GODART tech transfer news

National Aeronautics and Space Administration

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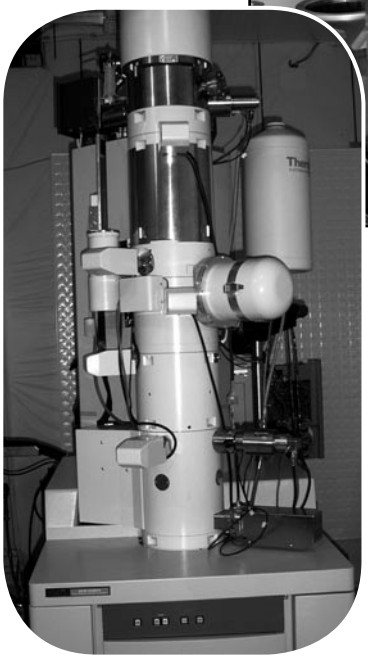
ARL and University Nanotech Facilities Available for Use

Goddard has entered into two agreements that grant NASA scientists access to cutting-edge nanotechnology research facilities outside the Agency. "These agreements essentially allow NASA to expand our infrastructure without incurring the costs of building the labs and buying the equipment ourselves," said **Dan Powell** (Code 540), Goddard's lead nanotechnology researcher. "And anyone at Goddard can take advantage of these arrangements."



(Above) Goddard personnel now have access to some of ARL's cuting-edge facilities. Photo courtesy of Army Research Lab; all rights reserved.

(Left) Goddard is establishing remote access to Lehigh University's JEOL transmission electron microscope. Photo courtesy of Lehigh University; all rights reserved.

Earlier this year, Goddard signed an agreement with the Army Research Laboratory (ARL) to develop a joint program of collaboration that enhances each lab's research capabilities. Areas of collaboration include design, fabrication, and testing of nanoscience and microelectromechanical systems (MEMS) devices and technologies for use in chemical and biological detectors, power generation, thermal management systems, radio frequency electronics, electro-optic devices, and distributed sensor networks.

Under the agreement ARL personnel will have access to Goddard's Detector Development Laboratory, and Goddard personnel can access ARL's Specialty Electronic Materials and Sensors Cleanroom.

Similarly, Goddard signed a Space Act Agreement (SAA) in June that allows NASA researchers to experiment with the new JEOL 2200FS aberration-corrected transmission electron microscope (TEM) at Lehigh University in Bethlehem, Pennsylvania, without ever leaving Greenbelt.

Lehigh's JEOL TEM, which has 0.1-nm resolution, can be operated remotely. Powell is establishing an operation interface within Building 30 to provide real-time, remote access to Lehigh's instrument. Once that interface is established, Goddard researchers have up to 100 hours of JEOL TEM time at no cost. This access allows NASA to begin to demonstrate the potential for space-based remote microscopy, which could be used in future missions.

For more information about how to take advantage of these agreements, contact **Dan Powell** (6-0428; Dan.Powell@nasa.gov) or **Darryl Mitchell** (6-5169; Darryl.R.Mitchell@nasa.gov) of the Office of Technology Transfer. ■

Other Projects with Lehigh University

The SAA with Lehigh University also involves two specific research projects. One project, which will study the properties and mechanics of thin films that might be used in the James Webb Space Telescope's Near Infrared Spectrograph (NIRSpec), is being led by **Michael Beamesderfer** (Code 541). The other project is being led by **Brian Jamieson** (Code 553) and involves testing miniaturized low-leakage valves for use in mass spectrometers and other science instruments. ■

Spin-In vs. Spin-Out

Spin-in: Partnering with or adapting technologies from industry, academia, or other government labs to address NASA mission needs.

Spin-out: Finding commercial, academic, and other government applications for NASA technologies. ■

award

Tilton Wins Excellence in Information Science and Technology Award

On May 18, **James C. Tilton** (Code 606.3) received Goddard's Excellence in Information Science and Technology (IS&T) Award for his Recursive Hierarchical Segmentation (RHSEG) software. This annual award is presented to a Goddard employee who best exhibits broad accomplishments in the area of IS&T, making an outstanding contribution to the field of information science and technology.

RHSEG provides a new approach to image analysis that increases accuracy for two-dimensional (and potentially three-dimensional) image analysis. Dr. Tilton began developing the software algorithm in 1983 for remote earth sensing. Because individual pixels do not necessarily provide enough information about where they fit into the overall "scene," he thought about image segmentation and analyzing the data beyond the typical "per-pixel" approach. Dr. Tilton theorized that a better understanding could be achieved by considering the context of the image and looking at the objects in the image rather than the individual pixels.

The RHSEG software offers unprecedented precision and control for image and image-like data analysis that can be applied to an extremely broad range of applications, including medical imaging, drug development, data mining, facial recognition, and thermal imaging. Improvements in these areas, particularly medical diagnosis, have far-reaching effects for everyday life.

Online information is available about the RHSEG technology (http://techtransfer.gsfc.nasa.gov/RHSEG/index.html) and the IS&T Award (http://ohr.gsfc.nasa.gov/awards/home.htm). ■

researcher profile

James Rash (left) and Michael Hinchey

Michael Hinchey

Code 581

4 years at NASA

Education: PhD, computer science, University of Cambridge, England; MS, computation (mathematics), University of Oxford, England; BS, computer science, University of Limerick, Ireland

Born: Limerick, Ireland

James Rash

Code 588

20 years at NASA

Education: MA, mathematics, University of Texas–Austin; BS, physics/mathematics, University of Texas–Austin

Born: Sulphur Springs, Texas

Tell us about your work with OTT. What have you been doing?

We have been developing a new software technology for generating correct systems from their requirements, for analyzing systems and aspects of their security, and for system validation. Our work has been greatly expanded through the involvement of the OTT. The office has been incredibly supportive, from getting the patenting process started to providing funding for prototype development. They've really taken time to listen to us and see the possibilities for our work. They also provided funding for Mike to go to Cyprus for the International Symposium on Leveraging Applications of Formal Methods, Verification, and Validation, which is highly relevant to human and robotic space exploration. Through our participation in Cyprus, we're now going to host a workshop near Goddard on the same topic at the end of September.

How have you benefited from this work?

Through the work of the OTT and the Office of Patent Counsel (OPC), we now have four full and three provisional patent applications filed. Aside from the financial awards associated with patenting, we feel like we've benefited from knowing that others are interested in our work and that is has value in the outside world. Now OTT is trying to find licensees for our technologies, and that's really exciting.

Any advice for your colleagues?

Talk to OTT and OPC early in your work. It's amazing what can be patented and might be of interest to other users. Something you think is insignificant can really attract attention. And that's also an important reason to talk to OTT before you publish or present your work. That way they can get the paperwork in place so that your work's patentability isn't compromised. OTT is very thorough and will help make sure that no missteps are made and that all the bases are covered. ■

SpaceWire: Revolutionizing Hardware Development

Developed in 1999 by a group working under the auspices of the European Space Agency, the SpaceWire standard defines a network of nodes and routers interconnected through bidirectional high-speed serial links. Previously no high-speed bus standard existed for space-flight hardware, resulting in custom-built designs developed on a by-project basis, which led to long development times with high costs and risks.

SpaceWire has revolutionized space-flight hardware development by defining a standard architecture for payload data systems and specifying the physical interconnections and communication protocols to enable the reliable sending of data at high speeds.

"SpaceWire lets you create one design that you can go to every time, for every mission," said **Glenn Rakow** (Code 561), who served as an adviser to the SpaceWire working group. "The more people we get using it, the more ideas we'll have."

Since the SpaceWire protocol was introduced, Rakow has played a leading role in its proliferation in the United States. "His innovative development of SpaceWire capabilities and expertise at NASA Goddard has established us as the internationally recognized expert in the development and delivery of products and features to support Earth and space science missions," said Goddard's **Mark Voyton** (Code 561), command and data handling systems manager for JWST.

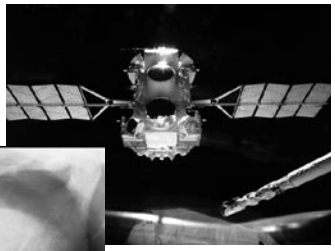
In addition to presenting SpaceWire and its benefits to many NASA projects and U.S. companies, Mr. Rakow has developed several technologies based on the SpaceWire standard, and these inventions are serving as the seed from which SpaceWire-based hardware can grow. By working closely with Goddard's Office of Technology Transfer, Mr. Rakow has been able to provide his SpaceWire technologies to the U.S. Department of Defense and nearly a dozen aerospace companies (see article below for a single example).

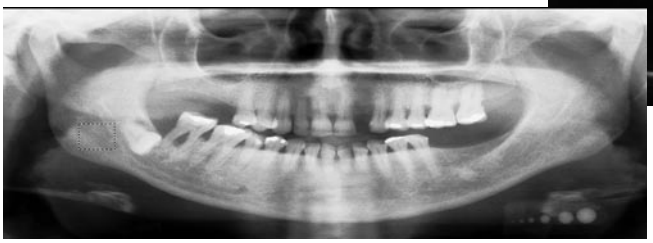
"The OTT is key to making sure the technology is transferred in a consistent, uniform way so that no one gets an unfair advantage," explained Mr. Rakow. "The rules and restrictions for tech transfer to industry are so complex, it would be difficult if not impossible for me to keep up with all of that and still maintain my technical edge."

The signing of Space Act Agreements (SAAs) also allows for assistance to be provided to industry under full-cost accounting. "The landscape has really changed," noted Mr. Rakow. "My contractors and I couldn't spend the time working with these industry partners without the SAA in place." ■

Assisting Industry while Giving Long-Term Benefits to NASA

Two recently signed agreements are providing private companies with Goddard expertise to help them address their technical challenges. In the short term, NASA will be reimbursed for its researchers' time. In the years to come, it is expected that the results of this joint research will come back to NASA to further benefit the space program.





researcher: **James Tilton** (Code 606.3)

area of expertise: **Recursive Hierarchical Segmentation Software (RHSEG)**

industry partner: **Bartron Medical Imaging**

Dr. Tilton will be working with Bartron to develop a three-dimensional (3-D) version of his RHSEG software. This image analysis program currently offers selectable levels of detail to increase accuracy for 2-D images, and Bartron uses RHSEG in its Med-Seg™ medical imaging device. By extending the software's capabilities to three dimensions, Bartron's device may be able to produce a much finer detail view of all sides of a tumor or lesion, drastically improving very early diagnosis and treatment of disease.

"Since a primary application of this technology is for medical imaging, it is reasonable to expect that NASA may also be able to use this technology aboard the International Space Station or in support of the NASA Exploration Initiative for Moon/Mars exploration and/or colonies," said OTT's **Joe Famiglietti**.

See http://techtransfer.gsfc.nasa.gov/RHSEG/index.html for more information about RHSEG.

researcher: **Glenn Rakow** (Code 561)

area of expertise: **SpaceWire**

industry partner: **undisclosed**

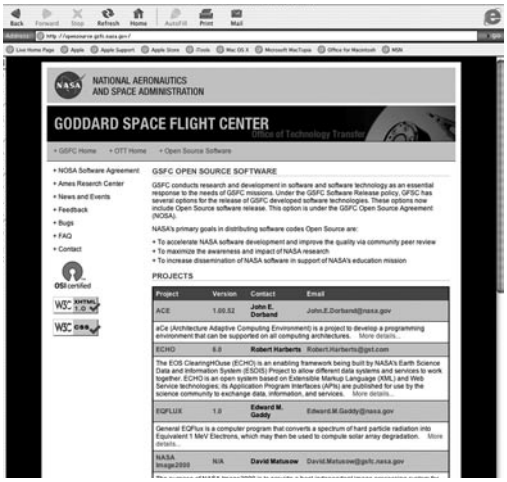
Continuing his extensive efforts to gain U.S. industry acceptance of the new SpaceWire standard (see article above), Mr. Rakow will be working cooperatively with a leading U.S. aerospace corporation to transfer his SpaceWire-based technology and to assist the company in modifying that technology to support its own space-flight missions. These modifications eventually will be made available to NASA.

The SpaceWire standard is a high-speed communications protocol for flight electronics that is flexible, modular, and reusable. Establishing SpaceWire as the space-flight networking standard will help to save both industry and NASA development time and resources for future missions. ■

software news

"Open Source" Web Site Boosts Use of Goddard Software

In September 2004, the Office of Technology Transfer created the Open Source Web site (**http://opensource.gsfc.nasa.gov**), making available the source code for various software programs developed at Goddard. Since then, the site has served as the launch pad for several programs designed by Goddard innovators.



The primary goals of the Open Source Web site are:

- To accelerate the development and improve the quality of NASA software via community peer review
- To maximize the awareness and impact of NASA research
- To increase dissemination of NASA software in support of NASA's education mission

In keeping with these goals, anyone can access this site and download the programs for their own use without having to sign any paperwork. As explained by **Bryan Geurts** of Goddard's Office of Patent Counsel, "Simply downloading and using the software binds the recipient to the terms of the NASA Open Source Agreement (NOSA)."

Developed jointly by patent counsel at several NASA centers, including Goddard, Ames, and Langley, the NOSA has been ratified by the Open Source Initiative (OSI) and added to the official list of certified licenses.

"Getting the NOSA certified by OSI was a real accomplishment," said Mr. Geurts. "It put NASA as the first government agency to obtain such certification. Now the NOSA is serving as a model for other federal agencies seeking to make their software available through open source."

The site is updated as new downloadable code and new versions of previous programs become available. Some programs, like **Alan Cudmore**'s (Code 582) Operating System Abstraction Layer (OSAL) 2.0, are featured on LinuxDevices.com, which has increased traffic at Goddard's site.

"This has allowed me to share my project with other NASA centers, industry partners, commercial vendors, and academic institutions" said Mr. Cudmore. "Since my software was released as open source, I have received positive feedback, bug reports, and interest in potential collaborations. In the long run, I believe it will increase our productivity and raise the awareness of the work we do at Goddard."

For information about how to get software programs posted on the Goddard Open Source Web site, contact **Dele Young** (6-7958; opensource@gsfc.nasa.gov). ■

award

Goddard-Led Team Wins NASA's Software of the Year Award

A team of researchers led by **Christa Peters-Lidard** (Code 614.3) and **Paul R. Houser** (George Mason University) is a co-winner of the NASA 2005 Software of the Year Award for the Land Information System (LIS) software. The team includes **James V. Geiger, Jr.** (Code 587), **Susan P. Olden** (Code 586), and **Luther Lighty** (Code 587) as well as **Sujay V. Kumar** and **Yudong Tian** (University of Maryland–Baltimore County).

Left to right: **Deputy Administrator Frederick Gregory; LIS team members Luther Lighty, Sujay Kumar, Christa Peters-Lidard, James Geiger, Jr., Susan Olden, and Yudong Tian; and Keith Hudkins, vice chair of the NASA Inventions and Contributions Board.**

A high-performance modeling and data assimilation system, LIS performs local, regional, and global land surface simulations. The software helps enable accurate prediction of water and energy cycles, providing information for water-resource management, weather prediction, air-quality monitoring, and military operations. LIS is being used in major areas of NASA mission support and is employed by other U.S. agencies.

"This award is a very exciting validation that NASA sees huge potential for LIS both within its own research walls and beyond–in both the larger scientific community and in applications with other agencies and commercial partners," said Dr. Peters-Lidard. Released as an open-source project (see article above), LIS provides great potential for commercial uses such as weather- and hazard-related information and services.

To apply for this and other NASA awards, innovators must complete a New Technology Report (NTR) via the eNTRe system (http://entre.nasa.gov) and a Space Act Award Application, which can be downloaded from the NASA Inventions and Contributions Board Web site (http://icb.nasa.gov). For more information, contact OTT's **Dale Hithon** (6-2691; Dale.L.Hithon@nasa.gov). ■

Leading Innovation Strategist to Speak at Workshop

On September 23, Goddard researchers will have the opportunity to learn from one of the authors of the highly acclaimed book *The Innovator's Solution*, which has been named on several top 10 lists and as the "Best Strategy Book of the Year" by Booz Allen Hamilton.

Michael Raynor will be the featured speaker at the fourth Technology Transfer Investment Workshop, a series designed to help researchers participate in the forming of high-impact partnerships.

Drawing on years of in-depth research and using new theories tested in hundreds of companies across many industries, Raynor (a professor as well as strategic thinker with Deloitte Research) and Harvard Business School professor Clayton M. Christensen have identified the processes that create successful innovations.

Innovators will benefit from the authors' insights in a program specifically tailored for NASA researchers. At the workshop, Mr. Raynor will be discussing:

- Tactics for researchers and others to effectively make the decision to build vs. buy a technology (spin-in)
- Introducing "disruptive" technologies to the marketplace (spin-out)
- The value of adding options and features early in the R&D process to increase applications of the final technology

For more information:

http://techtransfer.gsfc.nasa.gov/investmentworkshop/reg.php

Kate Littlefield (6-7609; llittlef@pop500.gsfc.nasa.gov) ■

Event	Technologies/Topics	Outcome
NASA Goddard 3rd Technology Transfer Investment Workshop	Spin-out	Goddard innovators learned how to evaluate the market potential of their technologies
Partnerships in Homeland Security Conference	Neutron Imaging for Special Nuclear Material Detection Autonomous Lidar Instrument	Identified 4 potential partnership opportunities
Society of Advanced Materials and Process Engineering (SAMPE) 2005	TETwalker Carbon Composite Hinge Micron and Submicron Pointed Structures	Identified 2 potential partnership opportunities
RoboBusiness Conference	Robotics	Identified 15 potential spin-in partnership opportunities
32nd Annual Small Business Conference	Various	Identified 18 potential partnership opportunities
National Business Incubation Association International Conference	Various	Highlighted NASA technology transfer in Baltimore (host city) and throughout the country
National Space Society 2005 International Space Development Conference	Aerospace	Strengthened relationships between private sector and government space organizations and sustained public support
2005 Defense Medical & Procurement Conference	Secure Ambulation Module (SAM)	Demonstrated NASA's involvement in technology transfer to the field of medicine
NASA Tech Briefs Nanotech 2005	Micron and Submicron Pointed Structures Nanoscale Magnetic Sensor	Identified 3 potential partnership opportunities
NIST Showcase: Advancing the Frontiers of Bioscience and Nanotechnology	Nanotechnology R&D	Further developed existing partnership opportunity
Electromagnetic Launch Assist (EMLA) Workshop	EMLA	Facilitated networking and explored partnership opportunities
NASA Earth-Sun System Technology Conference	ESTO-funded technologies	Learned of new technologies and capabilities

NIST: National Institute of Standards and Technology

New technologies reported: 37

New technologies were reported by the following civil servants, contractors, and universities.

Civil Servants

Code 400

Frank Cepollina, et al.: Space Robotic System for In-Space Servicing of Unmanned Spacecraft Applications

Code 500

Edward Gaddy: Light-Emitting Diode Solar Simulator for Photovoltaic Cells

Michael Hinchey: SPAACE: Self Properties for an Autonomous and Autonomic Computing Environment

Jeffrey Hosler: Adaptive Sensor Fleet

Arthur Ruitberg: High-Voltage Power Supply for Portable X-Ray System

Robert Sodano: Trending and Plotting System

John Vranish: T Slides

Michael Wilks: ESD Strap for Grounding of Lab Coats

Code 600

Barry Coyle: (1) A Solid-State Laser Gain Module Based on a Spoiled Hexagon Geometry and (2) A Pulsed, 1-Micron, Single-Frequency, Diode-Seeded Ytterbium-doped Fiber Amplifier with Variable Output Parameters

Noel Guardala: Neutron Imaging Spectrometer

Stanley Hunter: Neutron Imaging Spectrometer

Contractors

Ball Aerospace & Technologies Corp.

Global Science & Technology Inc. (GST)

ITT Space Systems Division

Mide Technology Corporation (MTC)

Mikros Manufacturing Inc.

Optimal Synthesis

Science Systems and Applications, Inc. (SSAI)

Swales Aerospace

Universities

George Mason University (GMU)

Johns Hopkins University

Northwestern University

University of Maryland University College

University of Ulster

Software Releases: 16

Innovators receive a $500 to $1,000 award for software approved for release.

- Radio Software Library, **Brad Fisher** (SSAI), **David Wolfe** (SSAI), **Bart Kelley** (GMU)
- Adaptive Sensor Fleet (ASF), **Jeffrey Hosler** (Code 588)
- Trending and Plotting System (TAPS), **Robert Sodano** (Code 581)
- Disturbance-Optics-Controls-Structures (DOCS) Toolbox, **Carl Blaurock** (MTC) and **David Miller** (MIT)
- (1) XML to HDF-EOS Converter, (2) HDF-EOS5 Validater, (3) HDF-EOS Web Server, (4) HDF-EOS2 and HDF-EOS5 Compatibility Library, (5) HDF-EOS To NetCDF Convertor, and (6) XML to ODL Converter, **Bob Bane** (GST), **Richard Ullman** (Code 604), and **Jinglie Yang** (Earth Resources Technology [ERT])
- (1) HDFEOS XML DTD and Scheams and (2) ODL to XML Converter, **Muhammad Rabi** (GST), **Richard Ullman** (Code 604), and **Jinglie Yang** (ERT)
- (1) User Friendly Metadater, (2) Metadata Check, (3) HDF-EOS Metadata Updater, and (4) HDF-EOS Extractor, **Richard Ullman** (Code 604), **Jinglie Yang** (ERT), and **Zhangshi Yin** (GST)

Issued Patents: 2

- U.S. Patent #6,895,115: Method for Implementation of Recursive Hierarchical Segmentation on Parallel Computers, **James Tilton** (Code 606.3)
- U.S. Patent #6,901,353: Computing Instantaneous Frequency by Normalizing Hilbert Transform, **Norden Huang** (Code 614.2)

Patent Applications Filed: 7

Innovators receive a $500 to $1,000 award for a filed patent application.

- Screw-Locking Wrench, **John Vranish** (Code 544)
- Anti-Backlash Gear-Bearings, **John Vranish** (Code 544)
- Charge Dissipative Electrical Cable, **John Kolasinski** (Code 565) and **Edward Wollack** (Code 665)
- Evolvable Neural Software System, **Steven Curtis** (Code 695)
- SMART Solar Sail, **Steven Curtis** (Code 695)
- Space Robotic System for In-Space Servicing of Unmanned Spacecraft Applications, **Frank Cepollina** (Code 442), et al.
- Passive Gas-Gap Heat Switch for Adiabatic Demagnetization Refrigerator, **Peter Shirron** (Code 552) and **Michael Dipirro** (Code 552)

Provisional Patents Filed: 4

- Automated Spectroscopy of X-Ray Fluorescence Spectra, **Timothy McClanahan** (Code 691), **Jacob Trombka** (Code 691), and **Samuel Floyd** (Code 691)
- Method for Improved Geiger-Mode Photon Counting with Avalanche Photodiodes by Reducing After-Pulsing, **Michael Krainak** (Code 694)
- Millimeter Wave Polarization Transformer, **David Chuss** (Code 665), **Edward Wollack** (Code 665), **Samuel Moseley** (Code 665), and **Giles Novak** (Northwestern University)
- SPAACE: Self Properties for an Autonomous and Autonomic Computing Environment, **Michael Hinchey** (Code 581) and **Roy Sterritt** (University of Ulster) ■

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