF will coordinate the review of proposals submitted to this solicitaiton with the Department of Energy (DOE) and the Environmental Protection Agency (EPA). RESTOR seeks multidisciplinary approaches to develop groundbreaking energy storage schemes using new materials, novel manufacturing approaches, and innovative designs. An essential element is that the energy storage concept must have the potential to store very large amounts of energy, in either a concentrated or distributed setting, in a cost-effective and environmentally-benign manner in order to maximize the potential for ultimate widespread, large-scale deployment. SEED addresses fundamental research needed to understand how buildings and their occupants use materials, water, and energy resources throughout their lifetimes. It is expected that research proposals submitted to this solicitation will contribute to the development of a rigorous engineering framework for the design and realization of topically-relevant engineered systems and provide an intellectual framework for education in this emerging area.

Award Size(s):

Up to a total of $500,000 per year for up to four years.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13708&org=EFRI&from=home

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EXP – Explosives & Related Threats: Frontiers in Prediction & Detection

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EXP – Explosives & Related Threats: Frontiers in Prediction & Detection

Purpose:

Supports leading edge, frontier research on sensors and other areas, including social and behavioral sciences, that are potentially relevant to the prediction and detection of explosives and related threats.

Highlight(s):

Research Related to Prediction: New fundamental research into the scientific and engineering principles of prediction will enable the recognition of explosives and other threats earlier than current technologies allow. The ultimate goal is to identify and isolate a threat at or before the point of device assembly and placement.

Research Related to Detection: The sensitivity and fine resolution of sensors often determine what can be detected, at what location, and how quickly. This is particularly important for the detection of explosive devices, since the earlier a threat can be identified, the easier it is to address.

Award Size(s):

About 25 small awards (up to an all-inclusive total, including both direct and indirect costs, of $400,000, over a duration not to exceed three years) and 10-12 large awards (up to an all-inclusive total, including both direct and indirect costs, of $800,000, over a duration not to exceed three years).

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500085

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FASED - Facilitation Awards for Engineers and Scientists

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FASED -- Facilitation Awards for Engineers and Scientists

Purpose:

To permit physically disabled persons to facilitate their work by providing special equipment or assistance needed in conjunction with NSF-supported projects. This announcement covers all projects supported by NSF in science and engineering research or education, including fellowships.

Highlight(s):

Requests for special equipment or assistance may be: (1) included in the original proposal submitted to a Foundation program, or (2) submitted as a separate request for supplemental funding for an existing grant.

Award Size(s):

No maximum amount has been set for requests. It is expected, however, that the cost (including equipment adaptation and installation) will not be a major portion of the total proposed budget for the project. Decisions about what constitutes appropriate support will be made on a case-by-case basis by the cognizant program officer.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5516

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FIA – Future Internet Architectures

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FIA – Future Internet Architectures

Purpose:

Stimulate innovative and creative research to explore, design, and evaluate trustworthy future Internet architectures. Objective is to engage the research community in collaborative, long-range, transformative thinking - unfettered by the constraints of today's networks yet inspired by lessons learned and promising new research ideas - to design and experiment with new network architectures and networking concepts that take into consideration the larger social, economic and legal issues that arise from the interplay between the Internet and society.

Highlight(s):

Proposals submitted must identify architectural requirements that are clearly informed by the legal, ethical and the societal contexts in which the Future Internet will exist. *Trustworthiness - broadly defined as encompassing security, privacy, reliability, and usability - must be considered as a fundamental design requirement in proposed architectures.*

Award Size(s):

Up to $9 million and durations of 3 years.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503476

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SEBML – Science and Engineering Beyond Moore's Law

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SEBML – Science and Engineering Beyond Moore's Law

Purpose:

Position the U.S. at the forefront of communications and computation capability beyond the physical and conceptual limitations of current technologies.

Highlight(s):

Fundamental research will focus on a number of areas, including:

• New materials, devices, and processes that exploit the capability to create and manipulate specific
quantum states.

• New architectures, including and especially multi-core processors, with new control principles, massive
parallelism, and designed asynchronicity and indeterminacy.

• New algorithms that exploit hardware and architecture characteristics to optimize computing power,
including those that exploit quantum interactions.

• New software that allows the effective use of new devices.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/about/budget/fy2009/pdf/44_fy2009.pdf

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GK-12 – NSF Graduate Teaching Fellows in GK-12 Education

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GK-12 – NSF Graduate Teaching Fellows in GK-12 Education

Purpose:

Provides funding for graduate students in NSF-supported science, technology, engineering, and mathematics (STEM) disciplines to acquire additional skills that will broadly prepare them for professional and scientific careers in the 21st century.

Highlight(s):

Through interactions with teachers and students in K-12 schools and with other graduate fellows and faculty from STEM disciplines, graduate students can improve communication, teaching, collaboration, and team building skills while enriching STEM learning and instruction in K-12 schools. Through this experience, graduate students can gain a deeper understanding of their own STEM research. In addition, the GK-12 program provides institutions of higher education with an opportunity to make a permanent change in their graduate programs by incorporating GK-12 like activities in the training of their STEM graduate students.

Award Size(s):

up to $600,000 per year for 5 years

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5472&from=fund

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GOALI – Grant Opportunities for Academic Liaison with Industry

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GOALI -- Grant Opportunities for Academic Liaison with Industry

Purpose:

Promotes university-industry partnerships by making project funds or fellowships/traineeships available to support an eclectic mix of industry-university linkages.

Highlight(s):

CISE offers opportunities in all areas usually supported by the directorate.

GOALI mechanisms of interest include:

- Industry-University Collaborative Projects
- Faculty and Students in Industry:
  - Faculty-in-Industry
  - Post Doctoral Industrial Fellowships
  - Graduate Student Industrial Fellowships
  - Undergraduate Industrial Fellowships
- Industry Engineers and Scientists in Academe
  - Industry Presence on Campus
  - Industry-Based Graduate Assistantship

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13706

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GRF – Graduate Research Fellowships

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GRF – Graduate Research Fellowships

Purpose:

Provides three years of support for graduate study leading to research-based master's or doctoral degrees and is intended for students who are in the early stages of their graduate study. The Graduate Research Fellowship Program (GRFP) invests in graduate education for a cadre of diverse individuals who demonstrate their potential to successfully complete graduate degree programs in disciplines relevant to the mission of the National Science Foundation.

Highlight(s):

The NSF expects to award 1,654 Graduate Research Fellowships under this program solicitation pending availability of funds. [See Program announcement for details.]

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=6201

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IGERT – Integrative Graduate Education and Research Traineeship Program

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IGERT – Integrative Graduate Education and Research Traineeship Program

Purpose:

To meet the challenges of educating U.S. Ph.D. scientists and engineers who will pursue careers in research and education, with the interdisciplinary backgrounds, deep knowledge in chosen disciplines, and technical, professional, and personal skills to become, in their own careers, leaders and creative agents for change. The program is intended to catalyze a cultural change in graduate education, for students, faculty, and institutions, by establishing innovative new models for graduate education and training in a fertile environment for collaborative research that transcends traditional disciplinary boundaries. It is also intended to facilitate diversity in student participation and preparation, and to contribute to a world-class, broadly inclusive, and globally engaged science and engineering workforce.

Highlight(s):

Proposals must describe integrative, research-based, graduate education and training activities in emerging areas of science and engineering. The IGERT project should be organized around an interdisciplinary theme that is based on transformative interdisciplinary research in science/technology/engineering/mathematical sciences. The proposed IGERT should involve a diverse group of faculty members and other investigators with appropriate expertise in research and teaching.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12759

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International Research and Education: Planning Visits & Workshops

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International Research and Education: Planning Visits & Workshops

Purpose:

Provides educational opportunities for Undergraduate Students, Graduate Students, Postdoctoral Fellows . This program provides indirect funding for students at this level or focuses on educational developments for this group such as curricula development, training or retention.

Highlight(s):

•Planning visits to assess foreign facilities, equipment, or subjects of research, and to have detailed discussions with prospective foreign partners to finalize plans for cooperative research. Visits typically range from 7-14 days.

•Joint workshops designed to identify common research priorities, focused on a specific, well-defined area of research collaboration. Workshops may be held at either a U.S. or foreign location. If held at a foreign location, organizers are encouraged to arrange visits to local research and education sites. Workshop results should include recommendations to the research community about possible areas for future collaboration and should be broadly disseminated.

Award Size(s):

Support for workshops will be for a maximum of two years and a maximum total budget of $60,000 over the duration of the award. Support for planning visits will be for a maximum of two years and a maximum total budget of $20,000 over the duration of the award.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12815

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IRFP – International Research Fellowship Program

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IRFP – International Research Fellowship Program

Purpose:

To introduce scientists and engineers in the early stages of their careers to international collaborative research opportunities, thereby furthering their research capacity and global perspective and forging long-term relationships with scientists, technologists and engineers abroad.

Highlight(s):

•Eligible applicants, in addition to being citizens or permanent residents of the United States, must have earned a doctoral degree within two years of the deadline date, or expect to receive the doctoral degree by the start of the project. Women, minorities, and persons with disabilities are strongly encouraged to apply.

•Support may be requested for residence abroad for nine to 24 months (minimum of nine continuous months). The purpose of this fellowship is to give young researchers international research experience.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5179

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IRES and DDEP – Developing Global Scientists and Engineers (International Research Experiences for Students and Doctoral Dissertation Enhancement Projects)

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IRES and DDEP – Developing Global Scientists and Engineers (International Research Experiences for Students and Doctoral Dissertation Enhancement Projects)

Purpose:

International Research Experiences for Students (IRES) component of the program supports groups of U.S. undergraduate or graduate students conducting research abroad in collaboration with foreign investigators. The Doctoral Dissertation Enhancement Projects (DDEP) component supports the dissertation research abroad of one doctoral student in collaboration with a foreign investigator.

Highlight(s):

International Research Experiences for Students (IRES)
Provides high quality educational experiences for small groups of U.S. undergraduate and/or graduate students through active research participation in collaboration with foreign researchers at an international site. IRES proposals must have a unifying research theme that enables a cohort experience for participating students.

Doctoral Dissertation Enhancement Projects (DDEP)
Supports dissertation research conducted by graduate students at a foreign site. Students are expected to work in close cooperation with a host country institution and investigator. The doctoral faculty advisor, on behalf of the student, submits the dissertation enhancement proposal.

Award Size(s):

IRES: $50,000 per year for 3 years;
DDEP: $15,000 per award for up to 2 years.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12831

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I/UCRC – Industry & University Cooperative Research Program

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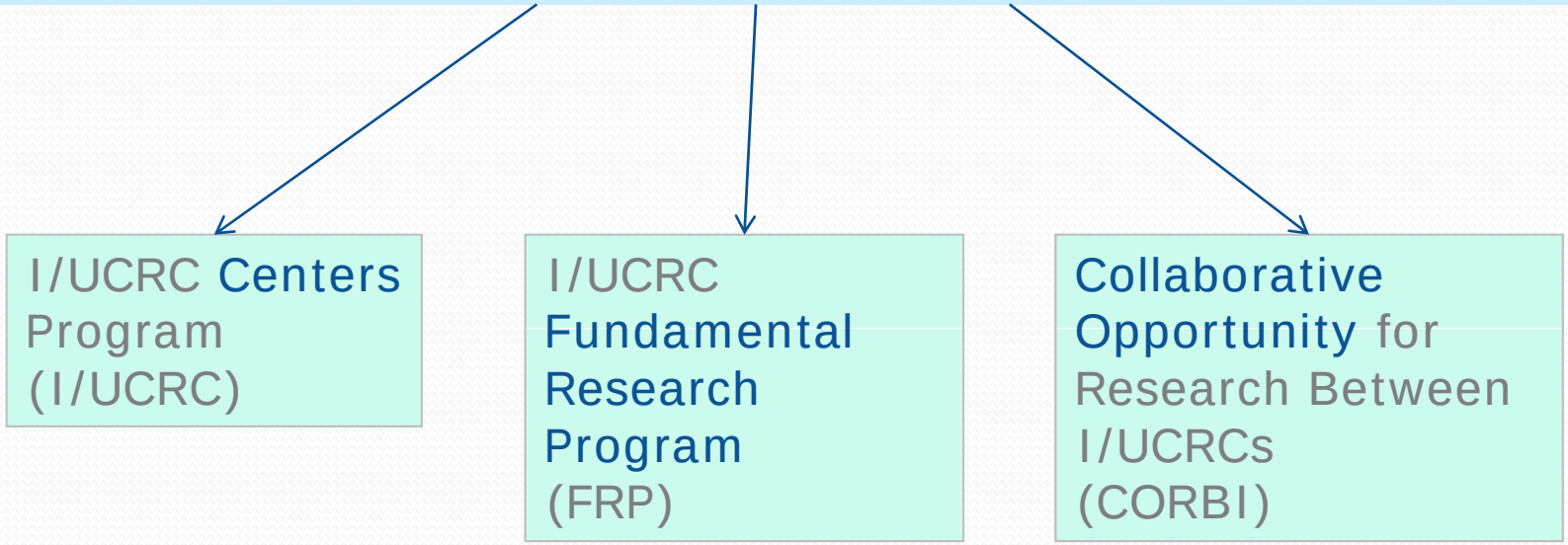
I/UCRC Components



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I/UCRC – Industry & University Cooperative Research Program

I/UCRC Centers Program (I/UCRC)

Purpose:

Develop s long-term partnerships among industry, academe, and government.

Highlight(s):

The National Science Foundation encourages the submission of industry-defined fundamental research proposals from NSF Industry/University Cooperative Research Centers (I/UCRC). Industry-defined fundamental research broadens the scientific and engineering understanding beyond the more specific applied research interests of the industries traditionally served by the I/UCRC. Industry participation extends the scope and horizon of center research projects so as to drive innovation with industrially relevant fundamental research projects.

Award Size(s):

$50,000 to $200,000

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503434

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I/UCRC – Industry & University Cooperative Research Program

I/UCRC Fundamental Research Program (FRP)

Purpose:

The Industry/University Cooperative Research Centers (I/UCRCs) program develops long-term partnerships among industry, academe, and government.
The Fundamental Research Program (FRP) for I/UCRCs provides the opportunity for centers to conduct fundamental research to better position themselves as leaders in emerging areas that could benefit the industries that they serve.

Highlight(s):

The I/UCRCs contribute to the knowledge base of a large number of industrial manufacturing processes that involve a wide range of technological pursuits and are found in areas such as aerospace, electronics, chemicals, recovery of natural resources, the environment, petroleum, biochemicals, materials, food, power generation, and allied activities. To better enable these processes, the I/UCRC **fundamental research program** supports research that involves the development of fundamental engineering and science principles, process control and optimization strategies, mathematical models, and experimental techniques, with an emphasis on projects that have the potential for innovation and broad application in areas in industry. This fundamental research is leading to applications that include sensors, materials, pharmaceuticals, imaging, visualization, embedded systems, next generation computers, medical devices and instrumentation, alternative energy, ecological engineering, water and waste treatment, and robotics.

Award Size(s):

$50,000 to $200,000

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503434&org=IIP&from=home

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I/UCRC – Industry & University Cooperative Research Program

Collaborative Opportunity for Research Between I/UCRCs (CORBI)

Purpose:

Supplements for cooperative research projects between NSF Industry/University Cooperative Research Centers (I/UCRC). This opportunity provides the means for I/UCRCs to collaborate on projects of mutual interest that benefit the research portfolios of multiple centers.

Highlight(s):

Previously, NSF's I/UCRC program accepted unsolicited TIE proposals which served to "tie" centers together by offering grants for collaborative research efforts. CORBI formalizes this funding mechanism so as to provide all I/UCRCs with the information needed to apply for this type of opportunity.

Award Size(s):

Up to $100,000 for a two center project with up to $50,000 per center.

URL for more information:

http://www.nsf.gov/pubs/2010/nsf10008/nsf10008.pdf

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NSF/FDA
Scholar in Residence at FDA

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NSF/FDA -- Scholar in Residence at FDA

Purpose:

An interagency partnership for the investigation of scientific and engineering issues concerning emerging trends in medical device technology. This partnership is designed to enable investigators in science, engineering, and mathematics to develop research collaborations within the intramural research environment at the FDA. This solicitation features four flexible mechanisms for support of research at the FDA: 1) Faculty at FDA; 2) Graduate Student Fellowships; 3) Postdoctoral Fellowships; and, 4) Undergraduate Student Research Experiences.

Highlight(s):

Faculty at FDA - For science, engineering, and mathematics faculty to conduct research for three to twelve months at FDA.

Graduate Student Fellowship -- For science, engineering, and mathematics graduate students for one to four semesters of full- or part-time work at FDA in an area related to his/her research under the guidance of an academic advisor and an FDA mentor.

Postdoctoral Fellowship -- For engineering, science, and mathematics fellows for full-time work at FDA under the guidance of an FDA mentor.

Undergraduate Student Research Experiences -- For engineering, science, and mathematics undergraduate students for summer projects, or one to two semesters of part-time or full-time work at FDA in an area related to his/her academic program under the guidance of an academic advisor and an FDA mentor.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5605

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PASI
Pan-American Advanced Studies Institutes Program

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PASI -- Pan-American Advanced Studies Institutes Program

Purpose:

An initiative between the Department of Energy (DOE) and the National Science Foundation (NSF) -- Pan-American Advanced Studies Institutes are short courses ranging in length from ten days to one month, involving lectures, demonstrations, research seminars, and discussions at the advanced graduate, post-doctoral, and junior faculty level.

Highlight(s):

Approximately 10 to 16 awards will be made yearly to U.S. research institutions or professional societies for the purpose of organizing a PASI. Institutes in the physical, mathematical, or biological science disciplines, the geosciences, the computer and information sciences, and/or engineering may be supported. Institutes in the biological sciences are encouraged to place a special emphasis on any one or more of the following areas: systems biology, biodiversity, modeling and simulation, ecology on a regional to continental scale, and synthetic biology. Institutes in the geosciences may opt to emphasize an interdisciplinary focus such as, for example, climate change and its impact.

Award Size(s):

The cost of any one institute may not exceed $100,000.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5327

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MSPA – MCS – Mathematical Sciences: Innovations at the Interface with Computer Science

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MSPA – MCS – Mathematical Sciences: Innovations at the Interface with Computer Science

Purpose:

The goal of the Mathematical Sciences Priority Area (MSPA) is to advance frontiers in three interlinked areas: (1) fundamental mathematical and statistical sciences, (2) interdisciplinary research involving the mathematical and statistical sciences with science and engineering, and (3) critical investments in mathematical and statistical sciences that embed training in research activities.

Highlight(s):

Investments in interdisciplinary research will focus primarily on three scientific themes:

- Mathematical and statistical challenges posed by large data sets
- Managing and modeling uncertainty, and
- Modeling complex nonlinear systems.

These themes provide the basis for most of the interdisciplinary competitions that are part of the MSPA. Innovative educational activities that foster closer connections between research and education in the mathematical sciences will also be supported.

Award Size(s):

$150,000 - $200,000 per year for up to three years duration

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=9673

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PetaApps – Accelerating Discovery in Sci. & Eng. Through Peta-scale Simulation & Analysis

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PetaApps – Accelerating Discovery in Sci. & Eng. Through Peta-scale Simulation & Analysis

Purpose:

Develop the future simulation and analysis tools that can use petascale computing to advance the frontiers of scientific and engineering research.

Highlight(s):

Proposals are encouraged in the following areas:

- enhancing algorithmic scalability using techniques that better exploit multi-threaded, highly parallel, hierarchical architectures,
- improving and creating data sampling, analysis, and clustering algorithms for massive data sets,
- developing innovative modeling and simulation algorithms suitable for petascale systems,
- developing software to solve forefront scientific problems on petascale systems,
- optimizing software for specific petascale hardware or predicted "best guess" extrapolations to future hardware,
- exploring innovative computational techniques that were not previously considered viable because of limited hardware capability,
- conducting performance analysis and profiling of software that is heavily used but may never have been analyzed for scalability, bottle-necks, and optimization,
- changing functioning problem solvers by substituting algorithmic implementations known from computational science research to scale more effectively to computing systems of very large scale.

Award Size(s):

Proposal budgets should not exceed $1.6M in size and the requested duration should not exceed five years.

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501015

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PIRE – Partnership for Int'l Research and Education

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PIRE – Partnership for Int'l Research and Education

Purpose:

To catalyze a higher level of international engagement in the U.S. science and engineering community by supporting innovative, international research and education collaborations.

Highlight(s):

Enables U.S. scientists and engineers to establish collaborative relationships with international colleagues in order to advance new knowledge and discoveries at the frontiers of science and engineering and to promote the development of a diverse, globally-engaged U.S. scientific and engineering workforce. International partnerships are, and will be, increasingly indispensable in addressing many critical science and engineering problems. The PIRE program will support bold, forward-looking research whose successful outcome results from all partners—U.S. and foreign—providing unique contributions to the research endeavor. It is also intended to facilitate greater student preparation for and participation in international research collaboration, and to contribute to the development of a diverse, globally-engaged U.S. science and engineering workforce.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12819

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ICES – Interface between Computer Science and Economic & Social Sciences

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ICES – Program Vision

The Interface between Computer Science and Economics & Social Sciences (ICES) program focuses on innovation and use of computational thinking for problems in the realm of economics and the use of ideas from economics for regulating and optimizing networked computer systems.

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ICES – Program Motivation

The histories and intellectual approaches of social and economic science and computer science have been strongly influenced by the crosscurrents among them. The ubiquity of socio-technical networks has led to new, more intimate ties between these two fields. New kinds of interactions and transactions have been enabled by such networks. Key features of these new transactions include:

- parties who do not know or trust each other
- parties represented by software agents
- real-time adaptation, decision making, and chain reactions by agents

Designing decision mechanisms that can govern these increasingly important types of transactions in ways that meet criteria such as fairness, revenue maximization, or efficient resource use is a challenge that requires the expertise of both social and economic scientists and computer scientists.

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ICES – Program Scope

Some of the main foci of the ICES program are:

- basic principles of evolving socio-economic network models
- design of mechanisms for traditional and new markets on such networks
- understanding of game-theoretic equilibria from a computational point of view
- application of economic principles to guide the behavior of large computing and communication systems
- learning and adaptive behavior of human and software agents
- the dynamics of contagion and similar network processes

This program does not support the use of existing computational techniques to model and simulate complex economic systems.

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ICES – Program Scope

Some research challenges that the ICES program addresses are:

- What is the nature of equilibrium prices in a network of buyers and sellers?
- How can we set up computationally efficient mechanisms that achieve any of several desirable objectives?
- How do networks of economic agents form and evolve?
- How do agents (human or machine) on a network learn and adapt dynamically in their choice behavior, especially in response to incentives?
- How does contagion spread and how can it be influenced (which may include both enhancement and retardation)? This includes the "spread of ideas," popularity of consumer products, internet memes, information dissemination in disasters, etc. What is the computational complexity of strategic equilibrium and what happens when this computation is intractable?
- How do we understand more complex and flexible decision and choice systems made possible by modern computer systems? This includes markets, voting, recommender systems, and recommendation systems
- How can we regulate traffic on the Internet using economic incentives?
- At the level of routing between Autonomous Systems (ASes) how can economic approaches be used to optimize any of several quantities of interest such as network utilization, congestion-minimization, latency, throughput, etc.?
- How can we disincentivize spam?
- How do we create stable reputation systems, voting systems, and other social mechanisms for gathering information about the preferences of individuals involved in multi-agent systems?
- How can we model adversaries (such as vandals, spammers, hackers, identity thieves, terrorists) as self-interested agents (typically with economic objectives) and build trust and security in networks against such adversaries?
- Can we incentivize the adoption of better security mechanisms that require widespread adoption before they become effective?
- How can we build manipulation-resistant recommender systems?
- How can we incentivize software agents in multi-agent systems to drive towards socially desirable goals?

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ICES – Contact Information

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503549&org=CISE&sel_org=CISE&from=fund

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RET – Research Experience for Teachers

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RET – Research Experience for Teachers

Purpose:

CISE's Research Experiences for Teachers (RET) supplemental awards introduce state-of-the-art computing competencies and knowledge into K-14 classrooms by providing K-14 educators with research experiences at the frontiers of computing.

Highlight(s):

Supports the active participation of teachers in on-going CISE research projects as an excellent way to strengthen the computing expertise of our nation's teachers. RET supplements help build collaborative relationships between K-14 educators and the CISE research and education community, encouraging the articulation of students interested in pursuing careers in computing between high school and community college, and between high school or community college and baccalaureate education. The duration of an RET supplement award is generally one year and the project may be carried out during summer months, during the academic year, or both. CISE RET teachers will be invited to participate in an annual CISE-sponsored workshop in the Washington DC area for the purpose of sharing and transferring best practices and materials.

Award Size(s):

Typically around $12,500 per teacher.

URL for more information:

http://www.nsf.gov/pubs/2010/nsf10013/nsf10013.jsp?org=NSF

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REU – Research Experiences for Undergraduates: Sites and Supplement

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REU – Research Experiences for Undergraduates: Sites and Supplement

Purpose:

Supports active research participation by undergraduate students in any of the areas of research funded by the National Science Foundation.

Highlight(s):

Two mechanisms for support of student research:
(1)REU Sites are based on independent proposals to initiate and conduct projects that engage a number of students in research. REU Sites may be based in a single discipline or academic department, or on interdisciplinary or multi-department research opportunities with a coherent intellectual theme. Proposals with an international dimension are welcome. A partnership with the Department of Defense supports REU Sites in DoD-relevant research areas.
(2)REU Supplements may be requested for ongoing NSF-funded research projects or may be included as a component of proposals for new or renewal NSF grants or cooperative agreements.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517&org=CISE&sel_org=CISE&from=fund

http://www.nsf.gov/cise/funding/2009_RED_supplement_DCL.jsp

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RUI – Research in Undergraduate Institutions

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RUI – Research in Undergraduate Institutions

Purpose:

Supports research by faculty members of predominantly undergraduate institutions through the funding of (1) individual and collaborative research projects, (2) the purchase of shared-use research instrumentation, and (3) Research Opportunity Awards for work with NSF-supported investigators at other institutions. All NSF directorates participate in the RUI activity.

Highlight(s):

RUI proposals are evaluated and funded by the NSF programs in the disciplinary areas of the proposed research. Eligible "predominantly undergraduate" institutions include U.S. two-year, four-year, masters-level, and small doctoral colleges and universities that (1) grant baccalaureate degrees in NSF-supported fields, or provide programs of instruction for students pursuing such degrees with institutional transfers (e.g., two-year schools), (2) have undergraduate enrollment exceeding graduate enrollment, and (3) award an average of no more than 10 Ph.D. or D.Sc. degrees per year in all NSF-supportable disciplines. A Research Opportunity Award is usually funded as a supplement to the NSF grant of the host researcher, and the application is submitted by the host institution.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518&from=fund

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SI^2 – Software Infrastructure for Sustained Innovation

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SI^2 – Software Infrastructure for Sustained Innovation

Purpose:

SI^2 is a long-term investment focused on catalyzing new thinking, paradigms, and practices in using software to understand natural, human, and engineered systems. SI^2's intent is to foster a pervasive cyber-infrastructure to help researchers address problems of unprecedented scale, complexity, resolution, and accuracy by integrating computation, data, networking and experiments in novel ways.

Highlight(s):

The SI^2 program envisions three classes of awards:

1. **Scientific Software Elements (SSE):** SSE awards target small groups that will create and deploy robust software elements for which there is a demonstrated need, encapsulating innovation in science and engineering.
2. **Scientific Software Integration (SSI):** SSI awards target larger groups of PIs organized around common research problems as well as common software infrastructure, and will result in a sustainable community software framework.
3. **Scientific Software Innovation Institutes (S2I2):** S2I2 awards will focus on the establishment of long-term community-wide hubs of software excellence. These hubs will provide expertise, processes, resources and implementation mechanism to transform computational science and engineering innovations and community software into robust and sustained tools for enabling science and engineering.

The FY 2010 SI^2 competition will be limited to SSE and SSI awards. The solicitation in FY 2011, and in subsequent years, will outline funding opportunities for all three classes of awards (SSE, SSI and S2I2), subject to availability of funds.

Award Size(s):

Varies

URL for more information:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503489

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On behalf of the NSF – thank you!

Questions?

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