Imaging Connection

The Newsletter of the Chester F. Carlson Center for Imaging Science Fall 2002, Issue 07

RIT Color Scientist Wins Mellon Foundation Grant to Aid Art Imaging

RIT has received an $874,000 grant from the Andrew W. Mellon Foundation to develop and build an imaging system that will be the first of its kind to document and reproduce artwork that matches the original under any light source.

The four-year grant will further the research of RIT color scientist Roy Berns and his colleagues at the National Gallery of Art in Washington, D.C., and The Museum of Modern Art in New York City. Berns' team is creating the next generation of imaging technology that will change how museums around the world reproduce and archive artwork. The total project is in excess of $2 million.

"The Mellon grant affords us the opportunity to develop a new imaging paradigm for museums, archives and libraries rather than focusing on engineering," says Berns, the Richard S. Hunter Professor of Color Science, Appearance and Technology in RIT's Munsell Color Science Laboratory in the Chester F. Carlson Center for Imaging Science. "The expanded scope includes theoretical research, implementation, knowledge dissemination and a limited testbed."

Berns' research will introduce new techniques, better accuracy and give museums a cost-effective and practical way to create their own spectral archives. His art-imaging system will measure the optical properties of materials, thereby representing a work of art by its essential spectral data.

Berns envisions an affordable, practical imaging system that will include image capture, archival storage, Web capabilities and large-format multi-ink printing based on spectral information. His imaging system will combine off-the-shelf hardware with highly sophisticated software.

The majority of Berns' research will occur at RIT with periodic visits to the National Gallery of Art and The Museum of Modern Art to test the new imaging system. In the later phase of the project, the RIT team will create spectral-based digital imaging facilities at both museums and at RIT.

Dr. Roy S. Berns, R.S. Hunter Professor

Berns' RIT team includes color scientists Francisco Imai and Lawrence Taplin, and color science and imaging science graduate students.

For more information about Berns' research, visit: ***www.cis.rit.edu/people/faculty/berns/research.html.***

Art-si.org
art spectral imaging

Eastman Kodak Contributes $500K

Eastman Kodak Co. has shaped the City of Rochester with its visionary technology and employment opportunities. Kodak also has helped RIT's Chester F. Carlson Center for Imaging Science shape its own future in a variety of ways that contribute to Rochester's long tradition as "the imaging capital."

Kodak's relationship with CIS can be viewed on multiple layers, including research and funding, outreach efforts, and through its role as an industry mentor in the Industrial Associates Program. As a leader in the imaging industry, Kodak's support of CIS has helped the young field of imaging science grow and attract student interest.

Kodak recently gave CIS a four-year gift of $500,000. The funding will help grow the student population at CIS and increase the number of undergraduates entering the program.

"We recognize that there aren't enough people with imaging science experience," says Michael Richardson, director of the Laboratory for Advanced Spectral Sensing at CIS. "One of the challenges we have in imaging science is that few have ever heard of it."

To this end, Kodak is providing CIS scholarship money to attract undergraduate students and to fund an outreach program that shows high school teachers how to incorporate imaging science into the classroom. Another important aspect of Kodak's support is the annual paid summer internship program that gives qualified high school students hands-on experience with imaging science. Kodak's support will enable CIS to increase the number of interns from seven in 2002 to 10 or 12 in the future.

Half of the recent funding from Kodak will be used as a research incubator, Richardson says. Seed funding will be made available based on the merit of submitted proposals.

"It's open to everyone in the center, including students," Richardson says.

Kodak also is a founding member of LASS, headed by Richardson and John Schott, which addresses research questions in the area of remote spectral sensing. According to Richardson, Kodak has provided LASS with more than $100,000 per year in funded research. Kodak also has helped support student researchers, including 35 students this past summer, who collected information and made measurements necessary for LASS' airborne sensor.

CIS students and summer intern collecting data for research supported by Kodak.

Another important part of CIS that benefits from Kodak's generosity is the Industrial Associates program. The centerwide program brings together industry leaders twice a year to provide input on CIS' academic programs.

Adds Joseph Pow, associate director of CIS: "Kodak is the largest contributor of the Industrial Associates. They are very supportive."

Active participation from Kodak and other companies have provided

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Imaging Science Defined at CIS

Imaging science is the science of the creation and/or utilization of visual representations of measurable properties of persons, objects, or phenomena. It draws upon foundations in the fundamental disciplines of mathematics, physics, chemistry, computation, and biology to formalize the study of images and imaging systems. The Center strives to be foremost in the minds of those interested in education and academic research on techniques, processes, and systems for imaging.

The Chester F. Carlson Center for Imaging Science is an academic unit in the College of Science of the Rochester Institute of Technology. The Center's activities are guided by the following fundamental objectives.

1) To provide an interdisciplinary undergraduate science curriculum leading to a B.S. in Imaging Science.

2) To administer related graduate programs leading to M.S. and Ph.D. degrees, both full-time and part-time, both on campus and online.

3) To carry out applied and fundamental research in areas of faculty interest and expertise.

4) To sustain an essential component for the success and relevance of the first three, liaison with industry, government, academia, and the broader community.

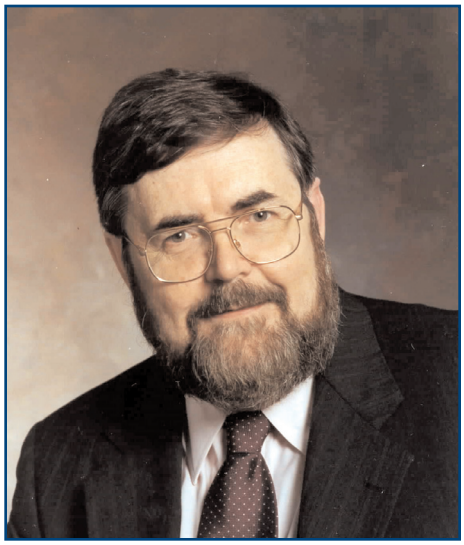
College of Science Names Dean, Dr. Ian Gatley

Internationally known astronomer and physicist Ian Gatley was recently named as the new dean of RIT's College of Science.

Interim dean of COS, 2001-02, and director of the Chester F. Carlson Center for Imaging Science, 1997-2001, Gatley will guide the college as it continues to challenge students with expanding research opportunities and degree programs in the newest sciences.

"I think we need to create the most fluid form we can in which the students can discover what it is they want to ask, what it is they want to answer and what kind of education goes with those needs," Gatley says. "I think nothing less than that is what we need to become — the premier technological institution in the country."

Collaborating teams are the trend, Gatley believes. "This engine of intellectual endeavor — ideas coming out of the College of Science; collaborating with engineers to build



the tools to make the measurements; collaborating with information technologists to extract the knowledge from the data — is one of the kinds of intellectual engines that colleges like RIT can and will operate in the future," Gatley says.

Before joining RIT, Gatley established an international reputation as an astronomer and project manager with the United Kingdom Infrared Telescope at Hilo, Hawaii, from 1979 to 1986, and for the National Optical Astronomy Observatories in Tucson, Ariz., from 1986 to1997.

The author of more than 125 technical publications and presentations, Gatley has served on advisory/review committees for the Hubble Space Telescope, the Kitt Peak National Observatory, the Center for Astrophysical Research in Antarctica and the National Science Foundation.

Gatley, a native of England, earned a bachelor of science with first-class honors in physics from Imperial College, University of London, and a doctorate in physics from California Institute of Technology. As a graduate student and postdoctoral fellow at Caltech, Gatley discovered protostars in Orion Molecular Cloud OMC2, the Orion Bright Bar, the Galactic center circum-nuclear ring and observed the Large Magellanic Cloud.

Breakthrough Technology Could Pinpoint Forest Fires

New fire-fighting technology could give the U.S. Forest Service a way to detect and monitor forest fires as they start. A breakthrough "sensing" process can pinpoint burning vegetation from the sky, via remote sensors attached to a satellite or an airplane.

The breakthrough was reported in the July issue of *The International Journal of Remote Sensing* in a paper by Anthony Vodacek, assistant professor of imaging science at RIT's Chester F. Carlson Center for Imaging Science, and co-author Don Latham from the Fire Sciences Laboratory, part of the U.S. Forest Service's Rocky Mountain Research Station, located in Missoula, Mont.

Their findings would improve the remote search for fire and could eliminate false alarms. This is because the new method detects actual flames, whereas thermal infrared sensors detect hot spots without discrimination. Sun glare also can trigger false readings.

"A lot of false alarms come from sunlight reflecting off water and clouds," Vodacek says. "That can fool the thermal infrared sensors. It would not fool our sensor."

The key to Vodacek's system is potassium, an omnipresent nutrient in soils found in the tissues of plants. His research shows for the first time that potassium emission can be used to detect forest fires. Using Vodacek's method in tandem with other techniques may help scientists separate smoldering from flaming vegetation.

Vodacek's method would be an inexpensive complement or alternative to the one now used for fire monitoring. Existing technology

Dr. Anthony Vodacek

could be modified to detect potassium emission. Sensors of this design could be deployed in space for real-time global fire monitoring or on an aircraft, including unmanned airborne vehicles.

Vodacek's research was conducted as part of the NASA-funded project, FIRES, or Forest fIRe

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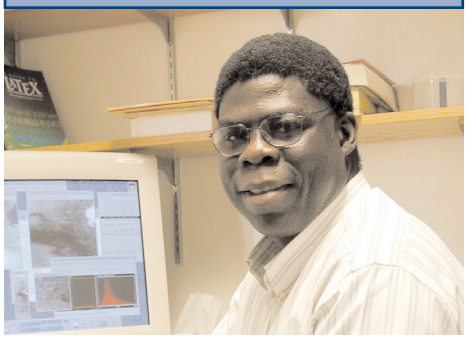
CIS Family Continues to Grow

Post-Doctoral Research Fellow



Ambrose Ononye is a new post-doctoral research fellow working with Assistant Professor Anthony Vodacek on the FIRES (Forest fIRe Imaging Experimental System) project. A native of Nigeria, Ononye received his M.S. in physics and his Ph.D. in electrical engineering from the University of Tennessee. His wife, Loretta Ononye, is teaching physics at RIT.

CAF Captains Study at CIS

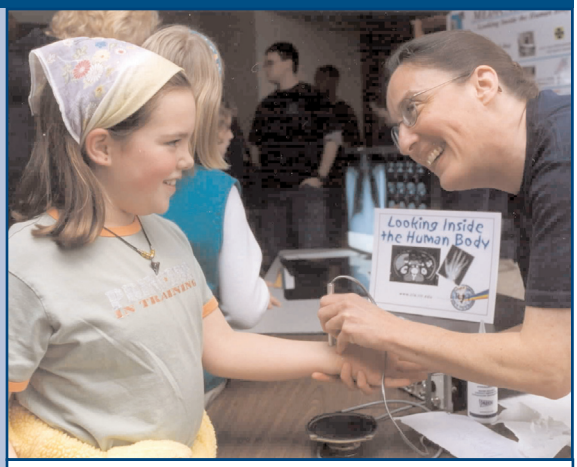
Gabriel Dore(left) and Neil Scanlon(right) are Canadian Air Force captains studying for M.S. degrees in imaging science. Both earned the opportunity to study at CIS through a competitive CAF selection process.

Dore is in his first year of study, and Scanlon is beginning his second year at RIT. Dore, originally from Montreal, is a nine-year CAF veteran and a graduate of Military College in Kingston, and Scanlon, an eight-year veteran, received his undergraduate degree from the University of Toronto.

Newly Promoted Visiting Assistant Professor

Maria Helguera has been promoted to the position of visiting assistant professor. She received her Ph.D. in imaging science from RIT in 1999, and holds an M.S. in electrical engineering from the University of Rochester. She earned her B.S. in physics from the National Autonomous University of Mexico, her native country.

She began teaching digital image processing for undergrads at CIS in 1999 as an adjunct professor, and from April 2000 to the present she assisted with the online M.S. program in imaging science. She also teaches several online courses.



Dr. Helguera explains how a small Doppler system is used in the medical imaging field to listen to blood flow in patients.

Helguera also is involved in research in the area of medical imaging, particularly ultrasound tissue characterization and image processing. She has worked with Associate Professor Navalgund Rao in this area, and also has collaborated with Dan Phillips, visiting assistant professor in electrical engineering.

New Visiting Scientists Get Settled

Takayuki Hasegawa (above), who arrived in August, is one of the two visiting scientists from Japan. Hasegawa works for Toppan, a Japanese printing company, and his area of research is color management in digital imaging. He is working with Mark Fairchild, director of the Munsell Color Laboratory.

Takayuki Ogasahara (above), is the other visiting scientist from Japan. He arrived in January and is conducting research in quality production issues with Xerox Professor Noboru Ohta. An employee of Canon, he expects to be at RIT until 2004.

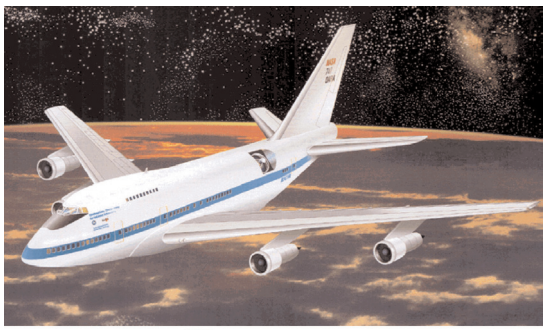
A Successful Combination: Don McKeown Leading the New LIAS Research Laboratory

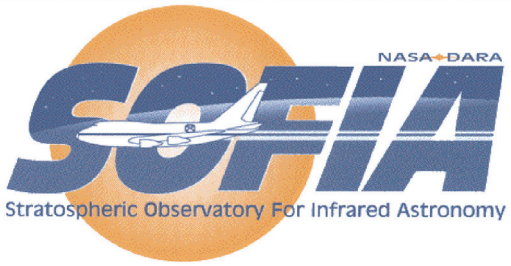
Distinguished researcher Don McKeown completes his first year at RIT this fall as coordinator of CIS' Laboratory for Imaging Algorithms and Systems (LIAS), a new lab that specializes in tool development and data management on a grand scale.

LIAS is the counterpart to the Laboratory for Applied Spectral Sensing (LASS), located down the hall at CIS. Whereas LASS generates pure science in the form of complex mathematical algorithms, LIAS puts the data to work in software applications.

McKeown joined RIT after 19 years at Eastman Kodak Co. as a systems engineer working on remote sensing for satellites and innovative architectures for satellite imagers, including IKONOS 1. His leadership skills have helped shape LIAS and its mission to translate complicated data into useful and accessible information by generating tools and data management infrastructure for managing data, sensor tasking, data retrieval, archive and processing or analysis tools for hyperspectral data.

"You may have a hyperspectral image—a picture of the ground, earth, taken in hundreds of different colors or spectral slices," McKeown says.





"What materials are in that scene? Are there materials indicative of a tank or a pollution source, each of which has a spectral signature associated with it, its unique response?

"In LIAS, we would develop the software tools that would allow an analyst to take that data set and crunch it through a software package, which would output an annotated image, a picture of the scene with some symbology on it, that would say, this is a tank or this is a pollution source, and this is the intensity," he says.

Scientists at LIAS can weave together data from different sensors. For instance, a picture of a reservoir can be combined with results of a sensor measuring E.coli levels in the water.

"Quite a bit of work is associated with how to tie in the data from different sensors," McKeown says. "But the information, when combined, gives you a very powerful description of the world."

LIAS is currently developing a data cycle system for NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA) program. The system will work with raw information collected by an airborne sensor attached to a Boeing 747. The data cycle system will make the process of manipulating the data more accessible to a broader range of users.

"The data cycle system permits the user—it could be a high school teacher in Boise, Idaho—to access the SOFIA database and process information and get some meaningful results."

LIAS is actively developing a data cycle system that will go beyond SOFIA's uses to broader remote sensing applications.

"Everything we do is focused on building off of what we did before," McKeown says.

McKeown lives in the Town of Warsaw with his wife, Laurie, and their three children.

Other LIAS Projects:

A grant from the National Imagery and Mapping Agency (NIMA). This University Research Initiative is to develop prototype tools to exploit hyperspectral imagery.

Wild Fire Airborne Sensor Program (WASP) formed to develop a prototype system for detecting and monitoring wildfires from an aircraft. This is a direct spin-off of LASS's research.

Contract from Kodak to develop tools for registering hyper-spectral and film images.

CIS "Survey Says..."

Regular readers of the Imaging Connection may remember that an alumni survey was included with the spring 2002 edition. The results of this survey were recently compiled by the RIT Office of Cooperative Education and Career Services. Here's a brief look at some of their findings:

- Forty people responded to the survey
- These 40 people earned a total of 48 RIT degrees (24 B.S., 20 M.S., 4 Ph.D.)
- Looking at current positions, the job titles of 10 responders indicated that they are engineers, while 7 responders are scientists.
- Six of the current job titles included the terms "software," "computer," or "multimedia." Only 2 of the current job titles included the terms "image" or "imaging."
- Average current salary for graduates with a B.S. degree is $61,358, with an M.S. - $82,720, and with a Ph.D. - $75,500. The drop off in Ph.D. salary could be attributed to the small number of respondents, and the fact that half were mid-grade Air Force officers whose pay may not be commensurate with their civilian counterparts.

If you'd like any more information about the alumni survey, please feel free to contact Joe Pow at: ***pow@cis.rit.edu***

IA Webcast Gets Rave Reviews

The Center for Imaging Science broke new ground during the spring 2002 Industrial Associates meeting by webcasting the entire day live over the Internet. This webcast, the first for any CIS event, was an experiment of sorts, according to Associate Director Joe Pow. "We're always looking for new ways to improve the Industrial Associates program. By webcasting the presentations we're hoping to make it easier for our members to stay connected with all the great research going on here." During the webcast remote viewers were able to ask questions to the presenters in real time via an online chat.

Feedback from participants was overwhelmingly positive. Jim Leland, a CIS "online learning" student in New Hampshire said, "...it's fantastic...just as if I was in the room!" "The success of this first webcast has convinced us of its effectiveness. We'll definitely be doing more of it in the future," said Pow.

Forest Fires

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(infrared) Imaging Experimental System. His team included RIT scientists and graduate students. New York Congressman James Walsh, chair of the VA/HUD/Independent Agencies Appropriations Subcommittee that funds the NASA budget, and Congresswoman Louise Slaughter supported federal funding for the FIRES program.

EK Support

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the center invaluable input as well as student co-op and mentoring opportunities.

"They help bring the industrial perspective to what we're doing in the center," Richardson says.

Imaging Connection is produced by a team of dedicated employees who work with CIS faculty, staff, and students to make this publication possible. Please send comments to managing editor, Colleen M. Desimone at: *desimone@cis.rit.edu* or call 585-475-6783.
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