Imaging Science major Stephanie Shubert has been chosen from among the eight college delegates to speak at RIT’s 2005 Convocation ceremony May 20. The following day, she will address her College of Science classmates at the college commencement ceremony.

Stephanie was selected as COS student delegate by faculty on the basis of outstanding effort both in and out of the classroom. RIT President Albert Simone asked her to speak at Convocation, a university-wide celebration.

A native of Lincoln, Neb., Stephanie became deaf shortly after birth. She and a twin sister were eight weeks premature and Stephanie, who was very sick, was given a medication that caused her deafness. Her twin and a younger sister are hearing. Stephanie’s parents learned sign language to communicate with their daughter.

She began her studies at RIT in the General Science Exploration Program, but ultimately was drawn to imaging science because of its interdisciplinary nature.

“I liked so many different areas of science and didn’t want to just focus on one area,” she says. “Imaging science includes mathematics, chemistry, biology, physics, and color.

CIS Student To Speak At Graduation

The Center for Imaging Science has teamed with a central New York high school to win one of the most prestigious grants available to K-12 educators. Carol Burch, a physics teacher at Hannibal High School was recently awarded $10,000 from Toyota’s Tapestry Foundation to pursue a year-long project entitled "Seeing is Believing: Infrared Imaging for Energy Conservation.”

The goal of the project is to improve student performance in math and science at all levels from grade 7 through 12 by incorporating thermal imagery into the curriculum. Burch intends to train her students to use a thermal camera to perform energy surveys of their homes, their school, and buildings throughout their community. The captured images will be analyzed using image processing techniques, and the students will develop and recommend plans to take corrective actions as required based on their findings. In performing all of these tasks, the students will be

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CIS’s Joe Pow teamed with physics teacher Carol Burch on the winning proposal.

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Integrated sensing systems are the way of the future—fusion of data from satellite-, aircraft- and ground-based sensors combined into an information package will give incident managers critical data at their fingertips whether confronting a wildfire or the aftermath of a dirty bomb.

RIT’s new Integrated Sensing Systems Initiative (ISSI) will combine sensors, wireless communication and advanced processing into a multi-tiered system for use in national and homeland security. Phase two of the project was allocated $1.5 million in federal funding in the Omnibus Appropriations bill for 2005 approved by Congress in November and is slated to begin in September. This funding adds to the $1.4 million allotted last year, which will be initiated this month. An early supporter of the project, Rep. Jim Walsh has helped secure funding for RIT’s initiative from the beginning.

The integrated sensing program builds on RIT’s previous work collecting information from aircraft and satellites to help with the management of wildfires.

“ISSI will add another dimension to remote sensing by using a layer of sensors on or near the ground to generate information products,” says Donald McKeown, project manager and distinguished researcher in RIT’s Laboratory for Imaging Algorithms and Systems in the Chester F. Carlson Center for Imaging Science. “People are doing work on sensors and networks of sensors, but integrating a multi-tier system of systems including satellite, aircraft and ground sensors is relatively new territory. That’s where the strength of RIT comes in—we have a strong system engineering approach.”

Radio links will transmit data measured by small ground sensors (weather-tight and fireproof) to aircraft collecting additional data. The two sets of information will be processed together along with data from NASA’s Moderate Resolution Imaging Spectroradiometer or MODIS satellite to generate tools to help incident managers make decisions.

“The idea is that information needed by incident managers is often times more than just a picture; they need other types of data as well,” McKeown says.

For instance, ground sensors will measure weather parameters of a wildfire—including humidity, temperature, wind direction and wind speed—or characterize toxic materials released into the air by a dirty bomb. The integrated system would combine those details with an instantaneous picture taken from an airplane.

McKeown and his team will design the integrated sensing system as a flexible tool for addressing wildfires and other major incidents, including terrorist attacks, when situational awareness is critical. The RIT team also has initiated discussions with the Monroe County Office of Emergency Preparedness for potential use on a local level.

Since 2000, Congressman Walsh has secured nearly $9.5 million in research funding for remote sensing programs at RIT’s CIS—the Wildfire Airborne Sensor Program and its precursor program, FIRES, which links RIT to NASA and applies remote sensing strategies to facilitate the early detection of forest fires. This federal investment focused on dramatically increasing the effectiveness of remote sensing in the production of image-based information for global environmental monitoring, homeland and national security.
CIS Eyetracking Research Forges Ahead With More “Real World” Activities

How do we use our eyes to perceive the world? Could eye movements be windows into human cognition?

Scientist Jeff Pelz thinks so. The director of the Visual Perception Laboratory at RIT studies the link between eye movements and cognition. His latest research, in collaboration with the National Technical Institute for the Deaf, focuses on how deaf students process information in the classroom. Another project tracks how the human eye perceives high-speed motion on large-scale LCD monitors for Sharp Research Laboratory of America.

Until recently, visual perception research was rooted in laboratories where subjects looked at simple patterns on monitors in darkened rooms. Pelz argues that those experiments tell scientists little about how people use their eyes in daily life.

“The overarching question is how much of what we learn in the laboratory can we extend to the real world?” asks Pelz, an associate professor at RIT’s Chester F. Carlson Center for Imaging Science.

The wearable eye tracker—new technology developed in the Visual Perception Laboratory—is helping to answer those questions. The eye tracker has transformed the field of visual perception by enabling subjects to wear the technology outside of the laboratory and even outdoors.

“The system we’ve developed at RIT is unique in its ability to automatically monitor even complex tasks in a large range of environments,” Pelz says. “We can study students in a classroom or people finding their way in the woods.”

The wearable eye tracker extends the laboratory to the real world by recording what people look at and how their eyes move as they perform a specified task, such as attending to a lecture in a classroom, driving a car, walking or playing racquetball. In other words, the device tracks how eye movements support perception and what people pay attention to in order to gather the information they need to perform everyday activities.

Two eye-tracking models unique to RIT have different capabilities: one performs on-line processing in real time within any indoor setting outside the laboratory; the second model fits neatly in a backpack and can be worn anywhere, even outside. The latter model trades real-time capability for lightness; data recorded outside is later processed in the lab.

Developing wearable eye-tracking technology has long been one of Pelz’s goals. His own research received a boost from the U.S. Naval Research Laboratory in 2002, which established a cooperative agreement with Pelz’s lab to develop the device. One goal of that project has been to study how people locate difficult-to-find objects in natural scenes.

The portable eye-tracking equipment also has led to a National Science Foundation-funded collaboration with professor Marc Marschark and Carol Convertino of NTID at RIT. This project, now in its second year, uses eye tracking with hearing and deaf students in a simulated classroom. The study,

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sponsored by the NSF’s Research on Learning and Education program, seeks to understand how deaf students divide their attention between instructor, interpreter and a graphic display. Mary Ellen Arndt, a graduate student in information technology with a concentration in human-computer interaction, took the lead in collecting and analyzing the large amount of data collected for that project.

Another study, conducted with a team including graduate student Justin Laird and faculty members Mitch Rosen and Ethan Montag, is funded by the Sharp Research Laboratory of America. In this case, Pelz’s team is exploring how people view rapid motion on the new class of large displays. Knowing how fast an object is moving across a viewer’s retina—rather than on the screen—will help them write software algorithms to overcome hardware limitations.

“The challenges to the imaging designers of those systems cannot be solved without understanding how people move their attention, and therefore their eyes, when viewing fast action sequences” says Pelz.

Pelz and his students are also conducting basic research with CIS graduate Constantine Rothkopf, now a doctoral student at the University of Rochester. This project uses the wearable eye tracker to model how people navigate and search for objects in complex natural scenes, in this case, the shady trails behind the Grace Watson building. A better understanding of how humans behave in the real world can help computer scientists develop better “computer vision” for robotic vision systems.

In the newest incarnation of the wearable eye tracker, Pelz and imaging science undergraduate Steve Broskey are using a binocular tracker that monitors both eyes to study how people move them together to explore the third dimension.

“By tracking both eyes, we can measure the angle between them and calculate not only the direction, but also the distance to objects in the world,” Pelz says. “This lets us identify the point in 3-D space where they are paying attention instead of just the 2-D direction.”

“We’ve learned a huge amount in the lab about what the visual system can do,” Pelz adds. “Now we’re beginning to learn what the visual system does in the real world.”

Stefi Baum, director of RIT’s Chester F. Carlson Center for Imaging Science, attended the U.S. House of Representatives’ Science Committee review of the Hubble Space Telescope mission in February.

The Science Committee held hearings on “Options for Hubble Science” as a prelude to budget debates. The NASA budget proposed for this year does not include money to service the Hubble Space Telescope.

Baum sits on the executive committee of the Hubble Origin Probe (HOP), which presented an alternative for continuing and enhancing the Hubble Science mission with a new free-flyer telescope. HOP is a collaborative venture between RIT, Johns Hopkins University, the National Astronomical Observatory of Japan, Lockheed, ITT, and Ball Aerospace Corporation.

HOP owes its competitiveness to new technology lightweight mirror and optical telescope assemblies, to its broad wavelength coverage from the ultraviolet through the infrared, and to its multiwavelength imaging and spectroscopy capabilities. HOP features a new very wide field imager, to be built and funded by the Japanese, which would dramatically enhance the Hubble Science Mission while complementing NASA’s other new missions. HOP’s very wide field imager, with its unique optical design, enables new efficient surveys to find planets around other stars and to study the dark energy and dark matter components of the universe through supernova searches and deep widefield imaging.

Prior to joining RIT in July 2004, Baum worked for 13 years as an astronomer and served as Engineering Division Head for three years at the Space Telescope Institute, the science operations center for the Hubble Space Telescope and the next generation space telescope, the James Webb Space Telescope (JWST).

For more information about the Hubble Origin Probe, visit, www.pha.jhu.edu/hop
The entrepreneurial spirit runs strong in imaging science alumnus Donald Forst.

Since he graduated in 1962, he has launched or had a hand in developing numerous successful and diverse businesses – including a restaurant and an antiques business as well as five companies based on imaging science.

“For me, the most exciting part of business is the start,” says Forst, who has spent only a fraction of his career working for other people. In fact, Forst refers to his 10 years with Itek Corp. – his first job after RIT – as “a great training ground for starting your own business.” He worked with many RIT grads at the company’s Lexington, Mass., facility, where the focus was on producing aerial photographic systems for the government.

In 1972, Forst and another imaging science grad, Bill Kinney ’64, left Itek to start Microtek in Manchester, N.H. Their idea was to microfilm medical X-rays and reclaim the silver from the used film. “It was very successful,” Forst says. “We pretty much captured the market.”

They sold the business in 1980 and Forst spent a few years doing something completely different: He restored old homes and, as an outgrowth of that business, he began buying and selling antiques. He continues to collect vintage photos and equipment, and buys and sells online.

He started his current business, New England Document Systems, in 1983. The company provides document imaging, microfilming and secure storage services for small to large businesses in a variety of industries, including medical, business, retail and education.

“Many companies have a need to preserve a variety of documents,” he explains. Over the years, the technology has transitioned from microfilm to digital scanning and storage. Today, business is booming; the company scans millions of customer documents each month. “We’re knee deep in rapid growth, since digital came along,” Forst says.

A native of Cleveland, Forst became interested in photography in high school. “Ohio University had a good photo program, but RIT was more techy, and that’s the way I wanted to go,” he says. “The photo sciences program prepared me for work from day one.

“The only regret about my time at RIT is I wish I had done more networking with people. It was a tough program, and I definitely felt the peer pressure to study hard.”

Still, Forst has forged business connections with fellow alumni over the years. Besides Kinney, Forst has worked with Ara Hourdajian ’66 on start-up businesses.

At the standard retirement age of 65, Forst does not talk about slowing down. “I still have the urge to start a new business,” he admits.
applying and reinforcing concepts they’re learning in their math, science, and technology classes, and they’ll be exposed to many opportunities in related fields, including imaging science.

The idea for the project came about after a visit by CIS Associate Director Joe Pow to Burch’s physics classes last fall. During his lectures Pow demonstrated the use of a thermal imaging camera to see beyond the visible portion of the spectrum. According to Burch, students and faculty alike were amazed by the images, and by the incredible array of opportunities available to students in RIT’s imaging science program. Burch decided on the spot that her students needed to learn more about this field of study. She made plans to follow-up on Pow’s visit with field trips to RIT for the top performers in her class.

During these field trips, Burch’s students received more in-depth exposure to various aspects of imaging science such as 3-D imagery and digital image processing. One of her seniors was even able to formally present the results of an independent study project on the camera obscura to a room full of CIS faculty, staff, and students. "He was answering questions from doctors," she noted. "How can you beat that kind of experience?"

Convinced by these visits that exposing more students to imaging science would result in greater interest and better performance in other technical subjects, Burch received approval to offer a semester-long elective course in imaging at her high school, and she started developing plans to incorporate imaging into the curriculum at lower grade levels. Knowing that she would need the help of a dedicated team to implement her ambitious plan, she solicited and received enthusiastic support from the community, local companies, members of the imaging industry, and of course, the Center for Imaging Science. Her success in building this diverse team enhanced the strength of the proposal she submitted to Toyota’s Tapestry Foundation, and resulted in her selection as one of 50 educators from across the country to receive one of the coveted grants.

Work on Burch’s project will begin this summer with two workshops at RIT for Hannibal teachers involved in the effort. These teachers will receive training on thermal imaging technology and digital image processing from CIS faculty and staff. During the school year CIS will also provide textbooks, additional guest lectures, and scholarships for students to attend RIT’s “College and Careers” events the following summer.

The CIS-Hannibal relationship has already paid significant dividends to RIT. “As a result of their exposure to our campus and our programs, four seniors from Hannibal’s graduating class have already been accepted at RIT -- two into imaging science, one into biology, and one into mechanical engineering technology,” said Pow. ‘I hope the relationship we’ve developed with Carol Burch and the Hannibal School District becomes a model for future interactions with other K-12 educators.”

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