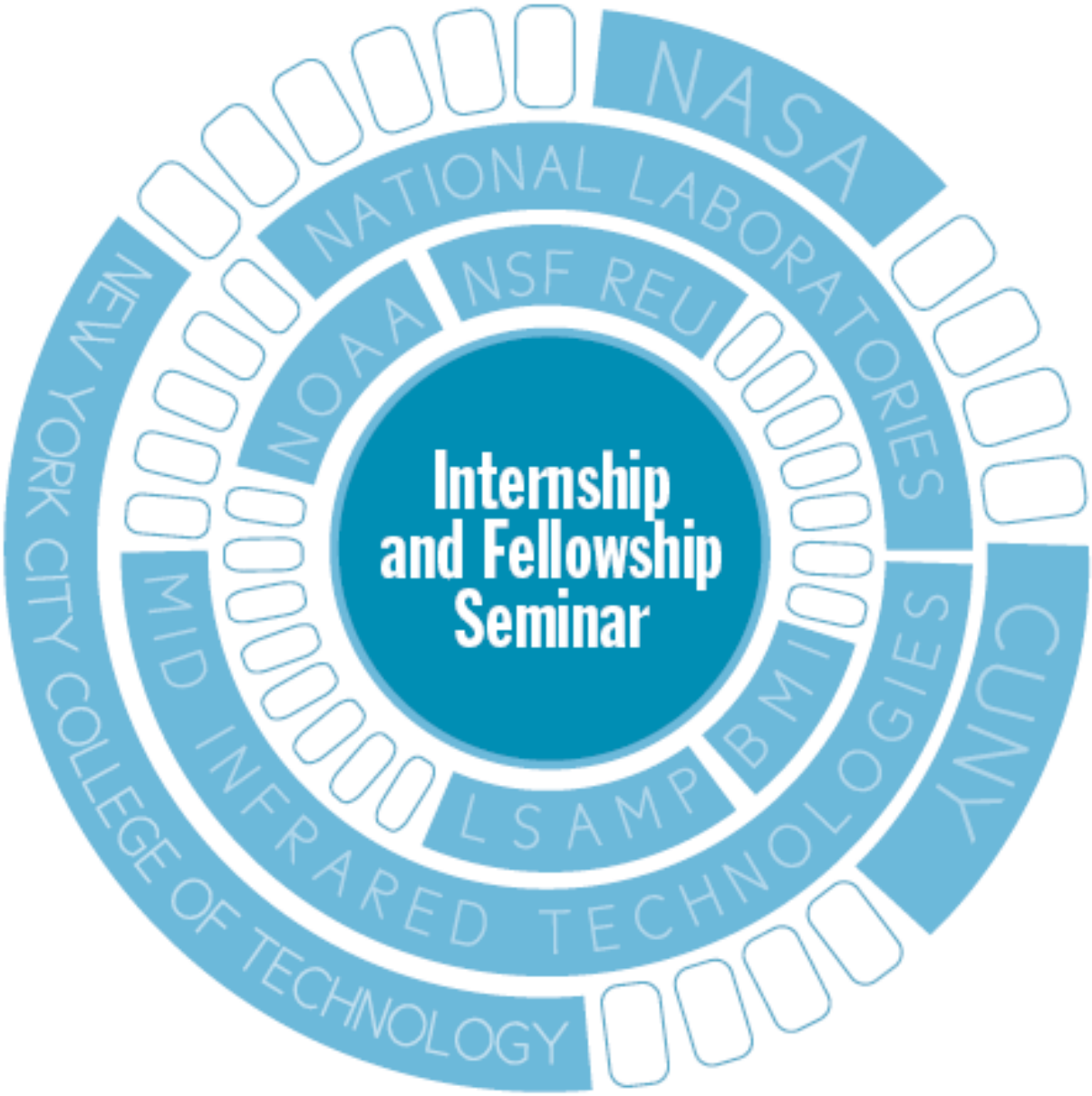

NASA
NATIONAL LABORATORIES
NSF REU
NOAA
Internship
and Fellowship
Seminar
BMI
LSAMP
SEES
CUNY
MID INFRARED TECHNOLOGIES
NEW YORK CITY COLLEGE OF TECHNOLOGY

Internship Seminar
National Laboratories & MIRTHE

VIVIANA VLADUTESCU

ASSISTANT PROFESSOR OF
ELECTRICAL AND TELECOMMUNICATIONS ENGINEERING TECHNOLOGY
NYCCT

National Laboratories

- **National Laboratories and Technology Centers**
  - DOE's laboratories and technology centers house world-class facilities where cutting-edge research is performed. The facilities, along with their more than 30,000 scientists and engineers,
- **Ames Laboratory**
  - The Ames Laboratory is a national center for the synthesis, analysis, and engineering of rare-earth metals and their compounds. Ames conducts fundamental research in the physical, chemical, and mathematical sciences associated with energy generation and storage.
- **Argonne National Laboratory**
  - The Argonne National Laboratory is one of the Department of Energy's largest multidisciplinary research centers. Argonne research falls into five broad categories: basic research, scientific facilities, energy resources programs, environmental management and National security.
- **Brookhaven National Laboratory**
  - Brookhaven National Laboratory conducts research in the physical, biomedical, and environmental sciences, as well as in energy technologies and national security and builds and operates major scientific facilities available to university, industry and government researchers.
- **Fermi National Accelerator Laboratory**
  - The Fermi National Accelerator Laboratory advances the understanding of the fundamental nature of matter and energy by providing leadership and resources for qualified researchers to conduct basic research at the frontiers of high energy physics and related disciplines.
  - http://www.energy.gov/organization/labs-techcenters.htm

National Laboratories cont'd

- **Idaho National Laboratory**
  - The Idaho National Laboratory is a science-based, applied engineering national laboratory dedicated to supporting the U.S. Department of Energy's missions in environment, energy, science and national defense.
- **Lawrence Berkeley National Laboratory**
  - The Lawrence Berkeley National Laboratory conducts unclassified research across a wide range of scientific disciplines with key efforts in fundamental studies of the universe; quantitative biology; nanoscience; new energy systems and environmental solutions; and the use of integrated computing as a tool for discovery.
- **Lawrence Livermore National Laboratory**
  - The Lawrence Livermore National Laboratory is a U.S. Department of Energy national laboratory founded in September 1952 as a second nuclear weapons design laboratory to promote innovation in the design of our nation's nuclear stockpile through creative science and engineering.
- **Los Alamos National Laboratory**
  - The Los Alamos National Laboratory, as part of the National Nuclear Security Administration, contributes to meeting the nation's nuclear deterrence capability and other security needs.
- **National Energy Technology Laboratory**
  - The National Energy Technology Laboratory assures that U.S. fossil energy resources can meet increasing demand for affordable energy without compromising the quality of life for future generations of Americans.
- **National Renewable Energy Laboratory**
  - The National Renewable Energy Laboratory develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals.

National Laboratories cont'd

- **New Brunswick Laboratory**
  - The New Brunswick Laboratory is the Federal government's Nuclear Materials Measurements and Reference Materials Laboratory and the National Certifying Authority for nuclear reference materials and measurement calibration standards
- **Oak Ridge Institute for Science and Education**
  - The Oak Ridge Institute for Science and Education is a U.S. Department of Energy facility focusing on scientific initiatives to research health risks from occupational hazards, assess environmental cleanup, respond to radiation medical emergencies, support national security and emergency preparedness, and educate the next generation of scientists.
- **Oak Ridge National Laboratory**
  - The Oak Ridge National Laboratory is a multiprogram science and technology laboratory conducting basic and applied research and development to create scientific knowledge and technological solutions that strengthen the nation's leadership in key areas of science; increase the availability of clean, abundant energy; restore and protect the environment; and contribute to national security.
- **Pacific Northwest National Laboratory**
  - The Pacific Northwest National Laboratory delivers science-based solutions to the Department of Energy's major challenges of expanding energy, ensuring national security, and advancing mission-driven science through outstanding staff and R&D capabilities, excellent operations, and high-value partnerships.
- **Princeton Plasma Physics Laboratory**
  - The Princeton Plasma Physics Laboratory is a national center dedicated to plasma and fusion science with a leading international role in developing the theoretical, experimental, and technology innovations needed to make fusion practical and affordable.

National Laboratories cont'd

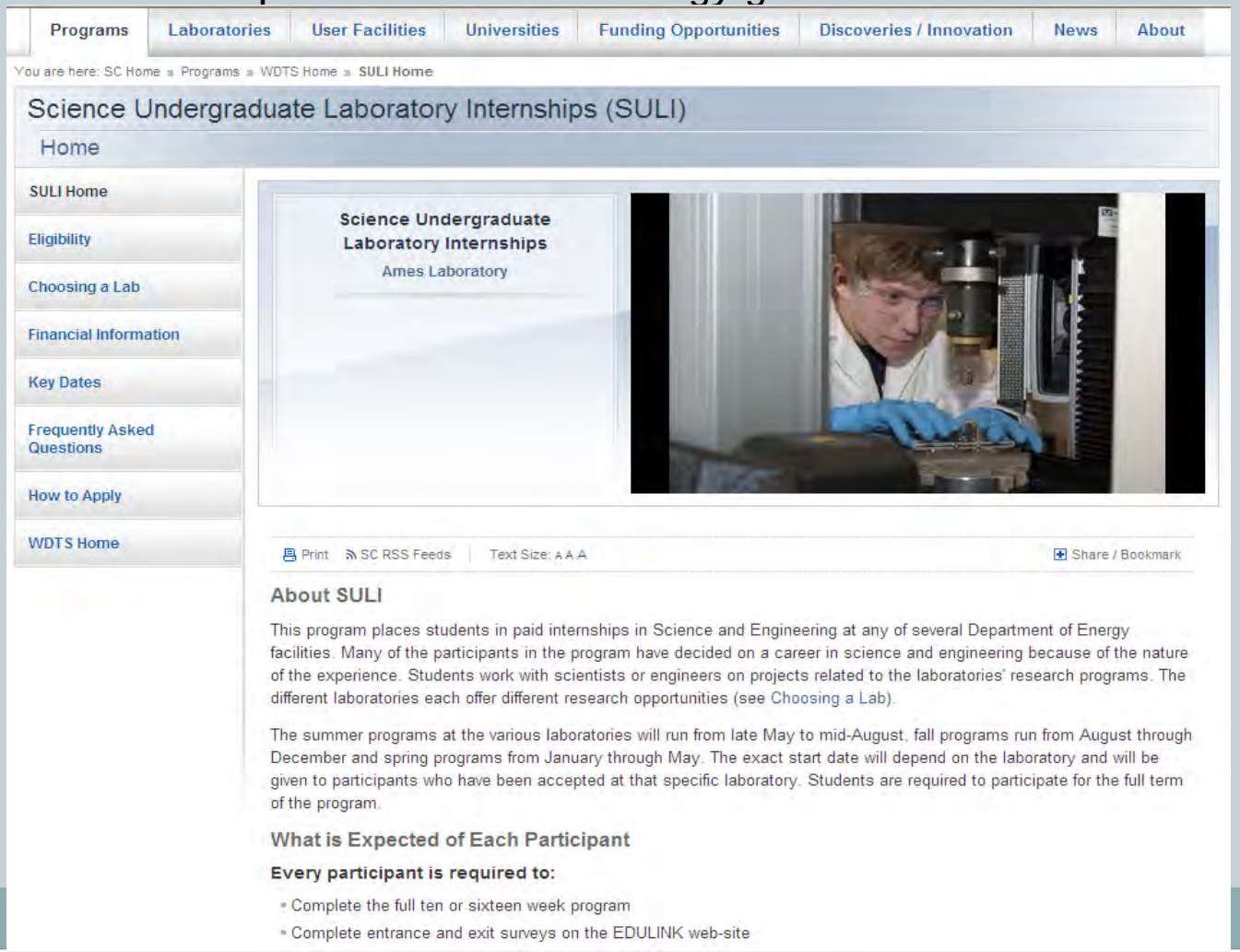
- **Radiological and Environmental Sciences Laboratory**
  - The Radiological and Environmental Sciences Laboratory provides the Department of Energy a reference laboratory to conduct key measurement quality assurance programs and provides technical support and quality assurance metrology that is directly traceable to the National Institute of Standards and Technology (NIST).
- **Sandia National Laboratories**
  - The Sandia National Laboratories develop science-based technologies that support national security through science and technology, people, infrastructure, and partnerships.
- **Savannah River Ecology Laboratory**
  - The Savannah River Ecology Laboratory provides an independent evaluation of the ecological effects of DOE's Savannah River Site operations through a program of ecological research, education, and outreach.
- **Savannah River National Laboratory**
  - The Savannah River National Laboratory is recognized as a world-class center of excellence for the development and application of unique and innovative science and technology solutions.
- **SLAC National Accelerator Laboratory**
  - The SLAC National Accelerator Laboratory is a laboratory dedicated to the design, construction and operation of state-of-the-art electron accelerators and related experimental facilities for use in high-energy physics and synchrotron radiation research.
- **Thomas Jefferson National Accelerator Facility**
  - The Thomas Jefferson National Accelerator Facility is a national user facility for nuclear science using continuous beams of high-energy electrons to discover the underlying quark and gluon structure of nucleons and nuclei.

What are your opportunities? SULI

- **About SULI (**Student Undergraduate Laboratory Internship**)**
  - This program places students in paid internships in Science and Engineering at any of several Department of Energy facilities. Many of the participants in the program have decided on a career in science and engineering because of the nature of the experience. Students work with scientists or engineers on projects related to the laboratories' research programs. The different laboratories each offer different research opportunities .
  - The summer programs at the various laboratories run from late May to mid-August, fall programs run from August through December and spring programs from January through May. The exact start date will depend on the laboratory and will be given to participants who have been accepted at that specific laboratory. Students are required to participate for the full term of the program.

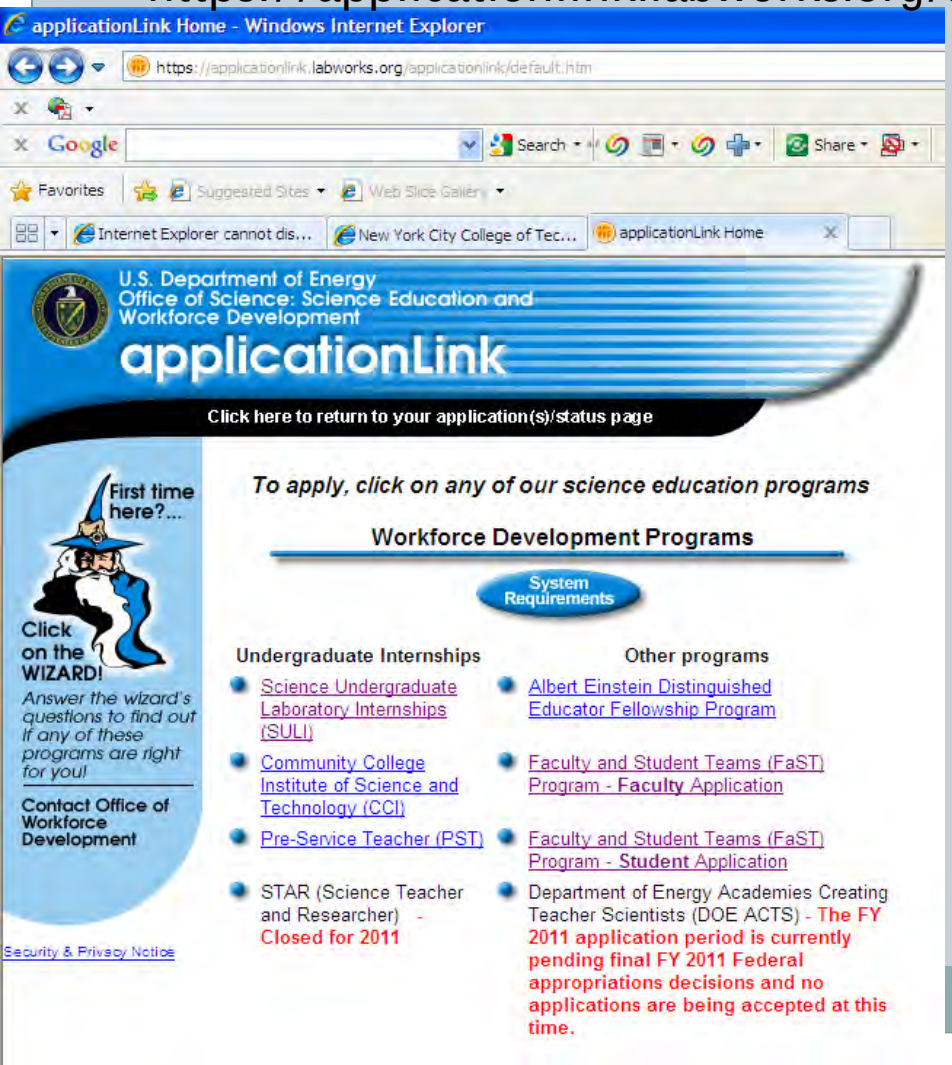
How to get there!

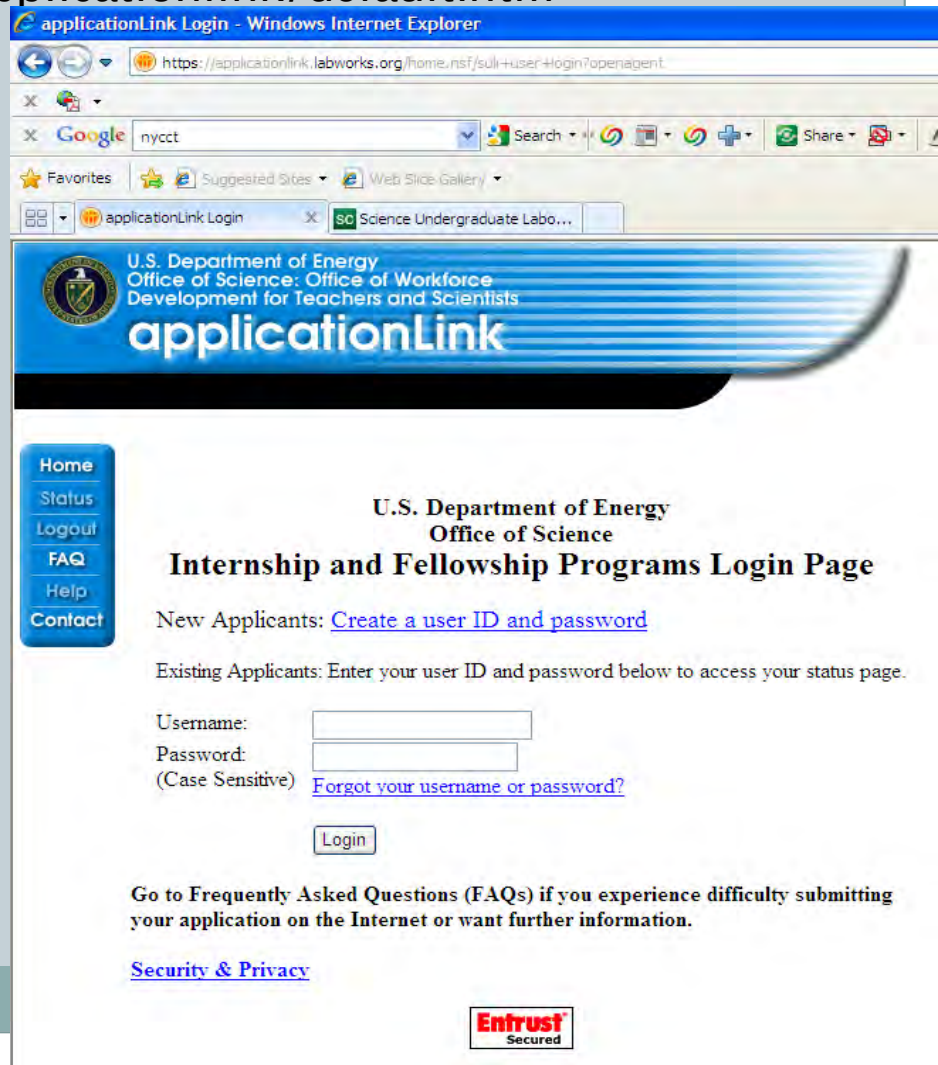
http://www.science.energy.gov/wdts/suli/



National Labs

https://applicationlink.labworks.org/applicationlink/default.htm





Experience?

Work Experience

Employer
Summer Internship, Brookhaven National Laboratory

Position	Dates of Employment
Research Assitant	06/2010-08/2010

Description of Work

Assembled and tested room-temperature nuclear radiation detectors for nonproliferation and national security applications. The research consisted of screening CdZnTe semiconducting crystals using x-ray diffraction topography and infrared transmission microscopy techniques , and data analysis using IDL software. The results were used to correlate detector performance degradation with crystal defects.

Employer
Optics and Remote Sensing laboratoy, EE Department, CCNY

Position	Dates of Employment
Research Assitant	09/2009-06/2010

Description of Work

Performed atmospheric measurement using a multiwavelength-Raman LIDAR (light detection and ranging) system. The measurements consisted of correct alignment of the optical components of the system, and monitoring during the measurement process. The collected data was further used for atmospheric optical properties analysis and model validations (CMAQ).

Essay questions (fermi lab)

- **Course Descriptions**

  Discuss some of your favorite courses, some classroom/lab experience that you enjoyed, and challenges that you faced.

  - Some of the most intriguing courses that I have engaged in are Mathematics, Physics, and Electronics. Although there are others, these instilled within me a passion for science and an earnest desire to pursue a career in Electrical Engineering. Optical systems, microprocessor designs and solid- state electronics are areas of particular interest. An experience in the laboratory that amplifies my curiosity and desire to learn is designing, building and testing electrical circuits. At my previous college- CUNY, New York City College of Technology, laboratory classes consisted of these interests, and I wholly delved into it and enjoyed it. Implementation of operational amplifiers, microprocessors, and data converters in analog/digital circuits was all fulfilling to explore. I learnt how to build a digital clock and audio amplifier; and how to integrate a microcontroller in analog circuitry to simplify and control operations, among other things.

    As a summer intern at Brookhaven National Laboratory (BNL) in 2010, I assembled and tested nuclear radiation detectors. The hands-on experience was grand, but what intrigued me the most was the critical thinking part of the work; challenges, such as locating areas that degrade detector performance and finding a solution to them was a major source of motivation for me. I am a true lover of science, and will bring determination and earnestness to the laboratory.

Essay questions (fermi lab)

- **Degree Plans**

  Briefly discuss what attracted you to your major and your career plans. Are you planning on attending graduate school? Going into industry, R&D, etc.?

  - My career goal is to become an electrical engineer. My objective is to positively influence society through creation of new technologies that will improve atmospheric measurement systems, aid in the clean-up of pollution, and develop the impoverished countries of the world. Atmospheric science can be greatly advanced through ultra- high spatial, spectral and temporal resolution devices that are both cost-effective and easy to monitor and record data about the atmosphere. Intense research this area will make a major difference in developing ways that can alleviate the problem. I would like to use my engineering skills into building new systems that could be advantageous not only to environmental concerns but also to earth's surveillance, photonics and microprocessor design.
  - My academic goal is to earn a PH.D. in engineering. My interests in engineering stems back to my childhood, analyzing electronics and attempting to decipher their internal operations. Mathematics was also instrumental in choosing my career path; the pleasure of working complex equations and finding correct solutions is highly rewarding. My passion for science is innate; I perceive it necessary to elevate my education to the highest degree.

Essay questions (fermi lab)

- **Project Experience**

  Describe in detail a project or projects that you've worked on. Did you meet the project design goals? What were some of the challenges you faced and how did you overcome them?

  - In the past summer, I studied room-temperature solid-state nuclear radiation detectors at BNL for homeland security applications. The research consisted of screening semiconducting crystals (CdZnTe) using x-ray diffraction topography and infrared transmission microscopy techniques to identify defects that might degrade detector performance. Crystals were fabricated into radiation detectors; and detectors were tested by exposing each to a radioactive source and collecting the generated charges with readout electronics and digital oscilloscope. An IDL algorithm was developed for data analysis; and a correlation between detector performance and crystal inclusions was observed. One of the challenges of this work was identifying the inclusions that are pivotal to performance degradation, and we overcame this by testing detectors of different crystal defects and noting their respective performances.
  - I also conducted research in optics and remote sensing of the environment using a LIDAR (Light detection and Ranging) system at the City College of New York (CCNY) for one year. At this laboratory, I had the opportunity to exercise my ability to perform correct optical measurements and troubleshoot systems. The optical mirrors used this laser based technology system are extremely sensitive and even slight variations from there set states can significantly attenuate laser intensity which is to be kept above a certain threshold in order to maintain proper operations and collect useful data about the atmosphere. One of my responsibilities in this laboratory was to monitor the LIDAR returns and ensure that proper data is collected , and if disruption of data collection was to occur due to a shift in one of the optical mirrors, realign those mirrors to re-stabilize desirable conditions.
  - These projects enriched my education through first-hand experience to some of the challenging problems facing scientists . Advancing my scientific skills is a top priority of mine, one that I wake up each day to pursue; my ultimate goal is make a positive contribution to science and engineering.

Essay questions cont'd

- Use this space to tell us more about you. It can be about your hobbies, your interests, issues that you feel strongly about, an experience you had, something you find challenging, etc. You may discuss anything you like.
  - **I was born in XXXX, a fascinating place** where I developed my love for mathematics and considered the prospects of **engineering**. Attending St. YYYY Primary, a prestigious school at that time, I enjoyed the environment in which I lived and marveled over the concepts of engineering and the science of things. How the radio was created and how can I construct my own was one of the many thoughts that attracted my mind during those stimulating years.
  - At the age of eleven, I **immigrated** to the U.S. and successfully completed middle school, high school, and am now attending college pursuing a degree in electrical engineering. In college, I have taken several steps to strengthen my education. One of such steps is **conducting research**.
  - Since my research experience in optics and remote sensing of the environment, I have developed a deep interest in atmospheric measurement systems, the interaction of atmospheric constituents with radiation and the mathematical analysis and molecular physics of environmental components. The reason for my regard of this kind of work is intelligible:
  -

Cont'ed

- It is highly rewarding to research and analyze data about the atmosphere. The environment is mysterious and each new discovery (although it might not be novel to the world) is fascinating, fulfilling and motivating to me. The point where my interests in the physics of the atmosphere grew and my curiosity of radiation brimmed was when I had to write a report about the LIDAR system at CCNY, and about what I've learned thus far about atmospheric engineering. It was an interesting **challenge** that I didn't imagine to be so fulfilling to explore. I delved into the books on atmospheric science and radiation that my mentor had given me the months before, and reviewed the notes of the LIDAR system that I had organized. I had made discoveries that I didn't realize was there before being involved in atmospheric research. I was enticed by the hygroscopic properties of aerosol particles and how it leads to the formation of clouds at different altitudes in the sky, alarmed by the depletion of the stratospheric ozone as a result of the photodissociation of chlorofluorocarbons, a man-made compound! and concerned about the tiny dust particles that seep into our lungs, make us sick, and increase our likelihood of acquiring lung cancer.
- I finished the report with **a feeling of knowing**, and I recognized that research must be continued, and aggressively at that, to stop the upward trend of greenhouse gases, among other things. So I became a dedicated participant, a person who portrays himself building a successful career in the field, making advancements in electrical engineering.

Recommendation Letters

Letters Of Recommendation

☑ I will contact **two** individuals and asked them to each submit a letter of recommendation on my behalf. The SIST committee recommends that the letters of recommendation come from faculty at your College or University. Instructions for submitting letters of recommendations will be e-mailed to you with your confirmation email.

I understand that my application will not be considered complete until **both letters** have been received at Fermilab.

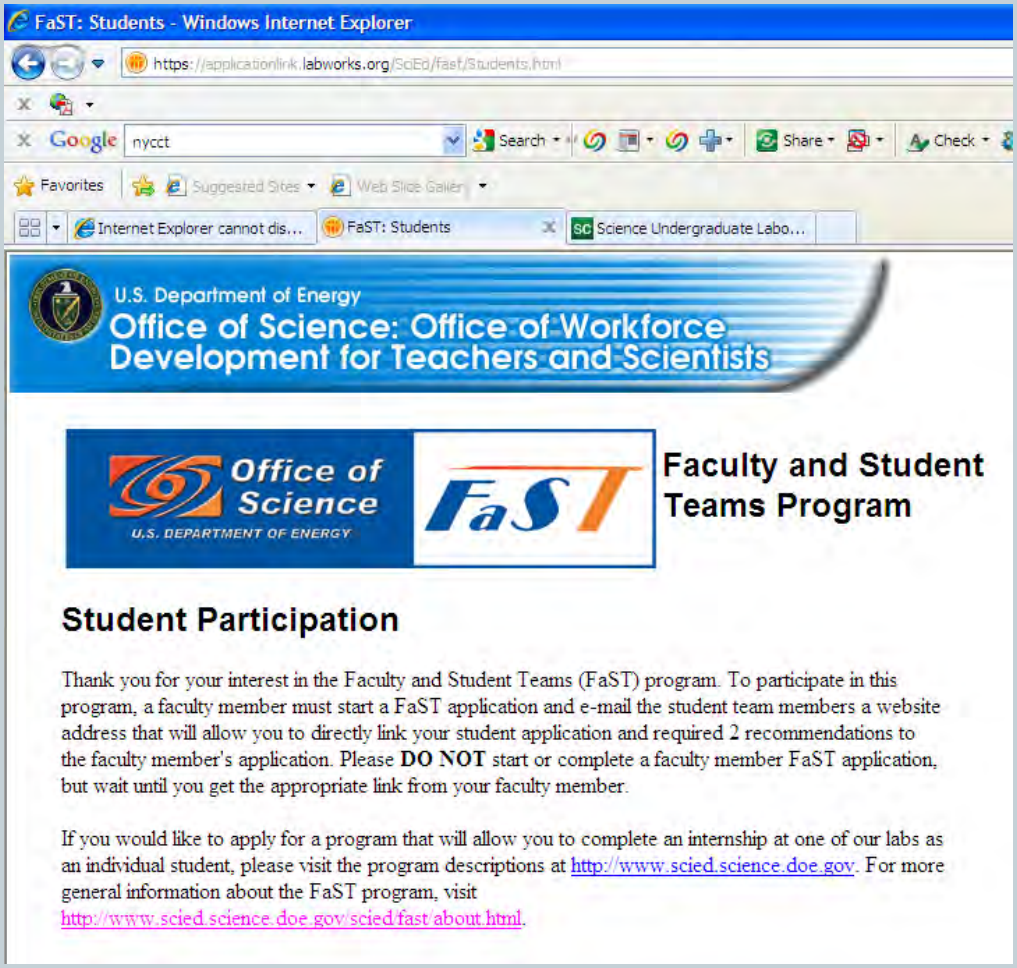
Transcripts

☑ I will arrange to have an **official transcript** sent from my College or University to Fermilab/SIST at the following address:

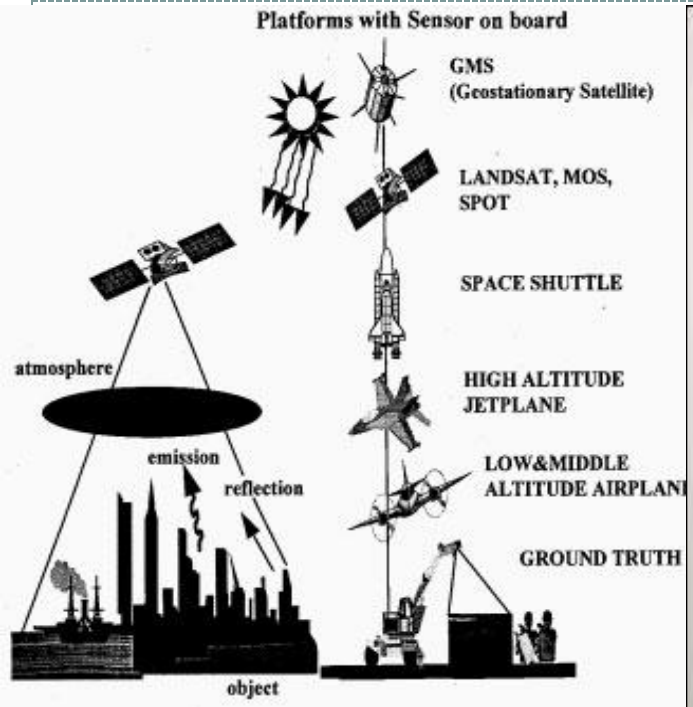
Fermilab/SIST
MS117
P.O. Box 500
Batavia, IL 60510-0500

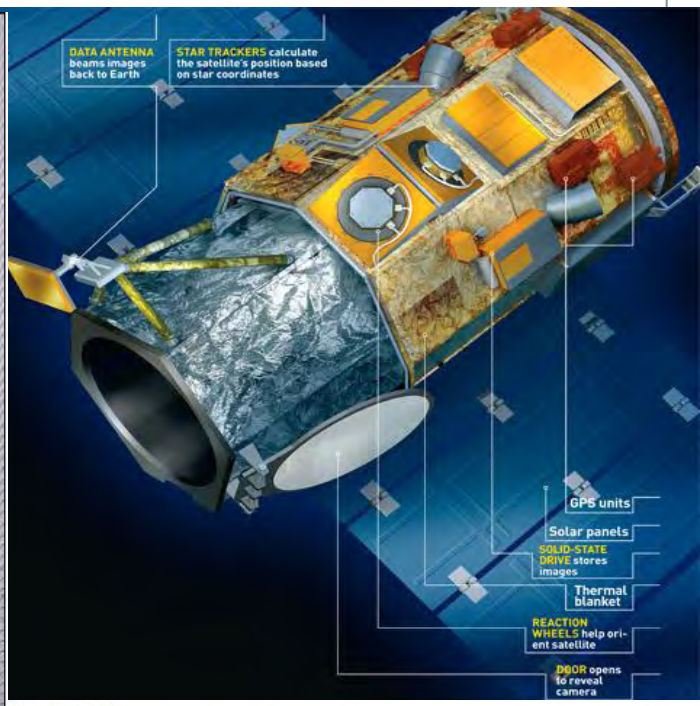
I understand that my application will not be considered complete until the official transcript has been received at Fermilab.

Alternatives



Remote Sensing Course





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MIRTHE Mid Infrared Technologies

- MIRTHE is a National Science Foundation Engineering Research Center headquartered at Princeton University, with partners City College New York, Johns Hopkins University, Rice, Texas A&M, and the University of Maryland Baltimore County.

- http://www.mirthecenter.org/

MIRTHE Mid Infrared Technologies

The center encompasses a world-class team of engineers, chemists, physicists, environmental and bio-engineers, and clinicians. MIRTHE's goal is to develop Mid-Infrared (£ - 3-30 µm) optical trace gas sensing systems based on new technologies such as quantum cascade lasers or quartz enhanced photo-acoustic spectroscopy, with the ability to detect minute amounts of chemicals found in the environment or atmosphere, emitted from spills, combustion, or natural sources, or exhaled.

Please remember

- All material presented here, today, will be posted on the school website as well as the main page of the ETET Department
- Return the questionnaires to the people collecting them before you leave