2005 SURF Summer Seminars and Tours

May 23 First official work day and orientation for Session I SURF students

June 1 NIST Safety Orientation for Summer Students

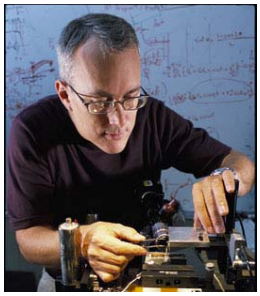
The session provided an overview, including how to report emergencies, use of personal protective equipment, general safety, office ergonomics, laboratory safety, and radiation safety. A session was also given later for Session II SURF students.

June 1 NIST Virtual Library (NVL) Demos and NIST Research Laboratory Tour

The sessions provided an overview and tour that included demonstrations of the Library facilities, both manual and computer based. This session was also repeated for Session II students.

June 2 Dr. Gordon Shaw
NIST Manufacturing Engineering Laboratory, Manufacturing Metrology Division

SI-Traceable Small Force Measurement at NIST



The international system of units (SI) is a coherent measurement system allowing the comparison of quantitative information. A brief explanation of the SI and SI-traceable measurement was given, followed by a discussion of small force measurement at NIST. Recent advances in small force metrology at NIST allow SI-traceable measurement of forces at the nanonewton level. This opens up many possibilities for mechanical testing of molecular to micro-scale materials, and also for systematically examining methods to join these materials. Recent efforts in development of small force standards and their application to the study of mechanical behavior of several inorganic and biologically-inspired micro- to nano-scale materials systems was discussed.

June 9 Dr. Wyatt Vreeland
NIST Chemical Science and Technology Laboratory, Analytical Chemistry
Division

Microfluidic Devices for Forensic DNA Analysis: Microfluidics, Electrophoresis and Optics

A new microfluidic DNA electrophoresis device with auxiliary optics, pneumatics, and software to enable rapid analysis of DNA "fingerprints" for forensic analysis and human identification was developed at NIST. The time required for analysis is reduced by nearly 90% when this device rather than the current method-of-choice for separations of this type – capillary electrophoresis – is used. The increased speed of analysis achieved when this microfluidic device is used as well as decreased cost will allow forensic case workers to address more rapidly the U.S. backlog of more than 0.5 million case samples.

June 13 First official work day and orientation for Session II SURF students

June 16 Jeffrey Bullard
Building and Fire Research Laboratory (BFRL) Seminar, Materials Construction Research Division

The Virtual Cement and Concrete Testing Laboratory

The Building Materials Division within BFRL, along with NIST's Information Technology Laboratory, has formed a NIST/industry consortium to develo a Virtual Cemtn and Concrete Testing Laboratory (VCCTL). The goal of the consortium is to deveop a web-based virtual laboratory for evaluating and optimizing cement-based matereials. Substantial savings in time, materials (purchase and disposal), human resources, and money can be achieved by reducing the number of physical concrete tests performed by private industry. The core of the virtual lab is a computer model for the hydration and microstructure develoment of cement-based systems that is based on 13 years of research at NIST.

June 16 Cynthia Howard Reed
BFRL Seminar, Building Environment Division

Ranking Interventions to Improve Inner-City Housing Indoor Air Quality

Measurement procedures are being developed and demonstrated to evaluate building ventilation and indoor pollutant concentrations. These procedures range from sophisticated tracer gas methods used predominantly in building research efforts to less involved procedures that can be employed by building operators. NIST researchers are continually developing new test procedures, and then demonstrating them in the field to evaluate their feasibility and reliability. The efforts in which these procedures are demonstrated in the field has resulted in the development of an important database of building ventilation and indoor air quality performance.

June 17 S. Shyam Sunder
BFRL Seminar, Deputy Director, BFRL

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

June 19 ***Making Choices***
Panel Discussion for SURF Students

Research track; management track; parent track? With so many possibilities to choose from, how do we decide on the smartest career path or the best time to start a family? Three NIST employees share their journeys, and talk about the choices, compromises, adventures, and twists of fate that took them to where they are today.

The panel was composed of: Barbara Goldstein, Frank Gayle, and Claire Saundry (NIST Staff). The facilitator and organizer was Kathryn M. Butler, NIST.

June 20 Professor Pietro G. Gambarova,
Milan University of Technology, Milan, Italy

BFRL Seminar: ***Thermal and Mechanical Characterization of a High-Performance Concrete for Heavy-Duty Roadways***

Dr. Liberato Ferrara,
Milan University of Technology, Milan, Italy

BFRL Seminar: ***Relationships Between Fiber Dispersion, Workability and the Mechanical Properties of SFRC Applied to Precast Roof Elements***

June 22 Mark W. Davis
BFRL Seminar, Building Environment Division

Parameters Affecting the Performance of a Residential-Scale Stationary Fuel Cell System

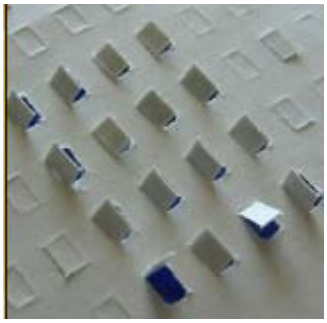
Fuel cells are being developed that produce both electricity and heat for residential applications. In order to facilitate the future commercialization of these systems, a rating methodology is being developed that will communicate their annual energy production and fuel consumption according to geographic location and intended use pattern. Factors such as ambient temperature, relative humidity, electrical power output, and thermal load are being considered. Several residential-scale stationary fuel cell systems have been tested to determine their response to these variables. Additionally, tests simulating a residential hot water and space heating load have been performed. The measured performance of two systems, a Plug Power Gensys 5c and an IdaTech EtaGen 5, will be discussed.

June 23 Dr. Sharon Laskowski
NIST Information Technology Laboratory, Information Access and User Interfaces Division

John Kelsey
NIST Information Technology Laboratory, Computer Security Division

Usability and Security of Voting Systems

The Help America Vote Act (HAVA) enacted by Congress in October 2002, gave NIST a key role in helping to realize nationwide improvements in voting systems by January 2006. The Information Technology Laboratory is coordinating HAVA efforts through its expertise in areas such as computer security and system usability. NIST supports the Election Assistance commission, chairing the Technical Guidelines Development Committee, which will recommend voluntary standards and guidelines in such important areas as: security of computers, computer



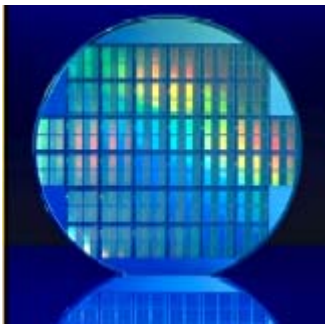
networks, and compute data storage used in voting systems; methods to detect and prevent fraud; protection of voter privacy; and the role of human factors in the design and application of voting systems, including assistive technologies for individuals with disabilities (including blindness) and varying levels of literacy.

June 28 Erica Kuligowski
BFRL Seminar, Fire Research Division

Evacuation Data Collection and Analysis

June 30 Dr. Eric Vogel
NIST Electronics and Electrical Engineering Laboratory, Semiconductor Electronics Division

The Future of Electronics: Moore's Law, Functional and Ubiquitous Electronics



Moore's law (the doubling of transistor density on integrated circuits approximately every 2 years) has provided smaller, faster and cheaper logic and memory for over 30 years. This has been driven by the ability to continue scaling the device dimensions of the Complementary Metal Oxide Semiconductor (CMOS) Field Effect Transistor (FET). Replacing or extending CMOS with emerging devices (Beyond CMOS) is an important aspect of continuing the acceleration of the rate of technical change. However, other electronic technology paradigms are becoming increasingly important. The concept of functional electronics or system-on-a-chip where optical, RF, MEMS and even molecular manipulation is performed on a CMOS platform is an increasingly important paradigm. The concept of ubiquitous electronics such as organic electronics in which electronics are cheaply incorporate din everyday items (clothes, packaging, etc.) is also an increasingly imortant paradigm. The talk provided a high-level overview of MOSFETscaling and discussed future technological paradigms (Beyond CMOS, Functional Electronics, Ubiquitous Electronics), which will continue to accelrate the rate of technical change.

June 30 ***National Science Foundation Physics REU Program Visit***

Dr. Beverly Burger, director of the Physics REU program at the National Science Foundation, visited the Physics SURFers. Dr. Burger evaluates our program and

gave us $100,000 towards supporting the Physics SURFers. She met with a number of Physics SURFers for 20-30 minutes who showed her where they work and chatted about their SURF experience.

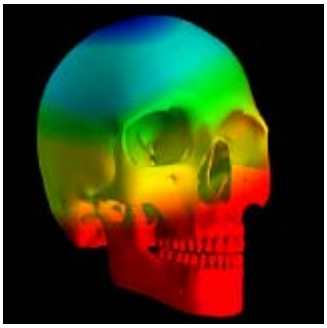
July 6 **Visit by University of Maryland Materials Research**

Ten students from a University of Maryland program similar to our SURF program toured a number of interesting labs (mammographic x-ray calibration range, Center for Neutron Research, and the weapons and protective systems lab) to get a feel for the science done at NIST.

July 7 Dr. Marc Desrosiers
NIST Physics Laboratory, Ionizing Radiation Division and PL SURF Director

Radiation Accidents: How Bones and Teeth Are Used to Measure Human Exposures

The how's and why's of radiation accidents were explained in t his presentation



on several accidents worldwide that included the former Soviet Union, Gaithersburg, and El Salvador. Electron Paramagnetic Resonance (EPR) spectrometry, also known as ESR, is sensitive to atoms/molecules with unpaired el ectrons (i.e. paramagnetic). EPR spectrometry is used to measure paramagnetic centers produced in materials after absorption of ionizing radiation (x-rays, gamma rays, high-energy particles). For bone, dentine and enamel tissue, ionizing radiation absorbed by the mineral component (hydroxyapatite) results in the formation of long-lived paramagnetic centers. This technique has been successfully used to quantify radiation overexposures to victims of radiation accidents and to assess the absorbed dose from internally-administered radiopharmaceuticals used in experimental medical therapy.

July 11 ***The Journal of Young Investigators (JYI)***

Contact: Heather Mispagel, Director of Public Relations (dpr@jyi.org)

The JYI recently launched a Resources Section, which features a Guide to Science Writing Manual. This 45-page manual is free for download at http://www.jyi.org/resources/rs.php. The manual can assist students in learnng the techniques of writing a resarch manuscript. Along with the manual, other JYI paraphernalia, such as JYI brochures and flyers, are also available for free download and distribution.

July 11 ***Annual Summer Horizons Program***

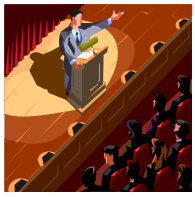
Contact: Lisa Portis Morgan (limorgan@umbc.edu)

SURF students were invited (and were provided transportation by UMBC) to attend the annual Summer Horizons program at the University of Maryland, Baltimore County (UMBC). Summer Horizons is the program whree the UMBC Graduate School takes a day to introduce students to graduate opportunities…some of the sessions dealt with how to get into graduate school, testing, decisions abut which program.

SURFers joined students from other summer research programs at UMBC, University of Maryland, College Park, University of Maryland at Baltimore, NASA, NSF, and NIH.

A continental breakfast, hot buffet lunch, and afternoon snacks were provided.

July 13 Mr. Donald Swenholt
Donald Swenholt Associates, Inc.



Giving Successful Presentations

Mr. Swenholt presented a few techniques and up-to-date procedures to assist the students in presenting their talks for the end-of-the-program SURF student symposium.

July 14 Dr. Andrew Persily
NIST Building and Fire Research Laboratory, Building Environment Division

Protecting Buildings from Airborne Chembio Agents

Concerns over airborne chemical and biological attacks have increased over recent years, prompting research, product development and programs to implement prevention, protection and response strategies. The vulnerability of buildings to airborne attacks depend on a number of factors related to building location, layout, and systems, and protective strategies strategies are increasingly being promoted and in some cases applied. The presentation addressed three key issues related to protecting buldings against airborne chembio agents: the threat, that is the agents and delivery mechanisms of concern; the vulnerabilities, building features that can increase occupant exposure in the event of an agent release; and, protective strategies, the engineering approaches being pursued to address these vulnerabilities. Special attention was given to activities occurring within the NIST's Indoor Air Quality and Ventilation group in terms of model development and application, development of guidance for building practitioners. In particular, the presentation spoke to current recommendations to protect buildings from outdoor releases through an outdoor air filtration and air cleaning in combination with building pressurization.

July 14 Peter Votruba-Drzal
BFRL Seminar

Nanomechanical Properties of Polymeric Coatings and Nanocomposites Through Instrumented Indentation

July 20 & July 27 ***NIST and the World Trade Center (Investigation Site Tour)***

The collapse of New York City's World Trade Center structures following the terrorist attacks of Sept. 11, 2001, was the worst building disaster in recorded history, killing some 2,800 people. More than 350 fire and emergency responders were among those killed, the largest loss of life for this group in a single incident.

In response to the WTC tragedy, the National Institute of Standards and Technology conducted a 3-year building and fire safety investigation to study the factors contributing to the probable cause (or causes) of post-impact collapse of the

WTC Towers (WTC 1 and 2) and WTC 7; expanded its research in areas of high-priority need such as prevention of progressive collapse, fire resistance design and retrofit of structures, and fire resistive coatings for structural steel; and is reaching out to the building and fire safety communities to pave the way for timely, expedited considerations of recommendations stemming from the investigation.

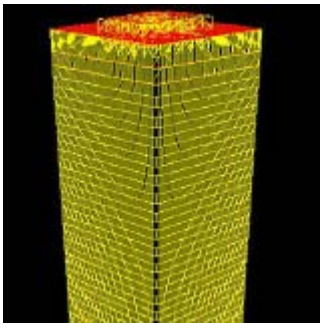
Forty SURFers (20 on each day) were able to tour the investigation site where much of the work that NIST has been involved with regarding the World Trade Center takes place.

July 20 & July 22 ***NIST Center for Neutron Research Tour*** (organized by 2nd Year SURFer Teresa Jacques, MSEL)

Neutron-based research covers a broad spectrum of disciplines, including engineering, biology, materials science, polymers, chemistry, and physics. The NCNR's neutron source provides the intense beams of neutrons required for these types of measurements. There are currently 29 experiment stations. The NCNR supports important NIST research needs, but is also operated as a major national user facility with merit-based access made available to the entire U.S. technological community. Each year, almost 2000 research participants from all areas of the country use the facility for measurements.

July 21 Dr. Frank Gayle
NIST Materials Science and Engineering Laboratory, Metallurgy Division

Aspects of the World Trade Center Disaster



In September 2002 the National Institute of Standards and Technology became the lead agency in an investigation of the World Trade Center (WTC) disaster of September 11, 2001. The investigation addressesd many aspects of the catastrophe, from occupant egress to factors affecting how long the Twin Towers stood after being hit by the airplanes, with the goal of gaining valuable information for the future.

A major part of the investigation was the metallurgical analysis of the structural steel from the Twin Towers. The analysis includes characterization of mechanical

properties, failure modes, and temperature excursions seen by the steel. In the overview of the metallurgical investigation, a description was presented of the structure of the towers, the steel recovered from the site, and special issues faced in the analysis of the steel.

July 21

Dr. William D. Phillips
NIST Physics Laboratory and 1997 Nobel Prize Laureate in Physics

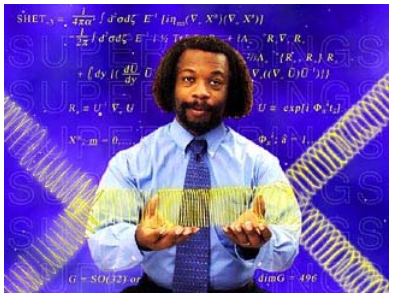
Time, Einstein, and the Coolest Stuff in the Universe

Being a SURF student at NIST affords one many benefits -- one of them being you just never know when you might run into one of our two Nobel Prize Laureates in Physics (Bill Phillips or Eric Cornell). Bill works at the Gaithersburg campus and Eric resides in Boulder. Bill wowed everyone on July 21 with a talk to celebrate the World Year of Physics.

What is time? Even Einstein had a hard time answering this question, but in spite of that, we can measure time more accurately than any other quantity. Atomic clocks are the most accurate timepieces ever made, and are essential for such features of modern life as synchronization of high speed communication and the operation of the Global Positioning System (GPS) that guides aircraft, cars, boats and backcountry hikers to their destinations. The limitations of atomic clocks come from the thermal motion of the atoms: hot atoms move rapidly and suffer from time shifts as predicted by Einstein's Theory of Relativity. Contrary to intuition, we can cool things by shining laser light on them. With laser cooling, we cool gases to less than one millionth of a degree above Absolute Zero. The slowly moving atoms in such a gas allow us to make even more accurate clocks, already so good that they would gain or lose only a second in 30 million years. Laser cooling has also made possible the observation of a long-standing prediction of Einstein: Bose-Einstein condensation hailed as one of the most important recent scientific developments.

What makes Bill so popular is many of his talks are aimed at people with no formal scientific training. His talks combine live demonstrations, video, and down-to-earth explanations with a bit of humour, but also discusses some of the most exciting recent developments in physics.

July 25 Professor Sylvester J. Gates, Jr.
John S. Toll Professor of Physics, University of Maryland's Center for String and Particle Theory Director



Superstrings: Einstein's Dream at the New Millennium

String theory was developed approximately 30 years ago by theoretical physicists who were uneasy with discrepancies between Einstein's theory of general relativity and quantum physics. In string theory, tiny open and closed strings are the most fundamental particles in the universe. The ability of these strings to spin has enabled physicists to make string theory consistent with both quantum mechanics and special relativity.

August 9 Final Presentations by SURF Students moderated by invited guests

August 9 Lunch: SURF Directors and special invited guests

August 10 Final Presentations by SURF students moderated by invited guests

August 11 Final Presentations by SURF students moderated by invited guests

August 12 Last Day for SURF students

2005 SURF Summer Activities

Finding a balance between work, play, and other activities isn't easy unless you're a SURF student. SURFers seem to have found the magic recipe, so look out when the 5 o'clock whistle blows because there's always fun and adventure when you get these SURFers together. Of course, it helps when you're in the DC Metro area where museums, baseball teams, and other entertainment opportunities abound. And, to get it all scheduled SURFers have their own forum for social and work-related SURF chatting.

SURF Forum

for social & work-related NIST SURF chat

SURF Forum Forum Index

Welcome

NIST News
- Seminars & Important Meetings

Now & the Future
- Does anyone know how to…?
- Graduate School
- Opportunities
- Anonymous Complaints

Activities
- After Work (get together for food & fun at home or around town)
- Take a Trip (explore Maryland, Virginia, New York & more)
- Our Global Community (leaving the world better than you found it)
- Sports (organize games and activities)
- Nature (take a hike, bike & more)
- Religion (find friends of your faith or share yours)
- Nightlife (clubs, etc.)
- Museums & the Arts (museums, performance arts, etc.)
- Dining (share a fave recipe, cheap eat or gourmet experience)
- Hobbies (your favorite pastimes, musical instruments, etc.)
- SURF T-Shirt Committee

Before you arrive…
- Getting Started
- How you get paid (know this before you leave school)
- What will happen on the first day (the schedule, transportation & more)
- Intro to NIST (dress codes & other fun stuff)
- Apartment Life (what to bring and what NOT to bring (like pets), the Internet, etc.)
- Summerfield Suites (chat with your new roommates)
- Oakwood Apartments (chat with your new roommates)
- The Locals (chat with other commuters, maybe carpool…)
- Air Travel Message Board (flying in at the same time? save $$ by sharing airport transportation)

SURF BBQ - NIST Picnic Grove

Food…food… did someone say food…OK, you'll find SURF students there. The SURF Directors provided the burgers, salads, desserts, and sodas. The students were the entertainment specialists providing Frisbees, music, etc. Check out a few pictures below

Is it Emeril -- BAM!
No, it's Chris White,
BFRL SURF Director

OK, no pushing,
there's plenty for all

Beauty and Brains --
Lady SURFers extraordinaire!

Is it the Wedding Crashers --
no, just a couple SURFer guys
mugging for the camera

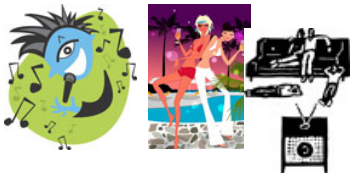
2005 SURF T-Shirt Design

And the tradition continues…each year the group designs a T-shirt during the summer. You don't have to be a student to want the T-shirt. Everyone from the NIST Director, the Physics Lab Director, to the niece of the SURF Administrative Coordinator wants one. Below is the design for the Summer 2005 -- what a creative group. Think you can outdo them next summer…

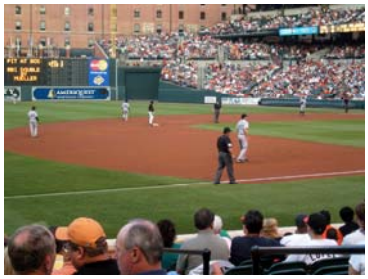
t-shirt front

t-shirt back

The Washington Metropolitan area is rich in cultural and recreational opportunities. NIST is just a short commute from the nation's capital, theaters, movies, restaurants, evening entertainment, historical and cultural sites, museums, shopping, and many local universities. Check out below some of the activities the SURF students took advantage of during the summer. They didn't wait for evening or weekends to have fun either since NIST boasts a fitness center, soccer, volleyball, softball, and many other activities to participate in during your lunch break. There were many other opportunities to have fun without spending a lot of cash because most college students watch their funds very closely. There were movie nights, poker parties, pool parties, a chance to show off your singing talents with karaoke, etc.



Camden Yards - Baltimore, MD ***RFK Stadium – Washington, DC***



Washington, DC finally has a baseball team again. The SURFers had their choice of seeing the Washington Nationals (Nats' -- sound like little bugs that bother me in the summer) or the Baltimore Orioles (Os) play the great game of baseball. What's summer without seeing your favorite home team play? Both teams were doing well this year so it should have been plenty of fun to see either team.

DC United Soccer

In 1996 the Nation's Capital because a charter member of Major League Soccer. They quickly set the standard for excellence in the league, on the field, and in the stands. In its short, nine-year history, DC United has earned more domestic and international honors than any other American side. The SURFers were able to attend some games and join the other soccer-hungry fans across the country.

Memorial Day in the Nation's Capital

PBS's National Memorial Day Concert remembered the sacrifices of American's veterans and the SURFers were on hand to view it live. The concert commemorated the 60th anniversary of Iwo Jima and honored our troops in Iraq and Afghanistan.

Of course, when you get a group of college kids together on a holiday, you're sure to find food, drink, and fun (and maybe the latest swim fashions).

United States Holocaust Memorial Museum

The United States Holocaust Memorial Museum is America's national isntitution for the documentatiion, study, and interpretation of Holocaust history. The SURFers went to learn about the unprecedented tragedy. The museum encourages its visitors to reflect upon the moral and spiritual questions raised by the events of the Holocaust as well as their own responsibilities as citizens of a democracy.

2005 Smithsonian Folklife Festival

More than 1 million visitors attended the 39th annual Smithsonian Folklife Festival on the National Mall between June 23-June 27 and June 30-July 4. Festival-goers enjoyed a variety of music, crafts and food in the four featured programs: "Food Culture USA," "Forest Service, Culture and Community," "Oman: Desert, Oasis and Sea" and "Nuestra Música: Music in Latino Culture." Not being a group to waste an opportunity, the SURFers were among the 1 million to check out things.

The Meaning of the Fourth of July

On the Fourth of July, we pause to remember and celebrate the values of liberty and justice that make our country great, and to be thankful for the remarkable freedoms that we enjoy in the United States of America.

The significance of this day has inspired speeches, literary works, and musical compositions. It is also an opportunity for each of us to ponder the meaning of our nation's heritage and to celebrate it in our own unique way. SURFers were able to celebrate "live" on the National Mall and not only enjoy the fireworks but ponder why this holiday is special to each of them.

WICKED

As with many others, the SURFers probably grew up on the story "The Wizard of Oz," but long before Dorothy dropped in, two other girls meet in the Land of Oz. One, born with emerald-green skin, is smart, fiery and misunderstood. The other is beautiful, ambitious and very popular. How these two unlikely friends end up as the Wicked Witch of the West and Glinda the Good Witch makes for a most spellbinding story. If you were an Oz fan, it was a necessity to see the "rest of the story."

Medieval Times Dinner and Tournament

You can count on the SURFers to find the ususual. Medieval Times is an adventure unlike anything you have ever experienced before or will ever experience again. During each live performance, guests enjoy an authentic medieval feast while valiant knights on horseback do battle to the death. Brilliant costumes, authentic in every detail add to the splendor of your visit. Cheer your brave knight to victory as he competes in games of skill, hand to hand combat and of course, the joust. Who will rise victorious and have his chance to select the queen of love and beauty? Only the strongest and bravest knight who hears the support of the loyal subjects will win.

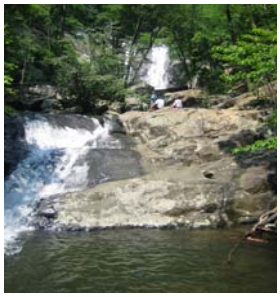
Twins Jazz Lounge

SURFers went to check out Twins Jazz Lounge, which was voted one of AOL's City Guides best live music clubs for 2005.

Another tradition continues… the trip to Kings Dominion!

It started way back in 1993 when the first group of SURFers came to NIST. A chance to get the whole group together to enjoy hair-raising rides, the wettest water park, sizzling stage shows, and tons of other cool stuff. What more could a "SURFer" want when the forecast calls for a **H**azy, **H**ot, and **H**umid Washington summer day.

Hike, Mountain Bike, Camping, and White Water Rafting



After a hot day at Kings Dominion, it was great to cool off at Great Falls Park, located in McLean, Virginia, which is 800 acres in size and has 15 miles of trails. Five miles of these trails are multiple use trails for mountain biking and horseback riding. The trail system offers a wide variety of environments for exploration. The river trail follows the Potomac river from the falls overlooks downstream along the scenic Mather Gorge; the Patowmack Canal trail follows the ruins of this historic canal and the ruins of the canal town of Matildaville; the Old Carriage Road trail, the Ridge trail and Mine Run trail follow upland oak forests; the Swamp trail follows along a unique swamp habitat and lowland forest.

Steven F. Udvar-Hazy Center

Never ones to miss an opportunity so close at hand, the SURFers visited the relatively new Steven F. Udvar-Hazy Center near Washington Dulles International Airport The Center is the companion facility to the National Air and Space Museum on the National Mall. The building opened in December, 2003, and provides enough space for the Smithsonian to display the thousands of aviation and space artifacts that cannot be exhibited on the National Mall. The two sites together showcase the largest collection of aviation and space artifacts in the world.

The Center was named in honor of its major donor, and features a large aviation hangar in which aircraft are displayed on three levels. The SURFers were able to walk among aircraft and small artifacts in display cases located on the floor, and view aircraft hanging from the arched ceiling on elevated skywalks. Many engines, helicopters, ultra-lights, and experimental flying machines are on display in a museum setting for the first time. Among the aviation artifacts on display are the Lockheed SR-71 Blackbird, the fastest jet in the world;

the Boeing Dash 80, the prototype of the 707; the Boeing B-29 Superfortress Enola Gay; and the deHavilland Chipmunk aerobatic airplane.

On the following pages you will get a glimpse of all the hard work the SURFers put in over the summer with an abstract from each telling of their work.

We hope you will join us next summer and experience all SURF has to offer!