

2006 SURF Summer Seminars and Tours

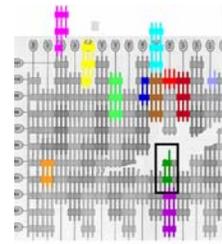
May 22 First official work day and orientation for SURF Session I students.

May 31 NIST Safety Orientation for Summer Students

The session provided an overview, including how to report emergencies, use of personal protective equipment, general safety, office ergonomics, laboratory safety, and radiation safety. A session was also given on June 14 for Session II SURF students.

June 1 Dr. S. Shyam Sunder
Deputy Director, Building and Fire Research Laboratory
Lead Investigator for federal building and fire safety investigation into the World Trade Center disaster

The Federal Building and Fire Safety Investigation of the World Trade Center Disaster



A major scientifically-based investigation of the World Trade Center (WTC) disaster was completed recently by NIST. This study was carried out under the mandate of the National Construction Safety Team Act of 2002, which authorizes NIST to investigate major U.S. building failures. The purpose of such investigations is to establish the technical causes of building failures and evaluate the technical aspects of emergency response and evacuation procedures. Since NIST is not a regulatory agency and does not issue building standards or codes, the institute is viewed as a neutral investigator.

The talk described the NIST investigation and how it seeks to make buildings, occupants, and first responders safer in future disasters.

June 7 Dr. Steve Banovic
NIST Materials Science & Engineering Laboratory, Metallurgy Division

Tour Stop: Metallurgical Studies on World Trade Center (WTC) Steel

Steve gave several tours throughout the summer in order for all interested SURF students to learn of this important NIST research. It was chilling to see the actual steel removed from the wreckage of the WTC.

In response to the events occurring on September 11, 2001, NIST conducted a 3 year, \$16M investigation of the World Trade Center disaster. The main goal of the Metallurgy Division during this study was to characterize the microstructure and mechanical properties, failure modes, and temperature excursions seen by the

steel. The information obtained was used as inputs to the models simulating the behavior of each tower on that day. Steve's talk first described the construction of the towers and then focused on the recovery and identification of critical structural steel elements.

June 8 ***NIST Virtual Library (NVL) Demo and Research Library Tour***

The sessions provided an overview and tour that included demonstrations of the Library facilities, both manual and computer based. A repeat performance was held on June 19 for Session II SURFers.

June 8 Dr. Timothy J. Foecke
NIST Materials Science and Engineering Laboratory, Metallurgy Division

Preserving Historic Shipwrecks: Titanic, Arizona, Hunley and Monitor

A project was developed within the Metallurgy Division over the past 9 years wherein they gave technical advice to other agencies and outside organizations on the preservation and life prediction of historic shipwrecks. The talk reviewed the ongoing work with various wrecks: USS Arizona, CSS Hunley, USS Monitor, RMS Titanic and a few others. Finite element models were developed to predict mechanical stability under marine corrosion conditions, and once the models were reliable, remediation techniques were tried out virtually before any irreversible actions were taken on the actual sites. The techniques being developed will eventually be transferred to the public to be used in stewardship of hazardous shipwrecks in the littorals and on the continental shelf.



June 12 First official work day and orientation for SURF Session II students.

June 15 Dr. Christopher Ekstrom
Leader, Clock Development Research Group
U.S. Naval Observatory



What Time is it Anyway?: Clocks, Timescales, and Atomic Fountains

Clocks range from the simple to the unbelievably complex. They are based on natural processes from celestial motions, to pendulums, to transitions in atoms. Each of these techniques has reigned supreme at different times in history, providing us with tools for applications from agriculture, to navigation, to basic science.

“What time is it anyway,” covered the basic building blocks of a clock and how they were used to tell (and even vote) on the time. Dr. Ekstrom covered

timekeeping and timescales, including how the world decides what time it is. Finally, he covered a type of laser-cooled atomic clock called an atomic fountain, where he focused on the atomic fountains at the U.S. Naval Observatory. Both NIST and USNO have built atomic fountains, but with much different goals, both of which were discussed.

Dr. Ekstrom is the leader of the clock development research group at the U.S. Naval Observatory. His group develops advanced atomic clocks for use in the DoD Master Clock, which is housed in Washington, DC.

June 23 ***Norfolk REU Program Visits NIST***

Jordan Peck (SUNY Binghamton) and Jennifer Wiley (UMD, College Park) talked to a group of college students from a Norfolk REU about their experience in the NIST SURF program.

June 23 Dr. Kris Bertness
NIST Electronics & Electrical Engineering Laboratory,
Optoelectronics Division (Boulder)

Research Advisory Committee Summer Seminar: ***GaN Nanowires:
Nanotechnology Goes Ultraviolet***

Wide-band-gap semiconductor nanowires combine optical and electronic properties of semiconductors to achieve new functionality with a multitude of applications. This is particularly important for the GaN-AlN-InN alloy system, where conventional epitomical semiconductor methods produce material with poor yield and strain-driven limitations to heteroepitaxy. The talk provided an overview of the variety of methods that exist to produce and process nanowires, including the vapor-liquid-solid (VLS) mechanism and catalyst-free molecular beam epitaxy. NIST researchers have shown that the catalyst-free methods produce material of exceptional crystalline quality, often better than the epitaxial films or bulk crystals. Although nitride semiconductors include materials with infrared band gaps, the most exciting applications are in the green, blue, and ultraviolet range of the spectrum. These materials have the potential to reduce the form factor and power consumption of UV light sources to revolutionize instrumentation in such diverse fields as biochemical analysis, water sterilization, and atomic ion traps. In addition to materials and application issues, the speaker addressed some of the interesting metrology challenges that was behind this work at NIST.

June 29

Dr. Laurie E. Locascio

NIST Chemical Science and Technology Laboratory,
Biochemical Science Division



Microfluidics: Doing Chemistry in Nanoliters

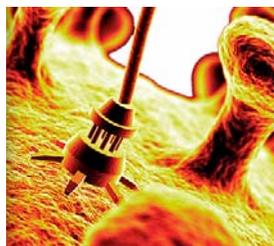
Microfluidics and microarray technology, collectively called microanalytical systems, have been referred to as some of the great technological advances of the last decade. Research in these areas continue to thrive as researchers learn that by scaling down chemical processes, fundamental changes occur that can dramatically affect chemical separation, reaction and detection. Systems continue to shrink in size motivated by the desire to multiplex chemical reactions based on combinatorial methodology. Dr. Locascio's talk focused on designing and developing microfluidics systems for ultra-small volume analysis of biological systems including whole cells and model cell structures, DNA and proteins.

July 6

Dr. Curt A. Richter

NIST Electronics and Electrical Engineering Laboratory

Emerging Nanoelectronic Devices



Nanoelectronics, though its exact definition often varies, encompasses emerging technologies under development to supplement and/or supplant present-day CMOS technology which, with its ~30 nm channel lengths and sub-1.5 nm effective gate oxide thicknesses, is considered by many already to be "well into the world of nanoelectronics." Two specific emerging nanoelectronic device technologies, Si-nanowires and molecular electronics, were discussed in detail. Si-nanowire technologies fabricated by top-down approaches are the logical extrapolation of current CMOS while molecular electronics is based upon self-assembly, a radically different fabrication approach. These two technologies form a bridge between top-down nanoelectronics and bottom-up nanostructures with novel properties and functions, and they bracket the possible fabrication approaches for future information processing technologies.

July 10

NIST Center for Neutron Research Tour

The NIST Center for Neutron Research (NCNR) annually invites the SURF students to tour its facilities and learn about some of the ways beams of neutrons are used in materials and other types of research. The tour was preceded by a lecture giving an overview of the Center



and principal areas of research, followed by stops at a number of experimental facilities where staff described ongoing research. The lecture and tour took about two hours to complete.

July 13

Dr. Daniel Sawyer
NIST Manufacturing Engineering Laboratory, Precision
Engineering Division



Large Scale Metrology

Laser trackers are becoming the tool of choice for dimensional inspection of large manufactured parts and assemblies. HIST has contributed significantly to the development of tests and procedures for characterizing the performance of these measuring instruments. The results of this effort have been incorporated in a recently approved ASME standard, *B89.4.19 Performance Evaluation of Laser Based Spherical Coordinate Measurement Systems*. The presentation provided an overview of the principles and design of laser trackers, their use and the important elements of a well-constructed performance evaluation standard.

July 19

Annual Summer Horizons Program
Lisa Portis Morgan, Ph.D.
Events Coordinator
The Graduate School
University of Maryland Baltimore County



SURF students were invited to attend the annual Summer Horizons program at the University of Maryland, Baltimore County (UMBC). Summer Horizons presented a one-day introduction to Graduate School. The day included sessions on the benefits of a graduate degree, the application process, fellowship opportunities, an introduction to graduate programs at UMBC and a motivational speech by UMBC's President, Dr. Freeman Hrabowski.

Another important part of the program: a continental breakfast, hot buffet lunch, and afternoon snacks were provided *free* of charge.

July 20

Bettijoyce B. Lide
NIST Information Technology Laboratory

Toward an Electronic Health Record

Do you know where your medical records are? If you became sick while on vacation away from home and went to a distant emergency room, would your clinical information be available at the point of care? Do you still hand carry prescriptions, or does your healthcare provider send them electronically to the pharmacy, where they are automatically checked against your known allergies and medications?

Our nation enjoys the best medical care and the brightest medical personnel in the world, yet the enterprise is fraught with poor coordination, administrative inefficiencies, and avoidable medical errors. Also, healthcare costs impact us all. For example, healthcare expenses for auto workers add approximately \$1,500 to the price of every new General Motors car.

The President has a Health Information Technology Plan and has created the Office of the National Coordinator for Health Information Technology within the Department of Health and Human Services to pursue technological opportunities to reduce costs, to greatly improve patient safety and quality of care, and to make healthcare more accessible. The seminar focused on the health information technology initiatives underway to fulfill the President's vision and, in particular, NIST's role in these path-breaking projects.

July 25 **Visit by University of Maryland Materials Research REU Program**

Sixteen students from the University of Maryland REU program (similar to our SURF program) toured a number of labs (metallurgical studies on WTC steel, trace explosive detection, and learning applied to ground robots) to learn of the research happening at NIST.

July 27 Mr. Donald Swenholt
Donald Swenholt Associates, Inc.

Giving Successful Presentations

An annual seminar provided to all SURF students, Mr. Swenholt gave techniques on making presentations more interesting to those in the audience, how to experience more pleasure and less anxiety in preparing and delivering your presentation. He also gave tips on making dry material come alive, how to make your long presentation seem short and the complex seem simple. If a SURFer wanted to learn how to gain and hold the attention of an audience, this class was not to be missed.

August 4 ***Tour of Pentagon***

The SURFers had the great opportunity of touring The Pentagon. The tour route was approximately 1 1/2 miles in length and lasted for about 90 minutes. The tour covered about 20 items of interest that included the mission of the Department of Defense and each of its branches of services, and numerous displays that highlighted and depicted significant moments in military history.

August 8 Final presentations by SURF students moderated by invited guests.

August 8 Lunch: SURF Directors and special invited guests.

- August 9 Final presentations by SURF students moderated by invited guests.
- August 10 Final presentations by SURF students moderated by invited guests.
- August 11 Last day for SURF students and farewell pizza party.