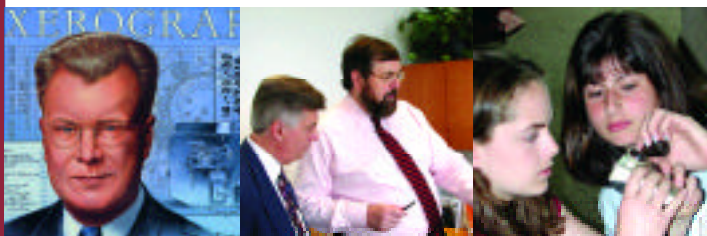


# Imaging



# Connection

The Newsletter of the Chester F. Carlson Center for Imaging Science

Fall 2001

## Over 300 Attend International Colour Association Meeting at CIS

On June 24, the International Colour Association (AIC) met for their quadrennial conference in Rochester. This ninth Congress of the AIC offered an exciting week of technical and social interaction for over 300 color experts from around the world.

A committee consisting of representatives from the Center for Imaging Science, Kodak, Xerox, and other members of the AIC spent almost four years planning and organizing this event, which was held at the Rochester Riverside Convention Center.

As with all AIC Congresses, this one was designed to attract people from all aspects of the color community. In an effort to appeal to the broadest audience, the planning committee arranged for presentations that addressed the following topics:

**What is color?**

**What is color used for?**

**How does color work?**

**How can color be controlled?**

**How should color be taught?**

Some specific presentations included "Climate and Colored Walls," "In Search of Visual Comfort," Trends in Color Imaging on the Internet," and "Developing a New Psychophysical Experimental Method to Assess Image Quality."



*A perfect day for the front lawn of the Chester F. Carlson Building to be used as the welcoming party for the many international and local guests.*

The AIC Congress also featured exhibits from more than twenty organizations. The exhibitors came from companies and other organizations that reflected the diversity of the conference itself. Represented were companies making color measurement hardware, color control software, and lighting systems. There were also publishing companies, professional societies, and educational institutions, all promoting their contributions to the color community.

In addition to providing a forum for the exchange of technical information, the planning committee wanted to foster a sense of community among participants at the Congress. They did this by organizing a program of interesting social events, the first of which was a welcome

reception and open house at the Center for Imaging Science. During this reception, hosted by the Munsell Color Science Laboratory, Congress attendees were treated to dinner and music, and were invited to tour the various CIS laboratories.

"The choice of CIS as the venue for the welcome reception was perfect," commented Paula Alessi, Chairperson of the AIC '01 Organizing Committee. "What more fitting a welcome to give our guests to Rochester, 'The World's Image Centre,' than to host them at the RIT Center for Imaging Science?"

Many of the Congress participants rightly credited the overwhelming success of the event to the hard work and dedication of several people from the Munsell

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## Star Search Keeps Student, Professor on the Move

CIS faculty and students continue to gain national recognition for their work in the field of astronomical imaging.

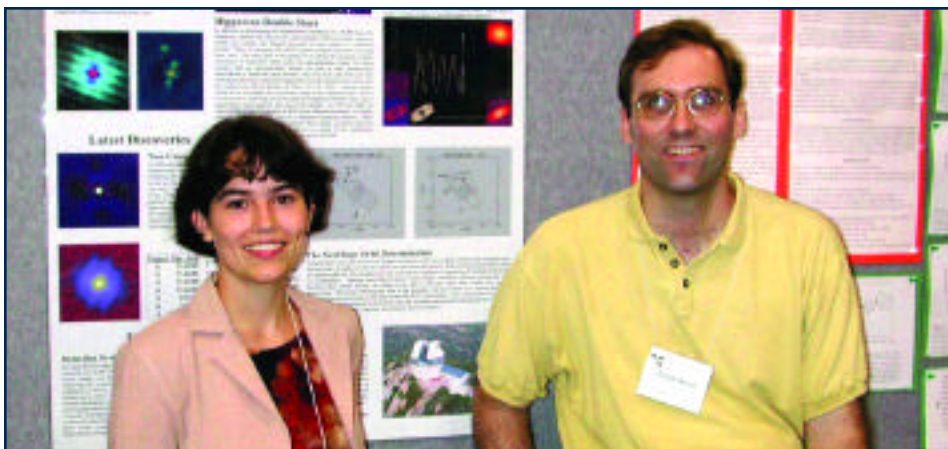
Fourth-year imaging science major Sally Robinson's summer job took her to the stars – specifically, to Terzan 7, an unusual star cluster near the center of the Milky Way galaxy.

Robinson was selected to be part of a nationwide group of eight college students who spent 12 weeks over the summer in astronomical research under the sponsorship of the National Science Foundation's Research Experiences for Undergraduates (REU) Program at the Kitt Peak National Observatory (KPNO) near Tucson, Ariz.

"It was a wonderful opportunity," says Robinson, "and I had fun with it. It was good for me to see the whole process from start to finish."

Robinson worked with Kenneth Mighell, an associate scientist at KPNO, investigating the age and chemical composition of Terzan 7. She analyzed digital images obtained with the wide field planetary camera on the Hubble Space Telescope that were taken in the yellow and red filters. Comparing their Hubble stellar photometry with several theoretical stellar evolution models, Robinson and Mighell were able to determine that Terzan 7 is 8.0 plus or minus 0.5 billion years old and is located about 74,000 light years from the Sun. They also determined that this intermediate-age star cluster is surprisingly rich in elements heavier than helium with a metallicity about one-third that of the Sun, Mighell explained.

Robinson gave an oral presentation of her summer research to the Tucson astronomical community on Aug. 24. She and Mighell will present a poster about their research at the 199th meeting of the American Astronomical Society Jan. 6-10, 2002, in Washington, D.C. The two are writing a paper about Terzan 7 that will be submitted for



*Sally Robinson, Imaging Science senior and Professor Elliott Horch show images of binary stars taken at the Kitt Peak National Observatory.*

publication in the *Astronomical Journal*.

"The REU program provides an exceptional opportunity for undergraduates considering a career in science to engage in substantive research activities with scientists working in the forefront of contemporary astrophysics," says Mighell.

This wasn't Robinson's first research experience. At RIT's Chester F. Carlson Center for Imaging Science, she worked throughout the 2000-2001 school year with Assistant Professor Elliott Horch on research involving binary stars. She presented a poster on this work at the American Astronomical Society meeting in Pasadena, Calif., last June. She and Horch are co-authoring a paper on the work.

"Sally is a truly outstanding student and a multi-talented person," Horch notes. "One quality that impresses me beyond her intellect is her high degree of integrity as a student and as a young scientist. I believe she would make a very good researcher and have a very productive academic and scientific career – if that's what she decides to do."

A native of Colorado, Robinson came to RIT to study imaging and photo technology. She soon realized that imaging science better suited her interests. Astronomy has long been a

special interest, "but I never thought of it as a practical career."

Nine months from graduation, she's still not certain what comes next. Probably grad school, she says, perhaps in astronomy or optics.

"The RIT program opened a lot of doors," she says.

In the meantime, she's continuing research work with Horch. She's also pursuing another longtime interest: she studies violin with Margaret Leenhouts, a member of the Rochester Philharmonic Orchestra. Robinson performs with the University of Rochester Symphony Orchestra. And then there's hiking, skiing, and rock climbing.

"I have a lot of interests," says Robinson.

Another astronomer at CIS will take a closer look at dying stars, or "planetary nebulae," in 2002 using the Chandra X-ray Observatory, one of NASA's four great observatories. Joel Kastner, professor of imaging science, will use Chandra to look at two planetary nebulae in detail to learn how such objects produce X-rays and, more generally, to understand how stars like the sun end their lives.

The two objects that Kastner and his colleagues will study are some of the more photogenic examples of planetary nebulae. These nebulae are known to harbor dying stars that are

*- article continued on page 4*

## CIS and Polaroid Expose Students to Imaging

This summer CIS and Polaroid teamed up to introduce some of the top high school science students in Massachusetts to the fundamentals of imaging science. During a day-long series of workshops, produced by CIS and hosted by Polaroid's Image Science Laboratory, 25 finalists from the Massachusetts State Science Fair got to experience firsthand how imaging is used in scientific inquiry.

The workshops were the brainchild of Dr. Jay Thornton, Science and Technology Fellow at Polaroid's Wayland, Mass., labs and member of the CIS Industrial Advisory Board. For the past several years, Thornton and the Polaroid Foundation have provided a cash prize to science fair winners. This year, Jay thought Polaroid should try something different. In an effort to encourage young scientists to enter the imaging pipeline, Thornton conceived of an experience that would "connect some of our local students with a great learning opportunity that combined fun with solid science." He called CIS Associate Director Joe Pow to see if RIT would collaborate on the project. The response was an enthusiastic "Yes!"



*Students gained valuable experience capturing and manipulating digital images.*



*Finalists in the MA State Science Fair learned first-hand what imaging science is all about.*

After some initial brainstorming Thornton and Pow settled on a concept for the event. CIS would be responsible for developing and presenting the content of the workshops, while Polaroid would provide the facilities and administration. The workshops would provide the students with a high-level exposure to several different aspects of imaging, and would give them hands-on experience using the "tools of the trade." In seven short weeks, an RIT van loaded with 12 computers, two projectors, several cameras, five gallons of liquid nitrogen, and a group of CIS staff scientists was headed east on the Thruway bound for Massachusetts.

On the day of the event Joe Pow set the stage with an opening presentation that answered the question "What is Imaging Science?" Dr. "TJ" Jeong followed up with dazzling display of holography, and a laboratory session in which each of the students made their own hologram. During the lunch hour the young scientists were able to experiment with digital imagery using cameras provided by Polaroid. Diane Kucharzyk later guided the students through a computer-based simulation of ancient document

restoration using the same techniques currently employed on the Archimedes Palimpsest. Scott Brown showed the group how to "image the invisible" using the CIS Inframetrics IR camera. And doctoral candidate Roxanne Canosa used a portable eye-tracking device to teach the students about visual perception.

Student response to the workshops was unanimously positive. "Extremely informative and captivating," said Jennifer French, a third-place finisher in the state science fair. Lesley Blumberg from Hannover High School said, "I have never seen anything like that before!" And Amy Dodenhoff from Walpole High School said, "It was great fun!"

Polaroid agreed that the workshop was a huge success. "I saw that the students are naturally attracted to digital imaging," said Jay Thornton. "It offers them a new tool for work, for communication, and for fun. The technology got them excited and then they naturally picked up some of the science behind the technology."

Joe Pow said, "Being able to interact with such talented students certainly made the trip to Polaroid worthwhile. We're already planning next year's visit."

## Local Teachers Learn Image Processing

This summer, as a part of its growing outreach program, the Center for Imaging Science hosted two week-long workshops for local teachers on the use of imaging in the classroom. These workshops, taught by the Center for Image Processing in Education (CIPE), were aimed at showing teachers how image processing and imaging technology can improve student performance in math and science.

Funding for the workshops was provided by a grant from the New



Local teachers learn image processing in the College of Science computer lab.

York State Education Department. The purpose of the grant was to increase student achievement by changing instructional practice in the classroom. NYSED placed particular emphasis on programs aimed at using innovative educational technologies to implement new teaching paradigms.

A team led by the Victor Central School District submitted the winning proposal. CIS, as a member of the team, developed and

recommended the concept which ultimately became the central element of the proposed program. The plan called for a series of CIPE workshops at RIT, with follow-up help from CIS faculty and staff on application of the material in the participants' classrooms. The proposal was strong enough to win the Victor/CIS team a \$200,000 state grant to implement the plan.

More than 30 teachers from five school districts received the CIPE training. The workshops were featured during a segment of the evening news on one of Rochester's TV stations, providing CIS and RIT with some favorable visibility in the local community. When the workshops were over, the feedback from the participants was overwhelmingly enthusiastic:

*"Wonderful workshop! Lots of 'gee-whiz' with science and math to back it up. It's really opened up my thinking about what role images can play in learning and teaching!"*

*"The workshop far exceeded my expectations!"*

*"I learned more than I ever imagined!"*



CIPE instructor Charles Murphy teaches participants how to extract data from digital images.

Based on the response, Victor and CIS are looking at the possibility of offering advanced image processing training in November, and they may submit a proposal for additional funding to support another round of workshops next summer.

According to CIS Associate Director Joe Pow, exposing local teachers to imaging science has had exactly the desired effect. "The biggest challenge to increasing enrollment is raising awareness of our programs, not only among prospective students, but also among people who are in a position to influence prospective students – their teachers and guidance counselors. By teaming with school districts as we did with the CIPE training, we're building the relationships that will eventually pay off with more students in our classes, and more graduates for the imaging industry."

## CIS Student Reaching for the Stars *Continued from pg.2*

now ejecting material in very specific directions at velocities exceeding one million miles per hour. When this material slams into gas previously ejected by the star, the gas can be heated to millions of degrees Kelvin, and produce X-rays. Kastner proposed for and was awarded time to search for and

image superheated, X-ray-emitting gas.

Kastner expects to have access to the Chandra X-ray Observatory for about one day next year, a little more than the average time allotment for accepted proposals. This work builds on his previous use of Chandra to detect and image X-

ray emitting regions in other dying stars.

Kastner, who worked on his proposal with theorist colleagues at the University of Rochester, say this program is one of the first funded research efforts of the recently founded Rochester Astrophysics Consortium.

## Assemblyman Koon Visits CIS

What could a state assemblyman from western New York possibly have in common with a scientist sporting a British accent? The answer to this question extends beyond international boundaries—to the extraterrestrial.

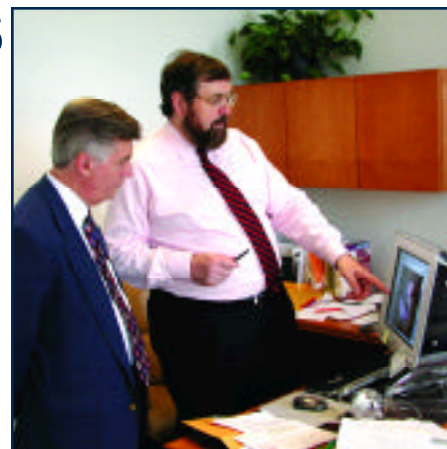
In a chance conversation at a graduation dinner in May, Interim Dean of the College of Science Dr. Ian Gatley and State Assemblyman David Koon struck up a conversation. They quickly found they had a common interest in astronomy that led to an invitation for Assemblyman Koon to tour the Center for Imaging Science.

Astronomy has been an avocation of Koon's since high school and, of course, Gatley has a Ph.D. in physics from Cal Tech.

While astronomy was the starting point of the visit, a presentation and tour by Associate CIS Director, Joe Pow shared the full gamut of exciting scientific research, degree opportunities, and career choices for students who major in imaging science. The varied academic backgrounds and interests which students bring to imaging science range from mathematics to psychology.

At the conclusion of the tour, Koon expressed his willingness to take the message forward of the world-class infrastructure and educational opportunities available to RIT students and industry in the Rochester area.

Koon requested a return visit to CIS when he can observe students in



*CIS Director Ian Gatley explains an infrared image of the galactic center to Assemblyman Koon.*

a classroom session and participate in the learning process. At a place like RIT you never know what dinner companions might have in common: maybe everything—in the universe.

## CIS Mentors High School Summer Interns

After last summer's successful high school internship trial, CIS decided to take the lessons learned and expand upon this program. This summer five students were accepted into the internship program.

The Munsell Color Laboratory chose two students to assist in calibration of scientific instruments and help conduct visual experiments. The Digital Imaging and Remote Sensing Laboratory selected students to expand its outreach efforts through the compilation, design, and presentation of environmental remote sensing applications.

All of the interns had the opportunity to work closely with CIS faculty, research scientists, undergraduate and graduate students. Two of the DIRS high school students became an

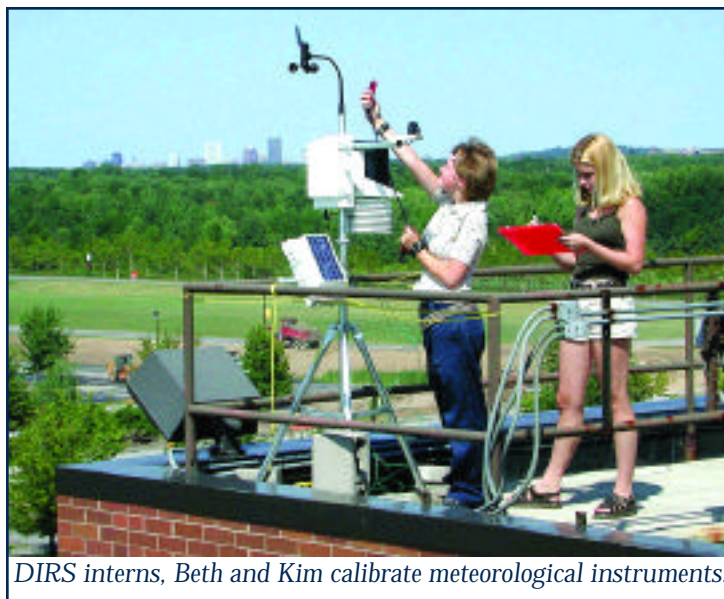
integral part of DIRS field collection team working side by side visiting NASA scientists.

The interns summarized their summer activities in presentations to

and make enhancements for next years interns. The interns will present this material to their individual high schools as a recruitment tool highlighting their

summer of science exploration. The internship program was a cooperative learning experience for all involved. CIS faculty and staff were treated to a refreshing view of what excites young minds.

One exciting outcome of the internship program is that two of the interns will be applying to the imaging science program! After two years of success CIS will continue the internship program in the summer of 2002.



*DIRS interns, Beth and Kim calibrate meteorological instruments.*

CIS. The presentations produced an opportunity for both the interns and the CIS undergraduate recruitment committee to rate their experiences

For more information please contact Joe Pow at: [pow@cis.rit.edu](mailto:pow@cis.rit.edu) or call (716) 475-7323

## Microgravity Demonstrator Supports Outreach Efforts

CIS Staff Scientist Gary DiFrancesco recently invented a new way to show prospective students how imagery is used in scientific inquiry. Gary designed and built a portable "microgravity demonstrator" – a device which allows researchers to see how various materials and systems



would behave if they were in a state of free fall aboard an orbiting spacecraft.

The concept behind the demonstrator is simple. An experiment is placed inside a small capsule which is suspended from the top of an eight-foot tall PVC framework. A button is pushed to release the capsule, and it falls into a catch basin placed on the floor. During the second drop, whatever is inside experiences "weightlessness." A video camera inside the capsule

records about 15 frames of digital imagery while the unit is in free fall, and this data is then analyzed to extract scientific information. So far Gary has successfully used the device to show how flames, fluids, and magnets behave in a microgravity environment.

A presentation about the microgravity demonstrator was recently given at Rochester's annual Science Educator's Conference. The teachers who attended responded enthusiastically to the offer to bring the system into their classes. The demonstrator will thus become an

important element in the CIS outreach program, helping the department to raise awareness in local schools about opportunities in imaging science.

Gary is also developing plans for a larger microgravity research laboratory which he hopes to install in the stairwell of the Carlson Building. This large drop tower, which would also be available to school groups, would allow professional-quality research on the effects of microgravity. RIT's Development Office is seeking funding for the construction of this facility.

## AIC Meeting *Continued from cover*



*CIS staff, Dr. Jonathan Arney, Val Hemink, and Colleen Desimone welcome guests.*

Color Science Lab. This RIT contingent included Roy Berns, Mark Fairchild, Dave Wyble, Colleen Desimone, Bob Chung, and Val Hemink. This team spent countless hours involved in all aspects of planning and production of the conference, from review of technical contributions, to publishing printed material, to administrative support, to graphic design, and web hosting. Their tireless efforts served to enhance the already solid reputation of RIT, CIS, and MCSL both here and abroad.

**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](mailto:desimone@cis.rit.edu) or call 716-475-6783. **Newsletter Team Members:** Colleen Desimone, Ian Gatley, Joe Pow, Susan Murphy, Kathy Lindsley, and Tim Gilbert. **Electronic Copies can be found at:** [www.cis.rit.edu](http://www.cis.rit.edu)

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