



## ICTAS Opens Gateway to Nanoscale Research

The first of three buildings being constructed for the Institute for Critical Technology and Applied Science (ICTAS) will be dedicated Sept. 21. The 32,000-square-foot building, located at the Corporate Research Center adjacent to the Virginia Tech campus, will house the **Nanotechnology Characterization and Fabrication Laboratory** (NCFL) and research-related offices. "This facility will allow Virginia Tech to have capabilities on a par with the best nanotechnology labs in the world," said **Roop Mahajan**, ICTAS director and the James Tucker Professor of Engineering.

The NCFL will occupy approximately 16,000 square feet of space and will house dedicated instrumentation for bio- and nano-fabrication, characterization, and testing. The state-of-the-art facility was designed to minimize interference to instruments from environmental factors such as building vibrations, stray electromagnetic fields,



*ICTAS A, home of the Nanotechnology Characterization and Fabrication Laboratory (NCFL)*

and temperature fluctuations. It will operate as a service center with a cost structure tailored to serve the needs of researchers from Virginia Tech as well as researchers in the surrounding industrial community, and will be staffed with instrument specialists to train users and assist in the operation of the equipment.

Note: Due to limitations of building capacity and parking availability, the NCFL formal building opening event is by invitation only. Open House opportunities will be posted to the ICTAS and NCFL websites at a later date. For special events or individual inquiries, please contact Dr. Bill Reynolds at 231-6825 or email: [reynolds@vt.edu](mailto:reynolds@vt.edu).

### *Instrumentation in the new ICTAS building includes:*



**Field Emission STEM**

**Field Emission STEM** is a Scanning Transmission Electron Microscope with the capability to reveal the atomic structure and chemistry of sub-micron regions in materials. The instrument can image the arrangement of atoms within solids with sub-angstrom resolution — the highest resolution available with any microscopy technique. It is used to study the nature of internal defects and interfaces that influence the mechanical, chemical, electrical, magnetic, and optical properties of solids.

*(more about NCFL instrumentation on page 4)*



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## DEAN'S CORNER

# ICTAS Has a Great Impact Upon Virginia Tech's College of Engineering

Since 1997, Virginia Tech's College of Engineering has spearheaded the development of what is today the Institute for Critical Technology and Applied Science (ICTAS). At that time, Associate Dean for Research and Graduate Studies Malcolm McPherson conceived the idea, and he presented the plan to the College of Engineering's Advisory Board for the first time in April of 1998.

Back then, our college was already among the top ten percent of all accredited engineering schools in the country in terms of our research expenditures. We would continue to grow, but, as Dr. McPherson pointed out, incremental growth would not take us any higher. In fact, he argued that without significant investment, the College of Engineering was more likely to decline in the rankings. He illustrated his concern by outlining a comparison to other leading colleges of engineering and showed a deficiency in research activity due to too few doctoral students and insufficient research expenditures.

Dr. McPherson looked at models at other universities including the Georgia Tech Research Institute, Lawrence Berkeley Labs (University of California at Berkeley) and Texas A&M's Engineering Experiment Station. Each of these institutes had several key features: significant initial investment, ongoing state support, a high degree of economic development, research space in shared facilities, and a strong collaboration among the faculty in the sciences and engineering. Dr. McPherson was quick to add that a research institute will not work for engineering unless there is a collaborative model that involves strong input from other colleges at Virginia Tech.

Today, under Director Roop Mahajan's leadership, ICTAS is fulfilling the vision of Malcolm McPherson. It is a strong and vibrant research environment that has enabled the College of Engineering to better partner with superb

researchers in other colleges at Virginia Tech. As a result, the breadth and depth of our research has grown enormously.

ICTAS Research awards have grown from \$16 million in 2006 to \$29.6 million in 2007. Some of the engineering-led ICTAS successes are: a \$3.4 million grant from the NIOSH for construction safety; a \$1.3 million grant for vehicle technologies; and more than \$9 million (in three different grants) for unmanned vehicles research.

Early investment in the School of Biomedical Engineering and Science (SBES) has been particularly noteworthy. This unique school is shared among three colleges at two universities: the Virginia Tech College of Engineering, the Virginia-Maryland Regional College of Veterinary Medicine, and the Wake Forest School of Medicine. Since its founding in 2002, SBES has seen an explosion of research activity, with current annual research awards of \$8.7 million. SBES will be an "anchor store" in the soon-to-be-completed ICTAS I building, and will surely rise to even greater heights.

Based on detailed analyses of factors that contribute to national rankings and on benchmarking at top-line universities, the paradigm of ICTAS has emerged as a vital vehicle that will carry the College of Engineering and Virginia Tech to a greater height.

The College of Engineering firmly believes ICTAS is entrepreneurial in nature, and that is a basis for its success. ICTAS presents a strong link to economic development for the entire Commonwealth. ICTAS presents a case for advancement of humankind through collaborative research, and ICTAS represents a strong link between all of the colleges of engineering across the Commonwealth.



*Richard C. Benson  
Dean of Engineering;  
Chair, ICTAS  
Stakeholders  
Committee;  
Paul and Dorothea  
Torgersen Chair of  
Engineering*

## DIRECTOR'S CORNER



Roop Mahajan  
Director, ICTAS

## Marching ahead ...

Hailed as the next industrial revolution, nanotechnology (NT) is poised to usher in a new era of change and development that may impact countless aspects of our lives, including healthcare, communications, national security, consumer products, and transportation, to name just a few. At the nano scale, materials exhibit properties that are not possible at bulk scale, and for the first time in the history of humankind we have engineering systems that are at the same scale as the basic units of life.

New opportunities have arisen to understand life at its basic cellular level and to optimize engineering systems based on the remarkable capabilities of cells to organize and self-assemble in response to external stimuli. However, to fully exploit the promise of nanotechnology, we need equipment that allows us to see, fabricate, characterize, and manipulate matter and living cells at that scale. I am pleased to announce that our newly established facility, the Nanoscale

Characterization and Fabrication Laboratory (NCFL), was designed to provide these capabilities on a par with the best nanotechnology labs in the world and we will celebrate the official opening on September 21, 2007. Equipped with the latest instrumentation, briefly described in the cover article of this newsletter, the NCFL will serve as the gateway to nanoscale research.

We are building a team of talented individuals to fulfill our collective vision and the mission outlined on

this page. I take this opportunity to thank all of the ICTAS team members for their dedication and enthusiasm for growth and success, and I invite you to become acquainted with them through the introductions on pages 10 and 11. Additionally, I would like to acknowledge the many constituencies which ICTAS supports and, in turn, receives nourishment from. These include the ICTAS stakeholder board which is composed of the deans of the colleges of Engineering, Science, Veterinary Medicine, Natural Resources; the dean of the Graduate School; and the Vice President for Research; also faculty, students, and alumni of this university and others with whom we partner; the Provost; the President; federal, state, and local funding agencies and benefactors and the community in which we reside. We could not prosper without these reciprocal relationships.

Finally, as an institute, our collective vision is to be among the top-rated global institutes in transformative, sustainable technologies geared towards societal needs. Our team is energized by the challenges ahead and is looking forward to not only meeting, but exceeding expectations.

### ICTAS VISION

*To be among the top-ranked global institutes in transformative, sustainable technologies geared toward societal needs.*

### ICTAS MISSION

To enable and engage in **path-finding, interdisciplinary research** at the intersection of **engineering, the physical sciences, biology, information technology, cognition, and humanities** with a dedicated mission to:

- **advance the frontiers of knowledge**
- **develop innovative and elegant sustainable solutions to promote economic development and enhance quality of life** in the Commonwealth of Virginia, the United States, and the world at large
- **enhance educational experiences** of both undergraduate and graduate students

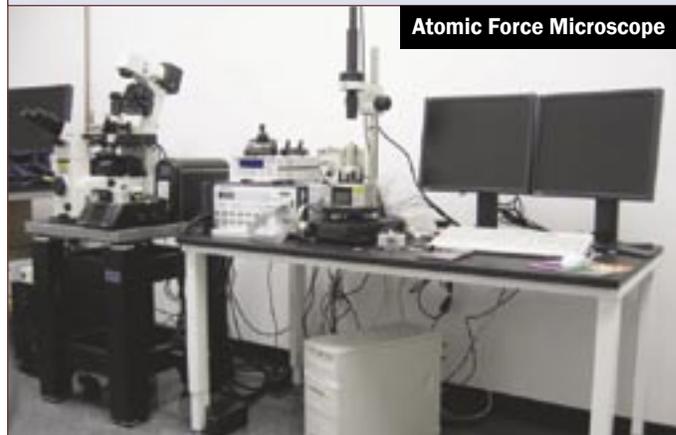
## Instrumentation at the new ICTAS Building *(continued from page 1)*

### Secondary Ion Mass Spectrometer



**SIMS** is a magnetic sector secondary ion mass spectrometer for surface molecular or elemental analysis, trace element depth profiling, and secondary ion microscopy. This instrument provides true elemental and stable isotopic analysis with high mass resolution and high sensitivity. It may be used to provide a 3-dimensional chemical analysis profile from a surface into the bulk of a solid with sub-micron spatial resolution.

**Atomic Force Microscope (AFM) integrated with a Confocal Microscope and Nanolithography Package** is a combined instrument that is capable of sub-wavelength (optical) resolution of films and biological samples, imaging of such things as cell substructure and DNA, and biological or molecular patterning. It is capable of imaging in dry or fluid environments with temperature control.



### Atomic Force Microscope



### Nanomanipulator

**Dimension 3100 Nanoman AFM Nanomanipulator** provides a variety of high-resolution surface imaging techniques and the ability to manipulate or create nanoscale structures. Imaging techniques include contact mode AFM, tapping mode AFM, scanning tunnelling AFM, conductive AFM, and scanning capacitance microscopy.

### Environmental Scanning Electron Microscope



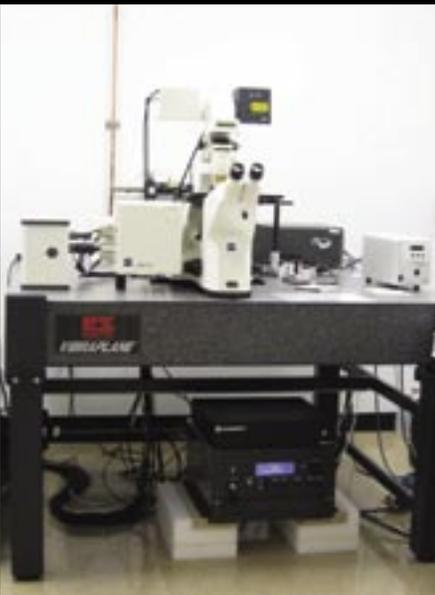
**X-ray Photoelectron Spectrometer** is optimal for quantitative characterization of chemical elements and chemical states of the top few nanometers of the surface of solids. It features a focused, monochromated X-ray source for small-spot analysis, and it is automated for high sample throughput. Depth profiling can be accomplished with automated ion milling.



### X-ray Photoelectron Spectrometer

**Environmental Scanning Electron Microscope** is used to investigate samples that are difficult or impossible to image in conventional high vacuum systems; for example, organic materials, hydrated materials, biomaterials, and in-situ observations of materials heated as high as 1000 degrees centigrade.

### Two-Photon Excitation Microscope



**Two-Photon Excitation Microscope** is a confocal laser scanning microscope with nonlinear optics extension for multiphoton fluorescence imaging of cell and tissue samples. It can generate 3-D stacks of sharply defined optical sections from thick biological samples with high spatial resolution, and it can spectrally discriminate multiple fluorophores.

### Nanomechanical Test Instrument

**Nanomechanical Test Instrument** is a nanoindenter for measuring mechanical properties such as hardness, elastic modulus, fracture toughness, wear resistance, coefficient of friction, and viscoelastic properties of thin films, coatings, and particles with nanometer spatial resolution using controlled indentation of surfaces.

### Nanomechanical Test Instrument



### Dual Beam-Focused Ion Beam

**Dual Beam-Focused Ion Beam** for dissecting or depositing material at a micro- to nano-meter scale. This instrument is a nano-machining platform built into a high-performance scanning electron microscope; it is capable of nanoscale lithography, deposition, and tomography.

**Field Emission SEM** is a scanning electron microscope that provides images of solid surfaces with a resolution approaching 1 nanometer, and uses an energy dispersive spectrometer to provide semi-quantitative information about the distribution of chemical elements. It is used for high-resolution imaging of surfaces, qualitative assessment of the distribution of elements (with atomic numbers between boron and uranium), submicron structure analysis, and determination of crystal orientation and crystalline texture.

### Field Emission SEM



## TECHNOLOGY FOCUS

## Nanomedicine: Emerging technology at Virginia Tech



*Undergraduates Julie Karfakis (top) and Matthew Kurnick (center) assess biological effects of ceria nanoparticles. Graduate student Courie Cohen and DO student Chine Logan (bottom) examine the effects of ceria on neurodegeneration.*

Traditionally, medical science has followed what the physicist Richard Feynman termed the “top down” approach, by focusing research on progressively smaller units of the whole and dissecting life down to smaller and smaller components. Nanoscience challenges us to move in a different direction – from the “bottom up” – when confronting biomedical problems, progressively constructing elements of the whole from its initial atomic and molecular building blocks. Nanomedicine implies application of the engineering concepts of nanotechnology to biological systems, providing novel opportunities to improve biological function or intervene in the pathology of disease. The nanomedicine group of Drs. **Beverly Rzigalinski**, **Kathleen Meehan**, and **Richey Davis** are doing just that, in designing a new generation of “nanopharmaceuticals” for aging, neurodegenerative, and inflammatory disorders.

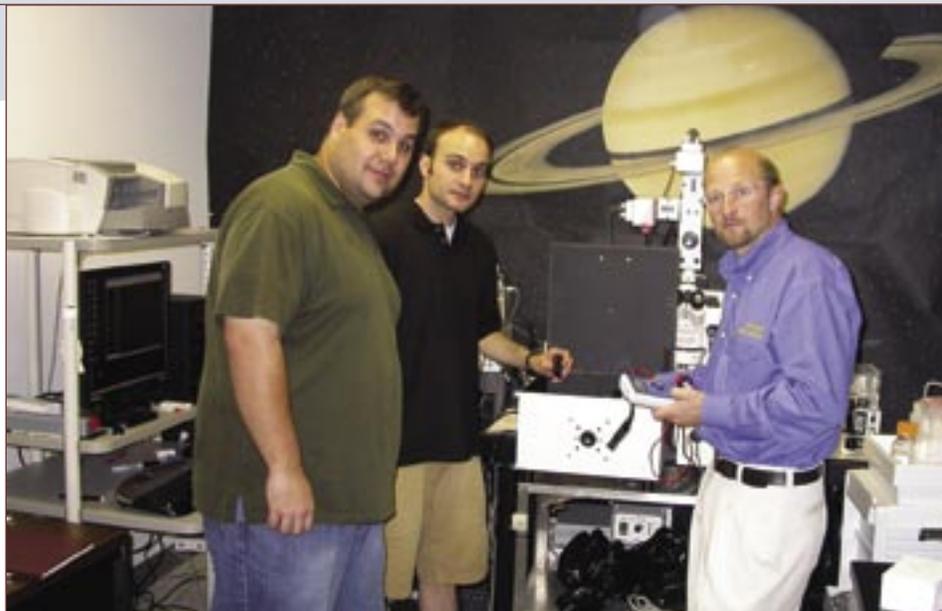
The “free radical theory of aging” maintains that aging is associated with accumulation of damage to cellular molecules and structures by compounds called free radicals, which promote cell dysfunction and death. Within the cell, there is a balance between the rate of free radical production and the capacity of natural cellular defense

mechanisms to mitigate free radical damage. When cellular defense mechanisms are compromised, such as in disease or aging, high levels of oxidative stress may cause extensive cell damage. A variety of disease pathologies associated with aging implicate free radicals in tissue damage, including Alzheimer’s disease, inflammatory disorders, Parkinson’s disease, diabetes, atherosclerosis, hypertension, and mechanical injury.

In industrial usage, cerium and other rare earth oxide nanoparticles are used as redox reagents, that retard oxidation, improve combustion, and reduce nitric oxide and other free radical products. In short, they are acting as free radical scavengers. In work funded by the National Institute on Aging, the Rzigalinski lab at the Edward Via Virginia College of Osteopathic Medicine (VCOM) found that cerium oxide nanoparticles act in a similar manner within the cell, removing damaging free radicals produced as a result of aging or disease. To date, the Rzigalinski group has demonstrated that cerium oxide nanoparticles of 20 nanometer size and less decrease cell injury and deficits in neuronal signaling associated with UV light exposure,  $H_2O_2$ ,  $\gamma$  irradiation, trauma and other sources of free radical injury.

Graduate student Neeraj Singh,

Mike Kovach of Photon Technologies Inc. (right) gives advanced training in real-time microspectrophotometry for analysis of nanoparticles to William Miles (left) and Jamie Clinton (center) in the Rzigalinski lab.



assisted by undergraduate Eric Amateis, is examining how aging, neurotoxins, and free radicals affect neuronal signaling — how cells of the brain talk to one another. Alterations in brain cell signaling decline with aging and are abolished by certain toxins. However, neurons and other brain cells treated with a single low dose of ceria live long and survive toxic insults, while maintaining their normal ability to communicate. Graduate student Courie Cohen and undergraduates Matthew Kurnick and Julie Karafakis are examining the effects of ceria in a commonly utilized aging model, *Drosophila melanogaster* (the fruit fly). Their studies thus far have shown that at the level of the organism, ceria dramatically extends the lifespan of the fruit fly and protects *Drosophila* from neurotoxins such as paraquat. The group is also completing toxicological and dose-response studies for cerium in several animal models. Dr. Jill Kramer, a neurologist at VCOM, will be working with the Rzigalinski group this summer to test the effect of ceria nanoparticles in neuroprotection, using a rat model for stroke.

However, in order to more completely understand the biomedical potential of nanoparticles such as ceria, biomedical research must heavily interact with engineering and chemistry. In a productive, unique nanomedicine collaboration, the Meehan (Bradley Department of Computer and Electrical Engineering) and Davis (Chemical Engineering Department) groups are investigating the properties of cerium oxide nanoparticles that impart their potent biological effects, and unraveling their mechanisms of action. Studies such as these are integral to development of the nanomedicines of the future. Dr. Meehan is synthesizing different ceria constructs with varying activities, to assess the properties of this series of nanoparticles. Graduate student Jamie Clinton is involved in synthesis of cerium oxide nanoparticles and determining how the electron structure of ceria changes

within the cell during free radical attack. Utilizing unique fluorescence properties of ceria particles, Jamie is making headway in understanding the mechanism of action of ceria under different biological conditions. He is also examining the different electronic states of ions in ceria and attempting to devise detection mechanisms for analysis of ceria at the biological level, using basic concepts of engineering.

Dr. Richey Davis and graduate student William Miles of the Chemical Engineering Department are applying classic colloidal modeling techniques to the quantification of cerium oxide and its behavior in biological fluids. To date, much of the focus on nanoparticle characterization has been under conditions of high temperature, pressure, or other non-biological parameters, making these studies a novel approach necessary for development of nanomedicine. Of particular importance is their work in determining the stability of ceria solutions under biological conditions — critical to improving drug delivery of nanoparticles. Miles is also working to characterize the surface chemistry of different types of cerium oxide constructs by measuring their interaction with free radical generating systems, which is critical to establishing dosing parameters and efficacy measurements.

The ultimate goal of the group is to design nanoparticles with controlled delivery of free radical scavenging activity for use in neurodegenerative and inflammatory disorders. In this unique collaboration, the group is making headway into the development of a new generation of drugs developed through nanomedicine.

## FACILITIES NEWS

## ICTAS A – THE NANOSCALE CHARACTERIZATION AND FABRICATION LABORATORY (NCFL)

*NCFL Director Bill Reynolds has been the key individual involved in putting together a business plan to run the NCFL as a cost center, and has coordinated efforts to purchase and install new instruments funded by the Commonwealth Research Initiative. The NCFL consolidates most of the characterization equipment that is available on the Virginia Tech campus under one roof. This facility opened for business in July 2007.*

### ICTAS I

*The building is making steady progress towards the goal of full occupancy in Fall of 2008. Based on the ICTAS research focus and theme areas, tenants for ICTAS I have been identified and have worked with representatives of the architecture and engineering firm (Burt Hill Kosar Rittleman Associates, Washington, D.C.) and Virginia Tech's Capital Design and Construction office to design the layout and upfit of the laboratory spaces to be located on the four floors of this building. ICTAS I will be home to the School of Biomedical Engineering and Science (SBES) laboratories and the ICTAS administrative headquarters.*



### ICTAS II

*Following the well-established bidding process and interviews with the finalists, SmithGroup has been selected as the architecture and engineering firm for this building. Believing that it is better to design and equip the laboratory space in this building to meet the requirements of future tenants up front rather than design it as a generic laboratory (with potentially expensive design changes to be incurred later), we have put together teams of faculty members from across the campus to help design the laboratory space. To ensure room for expansion in the selected areas or for future unanticipated hot area(s) of research, approximately 4,400 square feet of laboratory space is undesignated. This building is expected to open early in 2011.*



## STUDENT NEWS

## ICTAS Welcomes the First Class of Doctoral Scholar Awardees

The ICTAS Doctoral Scholars Program is a new program established in 2007. The program honors exceptional Ph.D. applicants through award of full financial support for the Ph.D. qualifying period. This program is a cooperative effort supported and coordinated primarily by ICTAS, with significant contributions from participating departments, colleges, and the Graduate School. Successful candidates of the highest caliber are selected for this honor. This award is an investment in the university's intellectual talent, creativity, and potential complementary to Virginia Tech's mission and strategic plan.

ICTAS is proud to announce the charter class of **ICTAS Doctoral Scholars**:

#### COLLEGE OF ENGINEERING

**Jeremy S. Archuleta**, Computer Science

**Muhammad Karami**,  
Engineering Science and Mechanics

**Marcel Christophe Remillieux**,  
Mechanical Engineering

#### COLLEGE OF SCIENCE

**Qian He**, Physics

**Matthew Williams**, Statistics

**Sihui Zhang**, Biological Sciences

#### COLLEGE OF NATURAL RESOURCES

**S. Carter Fox**, Wood Science and Forest Products

**Qingqing Li**, Wood Science and Forest Products

#### COLLEGE OF AGRICULTURE AND LIFE SCIENCES

**Justin Lemkul**, Biochemistry

**Jon Weekley**, Horticulture

#### COLLEGE OF VETERINARY MEDICINE

**Tila Khan**, Biomedical Sciences and Pathobiology

FACULTY SPOTLIGHT: **RAFAEL DAVALOS**

## Biomedical Engineers Use Electric Pulses to Destroy Cancer Cells

Photo by John McCormick

A team of biomedical engineers at Virginia Tech and the University of California at Berkeley has developed a new minimally invasive method of treating cancer, and they anticipate clinical trials on individuals with prostate cancer will begin soon.

The process, called irreversible electroporation (IRE), was invented by two engineers, **Rafael V. Davalos**, a faculty member of the Virginia Tech–Wake Forest University School of Biomedical Engineering and Science (SBES) and Boris Rubinsky, a bioengineering professor at the University of California, Berkeley.

Electroporation is a phenomenon known for decades that increases the permeability of a cell from none to a reversible opening to an irreversible opening. With the latter, the cell will die. What Davalos and Rubinsky did was apply this irreversible concept to the targeting of cancer cells.

“IRE removes tumors by irreversibly opening tumor cells through a series of short intense electric pulses from small electrodes placed in or around the body,” Davalos, the 2006 recipient of the Hispanic Engineer National Achievement Award for Most Promising Engineer or Scientist, said. “This application creates permanent openings in the pores in the cells of the undesirable tissue. The openings eventually lead to the death of the cells without the use of potentially harmful chemotherapeutic drugs.”

The researchers successfully ablated tissue using the IRE pulses in the livers of male Sprague-Dawley rats. “We did not use any drugs, the cells were destroyed, and the vessel architecture was preserved,” Davalos said. This work was completed with three additional colleagues: Lluís Mir, director of the Laboratory of Vectorology and Gene Transfer Research of the Institut Gustave Roussy, the leading cancer research center in Europe, and of the Centre National de la Recherche Scientifique (CNRS); Liana Horowitz, a visiting scientist at UC-Berkeley; and Jon F. Edd, a doctoral candidate at UC-Berkeley. They reported these *in vivo* experiments in the June 2006 *IEEE Transactions on Biomedical Engineering*.

*IRE shows remarkable promise as a minimally invasive, inexpensive surgical technique to treat cancer*



Oncologists already use a variety of methods to destroy tumors using heat or freezing processes, but these current techniques can damage healthy tissue or leave malignant cells. The difference with IRE is that Davalos and Rubinsky were able to adjust the electrical current and reliably kill the targeted cells. “The reliable killing of a targeted area with cellular scale resolution without affecting surrounding tissue or nearby blood vessels is key,” Davalos says.

Now, an article by Davalos on IRE is being featured in a special issue of *Technology in Cancer Research and Treatment* ([www.tcr.org](http://www.tcr.org)) dedicated to this new field. Rubinsky, who holds a Ph.D. from the Massachusetts Institute of Technology, is the guest editor for this special issue, published in August, 2007.

At Virginia Tech, Davalos directs the interdisciplinary Bioelectromechanical Systems Laboratory, where other research projects associated with utilizing the physical and electrical characteristics of cells, such as engineering methods for microfluidic single cell analysis, selective cell concentration, and image-guided surgery, broaden the understanding and potential of the field of IRE.

“IRE shows remarkable promise as a minimally invasive, inexpensive surgical technique to treat cancer. It has the advantages that it is easy to apply, is not affected by local blood flow, and can be monitored and controlled using electrical impedance tomography,” Davalos explained. Davalos and other researchers will continue to advance this promising method of treating cancer.

## Introducing the People of ICTAS



Mahajan



Johnson

### Roop Mahajan Director

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Roop earned a Ph.D. in Mechanical Engineering from Cornell University. He is an internationally known prolific researcher with expertise in a number of fields including heat transfer, artificial neural networks, bio micro-electro-mechanical systems, nanotechnology and humanistic engineering. He joined Virginia Tech and ICTAS in July 2006, bringing 30 years of background and experience at AT&T Bell Labs and the University of Colorado at Boulder. He is committed to taking Virginia Tech to the next level of prominence and is providing invaluable vision and leadership to ICTAS.



Thompson



Collier

### Shelley Johnson Administrative Assistant

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Shelley has served seven years in support administration at Virginia Tech, primarily as administrative assistant with the Center for Wireless Telecommunications. Shelley joined ICTAS in 2005. Shelley is central to all that ICTAS tries to do, enhancing unity and stability as the institute evolves from a fledgling institute to one of international stature.



Hall



Reynolds

### Christie Thompson Associate Director for Administration

231-5495 | [cthomp@vt.edu](mailto:cthomp@vt.edu)

Christie earned a Bachelor of Science degree in Civil Engineering and a Masters of Business Administration at Virginia Tech. Additionally, Christie has 10 years of experience in research administration at Virginia Tech, primarily with the Center for Wireless Telecommunications. Previous to her employment with Virginia Tech, Christie served as a civil engineer with VDOT and the Corps of Engineers. Christie joined ICTAS in 2002 and is responsible for all fiscal and facilities-related aspects of ICTAS.



McCartney



Jinschek



Craig



Beeby

### Linda Collier Fiscal Technician Senior

231-4036 | [lcollier@vt.edu](mailto:lcollier@vt.edu)

Linda earned an Associate Degree in Accounting from New River Community College and has devoted eighteen years of

service to Virginia Tech in various aspects of fiscal administration. Prior to joining ICTAS in 2005, Linda provided fiscal support to the Virginia Tech Foundation and the Electrical and Computer Engineering Department. Linda is integral to ICTAS' fiscal and administrative services.

### Lois Hall Fiscal Technician

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Lois is a relative newcomer to Virginia Tech and is looking forward to a long and productive career in fiscal support administration. Lois joined ICTAS in 2006 and has established herself as a cornerstone of the fiscal and administrative staff.

### Bill Reynolds Director – Nanoscale Characterization and Fabrication Laboratory (NCFL)

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Bill earned a Ph.D. in Metallurgical Engineering and Materials Science from Carnegie Mellon University and joined Virginia Tech in 1988. He serves double duty as a Professor of Materials Science and Engineering and the Director of the NCFL for ICTAS. Bill joined ICTAS in 2006 and has provided strong leadership for the ICTAS A building construction and instrumentation installation.

### Steve McCartney Instrument Specialist

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Steve earned an Associate in Applied Science in Instrumentation Technology and began working for Virginia Tech in 1988 in the Materials Science and Engineering Department. He has considerable experience in laboratory instrumentation and management gained through association with the Materials Research Institute and the Macromolecules and Interfaces Institute, and involving work with scanning electron microscopy, transmission electron microscopy, X-ray photoelectron spectroscopy, energy dispersive spectroscopy, and atomic force microscopy. Steve joined ICTAS in 2007.

**Joerg Jinschek****Research Assistant Professor and Director, STEM Lab**231-0479 | [jrjinschek@vt.edu](mailto:jrjinschek@vt.edu)

Joerg was awarded a Ph.D. in Physics from Friedrich-Schiller University Jena, Germany and joined Virginia Tech and ICTAS in 2005. He is currently serving multiple roles as Research Assistant Professor, ICTAS/MSE and Adjunct Professor, Geosciences as well as the Director of the TEM Lab. Joerg is a key player in the design, upfit and operation of the Nanoscale Characterization and Fabrication Laboratory.

**E. Zerrin Bagci****Post Doctoral Student**

Zerrin earned a Ph.D in Biochemistry and Molecular Genetics from the University of Pittsburgh and also holds degrees in Chemical Engineering from Bogazici University, Istanbul, Turkiye. Zerrin's research experience includes analysis of packing in globular proteins, modeling cellular response to apoptotic stimuli, and modeling effects of nitric oxide on apoptotic pathways. Zerrin also served as a teaching assistant for the NIH-NSF Bioengineering and Bioinformatics Summer Institute Program. She joined ICTAS in 2007.

**Ann Craig****Director of Communications and Program Development**231-2059 | [annc@vt.edu](mailto:annc@vt.edu)

Ann earned an Associate in Applied Science and a Bachelor of Science Degree in Business Administration. Ann has served Virginia Tech and related corporations for more than 35 years. Her experience covers a wide range of expertise areas and departments including human resources; communication; budget planning, analysis, and financial management; research administration; and intellectual property management. Most recently Ann served as Associate Director for Finance and Administration in the Center for Power Electronics Systems, Virginia's only National Science Foundation Engineering Research Center. Ann joined ICTAS and the Proposal Development Team in 2005.

**Jeff Beeby****Project Manager**231-2569 | [jeffbeeby@vt.edu](mailto:jeffbeeby@vt.edu)

Jeff has a Bachelor of Science in Electrical Engineering and a Master of Science in Systems Management. He retired from the Navy in 2006, having gained experience in aviation, research and development, program management, and teaching. Jeff joined Virginia Tech in 2006 as a Project Manager with the Proposal Development Team.

**Kathy Acosta****Graphic Designer**231-0704 | [kacosta@vt.edu](mailto:kacosta@vt.edu)

Kathy has a Bachelor of Science degree in Technical Writing and Publication Design. She has more than 20 years' experience as a graphic designer at Virginia Tech and other companies. Kathy joined the Office of the Vice President for Research (OVPR) in 2005 and divides her time between ICTAS and OVPR.



Acosta

**Dawn Maxey****Facilities Manager**231-7894 | [dmaxey@vt.edu](mailto:dmaxey@vt.edu)

Dawn has a Bachelor of Science degree in Organizational Management from Bluefield College and a Master of Science degree in Building Construction Science and Management from Virginia Tech and 26 years of service to Virginia Tech including seven years as a facilities and project manager. Dawn joined ICTAS in 2007, assuming management of ICTAS existing and under-construction facilities.



Maxey

**Josh Nay****Facilities Assistant**231-0466 | [jnay@vt.edu](mailto:jnay@vt.edu)

Josh is the youngest member of the ICTAS staff at age twenty-one and is a third year Building Construction Science student at Virginia Tech. His studies are focused on building design and environmental construction. Josh joined ICTAS in 2007 and is actively involved in day-to-day facilities management for ICTAS A.



Nay

**James Lane****Computer Network Support Technician**231-4957 | [jpl@vt.edu](mailto:jpl@vt.edu)

James was awarded a Bachelor of Science degree in Communication from Virginia Tech in 2000. For the past six years he managed R.H. Wright auditorium on the campus of East Carolina University. James joined ICTAS in 2007 and is leading the way forward in information technology management for the institute.



Lane

**John M. McIntosh****Instrument Specialist**231-6189 | [jmcintosh@vt.edu](mailto:jmcintosh@vt.edu)

John earned a M. S. in Metallurgy from Penn State University and a B. S. in Materials Engineering from Rensselaer Polytechnic Institute. He joined ICTAS during June 2007, offering specialist expertise in scanning electron microscopy, focused ion beam, x-ray diffraction, macro and micro-mechanical property testing, photolithography, and material characterization.



McIntosh

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ICTAS Connection is published by the Institute for Critical Technology and Applied Science at Virginia Tech

**Roop L. Mahajan**, Director

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## ICTAS Director receives 2007 Ralph Coats Roe Medal

By Lynn Nystrom, College of Engineering

BLACKSBURG, VA., June 8, 2007 – **Roop**

**Mahajan**, the James S. Tucker Professor of Engineering in the College of Engineering at Virginia Tech and director of the university's Institute for Critical Technology and Applied Science (ICTAS), is the recipient of the **2007 Ralph Coats Roe Medal for his contributions to a better understanding and appreciation of the engineer's value to contemporary society.**

The award, consisting of a \$10,000 honorarium and a gold medal, will be formally presented at the 2007 American Society of Mechanical Engineers' (ASME) International Mechanical Engineering Congress, Nov. 10-16 in Seattle.

In announcing the award, Virgil Carter, executive director of the ASME, said, "I have the honor of advising you that you have been selected to receive the 2007 Ralph Coats Roe Medal for lifelong contributions in communicating to the public the potential of engineering research for the betterment of society, and for contributions to engineering education as an inspirational teacher and role model to students."

"Professor Mahajan is deeply aware of the true calling of his profession to 'harness the basic principles of science and engineering to do something useful for society.' Through his own research spanning a period of over three decades, he has demonstrated the abiding power

of this principle by taking his innovations from the laboratory to the larger society in a seamless manner," wrote Professor Frank Krieth, an ASME honorary member.

Mahajan is an internationally known prolific researcher with expertise in a number of fields including heat transfer, artificial neural networks, bio micro-electro-mechanical systems (Bio-MEMS) and nanotechnology. He has over 170 archival journal publications, several book chapters and review articles, and an authoritative text book to his credit. He holds three patents and has five invention disclosures.

"Dr. Mahajan's efforts in these interdisciplinary fields make him a true Renaissance man and most worthy to receive the Roe Medal," said Richard Benson, dean of the College of Engineering at Virginia Tech.

Since coming to Virginia Tech, Mahajan has focused his efforts on leveraging the university's existing research strengths to help coordinate the University's talented and creative faculty in the further pursuit of interdisciplinary and multi-disciplinary research. Mahajan said his goal is to have ICTAS become a leader in technology transformation by "nurturing a proactive, responsive and nimble research culture, ultimately positioning the university as an agent of discovery and problem solving in the technological and scientific global environment."



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