



# Request for NSF Highlight

## National Science Foundation Computer and Information Science and Engineering Directorate (CISE) Computer and Network Systems Division (CNS)

Each year, NSF program officers are asked to provide descriptions of program accomplishments, or "highlights," about the outcomes of NSF awards. This activity is a requirement of the Government Performance and Results Act (GPRA). As a recipient of a NSF-CISE award, you are asked to provide the information outlined in this form.

**Please save a copy of this form (and the completed version of the form) with a file name formed by concatenating your proposal number with your last name as:**

**Your NSF proposal number your last name.doc**  
(For example: 0599999Smith.doc)

**Please return the completed form as an attachment to an email message you send to:**

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

*Please note: This form is a Word Form. Please use the **TAB key** to move through the form. Other keys (such as the ENTER key) are likely to cause spurious behavior.*

---

Your Last Name: Pitt  
First Name: Leonard  
Your Institution: University of Illinois  
Your email address: [pitt@illinois.edu](mailto:pitt@illinois.edu)  
Telephone Number: 217-333-7505

### Your Project's Title:

ICUBED: Informatics and Computation Ubiquitous throughout Baccalaureate Education

Please enter your **NSF/CISE/CNS Award Number**: [Please note – If you are describing a collaborative award, please enter the proposal numbers for **all** of the affiliated awards]

NSF-0722327	NSF-	NSF-	NSF-	NSF-
NSF-	NSF-	NSF-	NSF-	NSF-

What is the name of the NSF Program Officer who originally made this award or who is currently your cognizant Program Officer? **Taylor, Harriet**

**Select Primary (and Secondary) Strategic Outcome Goal**

Included below are two tables – titled **Primary Strategic Outcome Goal** and **Secondary Strategic Outcome Goal**

All NSF projects have "Primary" strategic outcome goals and they *may also have* "Secondary" strategic outcome goals. In the PRIMARY strategic outcome goal table please decide on **one category** (i.e., one column: Discovery, Learning or Research Infrastructure) that **BEST DESCRIBES** your project's highlight. Within that column, please check one or more boxes that apply. If your project also has clear Secondary strategic outcome goals, decide on the appropriate column in the *second table* labeled "Secondary Strategic Outcome Goals and check as many boxes within that column that describe your project. So, for example, if your Primary Strategic Outcome Goal was Discovery, your Secondary Goal may be Learning.

### Primary Strategic Outcome Goal

Decide whether your project's *Primary Strategic Outcome* goals address Discovery, Learning **or** Research Infrastructure. For whichever of the three that captures your project's focus, please check one or more boxes *within that column* that best describe your project.

#### Discovery

Fostering research that advances the frontiers of knowledge, emphasizing areas of greatest opportunity and potential benefit and establishing the nation as a global leader in fundamental and transformational science and engineering.

Please Note:

If you are reporting an outcome from an **EPSCoR** Research Infrastructure Improvement grant, or a research grant co-funded with the EPSCoR Program, please check the EPSCoR box under DISCOVERY, as well as the box that represents the area of science, engineering, or education for the project.  
 2) If you are reporting an outcome of research conducted at an NSF-funded large facility and check a category under Discovery for the PRIMARY goal, please also check the **Major Multi-User Facilities** category under Research Infrastructure for the SECONDARY goal.

#### Research Grants

- Biological Sciences
- Computer & Information Science and Engineering
- Cyberinfrastructure (excluding Shared Cyberinfrastructure Tools; see Research Infrastructure)
- Engineering Research
- Small Business Innovation Research/Small Business Technology Transfer
- Geosciences: Earth, Atmosphere, and Ocean Sciences
- Mathematical & Physical Sciences

#### Learning

Defined in the NSF Strategic Plan 2006-2011 as "Cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens."

Please Note:

1) If you are reporting an outcome from an **EPSCoR** Research Infrastructure Improvement grant, or a research grant co-funded with the EPSCoR Program, please check the EPSCoR box under DISCOVERY, as well as the box that represents the area of science, engineering, or education for the project.

- K-12 Education
- Teacher Education and In-service Professional Development
- Undergraduate Education and Undergraduate Student Research
- Graduate Education and Graduate Student Research
- International Research Experiences for Undergraduate & Graduate Students
- Postdoctoral Education, including International Postdoctoral Fellowships
- Public Understanding of Science and Lifelong Learning
- Broadening Participation to Improve Workforce Development
- Promoting CyberLearning Strategies to Enhance STEM Education
- Professional and Career Development (i.e., ADVANCE, Course, Curriculum, and Laboratory Improvement (CCLI) Program, & Advanced

#### Research

##### Infrastructure

Defined in the NSF Strategic Plan 2006-2011 as "Build the nation's research capability through critical investments in advanced instrumentation, facilities, cyber-infrastructure and experimental tools."

Please Note:

1) If you are reporting an outcome from an **EPSCoR** Research Infrastructure Improvement grant, or a research grant co-funded with the EPSCoR Program, please check the EPSCoR box under DISCOVERY, as well as the box that represents the area of science, engineering, or education for the project.  
 2) If you are reporting an outcome of research conducted at an NSF-funded large facility and check the **Major Multi-User Facilities** category under Research Infrastructure for the PRIMARY goal, please also check the appropriate category under Discovery for the SECONDARY goal.

##### Major Multi-User Facilities

- Academic Research Fleet
- ATLAS - A Toroidal Large Angle Spectrometer
- CMS - Compact Muon Solenoid
- Cornell Electron Storage Ring
- Gemini Observatory
- IRIS - Incorporated Research Institutes for Seismology
- Integrated Ocean Drilling Program
- Large Hadron Collider

- Social, Behavioral, & Economic Sciences
- Polar Sciences: Arctic and Antarctic Research
- CAREER: Faculty Early Career Program
- EPSCoR: Experimental Program to Stimulate Competitive Research
- International Collaborative Research
- Education Research and Evaluation to Improve STEM Learning and Teaching

**NSF Centers**

- Centers for Analysis & Synthesis
- Centers for Chemical Innovation
- Engineering Research Centers
- Materials Research Science & Engineering Centers
- Nanoscale Science & Engineering Centers/Networks
- Science & Technology Centers
- Science of Learning Centers

**Technological Education (ATE Program)**

- Laser Interferometer Gravitational Wave Observatory (LIGO)
- MREFC Projects: ALMA, Earthscope, IceCube Neutrino Observatory, SODV (Scientific Ocean Drilling Vessel), South Pole Station Modernization, NEON, OOI, ARRV, ATST
- National Astronomy and Ionosphere Center (NAIC)
- National Center for Atmospheric Research (NCAR)
- National High Magnetic Field Laboratory
- National Nanofabrication Infrastructure Network
- National Optical Astronomy Observatory (NOAO)
- National Radio Astronomy Observatory (NRAO)
- National Solar Observatory
- National Superconducting Cyclotron Laboratory
- Network for Earthquake Engineering Simulation (NEES)
- Polar Facilities & Logistics
- Major Research Instrumentation (MRI) Program
- Shared Cyberinfrastructure Tools
- Other Infrastructure and Research Resources

**Secondary Strategic Outcome Goal**

Complete this table **only** if your project has clear *Secondary Outcome goals*. So, for example, if your Primary Strategic Outcome Goal was Discovery, then your Secondary Strategic Outcome Goal can be either Learning or Research Infrastructure. Please check one or more boxes within that column that describe your project's Secondary Strategic Outcome goals:

**Discovery**

Fostering research that advances the frontiers of knowledge, emphasizing areas of greatest opportunity and potential benefit and establishing the nation as a global leader in fundamental and transformational science and engineering.

**Please Note:**

If you are reporting an outcome from an **EPSCoR** Research Infrastructure Improvement grant, or a research grant co-funded with the EPSCoR Program, please check the EPSCoR box under DISCOVERY, as well as the box that represents the area of science, engineering, or

**Learning**

Defined in the NSF Strategic Plan 2006-2011 as "Cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens."

**Please Note:**

1) If you are reporting an outcome from an **EPSCoR** Research Infrastructure Improvement grant, or a research grant co-funded with the EPSCoR Program, please check the EPSCoR box under DISCOVERY, as well as the box that represents the area of science, engineering, or education for the project.

**Research**

**Infrastructure**

Defined in the NSF Strategic Plan 2006-2011 as "Build the nation's research capability through critical investments in advanced instrumentation, facilities, cyber-infrastructure and experimental tools."

**Please Note:**

1) If you are reporting an outcome from an **EPSCoR** Research Infrastructure Improvement grant, or a research grant co-funded with the EPSCoR Program, please check the EPSCoR box under DISCOVERY, as well as the box that represents the

education for the project.  
 2) If you are reporting an outcome of research conducted at an NSF-funded large facility and check a category under Discovery for the PRIMARY goal, please also check the **Major Multi-User Facilities** category under Research Infrastructure for the SECONDARY goal.

**Research Grants**

- Biological Sciences
- Computer & Information Science and Engineering
- Cyberinfrastructure (excluding Shared Cyberinfrastructure Tools; see Research Infrastructure)
- Engineering Research
- Small Business Innovation Research/Small Business Technology Transfer
- Geosciences: Earth, Atmosphere, and Ocean Sciences
- Mathematical & Physical Sciences
- Social, Behavioral, & Economic Sciences
- Polar Sciences: Arctic and Antarctic Research
- CAREER: Faculty Early Career Program
- EPSCoR: Experimental Program to Stimulate Competitive Research
- International Collaborative Research
- Education Research and Evaluation to Improve STEM Learning and Teaching

**NSF Centers**

- Centers for Analysis & Synthesis
- Centers for Chemical Innovation
- Engineering Research Centers
- Materials Research Science & Engineering Centers
- Nanoscale Science & Engineering Centers/Networks
- Science & Technology Centers
- Science of Learning Centers

- K-12 Education
- Teacher Education and In-service Professional Development
- Undergraduate Education and Undergraduate Student Research
- Graduate Education and Graduate Student Research
- International Research Experiences for Undergraduate & Graduate Students
- Postdoctoral Education, including International Postdoctoral Fellowships
- Public Understanding of Science and Lifelong Learning
- Broadening Participation to Improve Workforce Development
- Promoting CyberLearning Strategies to Enhance STEM Education
- Professional and Career Development (i.e., ADVANCE, Course, Curriculum, and Laboratory Improvement (CCLI) Program, & Advanced Technological Education (ATE) Program)

area of science, engineering, or education for the project.  
 2) If you are reporting an outcome of research conducted at an NSF-funded large facility and check the **Major Multi-User Facilities** category under Research Infrastructure for the PRIMARY goal, please also check the appropriate category under Discovery for the SECONDARY goal.

**Major Multi-User Facilities**

- Academic Research Fleet
- ATLAS - A Toroidal Large Angle Spectrometer
- CMS - Compact Muon Solenoid
- Cornell Electron Storage Ring
- Gemini Observatory
- IRIS - Incorporated Research Institutes for Seismology
- Integrated Ocean Drilling Program
- Large Hadron Collider
- Laser Interferometer Gravitational Wave Observatory (LIGO)
- MREFC Projects: ALMA, Earthscope, IceCube Neutrino Observatory, SODV (Scientific Ocean Drilling Vessel), South Pole Station Modernization, NEON, OOI, ARRV, ATST
- National Astronomy and Ionosphere Center (NAIC)
- National Center for Atmospheric Research (NCAR)
- National High Magnetic Field Laboratory
- National Nanofabrication Infrastructure Network
- National Optical Astronomy Observatory (NOAO)
- National Radio Astronomy Observatory (NRAO)
- National Solar Observatory
- National Superconducting Cyclotron Laboratory
- Network for Earthquake Engineering Simulation (NEES)
- Polar Facilities & Logistics
- Major Research Instrumentation (MRI) Program
- Shared Cyberinfrastructure Tools
- Other Infrastructure and Research Resources

## Enter Highlight

NOTE: Insert only text in the box. **Do not try to paste in images.** An option for inserting images will appear later in the form.

Please write the highlight with sufficient information to describe the research, its significance, and its results in terms that the general public can understand. Technical information is useful, but please avoid jargon and explain any acronyms that you use.

Your lead-in sentence should “engage” the reader and relate the major impacts of your project. You may identify the project’s PI and institution in the narrative. However, please avoid lengthy lists of other project participants and institutions if your award is part of a large collaborative group.

Be clear and concise. Describe the problem that motivated your research. What were the key knowledge gaps? Describe the scope of your project.

**REQUIRED.** Please enter your Highlight text here [*Note: This form limits you to about 400 words*]:

From *The Digital Earth to Writing for the Web*; from *Digital History to Data Analysis and Informatics for Biologists*; and from *Little Bits to Big Ideas to Introduction to Programming*, a slew of interesting new courses are engaging a diverse pool of University of Illinois students in learning about and with information technology. Either taken alone, or as part of a newly developed Informatics Minor, these courses help prepare our students to be leaders in a workforce increasingly dominated by information technology

The courses, and the Informatics Minor, is one of the byproducts of ICUBED - a CPATH-program funded project that seeks to transform undergraduate CS and Informatics education at the University of Illinois, to significantly increase engagement in information technology-based education, and to create and institutionalize new pathways to application-oriented CS/Informatics from other majors. By so doing, the project expects to create a national model for informatics education.

**In terms of intellectual merit, why is this research outcome notable and/or important?** What was achieved that expanded the frontiers of knowledge or contributed to learning or workforce development?

**REQUIRED.** Please describe what is notable/important about your project here [*Note: The form limits your description to about 100 words*]:

The project represents a novel approach to transforming undergraduate education. The grant, together with strategic campus priorities, and a new Informatics Institute, may demonstrate what administrative and curricular changes are sufficient to jump-start informatics education at institutions without a pre-existing school of computing.

**In terms of broader impacts, why is this outcome notable and/or important?** How well does the activity advance discovery and understanding while promoting teaching, training and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

**REQUIRED.** In the context of Broader Impacts as described above, Please describe what is notable/important about your project here. *[Note: The form limits your description to about 100 words]:*

The project promotes course and curricula development in applications of information technology. Because of the broad topical areas involved, the courses appeal to a diverse pool of undergraduate students. By tapping in to non-computer-science-focused areas, and focusing instead on applications of computation within particular subject areas, the project encourages participation by typically underrepresented groups.

**Does this highlight represent transformative or potentially transformative research?** If so, please explain why. **Please check one.**

Yes  No

The National Science Board has defined transformative research as "Research that has the capacity to revolutionize existing fields, create new subfields, cause paradigm shifts, support discovery, and lead to radically new technologies."

**OPTIONAL.** Please describe the "Transformative" aspects of your project here [Note: The form limits your description to about 100 words]:

**Does this highlight represent Broadening Participation?** If so, please explain why. **Please check one.**

Yes  No

**If this highlight represents Broadening Participation, please explain why.**

The concept of broadening participation includes: *individuals* from underrepresented groups, certain types of *institutions* of higher education, *geographic areas* (e.g. EPSCoR states), and *organizations* whose memberships are composed of institutions or individuals underrepresented in STEM or whose primary focus is on broadening participation in science and engineering. It is important to note that underrepresented groups vary within scientific fields.

OPTIONAL. Please describe your project's Broadening Participation aspects (if any) here [Note: The form limits your description to about **100 words**]:

Initial data shows marked improvement in the numbers of women and underrepresented minorities enrolled in these new IT-infused courses, as compared with the demographics of computer science courses. Thus, this project broadens the base of students involved in computation and information technology-related coursework. Rather than restricted to a narrow major such as computer science, typically taken by a homogenous student body, the newly created courses and curricula under development appeal to students diverse in gender, racial/ethnic identity, and field of study, and encourage acquisition of IT skills relevant to a student's discipline.

**Are there existing or potential societal benefits of this research? It is important for NSF to be able to provide examples of NSF-supported research that have societal benefits, including benefits to the U.S. economy. Please check one.**

X Yes  No

**If there are any existing or potential societal benefits, including benefits to the U.S. economy, of this research of which you are aware, please describe in the space below.**

OPTIONAL. Please enter your project's societal benefits (if any) here [Note: The form limits your description to about **100 words**]:

The project's goals are directly aligned with the goals of meeting the needs of the nation's IT-workforce.

**NSF Investments (Existing and Proposed) -- select as many as apply:** The purpose of identifying one or more NSF investments is to provide guidance for NSF staff selecting highlights for publication in the annual budget, the annual performance report, and other public documents. These investments represent major cross-foundation initiatives.

**REQUIRED:**

- Adaptive Systems Technology
- American Competitiveness Initiative (ACI)
- Climate Change
- Cyber-enabled Discovery and Innovation (CDI)
- Cyberinfrastructure
- Environment (including the importance of fresh water and dynamics of water processes)
- Homeland Security
- Human and Social Dynamics
- International Polar Year (IPY)
- National Nanotechnology Initiative (NNI)
- Networking and Information Technology Research Development (NITRD)
- Science and Engineering Beyond Moore's Law
- Science of Science and Innovation Policy (SciSIP)
- Sensor Research
- Understanding Complex Biological Systems (including the interfaces of life, physical, and computational sciences)
- None Applicable

## Add Image(s)

### Why are images important?

NSF highlights and images are for illustration in the Foundation's annual Budget Requests, performance reports, and other documents.

Clear, colorful images (photos, pictures, graphs, charts, etc.) greatly enhance the value of highlights and often tell a story by themselves.

- Resolution should be **72 dpi or higher**.
- Files must be **GIFs or JPEGs**.
- Images must be the size you want them to appear. Recommended maximum width and height are **240 pixels**.
- A **descriptive caption** must be provided.

Insert your image(s) here. For each image, **please provide a caption**. If you have difficulty including your image(s) as described above, you may attach it to the email that you send back with this form.

### Image #1:





**Image #1 Caption:**

CPATH RET teachers hold poster session in NSF Atrium. Of course, we need a photo related to the project here!

[Optional: If you have multiple images, insert them below – please don't forget to provide captions for each image.]



## in for·mat·ics

Stand out by combining your major with a  
Minor in Informatics  
[www.informatics.illinois.edu](http://www.informatics.illinois.edu)

**Image #2 Caption:**

Table tent used to attract Informatics majors