Alumni Awards, *continued from page 5*

analysis of thermal barrier coatings used in gas turbine engines.

Dale S. Margerum Memorial Award

Presented annually to an undergraduate student for outstanding leadership qualities as exemplified by his or her participation in departmental extracurricular activities.

Jeff Kowtko of Cedar Point, Illinois, is a member of many associations but he is being recognized for his leadership as president of the microgravity team, the Float'n Illini. Prof. Eric Loth, the new faculty adviser for the Float'n Illini, recommended Kowtko for the award. Loth noted several "outstanding successes" under Kowtko's leadership, including fundraising efforts that obtained more funds from industry and university units despite budget restraints, acceptance of the Float'n Illini's experiment that was tested in April 2002 at NASA's Johnson Space Flight Center, and learning opportunities for grade schools through visits, and an exhibit for the Engineering Open House. "It should be noted that this was all done with a new faculty adviser to the Float'n Illini, who . . . very much depended on Jeff to make the majority of the decisions and organize the group primarily on his own," wrote Loth in his nomination letter.

Kowtko, who will graduate in May 2003 in his major with a minor in computer science, also performed research for the Center for Simulation of Advanced Rockets and is a member of the Illini Space Development Society (where he is on the Executive Council), National Space Society, American Institute of Aeronautics and Astronautics, the Planetary Society, and Natural Resource Defense Council. When he presented the award, Prof. Rod Burton noted that Kowtko was a "human dynamo" who had accomplished a great deal since arriving at the department from a community college only 18 months ago.

Thomas Tobey, who received the Distinguished Alumnus Award for 2002, receives congratulations from Debra Bragg. In the background, Department Head Mike Bragg is seen talking to Mrs. Stillwell.

In Memoriam

Robert L. Orem, MS '55, of Indianapolis, died April 8, 2002. He was 75. He worked for 20 years as an aeronautical engineer for the Naval Avionics Center, retiring in 1987. A veteran of the Korean War, he served in the Air Force for 17 years, retiring in 1967. Orem also served in the Army and the Navy. He was awarded a 40-year service award by the secretary of the Navy. He is survived by his wife Mary Ellen Baker Orem; children Daniel, Elizabeth Orem, and Patricia Garretson; stepchildren L. Michael, Patrick Mitchell, Lynn Gosser, and Ellen Charlene McClain; two grandsons; eight stepgrandchildren, and six great-stepgrandchildren.

William G. Nelson, '58, died on January 31, 2002. A native of Mount Olive, Illinois, he was born in 1928. He enlisted in the U.S. Navy in 1948, and served in a torpedo patrol squadron. After earning his AAE degree in 1958, he went to work for the Boeing Corporation in Seattle, Washington. He later joined LTV in Dallas, Texas, and McDonnell Douglas in 1964, retiring in 1996. At McDonnell Douglas, Nelson worked on such projects as the F-4 Phantom, F-15 Eagle, F-18 Hornet, the AV8B VSTOL, and the T-45. He then served as chief financial officer of PRN Transcription, Inc. until February 2000. He is survived by Helen, his wife of 40 years, and a son, William.

Introducing Natasha Neogi . . .

In Natasha Neogi resides a person of many accomplishments—aerospace researcher, speaker of many languages, figure skater, ballet dancer, piano player, and ardant Savoyard. Neogi is the most recent addition to the AAE Department, the second faculty member hired to build up the department in a new direction, that of information technology.

Neogi employs hybrid modeling and backwards reachability techniques to assess the safety of software and other systems. According to her, a safe system is one that is free from accidents or unacceptable losses. "The heart of analyzing a system from a safety perspective is identifying and analyzing the system for hazards, which are states or conditions of the system that, combined with some environmental conditions, can lead to an accident or loss event," Neogi said. How one analyzes for hazards in a system is through modeling, whether this be formal or informal. " . . . (This) may be an informal model in the mind of the analyst, a written informal or formatted specification of the system, or a formal mathematical model. Different models allow for different types of analyses and for additional rigor and completeness in the analysis. It's very ad hoc at this point. Part of my research is to come up with ways to formalize hazard analysis. The more people think about this problem, the more possibilities and more hazards one can predict." But she cautions that this does not guarantee complete success.

The department's newest faculty member came to dependable software systems by a roundabout route. Neogi started out in space research, made the transition to fluids, and ended up in software. "I started out doing the dynamics of thin, flexible structures in space (the Canadarm) for an undergraduate senior thesis. I then got interested in the dynamics of thin wing structures (like on the Space Shuttle), and what the effects of re-entry to the Earth's atmosphere would be like." She continued her research at Cambridge University in England, where she worked on visualization techniques for high-speed fluid flows. Neogi then attended the Massachusetts Institute of Technology (MIT) to further her work on space structures, studying the effect of crew motions on a space station. "I was actually working on my master's at MIT, when the unmanned cargo ship crashed into the Spektr module of Mir in June 1997, causing us to lose half of our data. That got me interested in the role of software and autonomous vehicles in accidents.

"Several other accidents that are directly linked to software are the Ariane 5 rocket, which exploded on its first launch because of improper software reuse from Ariane 4, and the Airbus 320 accident in Warsaw, Poland, in September 1993, in which the pilot attempted to deploy spoilers after landing. A software interlock prevented this from happening as the aircraft wheels were hydroplaning and thus the onboard systems did not think the plane had touched down. Mars Climate Orbiter failed to insert into Mars orbit because one software program performed calculations in imperial units and handed the answers off to another component, which worked in SI (the international system) units."

Neogi maintains strongly that engineers, computer scientists, and programmers need to talk to each other and review each other's assumptions to achieve integration between engineering hardware and software. "In aerospace, single points of failure don't happen often but it's disastrous when systems fail. These errors incur economic costs to corporations and governments, as well as loss of life."

She elaborated: "Most accidents are system accidents; that is, they stem from complex interactions between various components and activities. To attribute a single cause to an accident is usually a serious mistake. It is still a common belief that any good engineer can build software, regardless of whether he or she is trained in state-of-the-art, software-engineering procedures. Many companies building safety-critical software are not using proper procedures from a software-engineering and safety-engineering perspective. This is not limited to the aerospace industry but to any industry which relies on software to provide safety-critical functions. Domain-specific knowledge (whether it be aerospace, medical, or nuclear) must be conveyed from the engineering experts to the scientists who design the

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Natasha Neogi, *continued from page 7*

software. Aerospace accidents merely occasion the most comment because they are normally very visible (plane crashes and exploding hardware), and very expensive."

Neogi and fellow faculty member Emilio Frazzoli shared a common adviser at MIT, and now at AAE they are collaborating together on a project. "Prof. Frazzoli and I are working on investigating trustworthy networked systems. At present, we are trying to create an environment where we can fly both real and simulated airplanes and air vehicles and then perform conflict detection upon them. This is a long-term project, covering three to five years, and we are applying for funding from the National Science Foundation."

Neogi is also collaborating with faculty members from several other engineering departments on campus. "Prof. Bill Sanders (of the Coordinated Science Lab) and I are looking at dependable networked systems. We are investigating issues of reliability, security, stability, and availability of mobile systems (such as a mobile cellphone network, or a group of autonomous air vehicles).

"Prof. Ravi Iyer (of Electrical and Computer Engineering and director of the Coordinated Science Lab) and I are working on fault-tolerant systems. Basically, given that you already have a system (such as the national airspace, in which a whole lot of planes are flying) and something goes wrong (one plane has an engine failure and must land suddenly), how does it affect the rest of the system? So you take a system, inject some faults into it, and see how badly the dynamics of the system are perturbed. If the system goes back to working efficiently very quickly, then it is a fault-tolerant system."

Neogi and several other engineering professors who have similar research interests have set up a formal methods group. "Prof. Gul Agha (Computer Science), Prof. Michael Loui (Electrical and Computer Engineering), and several other professors from CS and ECE meet for a seminar every Friday, where one person will talk about his or her work (in verification, validation, reliability, etc.), and we have guest speakers from NASA, other universities, and industry."

At the department, she is teaching Introduction to Aerospace Engineering for first-year students, and she will next teach Advanced Flight Mechanics. She also supervises the ASME Green Emus, a student design team that competes in an SAE aircraft competition.

Outside of the department, Neogi is coaching 8- to 10-year-old girls in figure skating. "I've been figure skating since I was 6 years old and skated competitively for my last years of high school. I've also done ballet and have been playing the piano since I was 5. I enjoy singing and was a part of the MIT Savoy society, singing in such plays as *The Mikado*, *Princess Ida*, *Iolanthe*, and the *HMS Pinafore*."

Neogi is also an ace in languages, being fluent in English, French, and Bengali (her father's native tongue) and conversant in German, Russian, and Hindi. "At Cambridge University, a student is required to read and comment proficiently in two technical languages. I chose Russian and German."

William "Todd" Cerven, '97, MS '99, wed Marie Graziano on March 31, 2001, in Carbondale, Illinois. The couple resides in Rantoul. Cerven, who is working towards his doctorate, hopes to graduate in summer 2003.

John "Bill" Hartmann, '96, MS '99, and Kristine Stolte of DeKalb were married September 21, 2002 in Geneva, Illinois. Hartmann is pursuing an AAE doctorate in the area of spacecraft trajectory optimization.

Fired Up:
Student-built Satellite Nears Completion

The Department of Aeronautical and Astronautical Engineering is actively involved in this interdisciplinary design project, from program management to working on the propulsion system to faculty advising. The students hope to launch their tiny satellite into orbit in early 2004.—Editor

A small satellite being built by students at the University of Illinois may help pave the way to more versatile and less expensive spacecraft.

Called the Illinois Observing Nanosatellite (ION), the spacecraft was designed and is being built by a group of about 25 graduate and undergraduate students. Drawn from various engineering disciplines, the students in this special class are not just building a satellite, they are also building self-confidence and a spirit of camaraderie.

"Students rarely get the opportunity to take something from concept to launch in a university setting," said Victoria Coverstone, a professor of aeronautical and astronautical engineering and one of two faculty advisers for the project. "We are very pleased with how well the students have cooperated with one another in this interdisciplinary design project."

The satellite is tiny—measuring 4 x 4 x 8 inches and weighing less than 5 pounds—but the students have great expectations for its performance.

"In addition to a scientific mission, ION also will serve as a test bed to demonstrate several new technologies, including an electric propulsion system and a novel attitude control system," said **Bill Hartmann** ('96, MS '99), a graduate student and program manager for the satellite project. "In many ways, this project is a stepping stone toward a much more versatile and less costly small satellite system."

As a technology demonstration, ION has as its primary mission the space qualification of a miniature electric propulsion system. The propulsion system is being developed with Alameda Applied Sciences Corp. in San Leandro, California.

"The micropropulsion system consists of four vacuum arc thrusters, which work in a manner similar to a spark plug," said graduate student **Filip Rysanek** ('98), who presented a paper (co-written with Hartmann) at this summer's Small Satellite Conference, held at Utah State University in Logan, Utah. "An electric arc ejects material from the thruster surface at high velocity, producing a highly efficient method of propulsion."

Validation of the tiny thrusters would give small satellites such as ION a maneuverability previously reserved for much larger spacecraft, said Rysanek, who will continue working on the thrusters for his doctorate.

The students also are developing an active, three-axis attitude control system based upon free-air magnetic torque coils. The system will use three mutually orthogonal torque coils—which work as electromagnets—to reposition the spacecraft and to control roll, pitch, and yaw.

"Sending an electric current through a coil generates a magnetic field that interacts with Earth's magnetosphere and produces a torque on the satellite," Hartmann said. "By varying the current in the three coils, we can produce whatever torque is needed to control the satellite."

ION's main scientific mission is to study the airglow layer of Earth's upper atmosphere. Located about 60 miles above Earth's surface, the

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CLASS NOTES

1950s

Robert Farquhar, '59, mission director at the Applied Physics Lab, Johns Hopkins University, presented a seminar on campus November 20, 2002. He talked about his successes and failures during his 30-year career with spacecraft missions to comets and asteroids. His presentation highlighted three NASA missions: the fly-by in September 1985 of comet Giacobini-Zinner by the international Cometary Explorer (ICE) spacecraft; the Comet Nucleus TOUR (CONTOUR), which was successfully launched in July 2002 but was terminated by a catastrophic event on August 15; and the NEAR Shoemaker spacecraft, which became the first spacecraft to land on a small body, the near-Earth asteroid 433 Eros, in February 2001.

1960s

Sridhar Ramachandra, PhD '62, worked for NASA in Cleveland, Ohio, until 1991. He then became a consultant in the field of information technology and retired in April 2002. In his retirement, Ramachandra has resumed his aerodynamic research: "I have been engaged for some time in looking at the classical, century-old problem of transition of laminar flow into turbulence from the molecular viewpoint instead of the continuum model." He returned to campus recently and was able to meet former professors Hilton and Yen after nearly four decades.

Ed Prior, '65, is the Deputy Director for Education at NASA Langley in Hampton, Virginia.

George Muellner, '67, was one of eight alumni and former faculty members honored with alumni awards for distinguished service at the 38th College of Engineering Honor Awards convocation. The event was held in April 2002 at the

Illini Union. Muellner also presented a seminar that day on the future of aerospace and Boeing research.

Duane Teske, '68, most recently worked as the program manager for electric systems on the Embraer ERJ 170 for Hamilton Sundstrand in Rockford, Illinois. The company is supplying several integrated systems for Embraer's new family of regional aircraft.

Steve Nagel, '69, was the keynote speaker for the 2002 Illinois Aviation Hall of Fame induction and banquet on April 24. The event was the culmination of a two-day aviation conference in Urbana. Nagel also served on the steering committee to erect a veterans' memorial at Memorial Stadium.

1970s

Daniel Else III, '74, is an analyst in national defense for the Congressional Research Service. He has earned several degrees since his graduation from AAE: an MBA from National University, San Diego, in 1988; an MA in political science from Penn State in 1994; and an MA in political science from The George Washington University in 2000.

Dennis Reside, '75, works as an aerospace engineer in the U.S. Army's Program Executive Office in Madison, Alabama.

Bruce Goodwin, MS '77, PhD '82, was one of seven winners of the Ernest Orlando Lawrence Awards, presented on October 28 at The National Academies of Science, Washington, D.C. He was recognized in the national security category for his theory work in creating equations of state for plutonium under extreme pressures. Goodwin is a physicist and associate director in the Defense and Nuclear Technologies Directorate at Lawrence Livermore National Laboratory.

1980s

Scott Altman, '81, was an Illini Comeback Guest for 2002 homecoming activities on the Urbana campus in October. (Each year, the Student Alumni Association invites back to campus a group of distinguished alumni to take part in traditional activities such as the Homecoming Parade and Pep Rally.) The NASA astronaut talked to students about his work at a presentation on October 25. Altman's most recent Space Shuttle flight was in March 2002 on STS-109, a Hubble servicing mission.

Paul Lencioni, '86, and his wife, Cynthia, are new parents to a daughter, Arelia Cristina, who was born on January 13, 2002. The family lives in Portola Valley, California.

Richard Mange, '86, MS '90, PhD '96, was awarded Associate Fellow status by the American Institute of Aeronautics and Astronautics. Mange works for Lockheed Martin Aeronautics Company in Fort Worth,

Student-Built Satellite, *continued from page 9*

Ann Peedikayil, who worked on the layout of the solar panels, and Ryan Kuester, leader of the communications and data handling team, hold the framework of the Illinois Observing Nanosatellite.

airglow emission can reveal information about waves moving through the atmosphere.

"This light is absorbed in the lower atmosphere, so you can't study it with ground-based sensors," said Rich Hudec, a senior in aeronautical and astronautical engineering from Chicago. "ION will measure the brightness of the airglow layer from low-Earth orbit using a photomultiplier-tube detector."

Hudec designed the detector's mounting plate and view shield—a cylinder-shaped device that restricts the field of view and holds a filter that restricts the wavelength of light the detector sees.

"It was exciting to help build something that will be going into orbit," Hudec said. "It's been a fun, hands-on project that forces you to work as a team and communicate effectively with others."

The students not only had to communicate effectively through written progress reports and weekly meetings, they also had to try to understand each other's problems and seek common solutions for the good of the project.

"There's something almost magical about building and launching a satellite," said Ryan Kuester, a senior in electrical and computer engineering from Wauconda, Illinois.

Kuester is leader of the communications and data handling team. Students will communicate with the satellite by means of an antenna on the roof of Everitt Laboratory.

"Last semester, we demonstrated some primitive command and control features from our ground