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Rochester Institute of Technology

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RIT Center for Detectors Advances Detector Technology

Don Figer heads up new center, encourages collaborations and student research

Don Figer

Imaging sensors bring the world into sharper focus. Specialists in areas as diverse as astrophysics, biomedical imaging, and homeland security are peering into the early universe, detecting cancer and—in the case of a terrorist attack—preparing to trace airborne chemical agents and biohazards.

The Center for Detectors in RIT's College of Science will advance the science and technology of photon sensors and broaden their applications.

"The Center for Detectors is about scientific discovery," says Don Figer, director. "It's also about technology that will strengthen our national security, improve the quality of life and stimulate commercial innovation."

The center revolves around the design and development of advanced photon detectors and extends the technology that, in its simplest form, has made digital cameras ubiquitous. Detector technology involves multidisciplinary problem-solving that taps materials science, physics, imaging science, and the numerous engineering disciplines. Collaborations at the center will draw upon expertise from multiple colleges within RIT and external research partnerships.

"We see across departments, colleges, and universities, and we don't recognize barriers of organizational structure," Figer says. "Our intent is to connect with minds and great ideas.

"We want people who are aggressively interested in developing detectors for some cutting-edge application and who are driven to collaborate with other members of the center by the necessity that flows from their research and education goals."

A key component of the new center is the Rochester Imaging Detector Laboratory, which Figer formed at RIT in 2006 as part of a faculty development grant made possible by the New York State Foundation for Science, Technology, and Innovation. Under his guidance, the laboratory won $7.5 million in external research funding and formed a partnership with the Massachusetts Institute of Technology Lincoln Laboratory.

According to Figer, the Rochester Imaging Detector Laboratory has already positioned the university as a participant "in the highest-rated space-based and ground-based projects that will be funded in the next 10 years." Scientists identified several of these projects in the **Astronomy Decadal Survey**, a list of research priorities for major funding agencies.

“We won the only detector funding for a future NASA exoplanet mission,” Figer says. “Meanwhile, we advanced the guider detectors for the Large Synoptic Survey Telescope. We have funding from the Moore Foundation to develop detectors for the next generation of ‘Extremely Large Telescopes,’ like the Thirty Meter Telescope. We’re also part of the detector development for the project that has evolved into the Wide Field Infrared Survey Explorer.”

Another aspect of the center will focus on building integrated systems that interface and fit with other optical systems. Biophotonic imaging is one example that marries detectors with electronics and devices. This emerging complement to X-ray radiation uses optical light to noninvasively look inside the human body. Figer foresees developing a biophotonics test bed with colleagues at regional research hospitals, possibly resulting in commercial outcomes through local medical imaging companies.

“We want to have research in RIT’s new Institute of Health Sciences and Technology that would leverage and take advantage of these cutting-edge detectors,” Figer says. “In that case, the test bed would become a unique research tool for developing new medical instrumentation, a particularly fertile area for RIT’s focus on innovative technology.”

“If it is successful, we would have the only biophotonic program in the world with these kinds of detectors, at least until others caught up,” Figer says. “Our detectors will represent a quantum leap in sensitivity and the ability to obtain data simultaneously from many more channels. Instead of having 16 pixels, for instance, we would have tens of thousands, or even millions, of pixels. You can imagine what kind of difference that would make.”

The center’s educational component will focus on innovation, entrepreneurship and cross-disciplinary research, with a heavy emphasis on “team science.” Undergraduates, graduates, high school interns and co-op students will focus on a group approach to solving complex research problems.

More than 25 students have done research in the Rochester Imaging Detector Laboratory over the last four years. “We have a great demand for students who want to throw themselves into this kind of research,” Figer says. “The Center for Detectors is a great place for co-ops.”

“Something very interesting has been happening in science,” Figer says. “It’s the increasing trend toward team science—tackling problems that could not be solved by any one discipline alone.

“In recent years, scientists and engineers have taken on really hard, messy problems that involve many dimensions. They are banding together in large interdisciplinary teams to go after federal funding for ‘big’ projects, conducted over a longer time frame than conventional research projects.”