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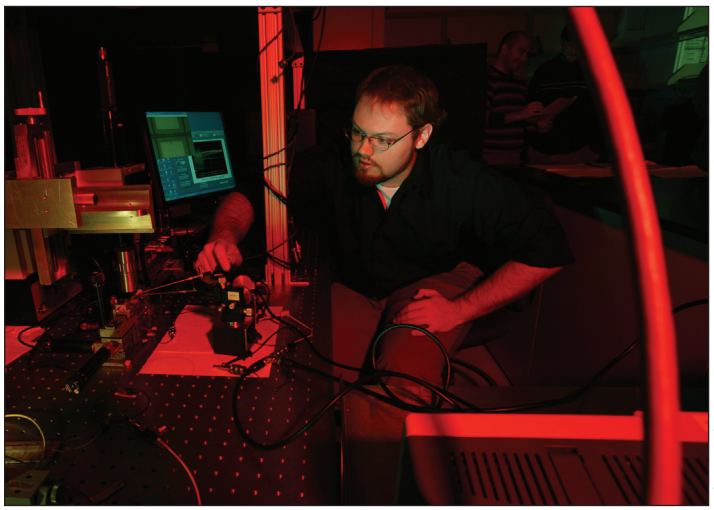
SYSTEM SOLUTIONS
THE INSTITUTE FOR SYSTEMS RESEARCH

The Institute for Systems Research

INSIDE

Chitosan nanosensor detects dangerous substances

A substance found in crab shells is the key component in a nanoscale sensor system developed by ISR researchers.



John Consoli

Graduate student Nathan Siwak works on the nanosensor project in Reza Ghodssi's MEMS Sensors and Actuators Laboratory.

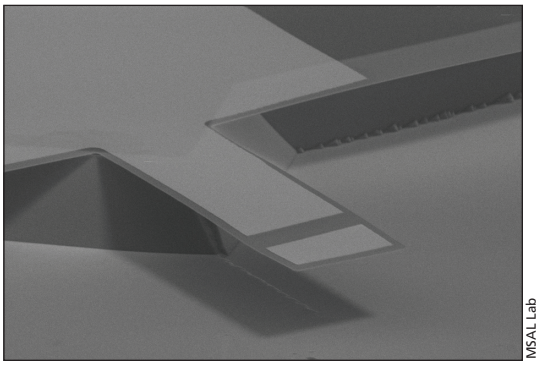
The sensor can detect minute quantities of explosives, bioagents, chemicals, and other dangerous materials in air and water, potentially leading to security and safety innovations for airports, hospitals, and other public locations.

The researchers are Associate Professor **Reza Ghodssi** (ECE/ISR), Maryland NanoCenter Director and former ISR Director **Gary Rubloff** (MSE/ISR), Fischell Department of Bioengineering Chair **Bill Bentley,** and **Greg Payne** from the University of Maryland Biotechnology Institute (UMBI).

They are using a substance called chitosan, found in the shells of crabs, other crustaceans and insects, to coat components of the microscopic sensor system. The material is extracted from shell waste.

"Chitosan is interesting because it's a biological compound that can interact with a wide variety of substances, and also works well in a complex, sensitive device," Ghodssi says.

Ghodssi's graduate students, **Nathan Siwak, Stephan Koev, Jonathan McGee** and **Mike Fan** are helping to develop the nanoscale "system on a chip."



MSAL Lab

A miniature vibrating cantilever coated with chitosan within the sensor system.

This micro-electro-mechanical system (MEMS) employs multiple miniature vibrating cantilevers, similar to diving boards, which are

continued on page 2...

director's CORNER

I am delighted to welcome to the Institute for Systems Research our first Professor of the Practice, Dr. Marvin R. Sambur. He becomes only the third person to be given the prestigious Professor of the Practice title in the A. James Clark School of Engineering. Dr. Sambur has extensive leadership experience in industry and government, and has made many important research contributions as well *(read our article on page 6)*. We are very excited that he has joined our ranks.

Dr. Sambur is already making significant contributions to ISR. In particular, he is leading an effort to assess and revise our masters degree curriculum in systems engineering. He has brought together a blue ribbon advisory panel to work with him on this task.

Dr. Sambur is credited with making major contributions to the field of systems engineering and with promulgating systems engineering education and processes during his term as Assistant Secretary of the Air Force for Acquisition. Besides the effort to revise our graduate curriculum, Dr. Sambur also is working with our faculty to define and pursue new research projects at the cutting edge of systems engineering, networks, and software validation and verification. I am grateful to him for his contributions thus far, and we in the ISR look forward to working with him for many years to come.

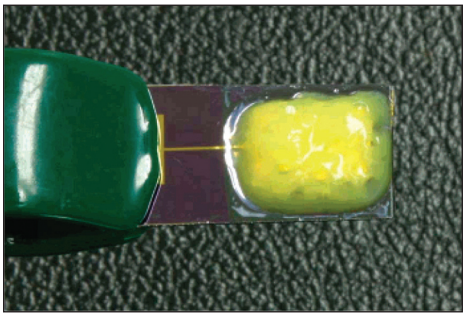
I also would like to thank all the external members of the Systems Engineering Education Advisory Panel: David F. Everett (NASA Goddard); John Wayne Hopkins, Jr. (Integrated Coast Guard Systems, Northrop Grumman); Ray O. Johnson (Lockheed Martin); and Robert Stow (BAE Systems). I am also very grateful to the University of Maryland faculty and staff involved in this effort: Mark Austin (Past Director, M.S. in Systems Engineering), Michael Ball (Chair, Educational Program Committee), John Baras (Founding Director, ISR), Paul Easterling, Susan Frazier and George Syrmos.

Finally, I hope you enjoy reading this issue of *System Solutions*. Our faculty, students, staff and alumni have again come through with many wonderful contributions and achievements of which we can all be proud.

ISR Director Eyad Abed

Chitosan nanosensor

... continued from page 1



MSAL Lab

A microscopic chitosan hydrogel sensor.

coated with chitosan, plus optical sensing technology that can see when the cantilevers' vibrations change.

Different cantilevers can detect different substances and concentrations. When a targeted substance enters the device from the air or water, the chitosan on a specific cantilever interacts with the substance and causes that cantilever's vibration to change its characteristics. The optical sensing system sees the vibration change and indicates that the substance has been detected.

Ghodssi and his collaborators have recently submitted a proposal to the National Institutes of Health (NIH) to develop a sensor system to detect the presence of avian flu.

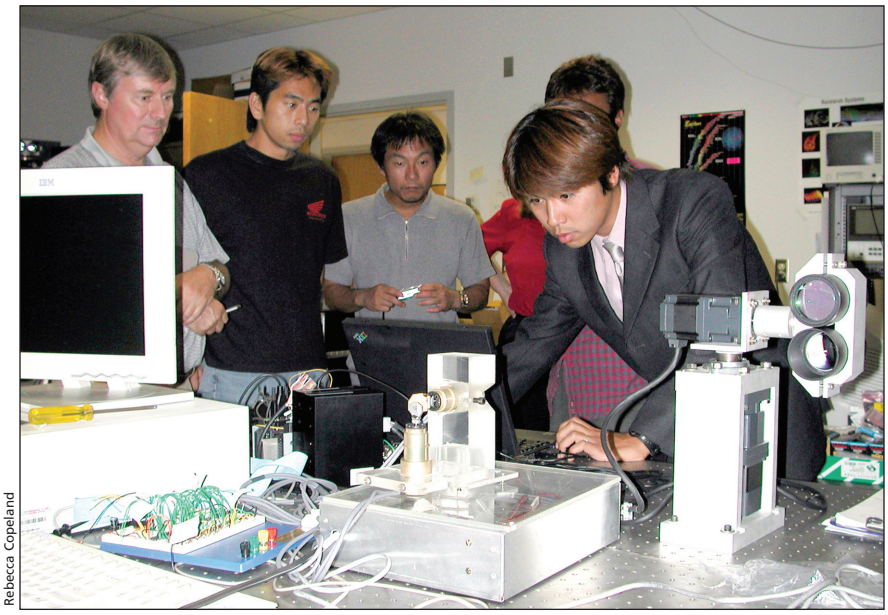
The technology was developed and initially tested at the Laboratory for Physical Sciences (LPS) in College Park, Md., and it is currently sponsored by LPS and the National Science Foundation (NSF).

"This is an exciting and complex microsystem that bridges biotechnology and nanotechnology to address critical needs of homeland security applications. My colleagues and I are expecting this work to become a product in the near future," says Ghodssi, who has filed for six patents on the technology. Parts of this research were recently featured in the *Journal of Micromechanics & Microengineering* in April 2006 and the journal *Biomacromolecules* in November 2005.

A recent press release about this groundbreaking work generated much television, radio, print and Internet publicity for ISR, the Department of Electrical and Computer Engineering and the A. James Clark School of Engineering. With creative headlines such as "The Crab Goes to War" and "Shellfish Security," the story was covered by WTOP radio, Washington, D.C.; NBC4, Washington, D.C.; NBC WBAL 11 and FOX 45, Baltimore; NBC TV10, Philadelphia; *The Washington Business Journal;* the Alaska Report's FishRadio; *Technology News Daily;* The American Vacuum Society website; FEMA's Metropolitan Medical Response System division; *The Philadelphia Inquirer;* PhysOrg.com; Photonics.com; The Fisheries Broadcast in St. Johns, Newfoundland; The Shanghai Nanotechnology Promotion Center (in Chinese); and The Biotech Weblog.

You can view video, listen to audio and read the various news reports at ISR's website, *www.isr.umd.edu/news/news_story.php?id=1006*.

Research and education opportunities abound for ISR Visiting Scholars



Rebecca Copeland

ISR Visiting Scholar Kazutomo Nishida of Honda R&D, Japan, demonstrates the stepping motor-aided pointing system for optical wireless tracking systems he developed while working with ISR-affiliated Professor Christopher Davis, at left.

Did you know that engineers and scientists have the opportunity to spend a year at ISR through our Visiting Scholars program? This program offers an excellent opportunity for staff members from companies and government labs to participate in cutting-edge research, further developing their knowledge and skills. Visiting scholars are integrated into ISR research teams and also have opportunities for education and training—including English as a Second Language (ESL)—at the University of Maryland campus.

This program, now in its eighth year, recently has been enhanced and has become part of ISR's Strategic Partners Program for industry and government.

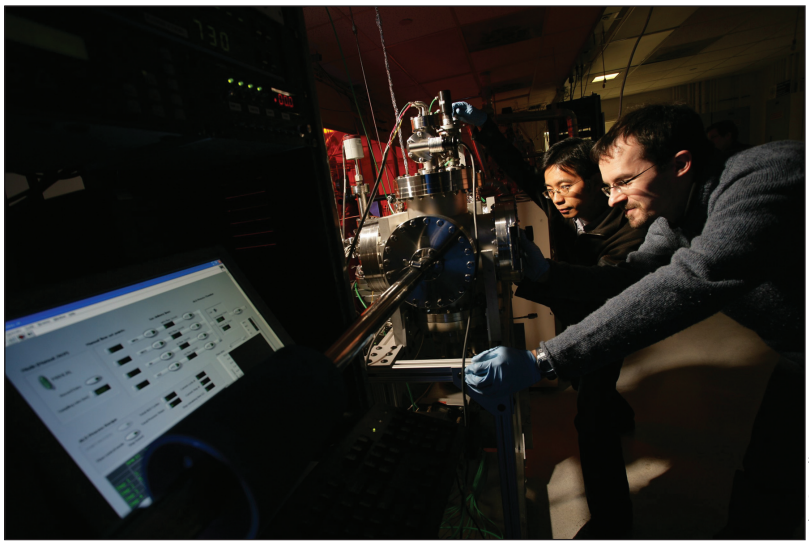
The program is designed for staff to work directly with ISR faculty and students on topics of mutual interest. The knowledge gained enables visiting scholars to review their company's operations, products and development needs from an enhanced perspective, often revealing opportunities for significant improvement and the introduction of new concepts.

Visiting scholars expand their knowledge of systems engineering, allied sciences, and business practices, and come to better understand the relationship between systems methodologies and application domains. In addition, they receive training in state-of-the-art tools including those based on ISR research. Visiting scholars from outside the United States acquire direct experience with the U.S. research culture.

Collaborations are possible in many technical areas, including network security, mobile and sensor networks, hybrid communication networks, MEMS sensor and actuator design and fabrication, nanotechnology, manufacturing and product realization systems, neuroscience and neuromorphic engineering, systems engineering methodologies, signal processing and multimedia systems, advanced control systems techniques, supply chain management, and transportation systems including air traffic management.

ISR alumni

We encourage ISR alumni currently working in industry or government laboratories to promote this program within their organizations. Share this information with colleagues and management, and contact us to pursue a relationship or with questions.



John Consoli

Visiting scholars can work on challenging projects and sophisticated, tools in settings like the Laboratory for Advanced Materials Processing.

For more information

A description of the program, examples of some past collaborations, and a list of ISR faculty and their areas of research expertise can be found on ISR's website: *www.isr.umd.edu/industry/VSP.htm* and by contacting ISR External Relations Director Jeff Coriale, 301-405-6604, *coriale@umd.edu;* or Karen Deal, 301-405-6634, *karend@umd.edu.*

major AWARDS

Ball, Lovell: NASA grant for air traffic flows

Professor **Michael Ball** (Robert H. Smith School of Business/ISR) and Associate Professor **David Lovell** (CEE/ISR) are co-principal investigators on a three-year, $728,000 NASA collaborative research project, "Dynamic, Stochastic Models for Managing Air Traffic Flows." The University of Maryland is the lead institution, others include UC Berkeley, MIT, Virginia Tech and Metron Aviation.

Lovell receives NSF grant for electrophoretic displays

The National Science Foundation (NSF) has awarded Associate Professor **David Lovell** (CEE/ISR) a three year, $213,000 grant to develop displays for transportation-related information. "Electrophoretic Displays for Urban Traffic Information and Control" will develop and test a novel display technology that is both electophoretic (involves the movement and/or rotation of charged particles in response to electric fields) and variably retroreflective, which means that incident light is reflected in the direction from whence it came. These display technologies could lead to developments such as electronically switchable roadway paints and tunnel walls that display messages.

Barg, Narayan receive NSF digital fingerprinting grant

Professor **Alexander Barg** (ECE/ISR) is the principal investigator on a $278,000 NSF grant, "Digital Fingerprinting: Information-Theoretic Analysis and Code Design." The research involves information-theoretic and code design issues connected with digital fingerprinting. Professor **Prakash Narayan** (ECE/ISR) is co-PI for the project, which also involves collaborative research with UC Riverside.

Digital fingerprinting protects copyrighted contents, such as software, images, audio signals, and multimedia, from unauthorized distribution. This research will use information- and coding-theoretic methods to determine the capacity limit—the maximum number of users with reliably fingerprinted data—that can be managed by the distributor, and to construct new, large-scale digital fingerprinting schemes.

McAvoy on team awarded NIH cancer research grant

Professor **Thomas McAvoy** (Emeritus, ISR/ChBE/Bioeng) is part of a team of University of Maryland engineers, scientists, and oncologists awarded a $330,000 National Institutes of Health grant for "Feedback Control and Inferential Modeling for Radiotherapy."

Led by principal investigator Assistant Professor Warren D'Souza (Department of Radiation Oncology, University of Maryland Greenbaum Cancer Center), the project is developing a new approach to planning and conducting radiation treatment in cancer patients.

While receiving treatment, a patient's respiration may cause a tumor to move, making the delivery of radiation to the right place more difficult, and irradiating healthy tissue in the process. Previous attempts at addressing the problem included having the patient hold his or her breath; and gating, a system in which delivery is synchronized with the patient's breathing. Holding breath can be difficult for patients, while gating increases the amount of time needed to deliver the treatment, and as a result increases the cost.

McAvoy and his team are developing a motion-synchronized "treatment couch" that uses feedback control and inferential skin markers to follow tumor movement and direct the radiation therapy. Markers on the patient's skin are monitored, allowing the system to estimate where a tumor is based. This information feeds into a control system that moves the treatment couch to compensate for breathing-induced tumor motion. The couch could significantly increase the accuracy and effectiveness of treatments for lung and upper abdominal cancers.

McAvoy has four decades of experience developing feedback control systems and also specializes in inferential sensing, making him a key member of the development process.

Abshire, Gupta, Liu receive MIPS grants

ISR faculty are associated with three Maryland Industrial Partnerships (MIPS) contract awards.

Assistant Professor **Pamela Abshire** (ECE/ISR) is working with Quantum Molecular Pharmaceuticals, Bethesda, Md., on a radiation sensor that could significantly reduce the size and cost of positron emission tomography (PET) scanners. PET is a nuclear medicine medical imaging technique that produces a three-dimensional image of functions in the body.

Associate Professor **S.K. Gupta** (ME/ISR) is working with Cardinal Scientific, Inc., Clinton, Md. He is designing a web-based interface for manufacturing parts using a water jet cutting machine.

Professor **K.J. Ray Liu** (ECE/ISR) is working with Pharad, LLC, in Glen Burnie, Md., optimizing its portable system for detecting concealed weapons on individuals from a distance (see our story on page 6).

The MIPS program provides matching funding for university-based research projects that help companies develop products. MIPS projects deal with innovative technological or scientific concepts and have direct commercial applications.

New look for ISR website

There's a new look at ISR's website, **www.isr.umd.edu**. With a handsome interface and easy-to-use menus, all the ISR news and information you're looking for is just a click away. Our home page carries a roundup of the latest ISR news as well as links to our upcoming events and a full calendar.

You'll find the site contains extensive information about our research, faculty, students, programs, and much more. You can search the last eight years' worth of ISR news items, view all our patents, and download more than 1,200 Technical Reports.

The website provides clear information about the many opportunities ISR provides for industry and government collaborations, as well as a place for alumni to update information, send in their own news and reconnect with ISR.

In addition, you can find links to ISR labs, centers, and special projects, as well as to news and happenings throughout the A. James Clark School of Engineering. Stop by!

NanoCenter receives two major grants; is named a 'URC'

The Maryland NanoCenter, directed by former ISR Director **Gary Rubloff** (MNE/ISR), has received major funding from the National Science Foundation (NSF) and the Robert W. Deutsch Foundation.

NSF is providing a $500,000 grant to purchase two new microscopes for the Nanoscale Imaging Spectroscopy and Properties (NISP) Laboratory in the Jeong H. Kim Building. The new equipment will allow researchers to better detect the composition of material and evaluate its chemical state. Essentially, the instruments 'see' individual atoms in material.

"This award is central to our continued progress as a leader in science, engineering and nanotechnology research on structure at the molecular and nanoscale," Rubloff said. "The NSF award builds on major investments the campus has made, providing funds to add pivotal chemical analysis capabilities to our new instrumentation."

The Robert W. Deutsch Foundation, based in Baltimore, is giving more than $1 million over four years for biological research on the nanoscale in the hope of speeding development of new life-saving drugs and advancing the field of nano-biotechnology. A nanoscale, microfluidic biochip that can serve as a tiny drug discovery laboratory is being developed. The chip is a miniature test subject that accepts a drug and reporting back on how it performs. The technology promises to give doctors a new way to discover drugs to treat bacterial infections without stimulating resistance-building bacterial mutations.

The researchers include Rubloff (MSE/ISR), Associate Professor **Reza Ghodssi** (ECE/ISR) and William Bentley (Bioengineering), and colleagues from the University of Maryland Biotechnology Institute in College Park and the School of Pharmacy in Baltimore.

In other NanoCenter news, the University of Maryland's Office of the Vice President of Research has designated the NanoCenter as one of the first University Research Centers (URC) on campus.

The URC program was created in 2006 to encourage the growth of major campus research centers, providing large center proposal and supplemental ongoing support.

The Maryland NanoCenter is a partnership among the university's A. James Clark School of Engineering, the College of Computer, Math and Physical Sciences, and the College of Chemical and Life Sciences.

ISR welcomes Professor of the Practice Marvin Sambur

Rebecca Copeland

ISR welcomed its new Professor of the Practice, **Dr. Marvin R. Sambur,** at a special lecture and reception Dec. 6. Sambur is a co-founder of Raptors Consulting Group, Potomac, Md. He currently serves as CEO. Raptors is a consulting company providing scientific advice to aerospace companies.

Previously, he was Assistant Secretary of the Air Force for Acquisition, responsible for all Air Force research, development and acquisition activities. He provided direction, guidance and supervision of all matters pertaining to the formulation, review, approval and execution of acquisition plans, policies and programs.

Dr. Sambur directed a $37 billion annual procurement that includes major programs like the F/A-22, F-35, C-17 and munitions, as well as capability areas such as information technology and command and control, intelligence, surveillance and reconnaissance systems. He formulated and executed the $220 billion Air Force investment strategy to acquire systems and support services to provide combat capability to joint warfighting commanders.

Dr. Sambur has more than 30 years of experience in high technology program acquisition, management and engineering. Prior to his Air Force position, Dr. Sambur was the President and Chief Executive Officer of ITT Defense, responsible for the management of ITT's $1.5 billion defense sector. In 1999, he received the Golden Apple Award for outstanding commitment to improving public school education for the children of Allen County in Fort Wayne, Ind.

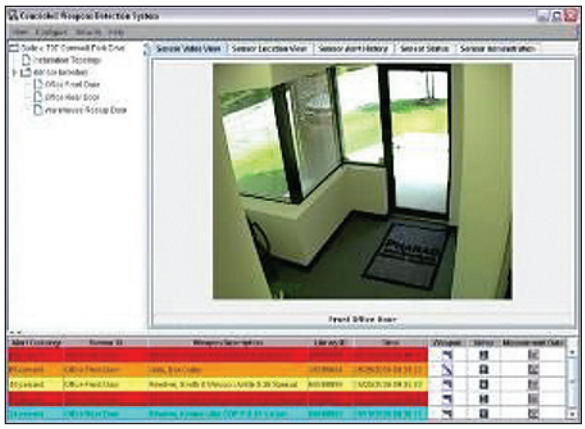
Liu develops 'brain' for concealed weapon detector

Professor **K.J. Ray Liu** (ECE/ISR) is in the news for his work with Pharad, LLC, in Glen Burnie, Md. Liu is optimizing Pharad's portable system for detecting concealed weapons on individuals from a distance. The system can be used in a variety of indoor and outdoor environments, including airport concourses and passenger train terminals, public buildings, shopping centers, stadiums and retail centers.

Liu is creating a state-of-the-art signal processing algorithm that first detects if a weapon is present, then classifies what kind of weapon it is. Each weapon has a unique signature defined by a set of electromagnetic resonances that reflect differently depending on its physical makeup. Pharad is testing various weapons to develop a signature library. While the initial system will detect concealed weapons, Pharad plans to add signatures to find disguised weapons, as well as bombs and explosives.

The system, currently in the development phase, could be on the market within two years.

Liu's work with Pharad is a project in the MIPS (Maryland Industrial Partnerships) program, administered by MTECH, the Maryland Technology Enterprise Institute. The MIPS program provides matching funding for university-based research projects that help companies develop new products. MIPS projects deal with innovative technological or scientific concepts that have direct commercial applications.

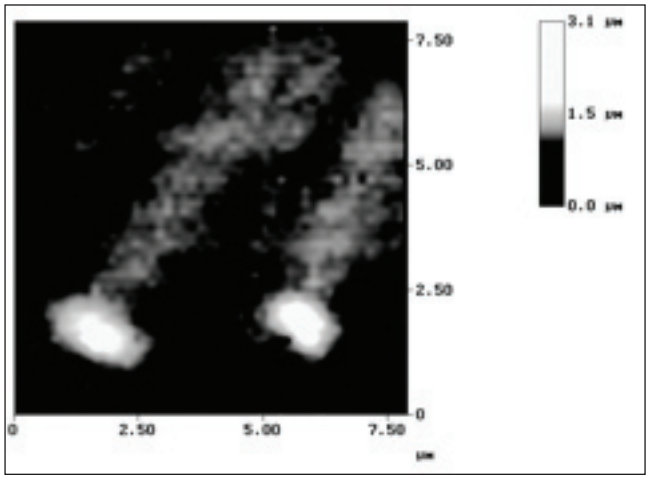


Pharad's portable system for detecting concealed weapons will be useful in entryways to public buildings as well as airports and other environments where crowds of people are present.

The original story, written by MTECH's Eric Schurr, has been picked up by *The Washington Examiner, The Maryland Daily Record* and online by securitysolutions.com. You can read the story online at *www.mtech.umd.edu/news/press_releases/MIPS_Pharad.html.*

Davis, Smolyaninov developing two-dimensional plasmon microscope

ISR-affiliated Professor **Christopher Davis** (ECE) and ECE Research Scientist **Igor Smolyaninov** are featured in "Physics and Technology Forefronts: Catching an electron wave with emerging plasmon applications," an online story at the American Physical Society (APS). The article discusses research into advanced applications of plasmon technology. Plasmons, electron waves generated when light strikes a metallic surface, are being used to help scientists see fine, nano-scale details that were previously undetectable.



A lithographic technique creates some simple prototype plasmon optics devices, such as plasmon "flashlights" shown here.

Davis, Smolyaninov and their research colleagues are developing a two-dimensional plasmon microscope ideal for imaging living cells that could operate much like a point-and-shoot camera. The new technology would reveal much more detail than existing imaging techniques, improving resolution to around 10 nanometers. Movies might even be possible, since each microscope image is taken all at once, rather than one pixel at a time.

In addition, *Scientific American* recently selected Smolyaninov as a Research Leader in its 2006 "Scientific American 50" (SA 50) list for his contributions in plasmonics.

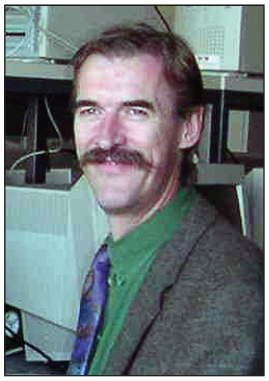
The magazine's prestigious annual list honors 50 individuals, teams, companies, and other organizations whose accomplishments in research, business, or policymaking demonstrate outstanding technological leadership. Previous SA 50 selections have included Google founders Sergey Brin and Larry Page; Nobel prize-winning neurobiologist Roderick MacKinnon; and high tech innovator Steve Jobs, CEO of Apple. This year's honorees for research leadership were selected for their contributions in a wide variety of areas, including biotechnology, microelectronics, energy, and genetics research. Read more about this achievement online at *www.eng.umd.edu/media/pressreleases/pr110906_sa50.html*.

industryNEWS

InterDigital becomes ISR strategic partner

ISR is pleased to announce that InterDigital Communications Corp. has become a partner in our Strategic Partners Program. InterDigital designs, develops and provides advanced wireless technologies and products that drive voice and data communications worldwide. Initial collaborations will be with Professors **Prakash Narayan** (ECE/ISR) and **Alexander Barg** (ECE/ISR) in information theoretic security. ISR Director **Eyad Abed** (ECE/ISR) said, "We are very pleased to have InterDigital partner with ISR in an area of shared strategic priority, and look forward to productive collaborations."

ISR Distinguished Lecturer: Jean-Yves Le Boudec



On February 13, Jean-Yves Le Boudec, Professor from Ecole Polytechnique Fédérale de Lausanne, visited ISR as a Distinguished Lecturer. He spoke to faculty and students on understanding the simulation of mobility models. Professor Le Boudec conducts research on the performance and architecture of communication systems and co-authored the recent book, *Network Calculus* (Springer, 2006).

facultyNEWS

Faculty awards

Professor **P.S. Krishnaprasad** (ECE/ISR) has won the 2007 Institute for Electrical and Electronics Engineers (IEEE) Control Systems Society Hendrik W. Bode Prize. The Bode Prize recognizes distinguished contributions to control systems science and engineering. Krishnaprasad will deliver the prize lecture at the 2007 IEEE Conference on Decision and Control.

Krishnaprasad also delivered the Munich Mathematical Colloquium for Fall 2006 at the Technical University of Munich, Germany. He spoke on "Geometric Control, Cohesion and Pursuit," which included joint theoretical work on swarming and pursuit with ISR alumnus and former ISR faculty member **Eric Justh** (now at the Naval Research Laboratory) and ISR alumnus **Fumin Zhang** (now a research associate at Princeton University). It also incorporated work on pursuit of insect prey by the echolocating bat *Eptesicus Fuscus* with Associate Professor **Timothy Horiuchi** (ECE/ISR), Professor **Cynthia Moss** (Psychology/ISR) and her former Ph.D. student, ISR alumnus and current postdoctoral researcher **Kaushik Ghose**.

ISR-affiliated Professor **Ben Kedem** (Math) received a 2006 IBM Faculty Award. The highly competitive $20,000 award from IBM's T.J. Watson Research Center recognizes the quality of Kedem's program and its importance to the computing industry.

Professor **K.J. Ray Liu** (ECE/ISR) has been selected as a 2007-2008 Distinguished Scholar-Teacher by the University of Maryland. He joins Professor **Michael Fu** (Robert H. Smith School of Business/ISR), 2004-2005; Professor **Steve Marcus** (ECE/ISR), 2000-2001; and Professor Emeritus **Thomas McAvoy** (ChemBE/Bioeng/ISR), 1997-1998; as ISR winners of the award in the past decade.

The Distinguished Scholar-Teacher program recognizes faculty members who have demonstrated outstanding scholarly achievement along with equally outstanding accomplishments as teachers. Nominees for the award are selected by their peers; six winners are chosen by a panel of former Distinguished Scholar-Teachers. Dr. Liu will make a public presentation on a topic of scholarly interest in the fall semester.

Students in the Professional Master of Engineering Program (ENPM) voted ISR Associate Professor **Guangming Zhang** (ME/ISR) as the first recipient of their new Outstanding Teaching Award. This award will be given annually to the ENPM faculty member who demonstrates excellence in teaching through curriculum development, revision and modernization.

Dr. Zhang has won several other teaching awards in his career. In early 2006, he was selected as one of the Clark School of Engineering's first six Keystone Professors. In 2004 he won the Clark School's Poole and Kent Outstanding Teaching Award for Senior Faculty.

Best paper awards

Associate Professor **S.K. Gupta** (ME/ISR) and his Ph.D. student **Tao Peng** received the Best Paper Award at the 2006 ASME Computers and Information in Engineering Conference in Philadelphia, Sept. 10-13. "A Computational Framework for Point Cloud Construction Using Digital Projection Patterns" was judged the best of the 94 papers presented at the conference.

Congratulations to Associate Professor **S. (Raghu) Raghavan** (Smith School of Business/ISR) for receiving the Glover-Klingman prize from the journal *Networks* for the best paper published in the journal in 2005. He co-authored "Strong Formulations for Network Design Problems with Connectivity Requirements" with Thomas Magnanti, Dean of Engineering at MIT. The article appeared in the January 2005 issue. The judges noted, "This paper stands out for its unifying perspective and its substantial contributions to understanding the role of flow formulations in the effective solution of an important class of combinatorial optimization problems."

Raghavan also recently received the Robert H. Smith School of Business's Olian Award for his proposal, "Assigning and Pricing Sponsored Online Ad-Sites as a Multi-Unit Auction with Budget Constraints." The award is given annually to the Smith School faculty member who presents the best summer research proposal.

Faculty in the news

Two years ago, National Public Radio's Michele Norris interviewed Professor **Shihab Shamma** (ECE/ISR) outside a New Carrollton, Md., polling station after he voted in the Iraq election. She reconnected with him for *All Things Considered* on Jan. 2, 2007 in a wide-ranging conversation about his current impressions of the situation in his home country. You can listen to the interview at NPR's website: *http://www.npr.org/templates/story/story.php?storyId=6712272*.

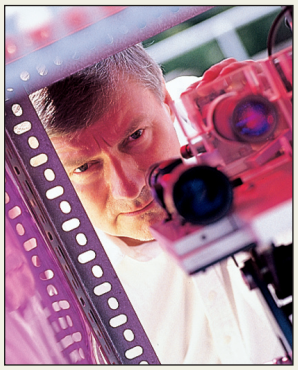
Associate Professor **S.K. Gupta** (ME/ISR) was interviewed by *Mechanical Engineering Magazine,* the premier publication of American Society of Mechanical Engineers, about the future of computer-aided manufacturing systems. "What designers ideally want to get to is a system where, after finishing a design, they could press a button on the computer and fabrication could automatically begin," Gupta says in the story. His lab is working on algorithms that would power computer-aided design toward such an end. Read the article, "Where Does CAM Stand?" at *www.memagazine.org/contents/current/features/camstand/camstand.html.*

At Halloween, Associate Professor **Timothy Horiuchi** (ECE/ISR) was interviewed by Washington, D.C. news radio WTOP about his work in transferring capabilities of echolocating bats to micromachines. Reporter Randy Atkins managed to work both a "bat" and "Frankenstein" angle in the same interview. You can listen to the interview online at *www.nae.edu/nae/pubundcom.nsf/weblinks/CGOZ-6UYJ3G/$file/Frankenstein%20Bat.mp3* and view Horiuchi's "batmobile" projects on his lab website, *www.isr.umd.edu/Labs/CSSL/.*

Computerworld magazine has named research projects by three ISR faculty members as winners in its second annual Horizon Awards for cutting-edge technologies. OASYS, a unique system for online opinion analysis developed by ISR-affiliated UMIACS Director **V.S. Subrahmanian** (CS/UMIACS), was selected for the award by an independent panel of senior IT executives. In addition, digital fingerprinting technology developed by ISR-affiliated Associate Professor **Min Wu** (ECE/UMIACS) and Professor **K.J. Ray Liu** (ECE/ISR) received an honorable mention.

Associate Professor **S.K. Gupta** (ME/ISR) and ISR-affiliated Associate Professor **Ralph Etienne-Cummings** (Johns Hopkins University) were recently designated as "Trailblazers" by *Science Spectrum* magazine. The publication annually honors 70 "outstanding Hispanic, Asian American, Native American and Black professionals in the science arena whose leadership and innovative thinking on the job and in the community extend throughout and beyond their industry."

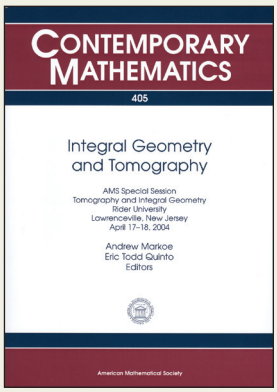
Patents


John Consoli

ISR-affiliated Professor **Christopher Davis** (ECE) was issued U.S. Patent No. 7,106,971 on Sept. 12 for "System and Method for Optical Wireless Communication." The invention facilitates optical wireless communication with fading resistance. A delayed diversity approach reduces fading significantly by sending data in a set of light signals which each have a different polarization and/or a different wavelength. Each light signal is carried over a different, uncorrelated "channel" through the atmosphere. The receiver adjusts and combines the signals into a single signal.

ISR-affiliated Professor **Ben Shneiderman** (CS) has been issued U.S. Patent No. 7,010,751 for "Methods for the Electronic Annotation, Retrieval, and Use of Electronic Images." Shneiderman invented software for electronically annotating electronic images, such as drawings, photographs, video, etc., through dragging and dropping annotations from a predefined, but extendable, list. The annotations are placed at a user-selected X,Y location on the image, and stored in a searchable database. They can be searched to retrieve, organize, group, or display individual images or collections of images. The annotations may be text, images, sounds, etc. The invention provides a flexible, easy-to-learn, rapid, low error rate and satisfying interface.

Books



The American Mathematical Society has published *Contemporary Mathematics 405: Integral Geometry and Tomography*. The volume includes an article on network tomography by Professor **Carlos Berenstein** (Math/ISR), Professor **John S. Baras** (ECE/ISR) and Ph.D. student **Franklin Gavilánez.** The publication is a record of the 2004 AMS Special Session on Tomography and Integral Geometry.

Invited lectures

Professor **Anthony Ephremides** (ECE/ISR) delivered a series of talks on wireless networks in September as a member of the IEEE Communications Society Distinguished Lecturers. Ephremides gave lectures on "Wireless Networks: Where is the Beef?" at four locations, and spoke on "The Essence of a Theory for Wireless Networking" at the Washington Chapter of the IEEE Communications Society.

Editorship

Associate Professor **Jeffrey Herrmann** (ME/ISR) has been named an associate editor of the American Society of Mechanical Engineers' (ASME) *Journal of Mechanical Design.*

studentNEWS

Rebecca Copeland

ISR undergrad Travis Young named Merrill Presidential Scholar

ISR undergrad student **Travis Young** and Professor **P.S. Krishnaprasad** (ECE/ISR) recently were honored at a ceremony for the University of Maryland's Philip Merrill Presidential Scholars Program.

Young was one of only 25 undergraduates campuswide to be named to the 2006-2007 Merrill Presidential Scholars list. The program honors the university's most successful seniors, along with faculty and teachers from their K-12 days who mentored them, and encourages stronger collaboration between the university and K-12 schools.

Young has been active in the robotics research of ISR's Intelligent Servosystems Laboratory. He said Professor Krishnaprasad was "an invaluable advisor who was helpful and willing to listen" and who gave him independence and helped him gain valuable experience. He also expressed appreciation for his high school teacher and mentor, Tom Sankey, of Mount Hebron High School in Howard County, Md. ES

Goldman and Chen selected as NCMR Scholars

Two ISR undergraduate seniors have been selected as NCMR Scholars. **Marc Goldman**, who works in the Computational Sensorimotor Systems Laboratory with Associate Professor **Timothy Horiuchi** (ECE/ISR), received a $10,000 scholarship, while **Eric Ying-Che Chen,** part of Assistant Professor **Pamela Abshire's** (ECE/ISR) Integrated Biomorphic Information Systems Laboratory, received $5,000. Goldman's major is electrical engineering, while Chen has a double major in electrical engineering and computer science.

NCMR, the National Consortium for MASINT Research, is a Defense Intelligence Agency program that provides cutting-edge research to the intelligence community. (MASINT is an acronym for measurement and signals intelligence.) NCMR's scholarship program encourages future scientists to consider technical career paths within the intelligence community. Dr. Abshire, who is the principal investigator for a current NCMR research project, "Integrated Transduction, Actuation, and Control for Cell-Based Sensing," managed the University of Maryland program this year. ES

Gahagan wins best paper award

ISR Ph.D. student **Sean Gahagan** won first place in the Institute of Industrial Engineers Lean Student Paper Competition for "Adding Value to Value Stream Mapping: A Simulation Model Template for VSM." His advisor is Associate Professor **Jeffrey Herrmann** (ME/ISR).

The competition recognizes outstanding student papers in the field of lean research and practices. As the winner, Sean will present his paper in May at the IIE Annual Conference in Nashville. ES

alumniNEWS

Al Santos

ISR alum Rajiv Laroia honored by Clark School of Engineering

On October 16, the Clark School inducted alumnus **Rajiv Laroia,** M.S. '89 and Ph.D. '92, electrical engineering, into the Innovation Hall of Fame in a ceremony at the Jeong H. Kim Engineering Building attended by campus leaders, faculty, staff, students and past Hall of Fame inductees.

Laroia was very active in ISR during his time at Maryland, through his advisor (now Clark School Dean) **Nariman Farvardin** (ECE/ISR) and their work together in the Communication and Signal Processing Laboratory. Laroia won ISR's Outstanding Graduate Student award for 1991-1992. He was one of the distinguished speakers at ISR's 20th Anniversary Symposium this past April.

Farvardin and Laroia, along with Professor Steven Tretter (ECE) received U.S. Patent 5,388,124 in 1995 for "Precoding Scheme for Transmitting Data Using Optimally-Shaped Constellations Over Intersymbol-Interference Channels." Laroia has continued his working relationship with ISR faculty through the years.

At the Clark School ceremony, Laroia was presented with a medallion commem-

orating his induction. A panel describing his work was revealed.

Laroia is a leading developer of wireline and wireless technologies who recently sold his company to communications giant QUALCOMM. He was honored for his inventions, which helped to double the speed of data over landline modems and will allow companies to bring enhanced Internet functions to mobile phones.

The Innovation Hall of Fame induction ceremony was followed by the Charles and Helen White Symposium, where Laroia was one of the speakers.

Jafarkhani named IEEE Fellow

Congratulations to ISR alum **Hamid Jafarkhani,** who has been named an IEEE Fellow "for contributions to space-time coding." Jafarkhani is a professor in the Department of Electrical Engineering and Computer Science at the University of California, Irvine. He earned his Ph.D. in Electrical Engineering in 1997 and was advised by Clark School of Engineering Dean **Nariman Farvardin** (ECE/ISR). Jafarkhani and co-author Yin Zhu also won the 2006 IEEE Marconi Prize Paper Award in Wireless Communications for "Differential Modulation Based on Quasi-Orthogonal Codes." This award is given for the best original paper on wireless communications published in the *IEEE Transactions on Wireless Communications* in the previous calendar year.

Sun receives NSF CAREER Award

ISR alum **Yan Lindsay Sun** has received a National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award. Sun is a former advisee of Professor **K. J. Ray Liu** (ECE/ISR). She earned a Ph.D. from the Electrical and Computer Engineering Department in 2004. The award will fund her research, "Building Trust in Distributed Networks: Theories, Architecture and Applications." She is an assistant professor in the Department of Electrical and Computer Engineering at the University of Rhode Island.

Sun's research will improve network security and performance by developing a system-wide trust infrastructure. This project has several major components: an architectural design, a formal methodology for trust establishment, case studies, graduate and undergraduate education, and outreach to the community at large.

The NSF CAREER program fosters the career development of outstanding junior faculty, combining the support of research and education of the highest quality and in the broadest sense.

Tenure for Sarkar and Poovendran

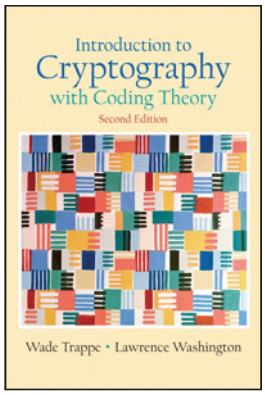
Two ISR alumni have been granted tenure at their respective universities. ISR alumnae **Saswati Sarkar** has been promoted to associate professor with tenure in the University of Pennsylvania's Electrical and Systems Engineering Department. Sarkar's Ph.D. advisor was former ISR-affiliated faculty member Leandros Tassiulas. ISR alumnus **Radha Poovendran** has been promoted to associate professor with tenure by the University of Washington's Electrical Engineering Department. He won a Presidential Early Career Award for Scientists and Engineers (PECASE) in 2005. Poovendran's Ph.D. advisor was Professor **John Baras** (ECE/ISR).

Gubner authors book on probability

John A. Gubner, a 1988 Ph.D. in electrical engineering advised by Professor **Prakash Narayan** (ECE/ISR), has written *Probability and Random Processes for Electrical and Computer Engineers,* an academic textbook published by Cambridge University Press. The book presents probability as a powerful tool that helps electrical and computer engineers explain, model, analyze, and design technology. Gubner is currently an associate professor in the University of Wisconsin's Department of Electrical and Computer Engineering.

Trappe book enters 2nd edition

A book that ISR alum **Wade Trappe** co-wrote with Math Department Professor Lawrence C. Washington in 2001 has been updated in a second edition. *Introduction to Cryptography with Coding Theory* grew out of a cryptography class the two developed at the University of Maryland. Trappe was a doctoral student in applied mathematics and scientific computing at the time; he was affiliated with both ISR and the Electrical and Computer Engineering Department, and was advised by Professor **K.J. Ray Liu** (ECE/ISR). He is now an assistant professor in the Electrical and Computer Engineering Department at Rutgers University.



Chen helps develop technology to regrow teeth

ISR alum **Jie Chen,** a 1998 ECE Ph.D. graduate and associate professor of electrical engineering at the University of Alberta, has developed new technology that helps regrow human teeth.

Alumni: share your news with us!

We'd love to add ***your*** news to our roundup of alumni stories. Email us at rebeccac@isr.umd.edu. And thanks!

continued on back cover...

...continued from page 11

Alberta, has developed new technology that helps regrow human teeth.

Chen and his colleagues Tarek El-Bialy and Ying Tsui have developed a patent-pending technology that enables the regrowth of teeth and dental tissue. The trio have designed a tiny wireless device for insertion into a patient's mouth which can gently massage the gums to stimulate the growth of the tooth root. The device is still in the prototype stage but is expected to be on the market within two years. It also will be capable of straightening up smiles by stimulating jawbone growth.

Chen's current research interests include nanoscale circuit design and applying nanotechnology for biomedical applications. He has published more than 50 scientific papers in refereed journals and conference proceedings, and has co-authored a book on genomic signal processing and another book on circuit and system design for digital video coding. He was also nominated as a Fellow of Canada's National Institution of Nanotechnology. While at Maryland, Chen was advised by Professor **K.J. Ray Liu** (ECE/ISR).

Chiu wins Macronix Golden Silicon Award

ISR alumnae **Ching-Te Chiu,** a 1992 ECE Ph.D. advised by Professor **K.J. Ray Liu** (ECE/ISR), has won the first place and innovation awards in the Macronix Golden Silicon Awards competition for "Loaded Balanced Birkhoff Von Neumann Symmetric TDM Switch IC." Chiu's research team implemented a switch architecture capable of providing both high scalability and high throughput rate. Macronix, in Hsin-Chu City, Taiwan, is a leading provider of Non-Volatile Memory (NVM). Chiu, an associate professor at National Tsing-Hua University in Taiwan, has been working in high speed switching and serial interface design, 10 Gbps IP routers, SONET/SDH framers and mappers, and HD television. ES

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