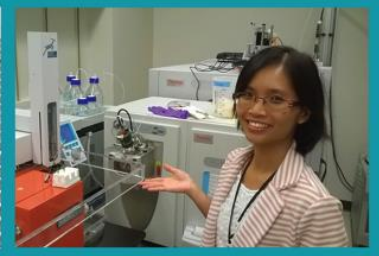
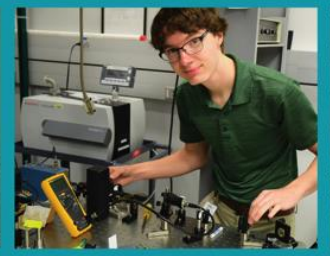
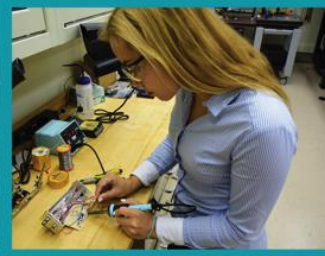




NIST Summer Undergraduate Research Fellowship (SURF) Program

Dr. Brandi Toliver
Managing SURF Program Director

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

NIST Overview

NIST: Did You Know…

- NIST's weight and measures services provide the basis for *fairness* and *efficiency* of sales?
- About 2.6 billion times a day (30,000 per second), NIST's internet time service sets computer clocks and other networked devices?

- In the Army alone, 58,000 different types of equipment require NIST-traceable calibration?
- NIST led the development of performance standards for smoke detectors?
- Closed-captioning for people with impaired hearing, now featured on all TV sets, was co-invented at NIST, earning it an Emmy Award in 1980?

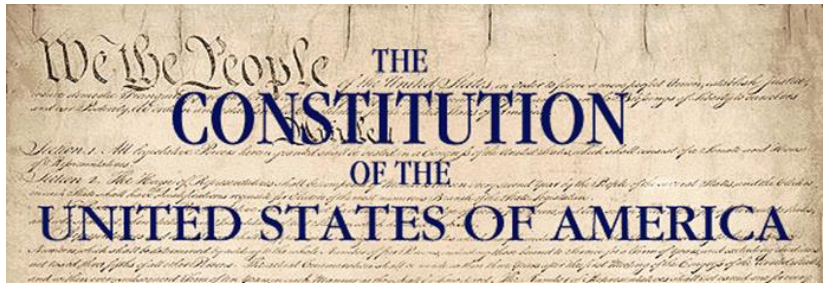
- More than 3,000 law-enforcement officers have been spared from death or disabling injury as a result of NIST-developed standards for ballistic-resistant body armor ("bullet-proof" vests)?
- Many of the tools and materials used in modern dentistry—from the panoramic X-ray to composite fillings to an array of adhesives—originated at NIST through a partnership with the American Dental Association that began in 1928?

www.nist.gov/public_affairs/factsheet

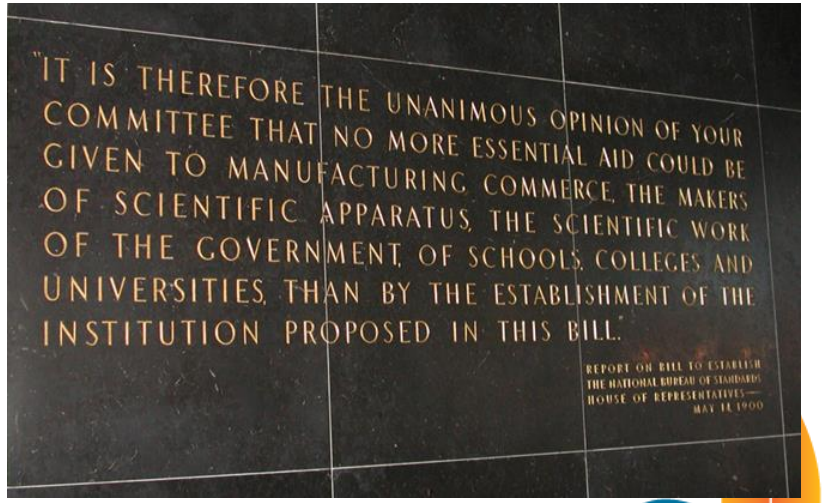
SURF

NIST: Who We Are and What Do We DO

- Founded in 1901 as the National Bureau of Standards
- Non-regulatory Agency



Article I, Section 8: The Congress shall have the power to …*coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures*



Unique Mission….
promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

SURF

NIST is in the Department of Commerce

Wilbur Ross
Secretary of Commerce

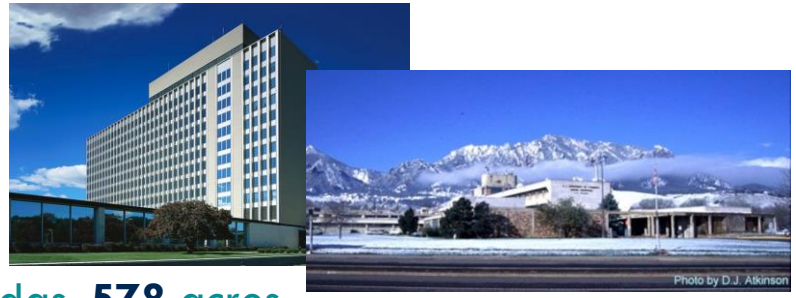
- National Oceanic and Atmospheric Administration
  - **(National Weather Service)**
- International Trade Administration
- Patent and Trademark Office
- **National Institute of Standards & Technology**
- Economics and Statistics Administration
- Other Agencies….
  - **(Census Bureau)**

Dr. Walter Copan
Under Secretary of Commerce for Standards and Technology
NIST Director

NIST At-a-Glance

Major Assets, Partnerships, People, Budget

2 Large Research Campuses

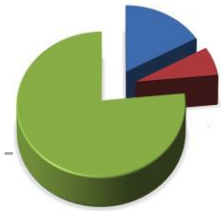


Gaithersburg, MD– **62** bldgs. **578** acres
Boulder, CO—**26** bldgs., **208** acres

Partnerships In Every State

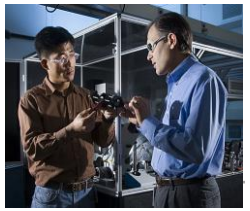
60 Manufacturing Extension Centers
10 joint institutes/Centers of Excellence

FY 2017 Appropriations. $962 Million



NIST labs, $**690M**
Industrial Technology Services, $**155 M**
Construction of Research Facilities, $**119 M**

Additional Resources
~ other government agencies
~ reimbursable services



People: Employees & Associates

~**3,400** Federal Employees
~**3,700** Guest Researchers & other NIST Associates
~**400** NIST Staff on ~ **1,000** standards committees

SURF

NIST: A Premier Scientific Institution

A world-leading measurement science and standards program with world-class staff!

Work resulting in 4 + 1 Nobel Prizes since 1997

Debbie Jin
2003 MacArthur Fellow
2013 L'Oreal/UNESCO "For Women in Science" award
2014 Isaac Newton Medal

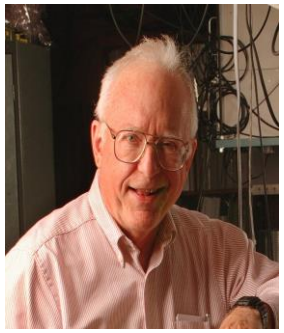
- **Kyoto Prize winner in 2011**
- **2 MacArthur Fellowship winners since 2003**
- **National Medal of Science winners in 1998 and 2007**
- **Isaac Newton Medal in 2014**
- **~ 10 National Academy Members**
- **~120 National Society Fellows**
- **~60 National/International Awards/yr**

Dan Madrzykowski
2013 Service to America Award

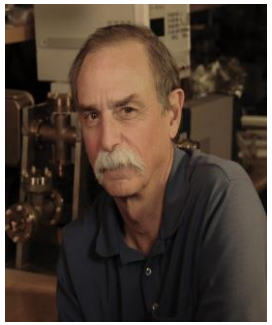
Ana Maria Rey
2013 MacArthur Fellow

Bill Phillips
1997 Nobel Prize
in Physics

Eric Cornell
2001 Nobel Prize
in Physics



John Hall
2005 Nobel Prize
in Physics



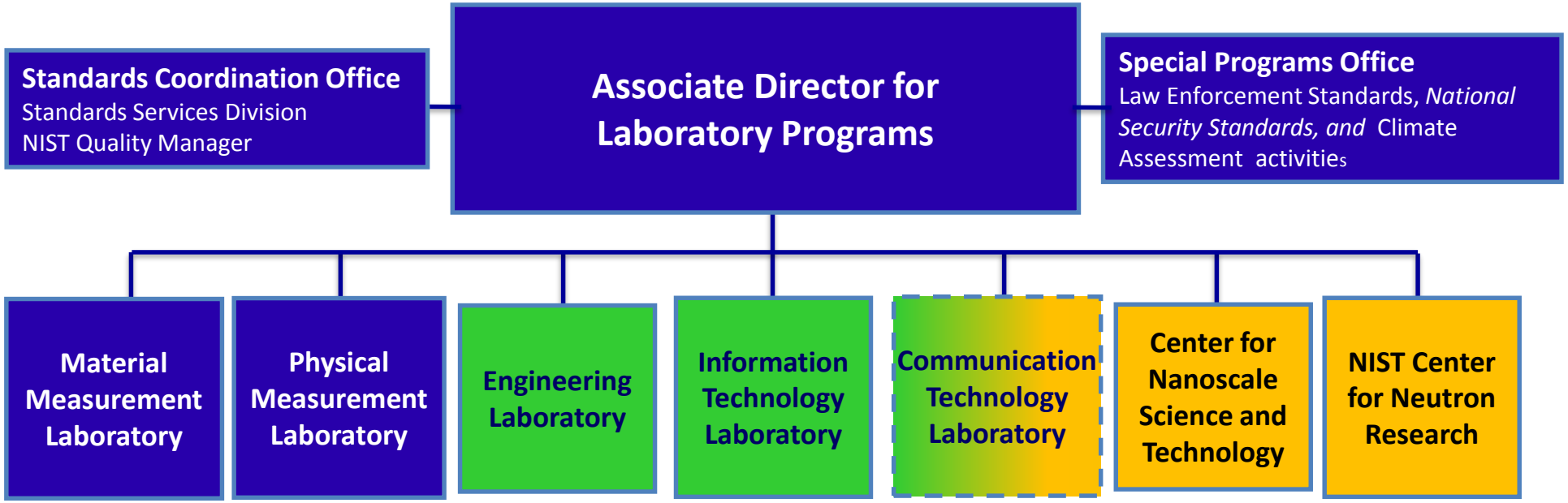
David Wineland
2010 Nobel Prize
2007 National Medal of Science

John Cahn
1997 National Medal of Science and 2011 Kyoto Prize in Materials Science

Dan Shechtman
2011 Nobel Prize
in Chemistry
based on work while Visiting Scientist at NIST

NIST Laboratory Program

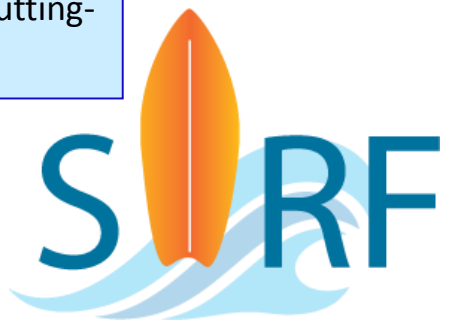
- providing measurement solutions for industry and the nation



Metrology Laboratories	Technology Laboratories	National User Facilities
Driving innovation through Measurement Science and Standards	Accelerating the adoption and deployment of advanced technology solutions	Providing world class, unique, cutting-edge research facilities

NIST Lab Resources for FY17

- $690 million in Direct Appropriations

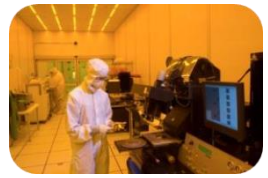


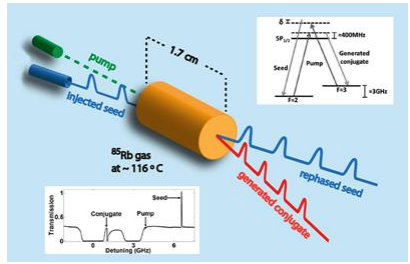
NIST Metrology Laboratories

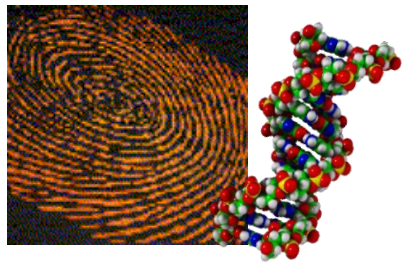
Responsible for advancing the state-of-the-art for measurement science and the dissemination of this metrology into industry, other government agencies, and academia.

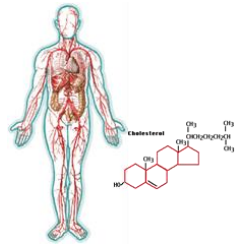
- **The Material Measurement Laboratory** (MML) **serves as the national reference laboratory for measurements in the chemical, biological, and material sciences** through activities ranging from fundamental and applied research, to the development and dissemination of certified reference materials, critically evaluated data, and other programs/tools to assure the quality of measurement results.

- **The Physical Measurement Laboratory** (PML) **develops and disseminates the national standards of length, mass, force and shock, acceleration, time and frequency, electricity, temperature, humidity, pressure and vacuum, liquid and gas flow, and acoustic, ultrasonic, and ionizing radiation** through activities ranging from fundamental measurement research to provision of measurement services, including calibration services, standards, and data.









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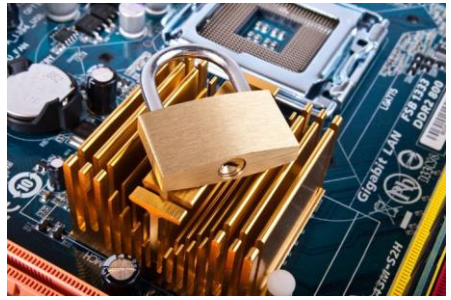
NIST Technology Laboratories

Information Technology Laboratory

- Cybersecurity
- Cloud Computing
- Identity Management
- Computer Forensics
- Wireless Communications
- Health IT
- Privacy Measur5ement



Engineering Laboratory

- Building Technologies
- Fire Research
- Smart Grid & Energy Technology
- Advanced Manufacturing Technology
- Disaster Resilience

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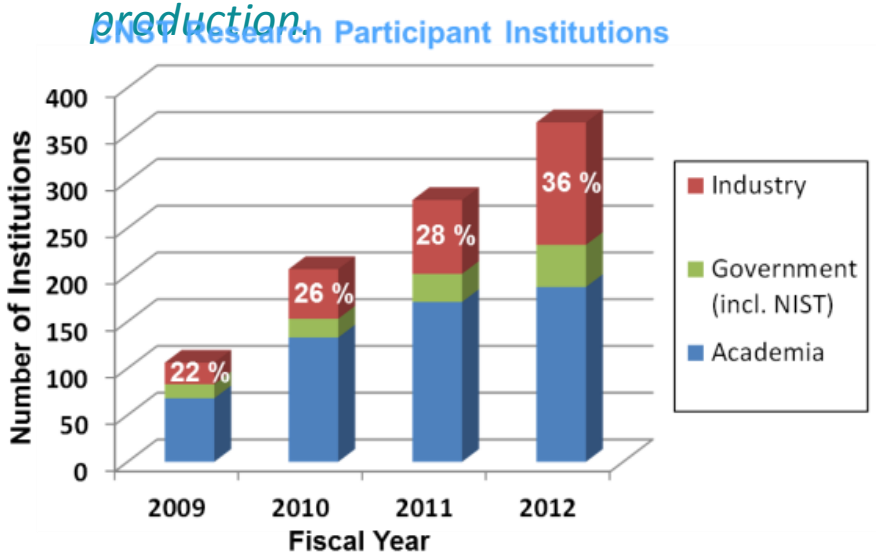
Communications Technology Laboratory

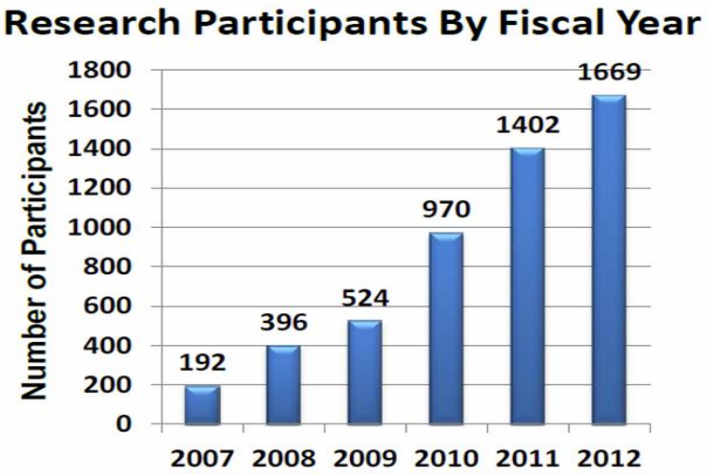
Functional Statement: The CTL promotes the development and deployment of advanced communications technologies through the conduct of leading edge R&D on both the metrology and understanding of physical phenomena, materials capabilities, complex systems relevant to advanced communications; and through the conduct of research targeted at supporting a multi-level testbed facility, including the development of precision instrumentation, validated test-protocols, models, and simulation tools necessary to support the testing and validation o new communications technologies

- **Initial Areas of Focus:**
  - **Public Safety Communications Research** (PSCR) – The NIST PSCR staff was the first NIST program to be moved into the CTL. Near-term, CTL will increase PSCR technical staff and enhance public safety LTE laboratory infrastructure.
    - **The Middle Class Tax Relief and Job Creation Act of 2012 created the First Responder Network Authority** (FirstNet) as an independent entity within the Department of Commerce to provide emergency responders with the first U.S. nationwide, high-speed, broadband network dedicated to public safety.
    - **NIST CTL gets $300M to provide the R&D and testing support for FirstNet.**
  - **Spectrum Sharing** – CTL, through the National Advanced Spectrum and Communications Test Network, will create a trusted capability to facilitate spectrum sharing studies; optimize access to engineering capabilities; and engage spectrum users in collaboration.

NIST User Facilities

*The **Center for Nanoscale Science and Technology (CNST)** operates a national, shared-use facility for nanoscale fabrication and measurement and develops innovative nanoscale measurement and fabrication capabilities to support researchers from industry, academia, NIST, and other government agencies in nanoscale technology from discovery to production.*





*The **NIST Center for Neutron Research (NCNR)** operates a national user facility providing neutron-based measurement capabilities to U.S. researchers from industry, academia, NIST, and other government agencies in support of materials research, neutron imaging, chemical and biological analysis, neutron standards, dosimetry, and radiation metrology.*

SURF

nSoft

A consortium focused on neutron-based measurement science
To support the manufacturing of Soft Materials

NIST

Some Products and Services from NIST Labs

Measurement research

- ~ 2,200 publications per year

Standard Reference Data

- ~ 100 different types
- ~ 6,000 units sold per year
- ~ 226 million data downloads per year

© NIST

© Robert Rathe

Standard Reference Materials

- ~ 1,300 products available
- ~ 30,000 units sold per year

Calibration tests

- ~ 18,000 tests per year

Laboratory accreditation

- ~ 800 accreditations of testing and calibrations laboratories per year

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SURF Program

Background info on the SURF Program

- Founded in 1993 in the Physics Laboratory
- Provides opportunities for undergraduates to engage in hands-on research pertaining to the NIST mission under the guidance of a NIST scientist or engineer
- A partnership supported by NIST and participating colleges/universities for students majoring in science, mathematics, and engineering
- Eleven week fellowships available in all the NIST laboratories @ Gaithersburg and Boulder campuses
- To date 2,600 undergraduates have participated in the prog
- The 2017 SURF Program consisted:

  Boulder: 22 participants

  Gaithersburg: 191 participants

Eligibility Requirements

- Must be a United States citizen or US Permanent resident
- Must be an undergraduate (freshman, sophomore, junior, or senior) majoring in biology, biochemistry, chemistry, computer science, engineering, mathematics, materials science, physics, or STEM field
- Must be in good academic standing
- Are considering pursuing a graduate degree or career in STEM

SURF

Application Deadline and Program Dates

- **Program Dates**

  SURF Boulder: May 21, 2018-August 3, 2018

  SURF Gaithersburg: May 29, 2018-August 10, 2018

- **APPLICATION DEADLINE: February 12, 2018**

Application Process

- An application consist of two parts:

(1) University Component

- Grant proposal -provides details about its academic program nominate one or more students.
- Financial Forms-SF-424, SF-424A, SF-424B, and CD-511
- Student Application Packet
- University submits student and university application packet electronically via *Grants.Gov*

- (2) Student Component
  - SURF Application Form (download from www.nist.gov/surf)
  - SURF Coversheet
  - Resume
  - Transcript (Unofficial recommended)
  - Two letters of recommendation
  - Proof of US citizenship or Permanent Residency
  - Letter of intent or personal statement-The letter should contain information that helps the review committee make an informed decision about the student such as why the student wants to participate in the SURF program, what areas of NIST research interest the student, and career interest.

NOTE: *The Notice of Funding Opportunity (NOFO) formally announces the SURF Program, application process, and other pertinent program details. The 2017 NOFO can be found on Grants.Gov. Copies of the NOFO are also listed on the SURF website under the Application tab.*

Application Form

NIST

Summer Undergraduate Research Fellowship (SURF)

National Institute of Standards and Technology

UNDERGRADUATE STUDENT APPLICATION

(To be completed by the student applicant and included with the completed institutional application package. DO NOT SEND Separately.)

Application Deadline: **February 15, 20XX**

APPLICANT INFORMATION

Name: _____ (Last) _____ (First) _____ (Middle Initial)

Permanent Address: _____ (Street Address or PO Box, Apartment #, etc.)

_____ (City) _____ (State (Abbreviation)) _____ (Zip Code)

Telephone: _____ (Quickest Contact Number (xxx-xxx-xxxx))

Email: _____ (Primary email address) **Gender:** ☐Female ☐Male

Citizenship: ☐ U.S. Citizen ☐Permanent U.S. Resident (with a valid Green Card)

NOTE: SURF participants **MUST** be US citizens or Permanent Residents

ACADEMIC INFORMATION

***Unofficial transcripts are acceptable at this time. Applicants who are accepted into the program may be required to provide an official transcript for verification.**

Name of College/University: _____

Current Class Standing (check only one): ☐Freshman ☐ Sophomore ☐ Junior ☐ Senior

Major/Minor: _____ **Overall GPA:** _____

SURF PROGRAM INTEREST

Have you participated the SURF program at NIST previously? ☐ **Yes** ☐ **No**

If yes, please indicate: Year (s): _____ Location: ☐Boulder ☐Gaithersburg

Mentor Name: _____

If you were to return, would you prefer to work with the same mentor? ☐Yes ☐No ☐No Preference

If accepted, will you require housing?

☐Yes

☐No

Note: Participants should expect to share a bedroom with one other student.

Which NIST location(s) are you applying to for SURF 20XX? (Note, the SURF Program accepts ~20 applicants at Boulder and ~120 applicants at Gaithersburg annually)

☐Boulder ☐Gaithersburg ☐Both

**Please complete research opportunity preference based on previously selected NIST SURF location.

Boulder SURF Research Preference

List (by reference number) the 6 research opportunities in which you are most interested, in order of preference. Try to include opportunities from at least two different divisions. (Go to http://www.nist.gov/surfboulder for the current list of research opportunities.)

1	2	3	4	5	6

Will you be able to be in Boulder from (XX XX, 20XX through XX XX, 20XX (11 weeks)?

☐ Yes ☐No

If no, give availability dates._____

**Total amount of time must span 11 weeks.

Gaithersburg SURF Research Preference

Select from the dropdown menu, the 2 research opportunities (by laboratory name) in which you are most interested, in order of preference. Try to include opportunities from at least two different laboratories. (Go to http://www.nist.gov/surfgaithersburg for a description of each laboratory.)

1	2

Will you be able to be in Gaithersburg from May 23, 2016 through August 5, 2016 (11 weeks)?

☐ Yes ☐No

If no, give availability dates._____

**Limited number of 9-week fellowships available (XX/XX/20XX – XX/XX/20XX)

NOTE: All students must attend through the final date in August.

SPECIAL SKILLS

Do you experience working in a laboratory? ☐Yes ☐No

If so, please describe *briefly* in the provided space. Please include specific details in your resume.

Do you have experience with computer languages? ☐Yes ☐No

If so, please describe *briefly* in the provided space. Please include specific details in your resume.

List any other special skills not included above (e.g., tutoring, extracurricular activities, leadership positions):

TERMS & CONDITIONS

Please provide your initials by each statement below to acknowledge that you have read the statements below and plan to abide by the conditions.

_____If invited to participate in the NIST SURF Program, I acknowledge that I must indicate in this application if I require housing. I will not have the opportunity to request housing once my application is submitted.

_____If invited to participate in the NIST SURF Program, I acknowledge that I am required to undergo a background check which includes fingerprinting.

_____If invited to participate in the NIST SURF Program, I acknowledge that I will provide the required federal identification for entry to NIST on the first day of the program established under the REALID Act of 2005. Drivers' licenses from the following states and territories will NOT be accepted for entry to NIST: American Samoa, Arizona, and Louisiana. In addition, only enhanced drivers' licenses (identified by the American flag on the face of the card) will be accepted from the following three states: Minnesota, New Hampshire, and New York state.

Application Deadline: before February 12, 2016

Checklist:

☐Resume (Important: be sure to include any laboratory skills or computer laguages, etc.)

☐Personal Statement of Commitment to participate (includes research interest)

☐Two letters of recommendation

☐Transcripts (unofficial acceptable)

☐Verification of US citizenship or permanent legal residence (e.g. legible copy of birth certificate, passport, or green card)

Please submit this application and the items listed in the checklist below to your University Contact for inclusion with institutional application-DO NOT SEND SEPERATELY.

SURF Program Contact: Dr. Brandi Toliver, Email: brandi.toliver@nist.gov

Website: http://www.nist.gov/surf

https://www.nist.gov/sites/default/files/documents/2017/11/22/surf_student_application_form_2018_1.pdf

Selecting Research Preferences for the SURF Program @ Gaithersburg

- Gaithersburg Process
  - Students select top two (2) laboratory preferences

	EL	CNST	MML/ NCNR	PML	ITL/ CTL	Special Project
Biochemistry			X	X		X
Biological Sciences		X	X	X		X
Chemistry	X	X	X	X		X
Computer Science	X	X	X	X	X	X
Engineering	X	X	X	X	X	X
Materials Science	X	X	X	X		X
Mathematics	X		X	X	X	X
Physical Sciences	X	X	X	X	X	X
Physics	X	X	X	X	X	X
Statistics	X				X	X

NIST Gaithersburg: SURFING CNST

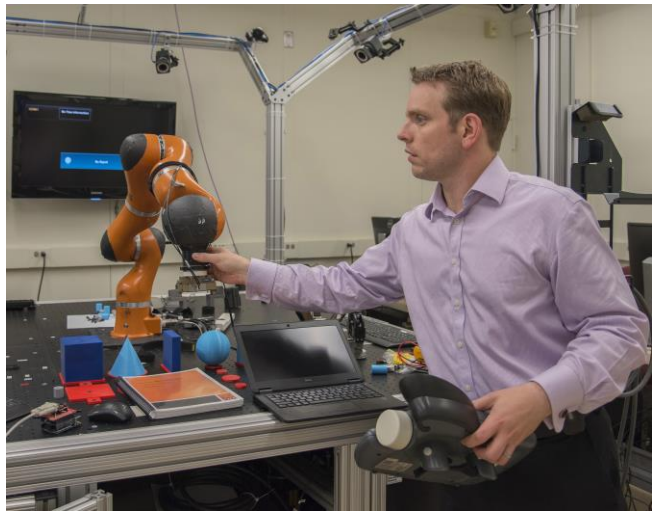
(The Center for Nanoscale Science and Technology)

- **Range of Research Activities**
  - Nanofabrication
  - Atomic-scale characterization & manipulation
  - Nanophotonics
  - Nanomagnetics
  - Nanoplasmonics
  - Environmental TEM
  - Nanoelectromechanical systems
  - Thermoelectrics & photovoltaics
  - Theory of nanostructures, and nanoscale control

***Relevant Academic Majors**: physical sciences, engineering, materials science, physics, chemistry, biochemistry, mathematics, computer science

SURF

NIST Gaithersburg: SURFING EL (Engineering Laboratory)



- **Range of Research Activities**:
  - Innovative fire protection
  - Sustainable manufacturing
  - Model-based engineering enterprise
  - Intelligent manufacturing (automation, robotics, and equipment) additive manufacturing
  - Net zero energy buildings
  - Integrated and automated construction processes
  - Building materials and systems
  - Economic impacts
  - Disaster-resilient structures and communities

***Relevant Academic Majors**: engineering including fire science, materials science, physics, chemistry, mathematics, statistics, computer science, and economics (electrical engineers should apply to PML)

SURF

NIST Gaithersburg: SURFING ITL (Information Technology Laboratory)

- **Range of Research Activities**
  - Human computer interaction
  - Computer network modeling
  - Pervasive computing
  - Multimedia computing
  - Information security
  - Biometrics for computer access and security
  - Cryptography
  - Computer forensics
  - Statistics
  - Software measurement science and Software quality testing
  - Digital data retrieval and preservation
  - Bioinformatics
  - Mathematical modeling
  - Image analysis

***Relevant Academic Majors**: computer science, mathematics, statistics

NIST Gaithersburg: SURFING CTL (Communications Technology Laboratory)

- **Range of Research Activities**
  - **High speed electronics**
  - **Wireless Systems Metrology**
  - **Antennas**
  - **Advanced optics**
  - **Network design and optimization**
  - **Public Safety Communications**

***Relevant Academic Majors**: computer science, mathematics, statistics

NIST Gaithersburg: SURFING MML/NCNR (Material Measurement Laboratory/NIST Center for Neutron Research)

Applicants can choose from two SURF concentrations:

1. Materials Science – Projects focus on synthesis, measurements, and computational/theory/modeling of innovative materials and devices

Range of Research Activities: ceramics, metallurgy, polymers, condensed matter science, biomaterials, semiconductors, metals, nanoscale materials and measurements (includes activities at the NCNR)

***Relevant Academic Majors**: materials science, chemistry, biochemistry, physics, physical sciences, mathematics, computer science, engineering, biological sciences, nuclear engineering (limited slots)

2. Chemical and Biochemical Sciences – Projects address the nation's needs for measurements, standards, technology development, and reference data in the areas broadly encompassed by chemistry, biotechnology, and chemical engineering.

Range of Research Activities: from fundamental work in the composition, structure, properties, and processes of chemical, biological, environmental, and nanomaterials to the development and dissemination of certified reference materials, critically evaluated data, and advanced chemical and biochemical measurement paradigms

***Relevant Academic Majors**: chemistry, biochemistry, molecular biology, chemical engineering, computer science, environmental science, and to a lesser extent materials science, physics, mathematics, and other areas of engineering

NIST Gaithersburg: SURFING PML (Physical Measurement Laboratory)

Applicants can choose from two SURF concentrations:

1. Physics – Projects provide hands-on research experience in physics fields of atomic, molecular, optical, radiation, chemical and condensed matter physics.

Range of research activities: atomic and molecular effects in spectroscopy, surface effects, collision, dynamics, and chemistry; radioactivity in environmental sensing, industrial dosimetry, and physical therapy, laser cooling and trapping; UV/optical/infrared light in detector development, tweezers and quantum optics; QED effects on atomic structure.

***Relevant Academic Majors**: physics, computer science, electrical engineering, mechanical engineering, mathematics, nanoscience

2. Electrical Engineering – Projects involved developing new electronic devices and metrology to serve US industry's need for improved and standardized measurement.

Range of research activities: Electrical engineering and control of systems applications for power-efficient electronics, reliability, high power and smart grid, CMOS and nanoelectonrics, dimensional metrology, and nano-interconnects. Also cross-disciplinary electronics application such as large area electronics (including solar cells), molecular/organized electronics, bioelectronics, MEMS, and quantum-based devices related to electrical and mass standards.

***Relevant Academic Majors**: biochemistry, chemistry, computer science, electrical engineering, mechanical engineering, material science, mathematics, nanoscience, and physics.

NIST Gaithersburg: SURFING Special Projects – Special Projects

- Periodically, there are opportunities for SURF students to participate in technical special projects (in Gaithersburg) which are not located in the NIST laboratories. NIST is soliciting applications for SURF students in the following special projects:
  - Standards Coordination Office (SCO) – 2 opportunities
  - Information Services Office (ISO)- 1 opportunity
  - Technology Partnerships Office (TPO)- 1 opportunity

Selecting Research Preferences for the SURF Program @ Boulder

- Boulder Process
  - Students select top six (6) research project preferences
    - Visit https://www.nist.gov/surf/surf-boulder/research-opportunities for a description of the 2018 research opportunities
  - There is an 8 applicant limit per institution for this site

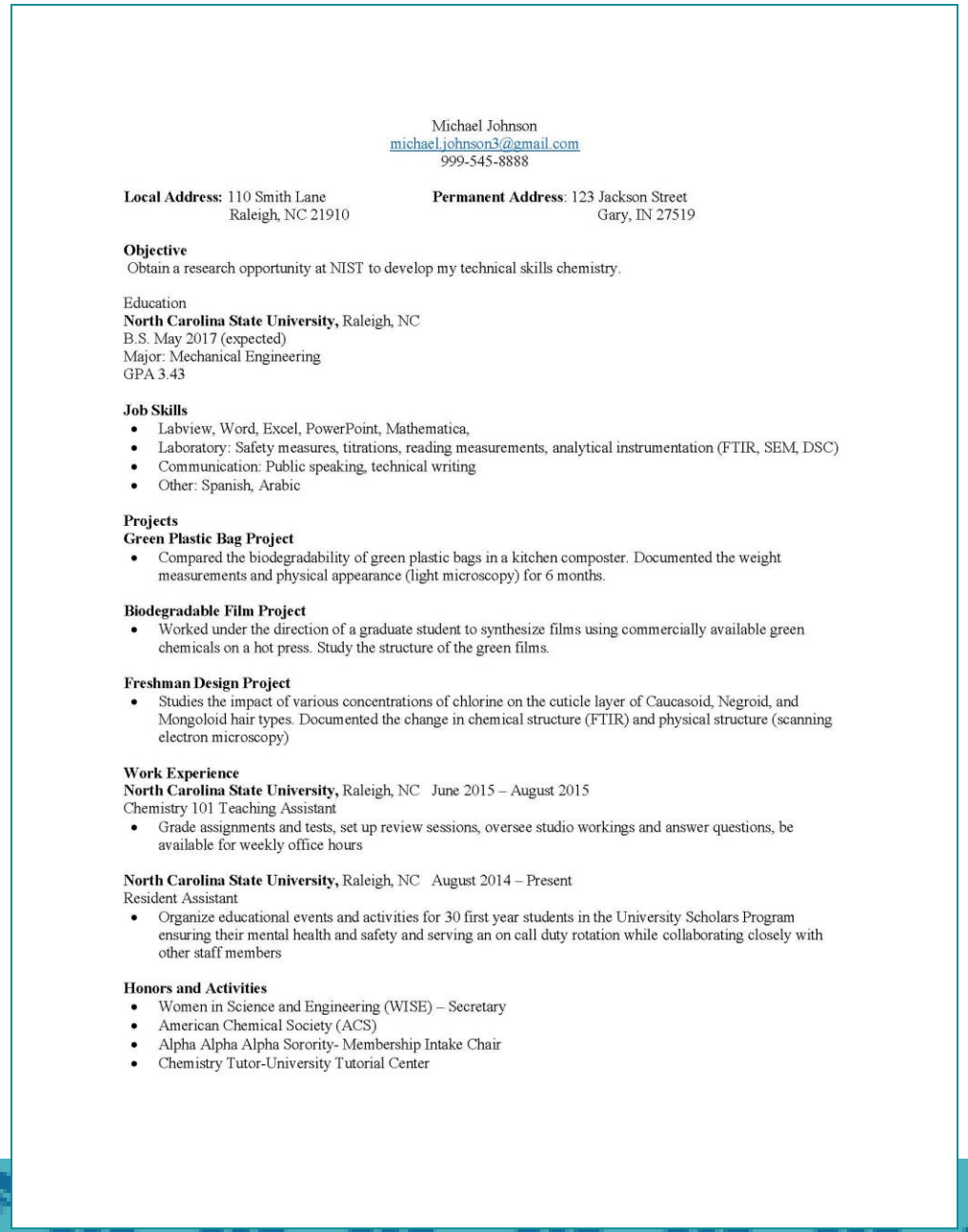
Example of Research Opportunity Posting @ Boulder Site

- Division Name
- Project Title
- NIST staff project contact
- Project description

SURF

Resume and Personal Statement

Resume



Michael Johnson
michael.johnson3@gmail.com
999-545-8888

Local Address: 110 Smith Lane
Raleigh, NC 21910

Permanent Address: 123 Jackson Street
Gary, IN 27519

Objective
Obtain a research opportunity at NIST to develop my technical skills chemistry.

Education
North Carolina State University, Raleigh, NC
B.S. May 2017 (expected)
Major: Mechanical Engineering
GPA 3.43

Job Skills
- Labview, Word, Excel, PowerPoint, Mathematica,
- Laboratory: Safety measures, titrations, reading measurements, analytical instrumentation (FTIR, SEM, DSC)
- Communication: Public speaking, technical writing
- Other: Spanish, Arabic

Projects
Green Plastic Bag Project
- Compared the biodegradability of green plastic bags in a kitchen composter. Documented the weight measurements and physical appearance (light microscopy) for 6 months.

Biodegradable Film Project
- Worked under the direction of a graduate student to synthesize films using commercially available green chemicals on a hot press. Study the structure of the green films.

Freshman Design Project
- Studies the impact of various concentrations of chlorine on the cuticle layer of Caucasoid, Negroid, and Mongoloid hair types. Documented the change in chemical structure (FTIR) and physical structure (scanning electron microscopy)

Work Experience
North Carolina State University, Raleigh, NC June 2015 – August 2015
Chemistry 101 Teaching Assistant
- Grade assignments and tests, set up review sessions, oversee studio workings and answer questions, be available for weekly office hours

North Carolina State University, Raleigh, NC August 2014 – Present
Resident Assistant
- Organize educational events and activities for 30 first year students in the University Scholars Program ensuring their mental health and safety and serving an on call duty rotation while collaborating closely with other staff members

Honors and Activities
- Women in Science and Engineering (WISE) – Secretary
- American Chemical Society (ACS)
- Alpha Alpha Alpha Sorority- Membership Intake Chair
- Chemistry Tutor-University Tutorial Center

Be sure to include the following

- GPA
- Study Abroad Experiences
- Special Skills (research, computer, language)
- Any tutoring or mentoring experience
- Leadership Skills
- Involvement in professional organizations

Part 1: Personal Statement

I decided to attend North Carolina State University s for the intellectual challenge. As a junior in the Engineering Physics program, I would say that I found that challenge. Every day, I find myself throwing my pencil to the paper and pushing myself back in my chair for the sheer magnitude of wonder that each lecture presents. I find, and have always found, physics beautiful. This is how the world works. And it is awe inspiring. My other classes only add to the wonders opening before me. For example Programming Concepts and Digital Electronics did not so much me awestruck by the wonders of what the world is, but instead made me breathless by the wonders of what I can do for it.

I am on the unique path of a five year combined program with an Engineering Physics Bachelor's Degree and an Applied Mathematics and Statistics Masters. This gives me the opportunity to see the wonders of the world in a different way than many of my classmates. I am given two lenses t o use when approaching electricity and magnetism or quantum mechanics. It is important to me not j u s t to understand what these are, but to understand how they can be used to solve some of the great problems of the world. Last semester I learned how to build and use AND gates and OR gates, and electronically what that looks like. I designed and built a counter and a machine that measures and displays an unknown frequency. But what I loved most about that was taking that knowledge with me as I learned how to program in C++, and seeing the differences between hardwiring a chip and programming a computer. I loved having an idea of what the computer looks at to see if 5 is truly equal to 5. But even that was not the most satisfying part of my semester. I then took what I learned from that class and brought it to my EPICS course, a course designed to give students experience in working with teams, clients and supervisors, writing paperwork, and executing a real-world problem. So I was able to take what I knew from one language and apply it to another as we learned Python in order to write a program that analyzed data for the location of water molecules in varying sizes of carbon cages and returned plots of the location and hydrogen bond density over time. Stepping from Physics and into the world of math and programming to return to physics, understanding the nature of the world around us i s one of the greatest joys I will ever encounter. This is a full circle that many of my peers never get the opportunity to see.

Start your personal statement by describing why you have a passion for STEM.
Think about what sparks your interest in your discipline. In other words, what energizes you.

Part 2: Personal Statement

Last summer, I attended the field session for physics. This is a summer only class where every major at Mines offers a unique experience geared toward their students. In this time, I assembled a laser from a mirror and a HeNe tube and used that laser to create a 3-D image on a screen. I also investigated vacuum technology, including thin film deposition and analyzing the deposition using several tools to show reflectivity and thickness. Another project was to build a small steam engine from a Solidworks part, which included spending time with lathes and cnc machines. In that time I also learned LaTex, Mathematica and Kile and spent time exploring labview - programming a working musical tuner with labview. It was a wonderful experience to have that many hands-on projects, and I learned a lot from that time. I hope to get as much out of this summer.

To get the opportunity to work closely with the projects at NIST would be a dream come true for me. Learning and discovering is one of my passions, and I have found in myself the desire to see that discovery benefit the world. The Center for Nanoscale Science and Technology appeals to my desire not only to be on the cutting edge of discovery, but to bring what we know forward. These projects look specifically at how to take what has been done and improve it, nanofabrication, nanophotonics, and thermoelectrics are fascinating. They seem like science fiction, and yet are already in use in some places, holding within them the potential to aid in our energy crisis. Looking at the Engineering Laboratory, I see ways to improve the safety and energy efficiency of construction. At the beginning of this year, I spent some time on a construction site and noticed that each worker had a badge on which they wrote "I am safe for:" some had "rock climbing" and others a photograph of their daughter or family. It made me realize that in such an environment, safety is critical. Improving guidelines and methods will not only improve the buildings we live in, but the quality of work for the people who build them. This holds for every manufacturing industry, and I feel that this is important to recognize. These two topics were discussed in an ethics course I took, and I found them of great interest from the side of morals, discussing questions such as releasing the relative unknown of nanotechnology to the public, or the perceived strictness of health and safety standards.

In my career, I hope to work in research, preferably in a laboratory working to bring new discoveries to light and to the world's benefit. Whether I spend time at a well-known institution such as NIST or hidden within a small company, my goal is to improve the world with my knowledge. Getting the opportunity to experience that first hand is not just a resume builder for me, it is the opportunity to do my dream job.

- Include descriptions of previous research opportunities or related projects

- Elaborate on why you wish to participate in the SURF Program.
- Which lab are you interested in conducting research.
- What do you hope to gain from the experience

- What are your career interest?
- Do you plan to attend graduate school?

SURF

Other Student Application components

- SURF coversheet or checklist (https://www.nist.gov/sites/default/files/documents/2017/11/27/surf_application_checklist.pdf)
- Resume
- Transcript (Unofficial is okay)
- Two letters of recommendation
- Proof of US citizenship or Permanent Residency

University Component

- Federal Forms – Completed in Grants.Gov as a part of the standard application download
  - SF 424
  - SF 424A
  - SF 424B
  - CD 511
  - SF LLL (optional)

- Proposal – Attached in Item 15 of the SF-424 along with the student application component

*** University (specifically the Sponsored Research Office or Grants Office) submits ALL the application materials via Grants.gov

SF-424

View Burden Statement

SF-424

OMB Number: 4040-0004
Expiration Date: 8/31/2016

Application for Federal Assistance SF-424

* 1. Type of Submission:
- [ ] Preapplication
- [x] Application
- [ ] Changed/Corrected Application

* 2. Type of Application:
- [x] New
- [ ] Continuation
- [ ] Revision

* If Revision, select appropriate letter(s):

* Other (Specify):

* 3. Date Received:

4. Applicant Identifier:

5a. Federal Entity Identifier:

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Fill in requested information

* b. Employer/Taxpayer Identification Number (EIN/TIN):

* c. Organizational DUNS:

d. Address:

* Street1: Enter text
Street2:
* City: Enter text
County/Parish:
* State:
Province:
* Country: USA: UNITED STATES
* Zip / Postal Code: Enter number

e. Organizational Unit:

Department Name: Enter text

Division Name: Enter text

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:
* First Name: Enter text
Middle Name:
* Last Name: Enter Text
Suffix:

Title: Enter text

Organizational Affiliation: Enter text

* Telephone Number: Enter number
Fax Number:

* Email: etner email@email

Leave 3-7 blank

Enter appropriate numbers in 8b. And 8c.

NIST

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Application for Federal Assistance SF-424

* 9. Type of Applicant 1: Select Applicant Type:

H: Public/State Controlled Institution of Higher Education

Type of Applicant 2: Select Applicant Type:

T: Historically Black Colleges and Universities (HBCUs)

Type of Applicant 3: Select Applicant Type:

* Other (specify):

* 10. Name of Federal Agency:

National Institute of Standards and Technology

11. Catalog of Federal Domestic Assistance Number:

11.620

CFDA Title:

* 12. Funding Opportunity Number:

2018-NIST-SURF-01

Title:

Summer Undergraduate Research Fellowship (SURF) Program

13. Competition Identification Number:

2018-NIST-SURF-01

Title:

NIST SURF Program

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

List your school's city, county, state

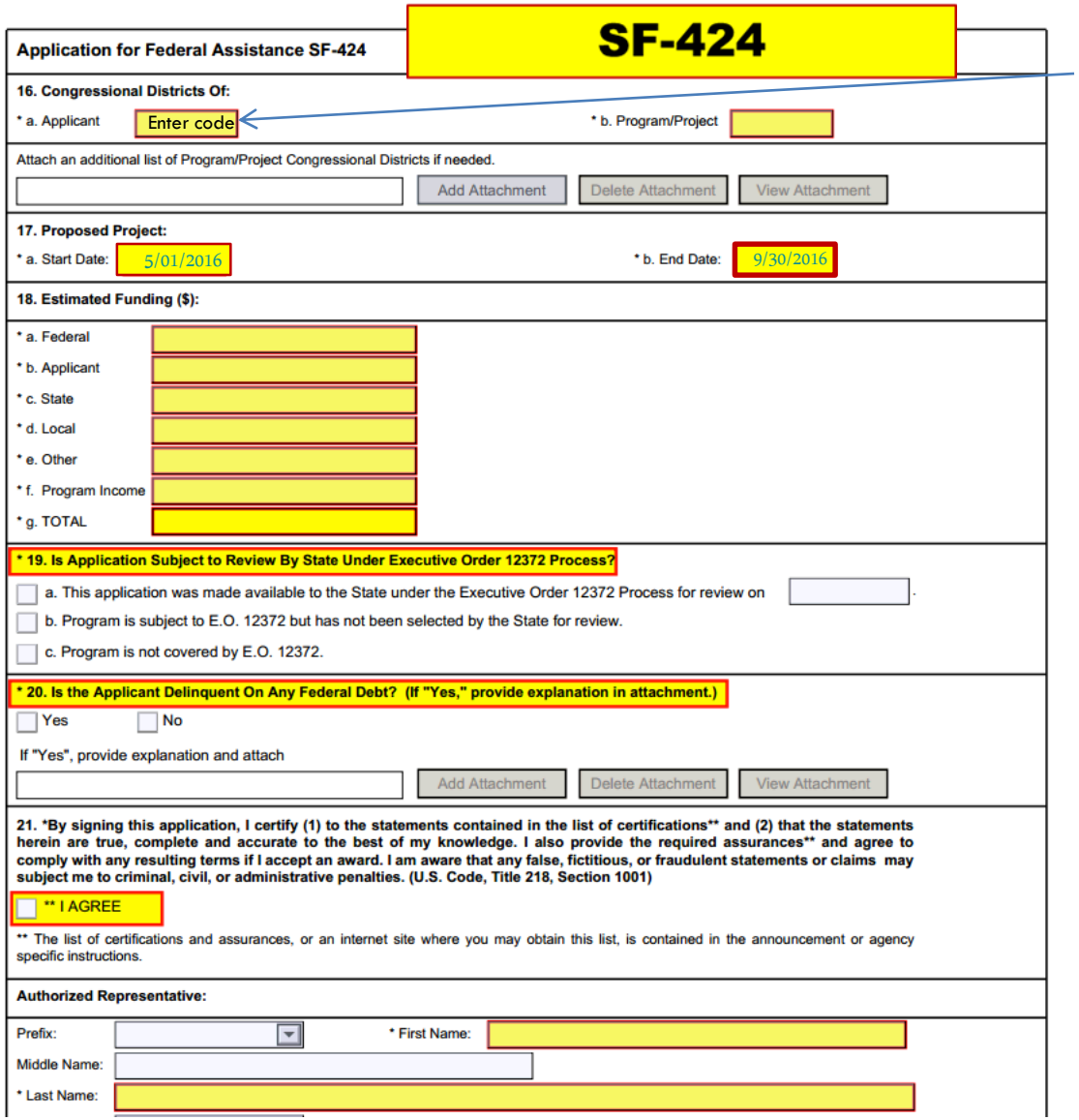
* 15. Descriptive Title of Applicant's Project:

NIST Summer Undergraduate Research Fellowship Program-Boulder
Or
NIST Summer Undergraduate Research Fellowship Program-Gaithersburg

Add Attachments | Delete Attachments | View Attachments

SURF

NIST



Application for Federal Assistance SF-424

SF-424

16. Congressional Districts Of:

* a. Applicant: Enter code

* b. Program/Project:

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 5/01/2016

* b. End Date: 9/30/2016

18. Estimated Funding ($):

* a. Federal
* b. Applicant
* c. State
* d. Local
* e. Other
* f. Program Income
* g. TOTAL

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

a. This application was made available to the State under the Executive Order 12372 Process for review on .

b. Program is subject to E.O. 12372 but has not been selected by the State for review.

c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

Yes No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: * First Name:

Middle Name:

* Last Name:

a good web resource to find your Congressional district - http://www.house.gov/writerep/ or http://nationalatlas.gov/printable/congress.html

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Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant
* b. Program/Project

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 05/01/2017
* b. End Date: 9/30/2017

18. Estimated Funding ($):

* a. Federal	
* b. Applicant	
* c. State	
* d. Local	
* e. Other	
* f. Program Income	
* g. TOTAL	

Insert from SF 424A, line 6k.

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

- [ ] a. This application was made available to the State under the Executive Order 12372 Process for review on .
- [ ] b. Program is subject to E.O. 12372 but has not been selected by the State for review.
- [x] c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

- [ ] Yes
- [ ] No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

- [ ] ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: | * First Name: Insert text

Middle Name:

* Last Name: Insert text

Suffix:

* Title: Insert text

* Telephone Number: Insert number | Fax Number:

* Email: Insert text

* Signature of Authorized Representative: | * Date Signed:

NIST

SURF

SF-424A

SF-424A

Single nominee example

BUDGET INFORMATION - Non-Construction Programs

OMB Approval No. 0348-0044

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	To
1. NIST SURF Program	11.609	$ 9,500.00	$	$	$	$ 9,500.00
2.						0.00
3.						0.00
4.						0.00
5. Totals		$ 9,500.00	$ 0.00	$ 0.00	$ 0.00	$ 9,500.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1)	(2)	(3)		Tota (6)
a. Personnel	$	$	$	$	$ 0.00
b. Fringe Benefits					0.00
c. Travel	4,000.00				4,000.00
d. Equipment					0.00
e. Supplies					0.00
f. Contractual					0.00
g. Construction					0.00
h. Other	5,500.00				5,500.00
i. Total Direct Charges *(sum of 6a-6h)*	9,500.00	0.00	0.00	0.00	9,500.00
j. Indirect Charges					0.00
k. TOTALS *(sum of 6i and 6j)*	$ 9,500.00	$ 0.00	$ 0.00	$ 0.00	$ 9,500.00
7. Program Income	$	$	$	$	$ 0.00

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Standard Form 424A (Rev. 7-97)
Prescribed by OMB Circular A-102

Previous Edition Usable

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SURF

SF-424A

Multiple nominee example

Approval No. 0348-0044

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. NIST SURF Program	11.609	$ 19,000.00	$	$	$	$ 0
2.						0
3.						0
4.						0
5. Totals		$ 19,000.00	$ 0	$ 0	$ 0	$ 0

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1)	(2)	(3)	(4)	Total (5)
a. Personnel	$	$	$	$	$ 0
b. Fringe Benefits					0
c. Travel	8,000.00				8,000.00
d. Equipment					0
e. Supplies					0
f. Contractual					0
g. Construction					0
h. Other Stipend	11,000.00				11,000.00
i. Total Direct Charges *(sum of 6a-6h)*	19,000.00	0	0	0	19,000.00
j. Indirect Charges	0.00				0
k. TOTALS *(sum of 6i and 6j)*	$ 19,000.00	$ 0	$ 0	$ 0	$ 19,000.00
7. Program Income	$	$	$	$	$

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Standard Form 424A (Rev. 7-97)
Prescribed by OMB Circular A-102

Reset Fields | Print Form

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SECTION C - NON-FEDERAL RESOURCES				
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8.	$	$	$	$ 0
9.				0
10.				0
11.				
12. TOTAL *(sum of lines 8-11)*	$	$	$ 0	$ 0

SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 0	$	$	$	$
14. Non-Federal	0				
15. TOTAL *(sum of lines 13 and 14)*	$ 0	$ 0	$ 0	$ 0	$ 0

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT				
(a) Grant Program	FUTURE FUNDING PERIODS (Years)			
	(b) First	(c) Second	(d) Third	(e) Fourth
16.	$	$	$	$
17.				
18.				
19.				
20. TOTAL *(sum of lines 16-19)*	$ 0	$ 0	$ 0	$ 0

SECTION F - OTHER BUDGET INFORMATION	
21. Direct Charges:	22. Indirect Charges:
23. Remarks:	

SF-424B

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OMB Approval No. 0348-0040

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

NIST

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9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
APPLICANT ORGANIZATION	DATE SUBMITTED: January 20, 2014

Standard Form 424B (Rev. 7-97) Back

NIST

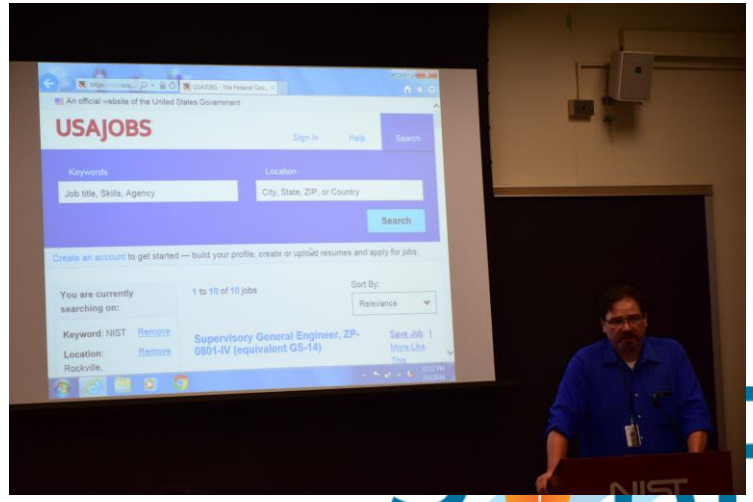
Stipend and Housing Allowance

- **SURF** participants receive
  - $5500 stipend for an 11-week fellowship or $500/week
  - Travel allowance (up to $600)
  - Housing in a nearby apartment or suite-style apartment

Other Components of the SURF Program

Weekly Technical Seminars

Laboratory Tours



Professional Development Seminars

Benefits of Participating in the Program

- SURF participants have the opportunity to contribute to exciting, real world, innovative, ongoing research projects in one of the seven NIST laboratories
- You will decide if a career in research is right for you
- Establish a mentor
- Learn how to communicate science
- Visit Capitol Hill
- Increase your network
- Visit new places
- Land a permanent position

Acceptance Rates

2017 Acceptance Rates @ Gaithersburg Site

NIST Research Labs	Students Applied	Students Accepted	Total Accepted (%)
CNST	47	6	13
EL	115	33	29
ITL/CTL	102	39	38
MML Chem Bio	110	22	20
MMML/NCNR MatSci	118	51	43
PML _ EE	30	18	60
PML_Physics	70	16	23
Special Programs	0	4	N/A

Acceptance Rate in the Overall Program: 615 applicants, 190 accepted (30%)

Program Acceptance Rate @ Boulder Site

24 acceptances

178 applications

13%

Don’t Forget!!!

- The Federal Funding Opportunity contains important dates and information for applying to the program. A copy is located at https://www.grants.gov/web/grants/view-opportunity.html?oppId=299040
- SURF application (student and university component) is required to be submitted by the nominating university via Grants.Gov
- If applying to Boulder and Gaithersburg locations, must submit an application to each location separately
- Read a blog posting about “Why You Should Consider a Summer Internship at NIST” http://nist-takingmeasure.blogs.govdelivery.com/calling-college-stem-students-why-you-should-consider-a-summer-internship-nist/
- SURF Website - www.nist.gov/surf
- Application deadline is February 12, 2018

Hope you will consider applying to the SURF Program next year. We may just find you in this picture for the 2018 SURF Program!

SURF

SURF NIST

Thank You!!!

Visit: www.nist.gov/surf

or

e-mail: Brandi.Toliver@nist.gov