Imaging Connection

The Newsletter of the Chester F. Carlson Center for Imaging Science Spring 2003, Issue 08

Congratulations 2003 Graduates!

CIS Graduates First Online M.S. Students

Matthew Hanson and Steve Jacob made history in May when they became the first graduates of the online learning master's degree program in imaging science.

Jacob, who works in the area of color science and print quality for Hewlett-Packard's color laser-jet printer operation in Boise, Idaho, already holds a B.S. degree from the University of Utah and an M.S. from Utah State, but the RIT program was a good fit for his career. "I had no formal background in imaging science," he says. "The wonderful thing was that I had immediate application for what I was learning."

Hanson found that to be true as well. He received a B.S. in imaging and photographic technology from RIT in 1995 and is an engineer for Photon Research Associates (PRA) in Newton, Mass. The company specializes in remote sensing projects for the government.

"I was looking to go back to school, and learned about the online program from the RIT Web site," Hanson explains. "I knew what I wanted, and there aren't many imaging science programs out there."

Steve Jacob, Online Graduate, M.S. Imaging Science 2003.

Hanson telecommutes to his job from his home in New Hampshire three or four days a week, so an online learning program suited his lifestyle.

As pioneers, they encountered some technical difficulties. Courses differ somewhat in format: some include conference calls and real-time chat groups, others consist primarily of video-taped lectures and reading assignments. In a few cases, the online students participated in regular on-campus classes via telecommunications.

Matt Hanson, Online Graduate, M.S. Imaging Science 2003.

"Online learning is very effective," says Jacob. "Most professors came up with very creative ways to develop interaction with students."

Imaging Science Professor Harvey Rhody says more than 40 students are now enrolled in the online program. RIT is well-known for imaging science, and the program makes an attractive degree available to people who wouldn't be able to come to campus. Ultimately, Rhody says, 100 students are expected to be enrolled.

"We can see that the outcomes are as good as with on-campus instruction," he adds. "It's exactly the same degree. This is not a watered-down program."

Jacob has never seen the RIT campus, but Hanson traveled to Rochester several times and attended graduation ceremonies in May.

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New CIS Interim Director, Ronald E. Jodoin

Following last year's appointment of Ian Gatley as dean, the position of director remains open and Dr. Ronald E. Jodin will be interim director for the coming academic year. A search committee has been formed to analyze the Center's needs and future direction. The committee will work with the Center's faculty and staff in hopes to fill the position for the next academic year.

During this transition year Ron will continue as associate dean, dividing his time between the college and the center.

Ronald E. Jodoin received his B.S. in Physics from Worcester Polytechnic Institute and his Ph.D. from the University of Rochester, where his research was in quantum optics. He began teaching in the Physics Department at RIT in 1974 as a visiting assistant professor. Along the way he spent 15 years as a consultant for Xerox Corporation at their Webster Research Center, where he also spent three sabbatical leaves from RIT. At Xerox he worked on modeling of optical systems and digital image processing, including research that led to several publications and thirteen US patents. In 1985 he was the recipient of the Eisenhart Award for Outstanding Teaching. He has always been interested in developing methods of teaching physics, and remains active in the American Association of Physics Teachers. Ron is currently finishing his fourth year as Associate Dean of the College of Science.

Carl Salvaggio, CIS Alumni Welcomed Back As Faculty Member

When Carl Salvaggio left the Center for Imaging Science in 1994, he hoped he'd come back someday.

Sure enough, last fall, Salvaggio joined the CIS faculty as an associate professor, bringing years of valuable industry experience.

Salvaggio, who received B.S. and MS degrees in Imaging Science from RIT and holds a Ph.D. from SUNY College of Environmental Sciences and Forestry at Syracuse University, worked with the Digital Imaging and Remote Sensing (DIRS) Laboratory from 1987 to 1994. He left RIT for Washington, D.C., working first for Hughes Aircraft and then MRJ Inc. (which became part of Veridian Corp.). He developed algorithms to help analyze images for the National Photographic Interpretation Center (now called the National Imagery and Mapping Agency), and worked on ground-based experiments to test the improved tools.

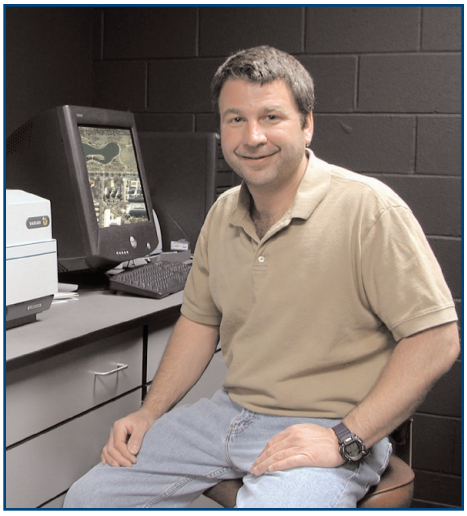
"Basically, I went out in the 'real world' and continued to do what I had been doing at DIRS," says Salvaggio.

In 1997, Salvaggio and his wife Nanette Guido Salvaggio (Imaging and Photo Technology '87), Joseph Sirianni (Imaging Science '94) and a fourth colleague, Mark Goforth, formed a consulting company called Imagery Solutions. The company provides services in remote sensing, digital image processing, computer system installation and administration, web site development and design, and custom programming.

It was a busy, demanding and rewarding life. But events of Sept. 11, 2001, made him think about making a change. Salvaggio was scheduled to fly to Los Angeles on American Airlines 77, the flight that was hijacked and crashed into the Pentagon. At the last minute, plans changed and his trip was cancelled.

Some months later, Salvaggio told DIRS Laboratory Director John Schott that he might be ready to come back to Rochester. Schott was delighted.

"It's great to have Carl back," he says. "We were very sorry to lose him in the early '90s, however, his time with industry has given him a broader perspective that he can share



with students to enhance their academic experience."

Salvaggio is enjoying the homecoming. "I absolutely love being in the classroom," he says. "I think teachers learn as much as students do."

In addition to his duties with CIS, he continues as president of Imagery Solutions. His wife, Nanette serves as vice president for the company and full-time consultant. The two have one son, Philip, age 11.

Archimedes Palimpsest

The Archimedes Palimpsest is in the news again. This time, *Advanced Imaging* magazine has singled out the project as one of its "10 Solutions of the Year" and put an image of the palimpsest on its January cover.

The award recognizes the joint project that brought passages of the defaced 10th century manuscript to light—both a scientific and scholarly triumph. Imaging scientists and manuscript scholars work together to retrieve the singular transcription of the seven treatises obscured by an overwritten prayer book.

Among the treatises is the only known copy of *Archimedes' The Method of Mechanical Theorems*, in which Archimedes describes his use of mechanical analogies to prove mathematical conjectures.

Based on the readings already obtained, Reviel Netz of Stanford University believes that Archimedes understood the concept of infinitesimal increments, and thus was well on the way to the concepts of the Calculus nearly two millennia before Newton and Leibnitz.

The award recognizes the scientific contributions of the team members of the joint project, which include Roger Easton, associate professor at RIT's Chester F. Carlson Center for Imaging Science; William Noel, curator of manuscripts and rare books, and Abigail Quandt, conservator, at the Walters Art Museum; Bill Christens-Barry of Johns Hopkins University; Mike Toth of R.B. Toth Associates; and Keith Knox, formerly of Xerox Corp., now senior scientist at Boeing Co.

TerraPix Digital Aerial Camera Detects Wildfires

Pixel Physics and RIT have developed an important working relationship over the last several years. This growing photonics company resides in the university's business incubator, shares a few top employees with RIT, employs a handful of alumni and partners with the Center for Imaging Science in a number of areas, including Precision Color Imaging with the Munsell Color Science and multispectral imaging system development with the Laboratory for Imaging Algorithms and Systems.

Zoran Ninkov, an RIT professor and Michael Richardson, an RIT researcher, helped start the firm in 1998 as an engineering-services company specializing in photonic systems. Today the company and its staff of seven design and develop photonic systems for remote sensing and custom metrology applications. Its technical repertoire includes optical and opto-mechanical design; sensor and electro optics; modeling and simulation; electronics and embedded systems; and algorithms and application software.

Pixel Physics is playing an active role in CIS' Wildfire Airborne Sensing Program (WASP). WASP integrates Pixel Physics' breakthrough product —the TerraPix Digital Aerial Camera—with infrared cameras, inertial guidance and an aerial geographic positioning system to detect and map nascent wildfires.

"What was a breakthrough for the remote sensing industry was Pixel Physics' ability to incorporate a large

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Medical Imaging Helps Fine-Tune Fingerprinting Identification Research

An RIT scientist with a passion for ultrasound is applying his medical imaging know-how to help a Buffalo-based company fine tune its unique fingerprinting-identification device.

Navalgund Rao, associate professor in the Chester F. Carlson Center for Imaging Science, has teamed up with Ultra-Scan Corp., the maker of ultrasonic finger scanners for companies, organizations and government agencies.

Ultrasound, also known as ultrasonics, uses high-frequency sound waves above 20 kilohertz to read information through barriers. The technology is commonly used to scan the ocean floor, to "see" beneath the earth's surface in search of gas and oil, and to monitor the development of a fetus.

Ultra-Scan uses ultrasound to read fingerprints. The technology's accuracy surpasses other methods of fingerprinting—such as optical imaging and the old ink pad method—because soundwaves can pierce through grease and dirt that otherwise could obscure a reading.

"The false rate is so low," Rao says. "It's convenient, it's fast. In less than 30 seconds it will scan a fingerprint and identify if your fingerprint is in the database."

Rao—whose regular research interests apply ultrasonic imaging to medical diagnostics—entered the project by way of happenstance and a bit of Internet surfing.

"I was searching on the Internet to see who else was working on (ultra) sound," Rao says. "I happened to come across their Web page. Georgia Giummarra, then a research administrator in CIS, helped me get in touch with John Schneider, the chief technology officer at Ultra-Scan."

Likewise, Schneider was looking for an ultrasound physicist to work with him on problems that his company lacked the time to investigate.

Graduate students Laura Blair and Raj Pai Panandiker characterize the ultrasonic finger-scanner system developed by Ultra-Scan Corp.

Photo by Silandara Bartlett

"It was just at the right time and the right place," Rao says. "It was amazing to me how this happened."

The collaborative project was made possible by a $30,000 NYSTAR CAT grant under the auspices of the Center for Electronic Imaging Systems and matching funding from Ultra-Scan.

Rao and visiting assistant professor Maria Helguera, who received her doctorate under Rao, along with graduate student Laura Blair are currently characterizing the finger-scanning device provided by Ultra-Scan and developing test targets to determine its quality metrics.

"We in imaging science know how to perform end-to-end analysis of a given imaging system and come up with experimental methods to measure system parameters such as Modulation Transfer Function or MTF," Rao says.

Rao and his students take the data with high frequency/high resolution ultrasound transducer, analyze it and then derive MTF information from it.

"Frequency and resolution is much higher here than in medical ultrasound," Rao says, "and that provides the element of challenge and excitement."

Rao's work will help Ultra-Scan delineate the test procedures that will be used in the future to verify compliance of ultrasound-based integrated, automated fingerprint-identification system (IAFIS) standards issued by the U.S. Department of Justice and the Federal Bureau of Investigation.

CIS Assists Forest Service Detecting Wildfires with Unique Cameras

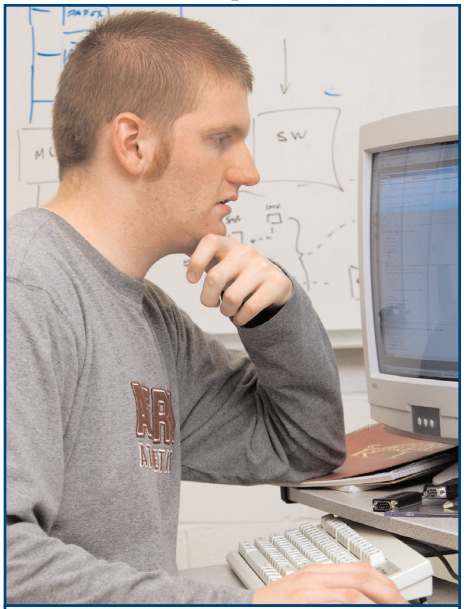
When the wildfire season begins, the United States will be drawn into a territorial battle that has become an unfortunate rite of spring.

The U.S. Forest Service soon will have the advantage of an entirely new tool that will identify and locate wildfires as small as 8-to-12 inches in diameter from 10,000 feet altitude. Scientists at RIT are creating a prototype of this new remote sensing system for trial by the Forest Service with a $1.4 million grant from NASA.

The project, known as the Wildfire Airborne Sensor Program (WASP), is being conducted at RIT's Chester F. Carlson Center for Imaging Science.

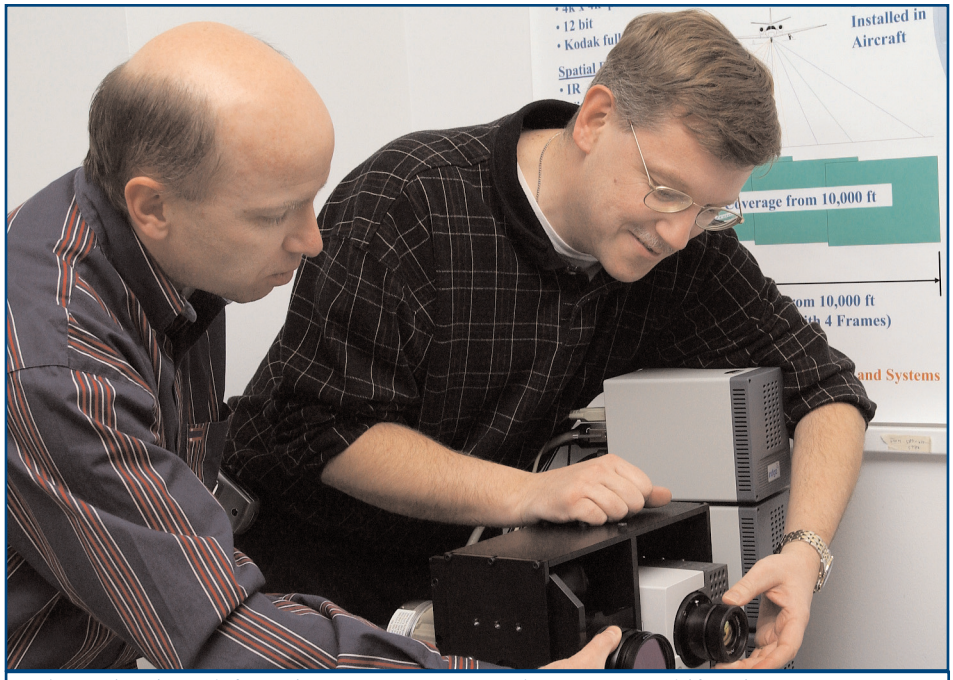
Project directors Donald McKeown and Michael Richardson, RIT distinguished researchers, updated the Forest Service on WASP at the organization's annual Geospatial Conference in Colorado Springs in April.

WASP, now in phase one of a two-phase project, will be a multi-spectral mapping system. It will combine infrared and high-resolution visible digital "mapping" cameras with a geographic positioning system, along with specially written software to operate the cameras and collect and interpret the data.



David Morse, a computer engineering graduate student at RIT, writes the software that will make the WASP system operational.

Photo by Susan Weisler



Mike Richardson, left, and Don McKeown work on a new wildfire detection system for the U.S. Forest Service.

Photo by Susan Weisler

"Mapping cameras are used elsewhere," McKeown says. "However, the combination of that camera with three infrared cameras isn't really being done by anyone else. The combination is unique."

The suite of cameras will be mounted on a gimbal, a pointing mechanism, on an aircraft. The cameras will take a series of snap shots as they pivot back and forth, sweeping across the line of flight. Automated software will stitch the images into a mosaic and combine them spectrally to detect the presence of a fire.

Each camera will read a different spectral band: three infrared cameras from Indigo Systems Inc. will detect fires by "seeing" heat in the short-wave, mid-wave and long-wave bands of the electromagnetic spectrum; a high-resolution digital camera from Pixel Physics will map the terrain in the visible spectrum.

The combination of cameras will allow the Forest Service to reliably detect fires with low false alarms even under bright sunlight, which normally reduces the effectiveness of current fire-detection systems.

RIT computer engineering graduate student David Morse is writing the software that will run the WASP system by operating the cameras, collecting data and knitting together the information in an integrated way for the operator to use.

Critical to the system is an inertial measurement unit, a precision instrument from Applanix Corp. that will pinpoint the exact location of the high-resolution digital "mapping" camera each time a picture is taken.

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On-Line Grads

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"The program was great," he says. "I'm very glad that I did it."

"I just wish there was a Ph.D. program online," says Jacob.

Hanson invites anyone interested to visit his personal and professional Web site, www.omnium-gatherum.org. In addition to being a collection of Internet resources in Imaging Science and Programming it also contains the majority of papers/code/labs that he wrote while at RIT, to serve as a potential learning tool for others.

WASP

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"We'll be able to correlate every pixel and every image to a place on the ground, longitude and latitude, so we can go from an image to a map," says McKeown, who is also director of RIT's Laboratory for Imaging Algorithms and Systems, where WASP research takes place.

The two scientists expect to have the system installed on an aircraft in this sumer for flight testing, data collection, and system characterization and calibration. To avoid taxing Forest Service resources, they will wait until the end of the fire season to try out the equipment on a Forest Service plane.

Notes Richardson: "RIT is not only developing a state-of-the-art fire-detection system, but also an important research instrument that can be used to analyze a variety of environmental problems."

TerraPix

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focal plane into a digital camera for mapping," says Pano Spiliotis, Pixel Physics General Manager and RIT Alumnus.

Pixel Physics sells the new TerraPix cameras through a partnership with Applanix Corp., the maker of position and orientation systems.

As another measure of its success, Pixel Physics has produced its first spin-off company, Flowtonics Inc. The young company caters to the wine industry with state-of-the-art process-monitoring technology that integrates photonic devices originally developed at Pixel Physics.

"Flowtonics is now in the RIT incubator and is in the process of taking their products beyond wine producers and to the whole beverage industry," Richardson says.

PIXEL PHYSICS

Update Your CIS Mailing Address

The Center for Imaging Science keeps its own newsletter and alumni mailing database. CIS is aware of graduates who may be apprehensive about updating their addresses on campus and would like to reassure our readers that the editor maintains the addresses and does not share, sell or forward the addresses. Unfortunately, that means the CIS database is also not updated from RIT Alumni Office.

If your address has changed, let us know so you can continue reading about the great things going on here at CIS. Please email comments directly to: *desimone@cis.rit.edu*

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