NIST Summer Undergraduate Research Fellowship (SURF) Program

Dr. Brandi Toliver
Managing SURF Program Director

SURF

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?

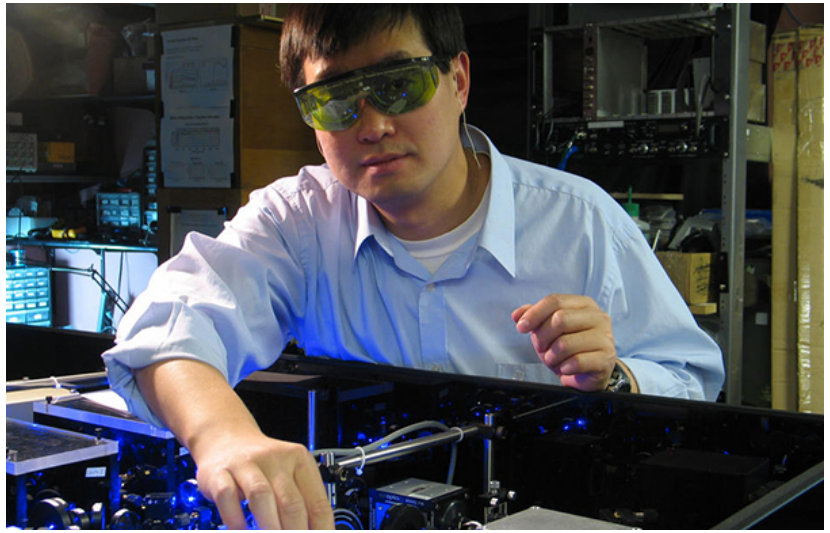
- More than 3,000 law-enforcement officers have been spared from death or disabling injury as a result of NIST-developed standards for ballistic-resistant body armor ("bullet-proof" vests)?
- Many of the tools and materials used in modern dentistry—from the panoramic X-ray to composite fillings to an 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 Mission

To 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



Measurements essential to commerce, trade, and innovation

Federal role established in the U.S. Constitution

Measurement Science, Standards & Technology

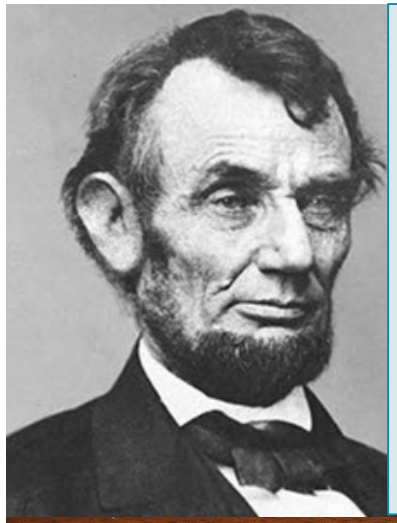
Nordroden/Shutterstock

Important to:

- **Commerce**
- **International trade**
- **Innovation**

Up to 92% of U.S. exports affected by standards / technical regulations

Innovation



The patent system … added the fuel of interest to the fire of genius in the discovery and production of new and useful things.

Abraham Lincoln – April 6, 1858

U.S. Patent No. 6469

…Giving effectual encouragement as well to the introduction of **new and useful inventions** from abroad as to the exertions of skill and genius in producing them at home, and of facilitating the intercourse between the distant parts of our country…

George Washington, State of the Union Address, January 8, 1790

NIST's Biggest Strength: Our Reputation

NIST Nobel Laureates David Wineland, Eric Cornell, and Bill Phillips

- Technical excellence
- Integrity
- Uncompromising
- Rigorous
- Unbiased
- Industry focused
- Non-regulatory

NIST Partners Include Industry, Academia, and Government

Industry

Universities

Nonprofits

Government

NIST's Leadership Team

Chief of Staff

Kevin Kimball
Chief of Staff
NIST

Director

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

Laboratory Programs

Jim Olthoff
Associate Director
for Laboratory Programs

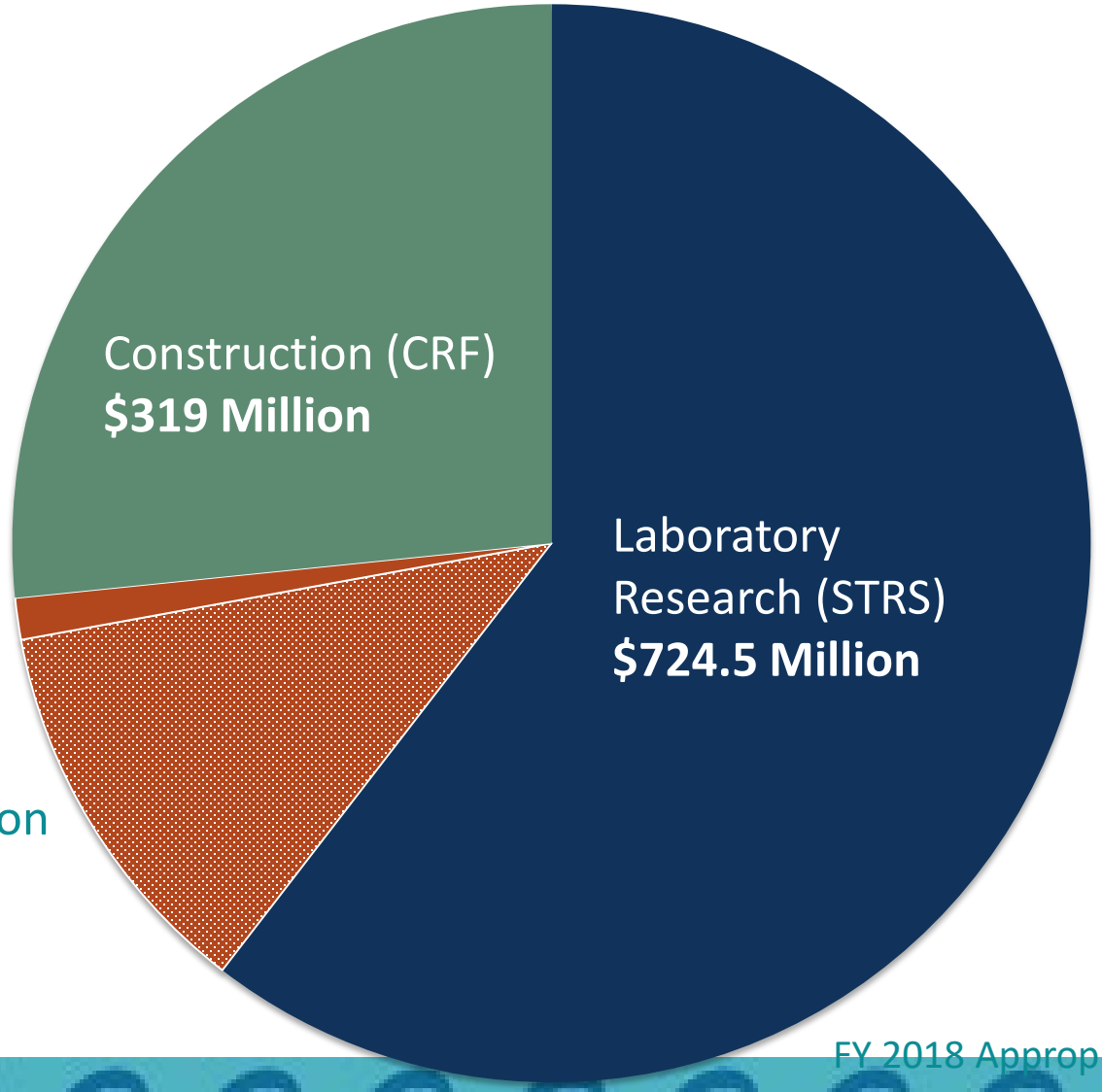
Innovation and Industry Services

Phillip Singerman
Associate Director
for Innovation and Industry Services

Management Resources

Del Brockett
Associate Director
for Management Resources

NIST Budget: $1.2 B



Manufacturing USA (ITS)
$15 Million

Manufacturing Extension
Partnership (ITS)
$140 Million

FY 2018 Appropriated Budget

NIST AT A GLANCE

Industry's National Laboratory

3,400+
FEDERAL EMPLOYEES

5
NOBEL PRIZES

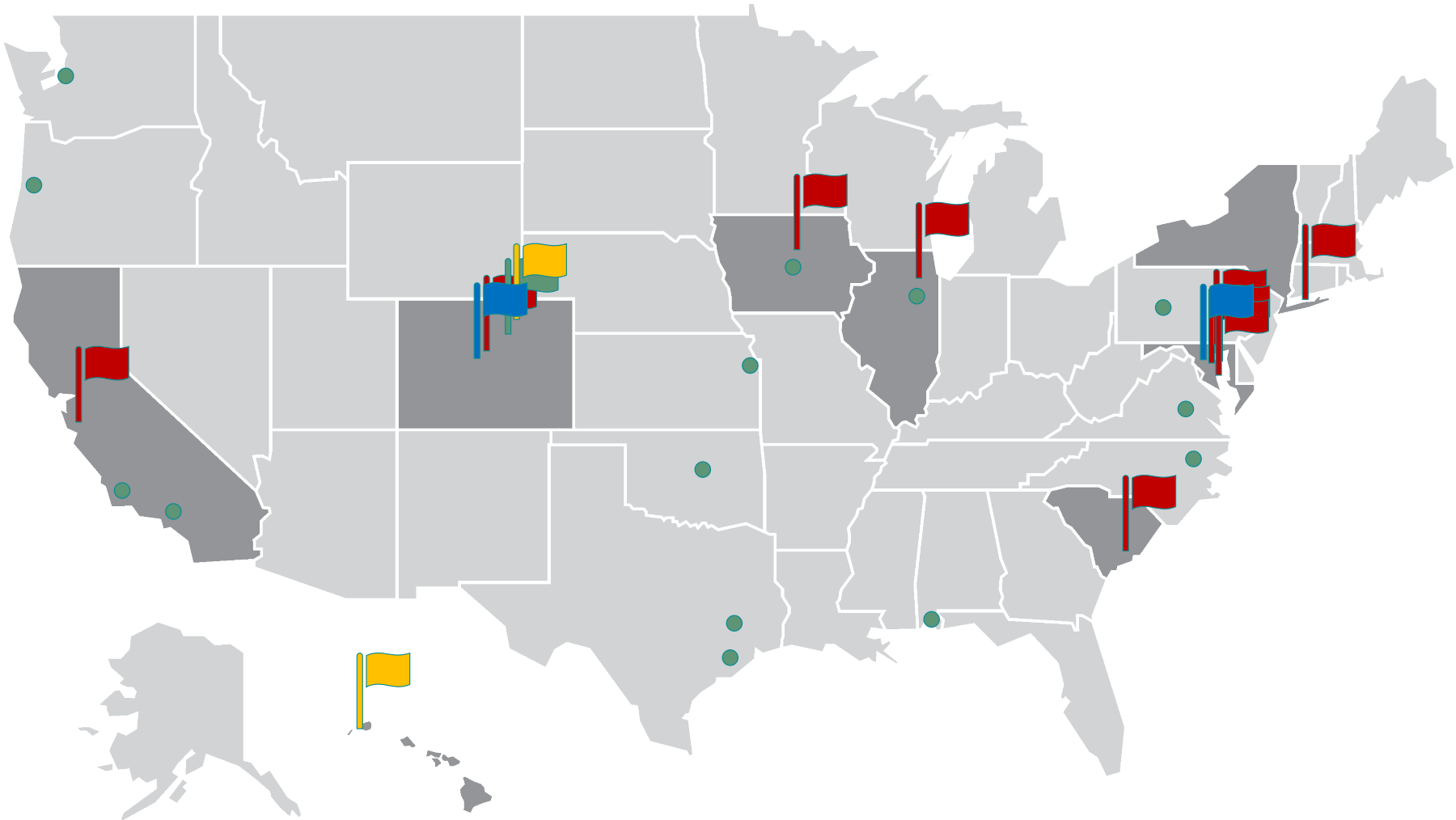
2 Main Campuses
GAITHERSBURG, MD [HQ]
BOULDER, CO

3,500+
ASSOCIATES

10
COLLABORATIVE INSTITUTES

Thousands
of U.S. BUSINESSES
Collaborate with NIST

NIST and Joint Institute Locations



NIST Main Campuses

- **Gaithersburg, MD**
- **Boulder, CO**

Joint Institutes and Centers

- National Cybersecurity Center of Excellence
- Institute for Bioscience & Biotechnology Research
- Joint Quantum Institute
- Joint Center for Quantum information & Computer Science
- JILA
- Hollings Marine Lab
- Brookhaven National Lab
- Joint Initiative for Metrology in Biology

Atomic Clock Signal Stations

- NIST Ft. Collins CO WWV
- NIST Kauai HI WWVH

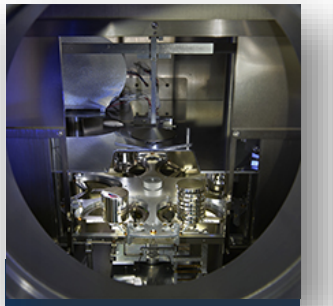
NIST Centers of Excellence

- Forensic Science
- Disaster Resilience
- Advanced Materials

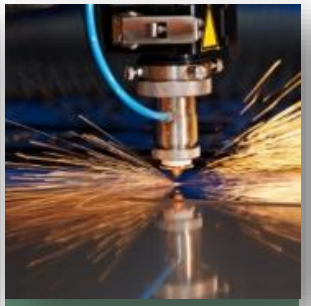
NIST Collaborative Research Centers

NIST Laboratory Programs

Material Measurement Laboratory



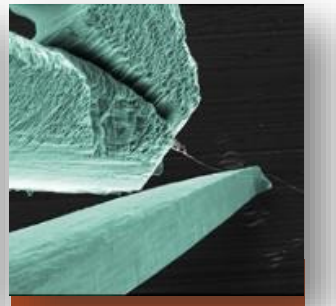
Physical Measurement Laboratory



Engineering Laboratory

Information Technology Laboratory

Communication Technology Laboratory



Center for Nanoscale Science and Technology

NIST Center for Neutron Research

Unique NIST Products and Services

1,200 Standard Reference Material (SRM) products

100 Standard Reference Data (SRD) products

600 measurement services

Every year:

32,000 SRM units sold

13,000 calibrations and tests

800 accreditations of testing and calibrations laboratories

Accurate Time is Essential

GPS, Internet, and Telecommunications rely on NIST's time standard

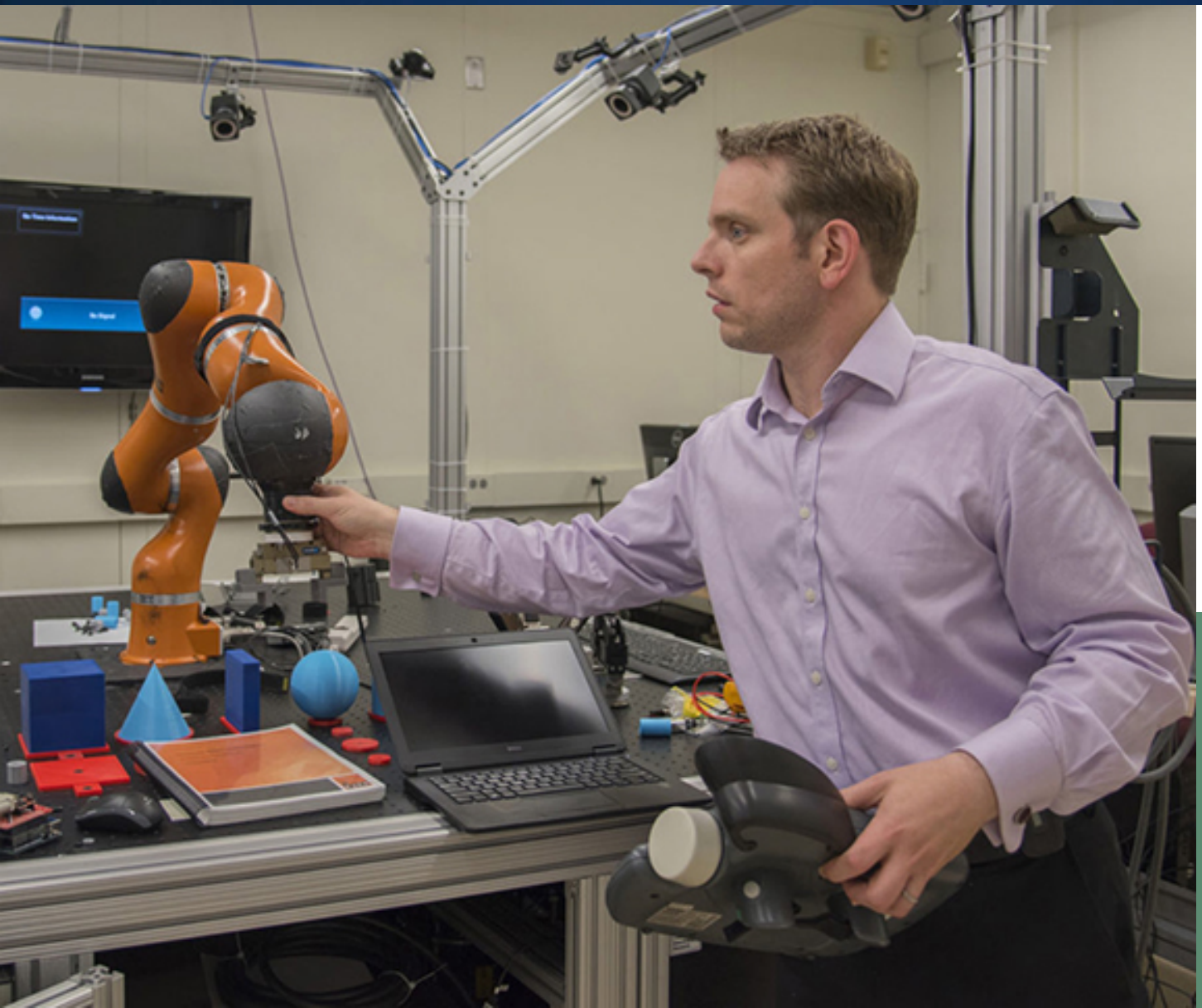
Calibrated Equipment is Essential

Boeing force measurements are traceable to the SI

Certified Reference Materials are Essential

NIST's Genome in a Bottle reference material ensures the accuracy of new, high-throughput DNA tests

Documentary Standards



Important Role

- **400+** NIST technical staff in **100+** standard committees
- Leadership in **international standards** bodies

NIST's technical expertise results in improved standards and U.S. competitiveness

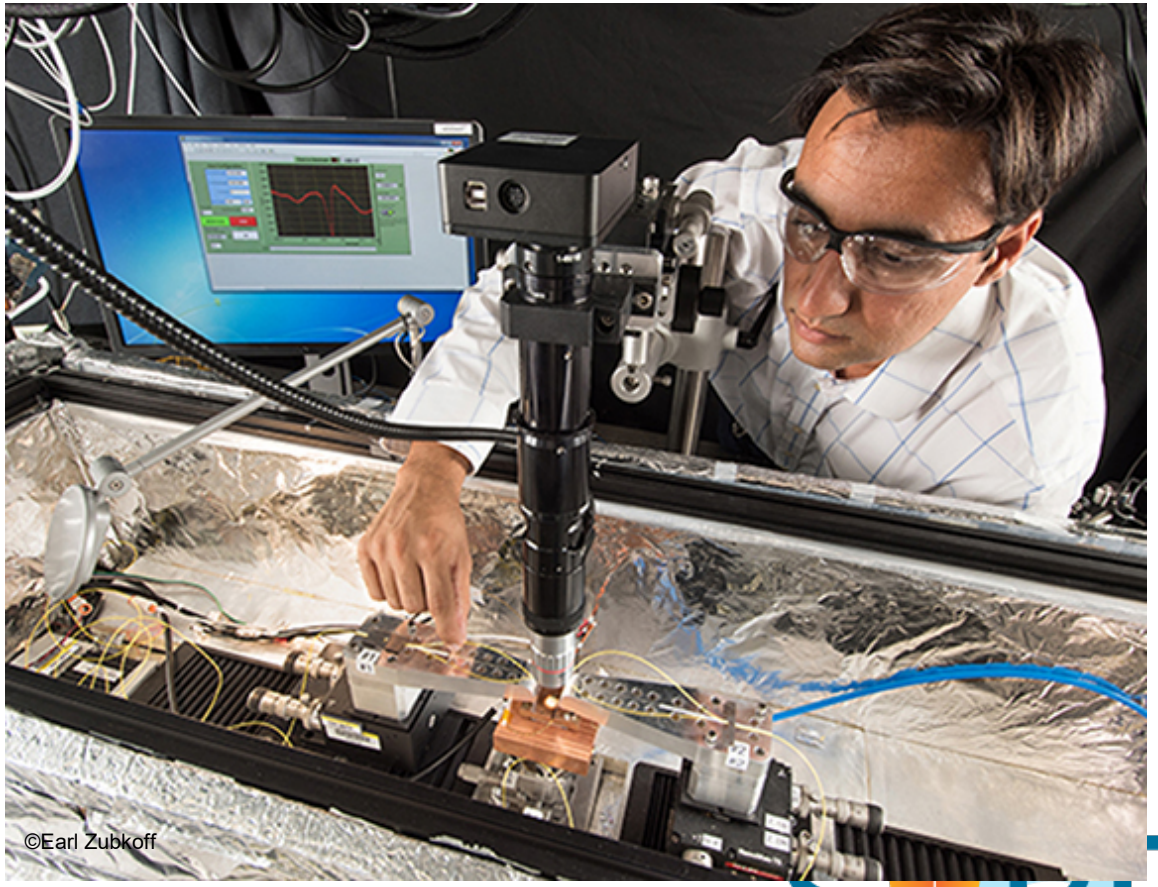
Strategic Priorities, National Impacts

Cybersecurity

Advanced Manufacturing

Strategic Priorities, National Impacts

Bioeconomy



Quantum Science

Strategic Priorities, National Impacts

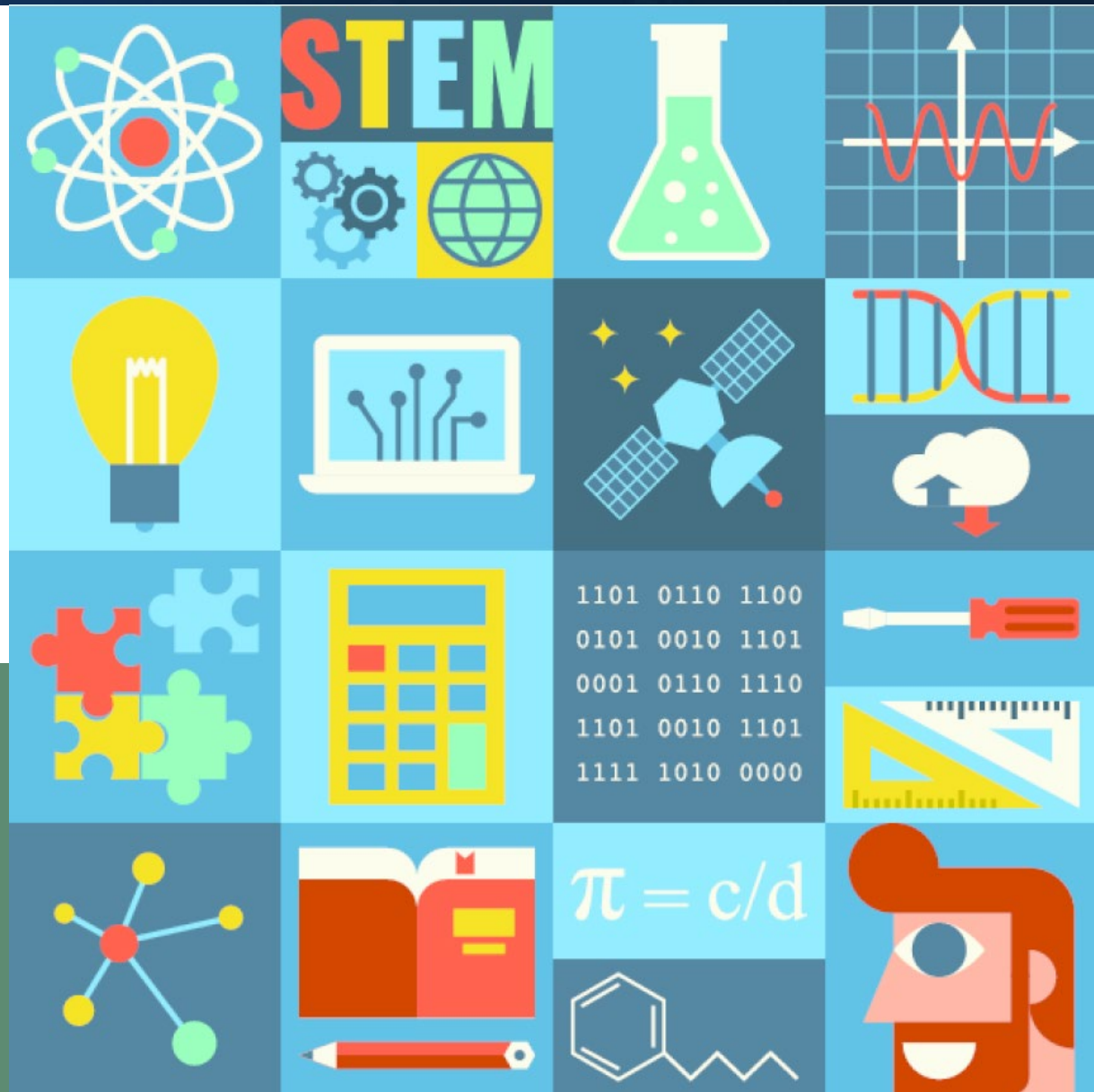
Artificial Intelligence

Internet of Things

Mission in STEM Education

To develop a diverse, world-class pool of scientists and engineers to support NIST's mission in measurement science and standards research, and to support the development of a general population that understands and appreciates measurement science and standards.

The development and support of highly-skilled, talented people is an integral component of U.S. economic strength



SURF Program

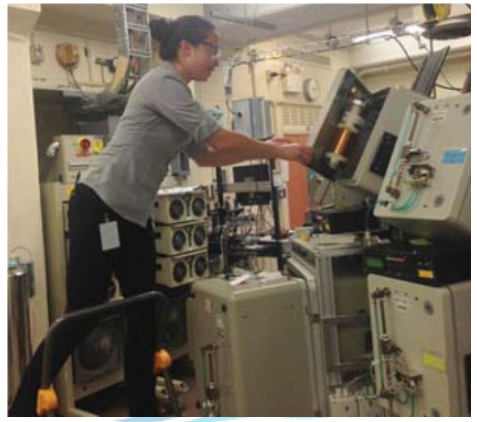
Background info on the SURF Program

- 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 at Gaithersburg and Boulder campuses
- To date 2,985 undergraduates have participated in the program
- The 2019 SURF Program consisted:

  Boulder: 17 participants

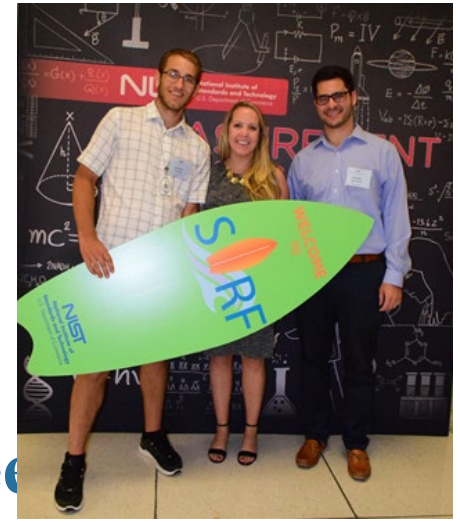
  Gaithersburg: 158 participants

- SURF website: https://www.nist.gov/surf



Eligibility Requirements

- Must be a United States citizen
- 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
- Considering the pursuit of a graduate degree or caree in STEM



SURF

Important Dates

- **APPLICATION DEADLINE:** ***February 3, 2020 or when the applicant limit is reached***
- **Program Dates**

  SURF Boulder: May 18, 2020-July 31, 2020

  SURF Gaithersburg: May 26, 2020-August 7, 2020

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Application Requirements

- **Students must apply and submit their entire application package on USAJOBS.gov. Note: SURF Boulder and SURF Gaithersburg have separate vacancies.**

- **A completed submission includes:**
  - Responses to the on-line questionnaire
  - Transcript (Unofficial recommended)***
  - Personal Statement***
  - Resume***
  - Verification of health insurance coverage***
  - Proof of US citizenship ***
  - Two (2) letters of recommendation

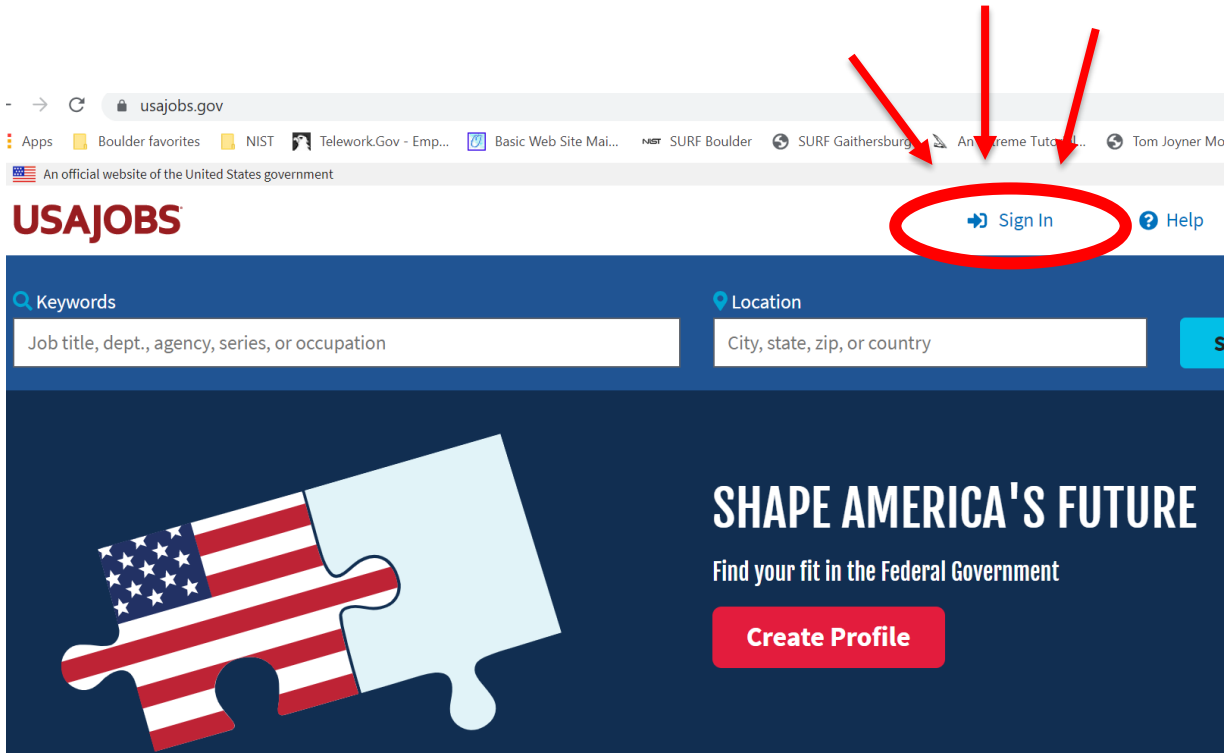
***Indicates the component is an attachment**

NOTE: Prospective applicants must create a profile on USAJobs.Gov to apply to the program.

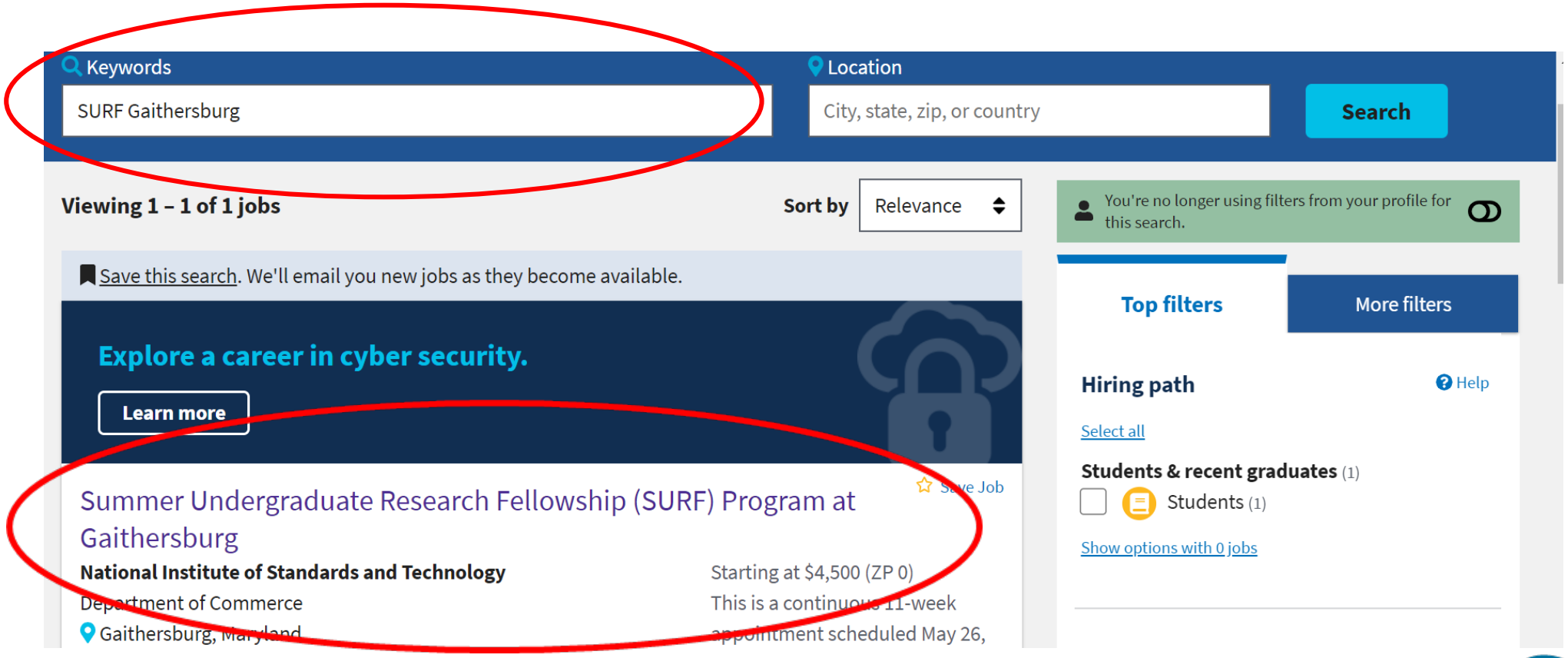
SURF

STEP 1: Sign In

1. Visit USAJOBS.GOV
2. Sign in to your account. The account is called login.gov. If you do not have an account and need assistance creating it, visit https://www.usajobs.gov/Help/faq/account/login-gov/.



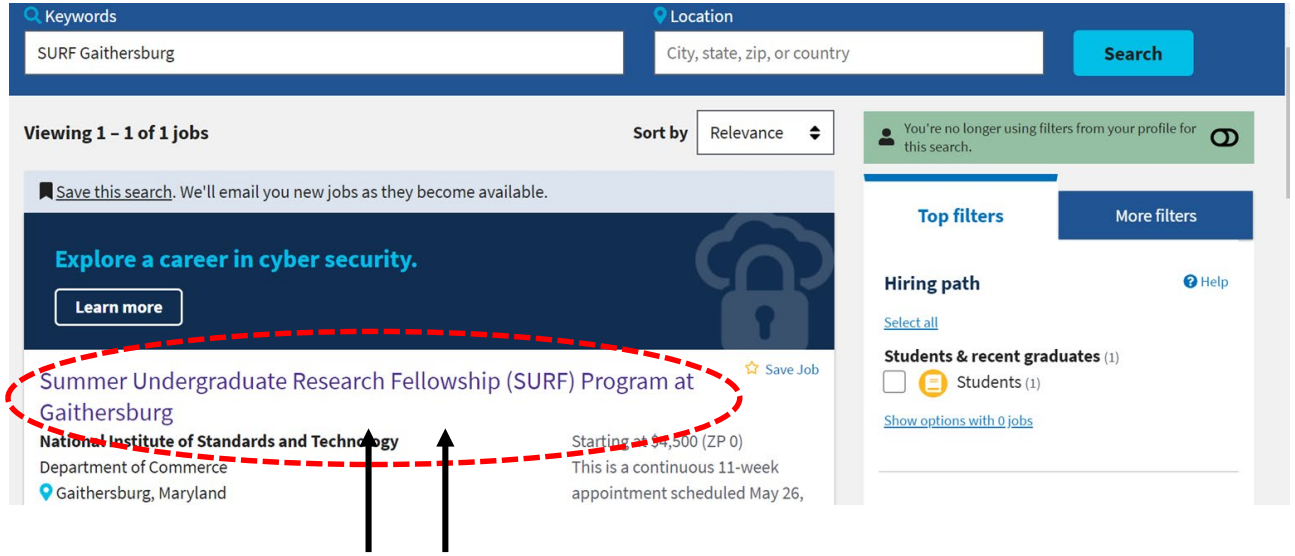
Step 2: Search for the Announcement



***Keywords: SURF, SURF Boulder, SURF Gaithersburg, NIST

Step 3: Select the Announcement

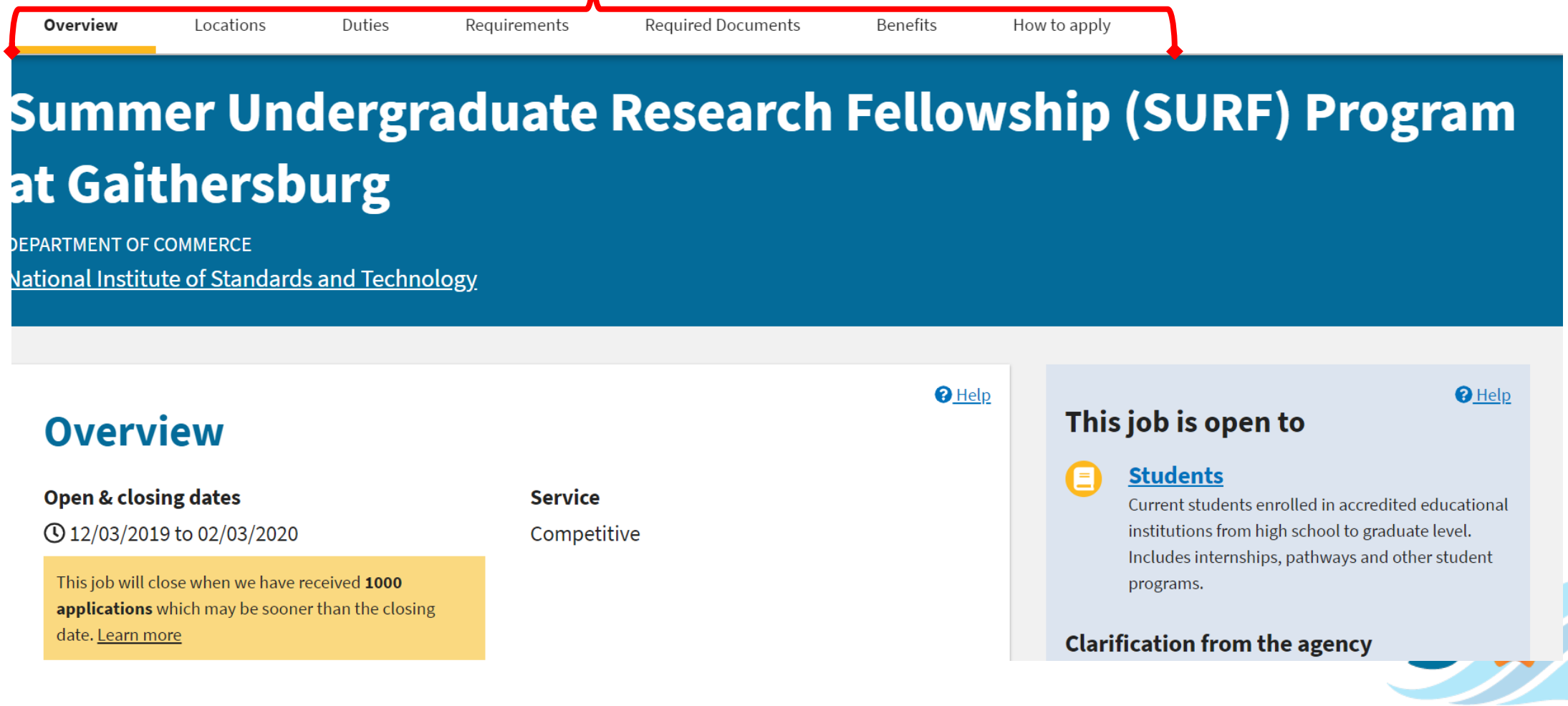
- Select the the appropriate announcement.
- Reminder: SURF Boulder and SURF Gaithersburg are separate announcements. Must apply to both announcements to be considered for both locations.



Double click the vacancy name

Step 4: Read the Vacancy Announcement

Select each of the terms or scroll though the page. Note key terms.



Step 4: Read the Vacancy Announcement (continued)

Overview | Locations | Duties | **Requirements**

courses taken while solely a high school student.)

Quality of research accomplishments to date.

Assessment of whether the laboratory experience is an oppor
encourage future postgraduate training.

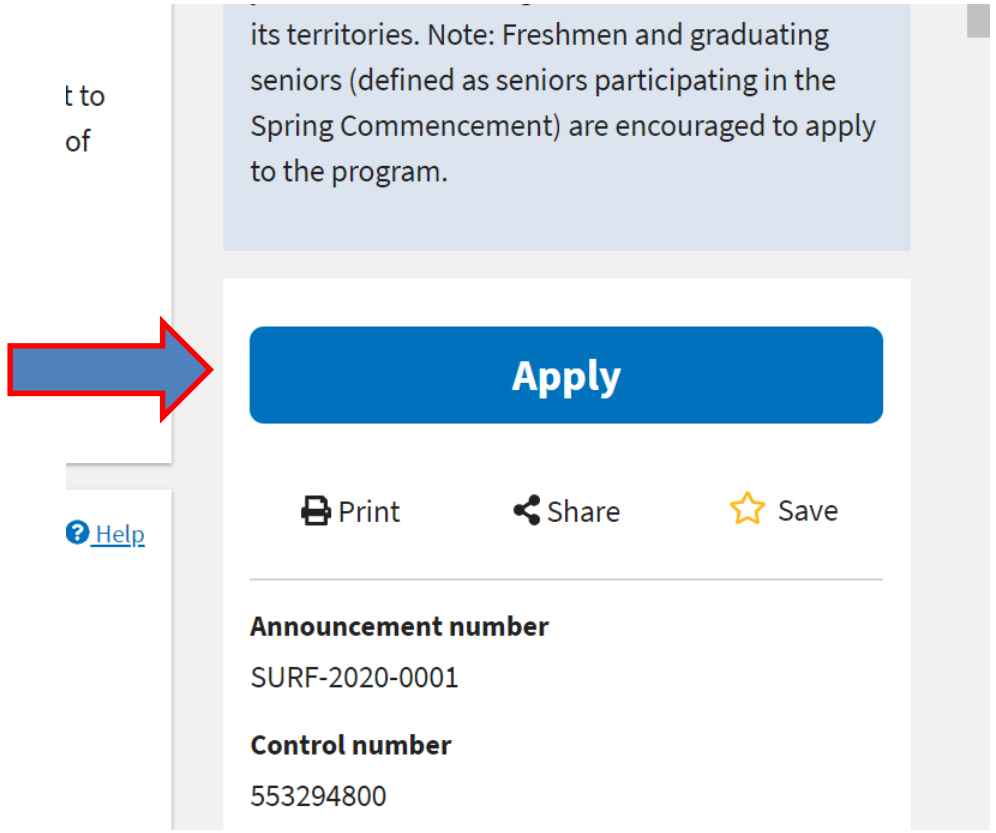
To preview questions please click here.

Close

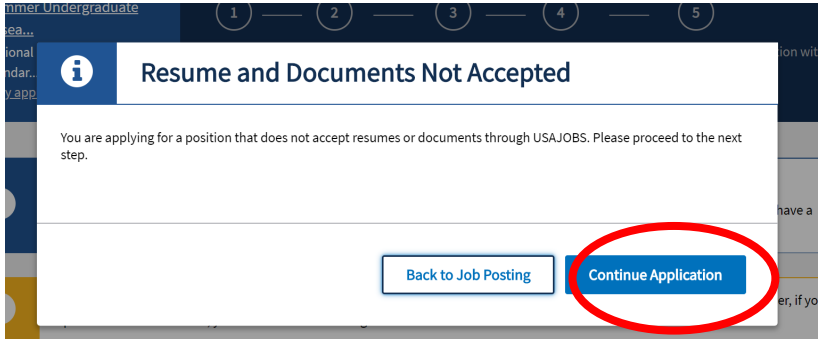
***Note: Must provide an answer to each question. There is not an option to save.

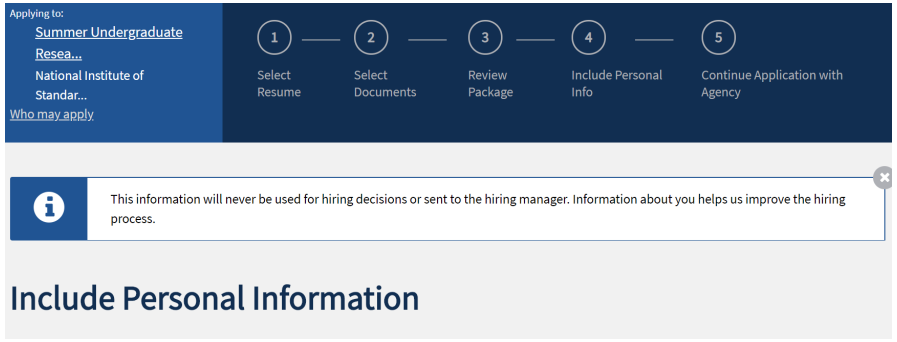
Step 5: Apply to the Vacancy

Select the “Apply” menu on the Right side of the vacancy.



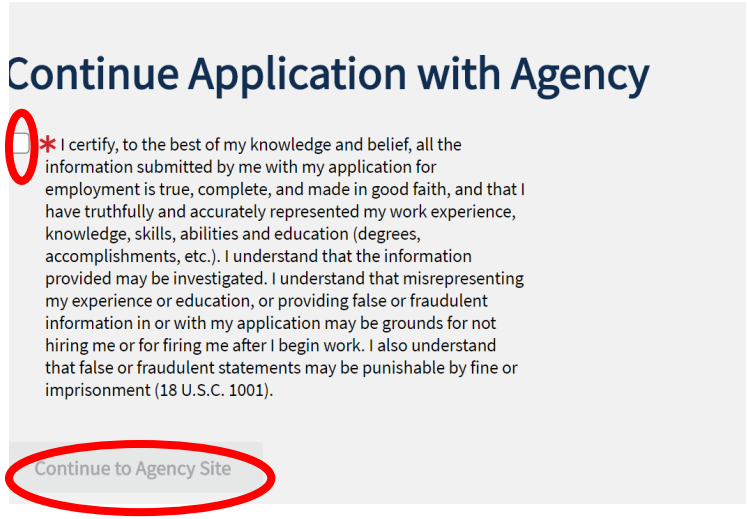
Step 6: Applying in Progress…..



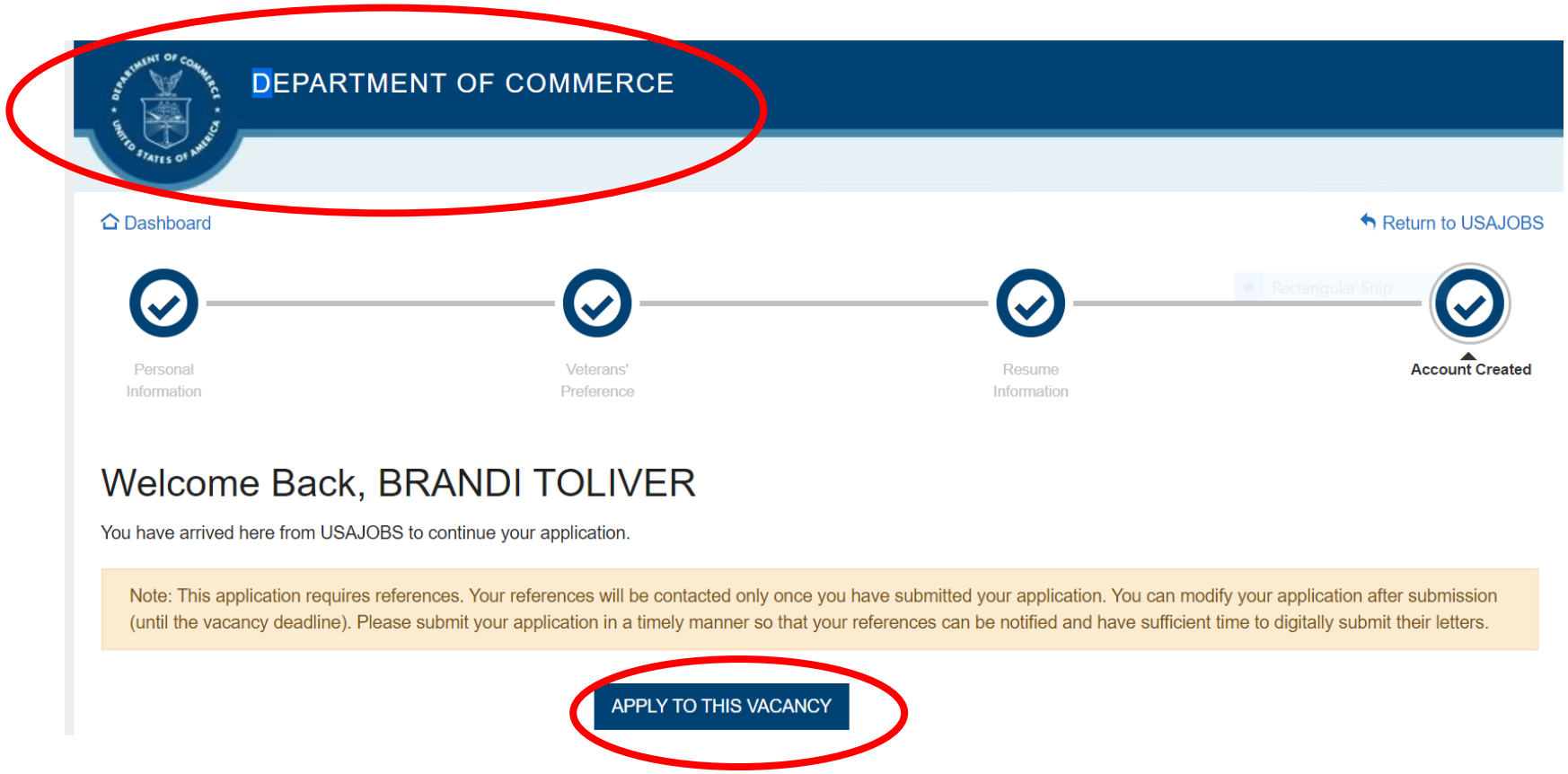


-Complete the personal information.
-Select “Save and Continue” at the bottom of the page.

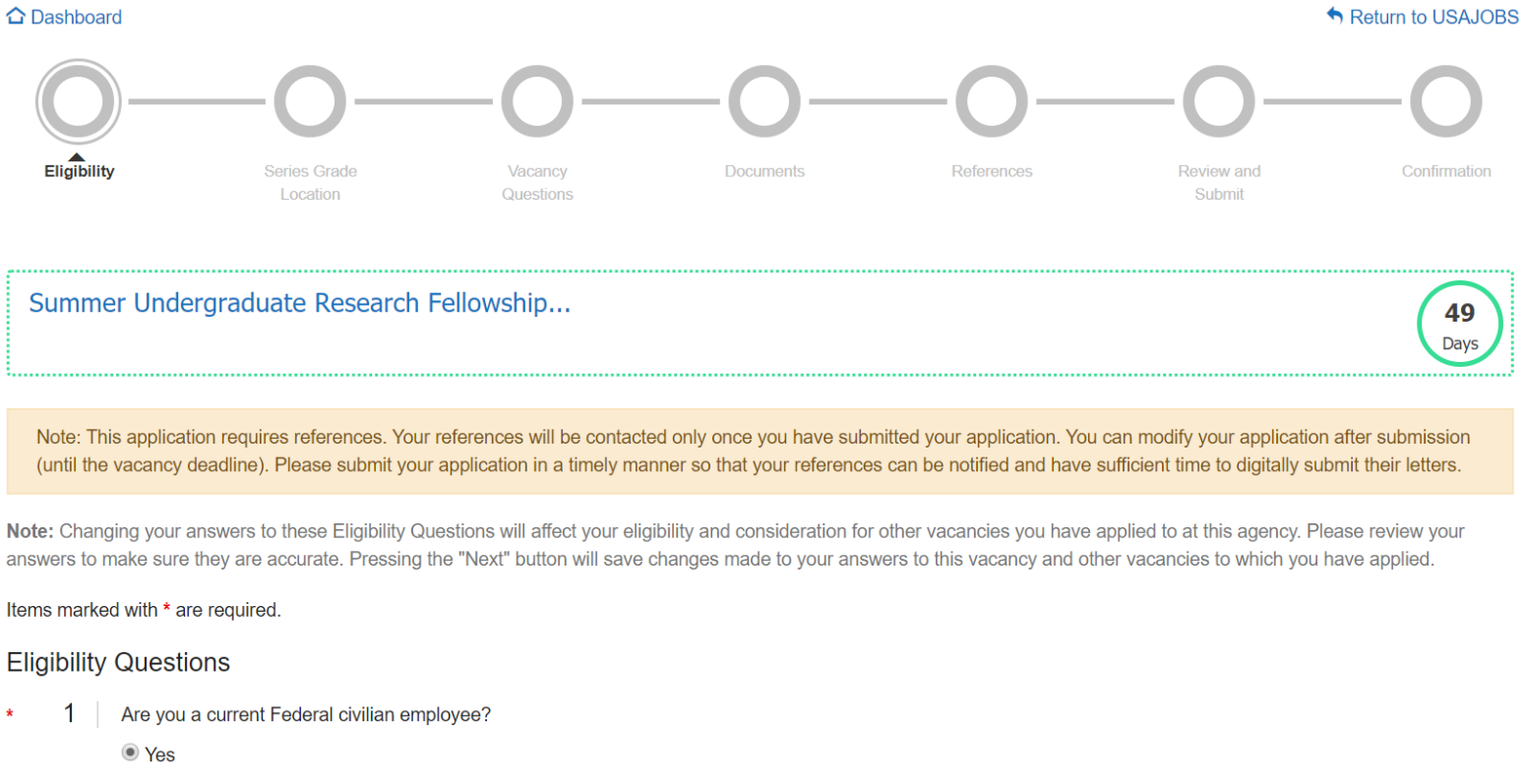
-Complete the circled items



Step 6: Applying in Progress (continued)…..



Step 6: Applying in Progress (continued)…..



Complete the Eligibility questions. Note: These questions are applicable to permanent, full-time positions for federal employment. Most of your answers will be “no” or “NA.”

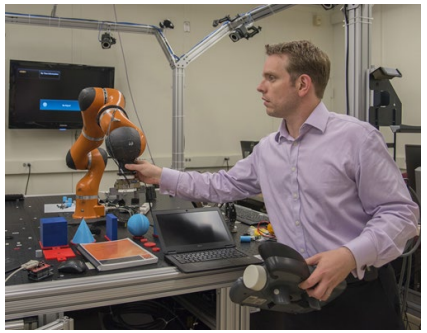
Step 6: Applying in Progress (continued)…..

-Answer all questions containing an asterisk.
-Select “Next” after completing each page.
-Eligibility, Series Grade Location, and Vacancy Questions must be completed in a single session before you can save.

Vacancy Questions

- Read and answer carefully.
  - Must request housing and commuting subsidy in questions.
  - Selection of research preference

Selecting Research Preferences for the SURF Program @ Gaithersburg



- Gaithersburg Process
  - Students select top two (2) laboratory preferences
- Laboratories should be chosen carefully, because the completed application is considered primarily by the first choice host laboratory.
- Occasionally, a laboratory outside of the selected preferences may align with the desired skillset

SURF Gaithersburg Lab Preferences

- **Communications Technology Laboratory**
- **Engineering Laboratory**
- **Information Technology Laboratory**
- **Material Measurement Laboratory** – consists of three concentrations
  - Chemical and Biochemical Sciences
  - Materials Science (includes projects from the NIST Center for Neutron Research.
  - Computational Materials Science
- **Physical Measurement Laboratory** – includes the Center for Nanoscale Science and Technology

Note: Descriptions of each lab can be found at https://www.nist.gov/surf/surf-gaithersburg/research-programs.

SURF

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 2020 research opportunities

Example of Research Opportunity Posting @ Boulder Site

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

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Step 7: Uploading documents

Vacancy Documents

The following documents are requested for this application. You do not need to submit documents that are not applicable to you. Documents frc
o your application however, they may be updated or modified prior continuing this application. Prior to the vacancy close date, documents may
his application. Note: Adobe Acrobat Reader is required to view PDF files.

Documents to Attach

Your Documents from USAJOBS

There were no documents brought over from USAJobs for this application.

Additional Document Actions

Upload from your computer
Fax a Document

Review Your Attached Documents

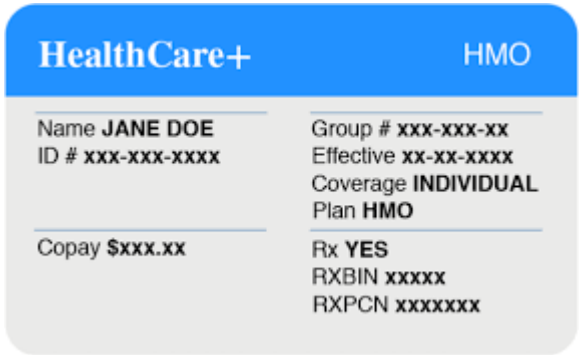
Requested Document Type	Attached Document Description	Source
*SURF – Verification of U.S. citizenship	No document Submitted	
*SURF – Copy of School Transcript	No document Submitted	
*SURF – Personal Statement	No document Submitted	
*SURF – Resume	No document Submitted	
*SURF-Proof of health insurance coverage	No document Submitted	

Transcript

- Undergraduate transcript is required
- Unofficial is preferred
- Make sure personal identifiable information such as social security number is blacked out

Verification of health insurance coverage

- Copy of health insurance card



Proof of U.S. citizenship

- Proof of U.S. citizenship
  - Birth certificate with seal
  - Unexpired passport book
  - Unexpired passport card
  - Naturalization Certificate
  - Certificate of citizenship
  - Consular Report of Birth Abroad

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

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Personal statement

- Put time and effort into writing your personal statement as this is what sets applicants apart.
- Limit to a single page

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?

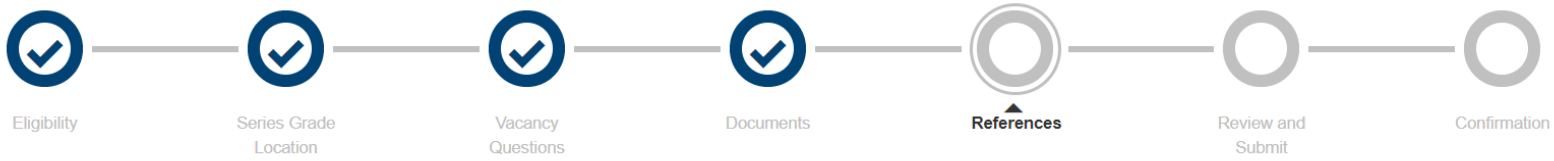
SURF

Supporting Documents

- The following must be attached in USAJOBS
  - Resume
  - Transcript
  - Proof of U.S. citizenship or lawful residency
  - Verification of health insurance coverage
  - Personal statement

***Failure to attach any of these documents will result in your application package submission labeled incomplete/ineligible for review.

Step 8: Letters of Recommendation



Reference Information

Reference 1 - New

* Reference Type
Select

* First Name

* Last Name

* Institution/Organization Name

* Email Address

Phone Number

Extension

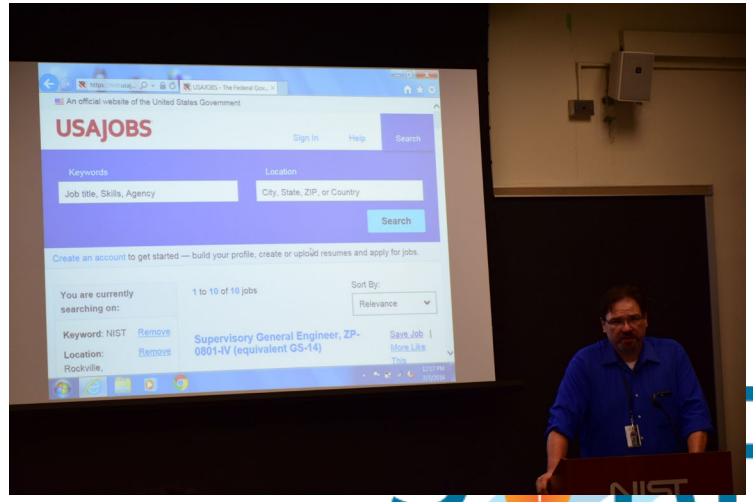
Step 8: Letters of Recommendation

- Indicate contact information for two (2) references. Make sure the information provided is correct as you cannot change the info after submitted.
- Must select “Next” and “Submit” on the next page for the reference writers to receive the request.
- Reference writers receive the request to provide a reference from the e-mail address noreply@monstergovt.com. Please inform the reference writer to check their Spam folder if they do not receive the auto-generated request to submit the reference.
- Request recommendations from professors who are knowledgeable about your academic background (preferably in STEM) or prior internship supervisors
- Give adequate time for your recommenders to write a good letter

Enrichment Activities of the SURF Program

Weekly Technical Seminars

Laboratory Tours



Professional Development Seminars

Benefits of the SURF Program

Stipend and Housing Allowance

- **SURF** participants receive
  - $5500 stipend for an 11-week fellowship or $500/week
  - Housing and travel subsidy
  - Local commuting subsidy

Benefits of Participating in the Program

- Contribute to exciting, real world, innovative, ongoing projects in the NIST laboratories
- Build professional networks with scientist and engineers
- Opportunity to establish a mentor
- Enrichment opportunities through professional development and technical seminars
- Visit new places
- Decide if a career in research is right for you
- Land a permanent position

Acceptance Rates

- *SURF Boulder*

24 acceptances
178 applications

13%

- *SURF Gaithersburg*

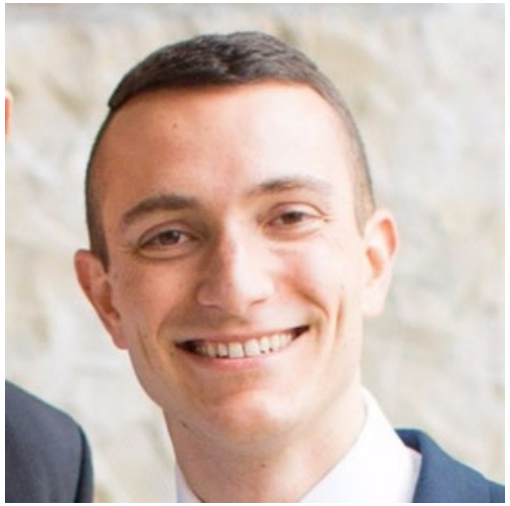
194 acceptances
750 applications

25%

SURF Spotlight

Tanya Kiryutina, MML
PhD student at Georgia Tech

Sai Meghasena Chavali EL
PREP and MS student at UMD



Ryan Need, MML
NRC and recently accepted faculty position

Don't Forget!!!

- Apply to the SURF Program on USAJOBS.Gov now!!
- Application deadline is February 3, 2020 or when the application limit is reached.
- If considering Boulder and Gaithersburg locations, must apply to each vacancy announcement separately.
- SURF Boulder has 350 applicant limit while SURF Gaithersburg has a 1,000 applicant limit.
- Prospective applicants are anticipated to receive e-mail correspondence pertaining to a decision in the timeframe of March 1, 2020-April 15, 2020. Pay attention to your e-mail as the decision time is 3 days or less.
- 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
- Plan ahead and apply early!!!

Hope you will consider applying to the SURF Program next year. We may just find you in this picture for the 2020 SURF Program!

SURF

Thank You!!!

Visit: www.nist.gov/surf

or

e-mail: Brandi.Toliver@nist.gov