National Aeronautics and Space Administration

goddard tech transfer news

volume 5, number 4 | FALL 2007

Goddard innovator **Bradley Frey** leads efforts at the Cryogenic High Accuracy Refraction Measuring System (CHARMS) facility to measure the refractive index of optical materials at cryogenic temperatures. Frey and his colleagues have performed measurements for partner organizations through several reimbursable Space Act Agreements.

Read more about his tech transfer activities and research inside.

photo credit: Chris Gunn

in this issue:

about the ipp office

The IPP Office and You

photo credit: Chris Gunn

Nona Cheeks

"The IPP Office is a catalyst for helping Goddard innovators and technology managers find solutions to technology needs and research challenges within and beyond NASA. By facilitating innovative partnerships, we can help both NASA and its partners be more successful.

— Nona Cheeks,
Chief, Goddard's
IPP Office"

The most innovative partnership of all

The Innovative Partnerships Program (IPP) Office is a key partner to NASA Goddard Space Flight Center, its innovators, and technology managers in meeting NASA's technology needs and identifying opportunities beyond NASA for use of Goddard technologies. We endeavor to provide value to NASA, businesses and partner organizations, taxpayers, and the public good through mutually beneficial collaborative research, licensing, and other innovative agreements.

What we do

The IPP Office helps Goddard achieve its mission—within the context of the Agency-wide mission of pioneering the future in space exploration, scientific discovery, and aeronautics research—by identifying and securing agreements with partners that can positively contribute to NASA's technology developments.

The IPP Office brings value to NASA and our partners by:

- Securing partnerships with outside organizations for technology development that will yield future benefits for NASA
- Out-licensing Goddard-developed technologies to benefit NASA, the U.S. economy, and humankind
- Supporting regional economic development by extracting value from NASA technology and expertise
- Protecting NASA intellectual property rights in partnership activities

Where you come in

Goddard's IPP Office works hard toward achieving successful partnerships that provide value to NASA and beyond to support new business, economic growth, collaborative research and further discovery. But we cannot be successful alone. We need your help. As an innovator, you play an important role in helping us achieve NASA's technology transfer goals by:

- Filing New Technology Reports (NTRs) as soon as you recognize that you have a new invention or concept
- Maintaining active communication with the IPP Office about your technologies and any changes you may be working on
- Letting the IPP Office know about industry or academic contacts you've made that may be potential for formalized agreements or partnerships, or that may have a technology that could fulfill a strategic mission need

For more information about how the IPP Office can help further your research to benefit NASA and beyond, please contact us :

techtransfer@gsfc.nasa.gov
http://ipp.gsfc.nasa.gov

NASA explores for answers that power our future

NTR Corner

James Pontius

technology title:
Cryogenically Compatible Flexure-Snubber System for Adhesively Bonded Dissimilar Materials Subjected to High Vibration Environments

inventor: **James Pontius** (Code 542)

case no.: GSC-15369-1

What it is: A structural system that enables dissimilar materials adhesively bonded together to:

- Survive cryogenic temperature exposure to 19 Kelvin
- Maintain precise alignment of optical features to less than 100 microns from room temperature to 30 Kelvin
- Survive extreme vibration environments in excess of 50 G's at ambient temperature

What makes it better: The innovation consists of incorporating two novel features—a twin axis, and a three-blade "flexure" and a "snubber" preloaded together. The flexure maintains alignment of an optical component (such as a microshutter array) and allows for differential thermal expansion at cryogenic temperatures, while the snubber protects the component(s) from being damaged by extremely harsh launch conditions and vibrations. The use of a snubber converts the dynamic problem to a static one, significantly limiting displacements and accelerations, while judicious choice of the flexure and snubber materials prevent the snubber from coming into contact with the optical materials at operating cryogenic temperatures.

How it might be used: The system is the current design for the James Webb Space Telescope (JWST) NIRSpec microshutters silicon substrate mounting. The NIRSpec microshutters are at the heart of JWST's ability to perform multi-image spectroscopy at 35 Kelvin. Other applications that would need to survive harsh launch conditions and then operate at very low temperatures would benefit from the system as well. Examples of such applications may be found in other NASA, government, and defense missions.

Tech transfer status: A patent application has been filed. The IPP Office is engaging with interested organizations outside NASA as well as other NASA missions that may benefit from this unique system. ■

file • file • file • file

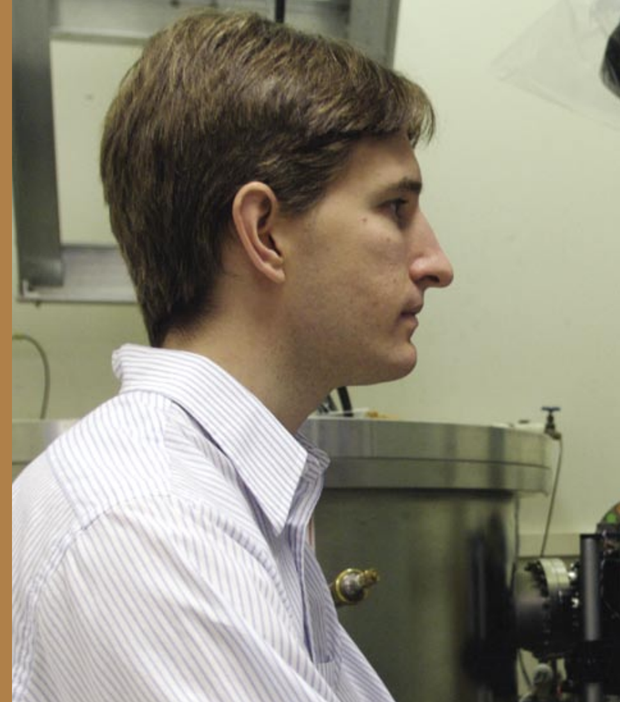
File your New Technology Reports (NTRs) on eNTRe

For more information, contact

Goddard's IPP Office (**6-5810**)

or go to

http://entre.nasa.gov



Bradley Frey

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If not for these Space Act Agreements, the CHARMS facility would have been completely idle for the past two years, limiting the availability of crucial data to the entire infrared science community.

— Bradley Frey

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Tell us a bit about the research you've been doing for Goddard.

Over the past five years, Doug Leviton (code 551) and I have constructed the Cryogenic High Accuracy Refraction Measuring System (CHARMS), a one-of-a-kind facility at Goddard used to measure the refractive index of optical materials at cryogenic temperatures. This facility allows us to characterize the refractive index properties of a wide variety of optical materials that are used as lenses and filters in new instrument optical designs.

Why is this type of measurement important?

The refractive index of a material is an important property to optical designers since it tells them how a particular material will refract or bend light of different wavelengths and at different temperatures. For example, the NIRCam instrument for JWST will operate at very cold temperatures, and the properties of its lenses will be very different in orbit than at room temperature on the ground. Understanding these sometimes-subtle differences allows instrument teams to optimize their optical designs for flight performance and to minimize very expensive cryogenic testing before launch.

So is this research new to NASA, or has it always been a part of mission science?

While some of this research has been done in the past for the most common optical materials, there has been little done in some cases since the 1960's. Of the measurements that have been done, we have found that few measurements have been performed at very low cryogenic temperatures, and they were of only limited accuracy. Since that time, the development of supporting technologies for high performance, cryogenic, infrared instruments has expanded dramatically, therefore increasing the demand for characterization of new materials and at new wavelengths and temperatures. Further, there have been significant improvements in material production processes and purity, which also influence refractive index. The CHARMS facility at Goddard is the only facility in the world capable of performing these refractive index measurements over the wide range of wavelengths and temperatures at the accuracies we can achieve. We have been able to achieve these accuracies by improving upon the techniques used by previous investigators and by utilizing several new NASA technologies including ultra-high resolution, absolute optical encoders invented by Doug Leviton.

And how does this research specifically benefit NASA?

The measurements performed by CHARMS are important not only to the success of current NASA missions, but also in opening up the design space for future instrument design concepts. For example, we have performed many measurements for the JWST NIRCam instrument. Since NIRCam's optical design is almost entirely refractive—including six lens elements in each channel—and operates at a temperature near 37 K, measuring the refractive indices of the materials used in their optical elements was a mission-critical, risk-mitigation effort. We have also performed measurements for the Kepler Photometer mission where we were once again able to provide mission-critical measurements to prove that their field large corrector lens would perform to its stringent requirements in orbit, allowing the mission to achieve its science goals.

In addition, once we have completed measurements for a particular material, other optical designers can use these data as a starting point for future optical designs. For newly developed materials or materials that haven't been characterized in more than 50 years, our measurements open up the design space of materials from which designers can choose.

photo credit: Chris Gunn

So organizations or researchers outside NASA can also benefit from these new measurements?

Yes, many of the benefits to NASA also apply to outside organizations. In most cases the data we provide isn't available anywhere else in the industry or in the literature, so organizations designing cryogenic infrared instrumentation across the globe can utilize our capabilities. We have collaborated with groups from all over the world—universities, ground-based observatories, private companies—to provide either custom measurements or data for materials that we have measured for other customers. This has allowed these organizations to improve their instrumentation in support of NASA contracts or in the pursuit of goals similar to those of NASA's missions.

Have these collaborations been through tech transfer agreements facilitated by the IPP Office?

Many of them, yes. Since we completed and published our initial measurements for the JWST/NIRCam and Kepler missions, we have received dozens of inquiries from outside organizations wanting to benefit from our capabilities. There has been significant interest in the CHARMS facility from across the scientific community, and we have been working with the IPP Office over the past couple of years attempting to establish Space Act Agreements to bring in work from these outside organizations to Goddard and CHARMS. After considerable effort, we have completed three of four agreements with the fourth pending approval at the time of this publication.

Editor's Note: Information about two recent agreements related to CHARMS can be found on pages 6-7.

What do you see as the value of technology transfer and/or partnering with outside organizations for collaborative R&D?

Working with external organizations is a good way to advertise the unique capabilities like CHARMS that we possess here at Goddard. These agreements are a good way to bring in funding for fundamental research no longer supported by Goddard in the current funding climate. If not for these Space Act Agreements, the CHARMS facility would have been completely idle for the past two years, limiting the availability of crucial data to the entire infrared science community.

Any advice for your colleagues?

If you are considering establishing a Space Act Agreement, know that the process is time consuming and will take a considerable amount of effort. Working with international organizations in particular on these types of agreements is cumbersome based on the Agency's policies and some inexperience by HQ reviewing such agreements. Though one of our agreements was completed in a month, the three remaining agreements took between nine and 24 months to complete—all of which were for less than two weeks' subscription of the CHARMS facility. Since potential customers generally do not anticipate these kinds of delays for small contracts, you may want to let them know up front that there can be a very long lead time to process these kinds of agreements, and that you cannot specify an accurate delivery date until after the agreement is officially approved. If their schedule is compatible with this timeline—or can tolerate a potential delay of this magnitude—providing this information at the outset will help to appropriately set their expectations and mitigate future frustration. Once the process for establishing Space Act Agreements is mature, these agreements have the potential to be a great resource for NASA and ultimately benefit all parties involved. ■

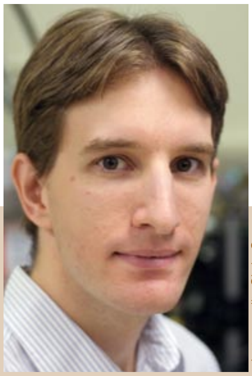

photo credit: Chris Gunn

name: Bradley Frey

code: 551

years at NASA: 6

field of research: Optics

birthplace: Erie, Pennsylvania

education: B.A., Physics, The Johns Hopkins University

The IPP Office is pleased to announce the following new agreements:

partner	technology/focus	agreement	NASA goals/benefits
National Cancer Institute & University of Maryland	NanoFET	MOU	Collaborative research may help NASA monitor the health of astronauts' cells while in space
Lockheed Martin	"Navigator" GPS receiver	Reimbursable SAA	Reduced risk for the GOES-R mission, as well as future NASA missions requiring onboard navigation using GPS in geo-stationary orbit
Defense Intelligence Agency	Creation of a Technology Exchange Group	MOU	Potential technical exchange, infusion, and partnerships
The Aerospace Corporation	CHARMS	Reimbursable SAA	Conducting refractive index measurements will provide reimbursement revenue, and will enable NASA to improve future instrument designs
University of California Observatories	CHARMS	Reimbursable SAA	Conducting refractive index measure-ments will provide reimbursement revenue, and will enable NASA to improve future instrument designs

MOU = Memorandum of Understanding
SAA = Space Act Agreement

National Cancer Institute and University of Maryland

A Memorandum of Understanding (MOU) between Goddard, the National Cancer Institute (NCI), and the University of Maryland (UM) is enabling collaborative development of nanoscale field effect transistor (NanoFET) platforms for the recognition of nucleic acid hybridization which can be used to identify key biomarkers in the detection of cancerous cell mutation. This multi-disciplinary effort will help medical researchers use Goddard's nanotechnology expertise to develop new methods of cancer detection as well as diagnostic and therapeutic applications. The three organizations together will develop a NanoFET prototype, sharing best practices and know-how as well as data, research materials, and results. These collaborative efforts are expected to facilitate the use of nanotechnology for highly sensitive monitoring of gene, DNA, and RNA expression and integrate mutation-recognition software with a final prototype apparatus to be used for diagnosis, prognosis, and detection of cancer. Goddard researchers also are currently investigating other applications for the NanoFET such as *in-situ* chemical sensors for planetary science.

Lockheed Martin Space Systems Company

Through a fully reimbursable Space Act Agreement (SAA) between Lockheed Martin (LM) and Goddard, scientists are collaborating on testing of Goddard's "Navigator" GPS receiver to determine whether it will meet the navigation requirements of the Geostationary Operational Environmental Satellite Program R Series (GOES-R) program (a joint effort between the National Oceanic and Atmospheric Administration [NOAA] and NASA) when paired with LM's specific antenna system implementation. The Navigator is a fully space-flight-qualified GPS receiver that uniquely enables the use of GPS navigation in high Earth orbit (HEO), geostationary orbit, and other high-altitude applications. If testing goes as expected, the combination of the Navigator with LM's antenna system will reduce risk for the GOES-R mission as well as future NASA, NOAA, Department of Defense, and other commercial space missions that require onboard navigation using GPS in geostationary orbit.

Defense Intelligence Agency

Promoting cross-agency technology infusion for mutual benefit is the goal behind a new MOU between Goddard and the U.S. Defense Intelligence Agency (DIA). The agreement creates a Technical Exchange Group (TEG) between the two organizations. The TEG will meet biannually with the goal of sharing new technology developments, plans, and future

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I think that this partnership between UMD, NIH, and NASA is going to be an example of how the government sector and universities should be collaborating. Here are diverse areas spanning biology, space exploration and electrical engineering and physics working towards a common goal. These [nano] sensors would have applications not only in biology but also in space exploration and that is, I think, the beauty of it.

— Monique Anderson,
Associate Director,
Office of Research Administration,
University of Maryland

”

aerospace and defense mission needs and requirements in order to identify potential areas of technical exchange, infusion, and partnerships. As part of the agreement, the DIA will work to advocate for appropriate infusion of Goddard-developed technologies throughout the defense intelligence community.

The Aerospace Corporation and the University of California Observatories

Through two separate, fully reimbursable SAAs, Goddard researchers will conduct absolute refractive index measurements of prisms using Goddard's Cryogenic High Accuracy Refraction Measuring System (CHARMS) located in the Agency's Optics Branch. Sample prisms of various optical materials will be provided by The Aerospace Corporation and the University of California Observatories and measured by CHARMS at a wide variety of temperatures and wavelengths. The refractive index of a material is an important property to optical designers since it tells them how a particular material will refract or bend light of different wavelengths and at different temperatures. This knowledge will enable the organizations to design optics that will behave correctly when cooled to the cryogenic temperatures required to achieve various science goals. The resulting data will also be available to NASA to improve future instrument designs as well as to the scientific community as a whole. ■

Tech Transfer Metrics *(continued from page 12)*

Ad-Hoc Content-Based Queries and Data Analysis for Virtual Observatories by Aquilent

10-100 Gbps Offload NIC for WAN, NLR, Grid Computing† by Gonzaga University

Using Radio Frequency Telecommunication Subsystem as a Sensor For Attitude Estimation by Johns Hopkins University

Tower Based Subsurface Imaging Radar And Inversion Algorithms by Univ. of Michigan

ADM Through the Null by ITT Space Systems Division

Pupil Imaging Objective Lens by ITT Space Systems Division

Superpolished SI Coated SiC Optics for Rapid Manufacture of Large Aperture UV and EUV Telescopes by SSG-Tinsley

Effective Life-Cycle IV&V of Autogenerated Code by L-3 Communications Titan Group

Low Density Parity Check FPGA Decoder for the (8176,7154) Code Specified in the CCSDS Orange Book 131.1-O-2. by Univ. of Idaho

Computing Infrastructure and Remote, Parallel Data Mining Engine for Virtual Observatories† by SciberQuest

Ku Telemetry Modulator for Suborbital Vehicles by LJT & Associates

Models and Algorithms for Cryogenic Electronic Design† by CoolCAD Electronics

Space Link Extension Return Channel Frames (SLE-RCF) Service (User side) Software Library† by Timonthy Ray, et al. (Code 584)

A Next-generation Testable Language† by West Virginia University

Improving Web Quality through an Integrated Approach by West Virginia University

Empirical Study of Architecture-Based Software Reliability by West Virginia University

Architectural Level Model-Based Risk Assessment by West Virginia University

See More Learn More Tell More† by West Virginia University

PseudoDiversity—Direct Wavefront Control and Image Restoration at High Bandwidth by Richard Lyon (Code 606)

Compact, Efficient Servo-Drive Amplifier for Micro-Satellites by Barrett Technology

A Nondestructive Precision Measurement Technique for Determination of Microwave Surface Emissivity by Edward Wollack, et al. (Code 665)

Machine for Polishing and Non-contact Shape Measurement of Large Mirrors by Bauer Associates

EVEREST Is a Web-based Spacecraft Launch & Activation Timeline Managment Tool† by General Dynamics C4 Systems

Global Precipitation Radar (GPM) Space and Ground Radar Comparison Software† by SAIC

Broadband Planar Magic-T with Low-phase and Amplitude Imbalance by Kongpop U-yen, et al. (Code 555)

Data Management System† by The Hammers Company

Monolithic Time Delay Integration APD Array by Epitaxial Technologies, LLC

Model-Validation in Model-Based Development by Univ. of Minnesota

Beam Combination for Sparse Aperture Telescope by Seabrook Engineering

Development and Deployment of a CEOP Satellite Data Server† by OPeNDAP

C++ Implementation of a Robust Image Registration via Fast Fourier Correlation of Patterns† by Nargess Memarsadeghi (Code 588)

Patent Applications Filed: 9

Miniaturized Double Latching Solenoid Valve by James T. Smith (Code 544), Atmospheric Observing Systems

Microsphere Fiber Laser System by Hossin Abdeldayem (Code 305)

Blocking Contacts for N-Type Cadmium Zinc Telluride by Carl Stahle (Code 550), Bradford Parker (Code 541), and Sachidananda Babu (Code 553)

Dual Order Common Path Spectrometer by Amy Newbury (Ball Aerospace & Technologies Corporation)

Otoacoustic Protection in Biologically-Inspired Systems by Michael Hinchy (Code 580) and Roy Sterritt (Univ. of Ulster Northern Ireland)

Flexure Based Linear and Rotary Bearings by George Voellmer (Code 543)

Systems, Methods, and Apparatus of a Low Conductance Silicon Micro-leak for Mass Spectrometer Inlet by Dan Harpold (Code 699), Hasso Niemann (Code 699), Brian Jamieson (Scientific & Biomedical), and Bernard Lynch (MEI)

System and Method for Determining Stability of a Neural System by Steven Curtis (Code 695)

Nanowire Device and Method of Making a Nanowire Device by Stephanie Getty (Code 541)

Provisional Patent Applications Filed: 2

Magnetorheological Fluid-Based Conformal Gripper by Matthew Gilbertson, Edward Doepke, Sarah Grice, and Lisa Perez (all Code 695)

Directed Flux Motor Utilizing Concentric Magnets and Interwoven Flux Channels by Andrew Wilson, Andrew Punnoose, Katherine Strausser, and Neil Parikh (all Code 695)

Patents Issued: 1

Method and Associated Apparatus for Capturing, Servicing, and De-Orbiting Earth Satellites Using Robotics by Richard Burns (Code 444), James Corbo (Code 599), Jill McGuire (Code 442), Frank Cepollina (Code 442) and Nicholas Jedrich (Code 599) U.S. Patent No.: 7,240,879 ■

seed fund

NASA HQ Announces Seed Fund Recipients

"I'd like to express my sincere thanks and appreciation to [the IPP Office] for your outstanding support throughout the latest IPP Seed Fund proposal preparation process. Your comments, feed-back, suggested edits, etc. were highly valued and, in my opinion, significantly contributed to a terrific proposal.

— Stephen Talabac
Goddard innovator"

The Innovative Partnerships Program (IPP) at HQ established the Partnership Seed Fund to address barriers and initiate cost-shared, joint-development partnerships, providing "bridge funding" to enable larger partnerships and development efforts to occur. For 2007, Goddard's IPP Office coordinated and advised the proposal efforts for eight projects that included partnerships with other government agencies, small and large businesses, universities, and other NASA Centers. Of those, the following proposals will receive IPP Seed Funding:

- Extremely High-Performance, Ultra-Low Power, Radiation-Tolerant Processor: An Enabling Technology for Autonomous and Computationally Intensive Capabilities (PIs: **Michael Johnson** code 560, **Ken LaBel** code 561, and **Wes Powell** code 564)
- SpaceWire Plug-and-Play-Capable GPS Receiver (PIs: **Glenn Rakow** code 561 and **John Carl Adams** code 596)
- Mission Enabling, Lightweight, Ultra Bandwidth Inverse Synthetic Aperture Radar (ISAR) for Characterization of the Interior of Planetary Bodies (PIs: **Manohar Deshpande** code 555, **Dave Smith** code 690, **Damon Bradley** code 564, and **Paul Racette** code 555)
- Replacing Multiple Fiber Amplifiers with One for Mapping Lidars Featuring Multiple Frequency-Doubled Beams (PIs: **Jeffrey Chen** code 554 and **David Harding** code 698)
- Integrating Space Weather Model and Event Data into Decision Support Systems to Ensure Exploration Safety & Mission Success (PIs: **Stephen Talabac** code 586, **Michael Hesse** code 674, and **Jack Trombka** code 691)

The IPP Office congratulates the recipients and looks forward to hearing about their funded research. In the meantime, the IPP Office caught up with the recipients of 2006 Seed Funding. The four Goddard projects have made great progress:

Project (PI)	Progress to date	Applicability
Development of a Continuous ADR and Integrated Control Electronics (**Peter Shirron** code 552)	Feedforward control: Calculation of control voltage and improved stability from 45 to 10 μK rms	Efforts requiring ultra-low cooling of detectors (PAPPA, Constellation-X, ESA's XEUS, SAFIR, SPIRIT/SPECS, SIRCE)
Large Focal Plane Technology for Simultaneous Imaging and Guiding (**Bernard Rauscher** code 665 and **Brent Mott** code 553)	Demonstrated simultaneous imaging and guiding of Teledyne's 4Kx4K sensor chip assembly (not adequate for space astro-physics); working with Teledyne for new sensor chip assembly for testing	Astronomical missions requiring large-format focal planes and precision guiding (Joint Dark Energy Mission, Microlensing Planet Finder, EPIC)
Lightweight, Cryostable, Low-Cost Mirrors for Next-Generation Space Telescopes (**David Content** code 551 and **Douglas Rabin** code 671)	Completed design of 2.8 kg mirror; passed preliminary acoustic test; second mirror in fabrication	Missions requiring mirror develop-ment for cryogenic applications; Beyond Einstein, Solar Orbiter and RAM, SAFIR, TPF, SPECS, large UV-optical observatories
Infusing Environmental Know-ledge into Decision Support and Planning Tools for Exploration Mission Opera-tions (**Julia Loftis** code 101)	Demonstrated integrated software's capabilities; defined and began implementing interface control document; model development underway	LRO, LPRP, crewed lunar opera-tions, CEV, ISS

Test Your TTQ*

**technology transfer quotient*

T&F: Software Release and IP Protection

Decide whether the following software-specific statements are true or false.

1. ***Software innovations are considered to be in a different technology category than other inventions; therefore, they don't need to be reported.***

2. ***I've developed a software application for a specific NASA mission. Since it was developed only for NASA use, I don't need to report the technology.***

3. ***If I report my software via a New Technology Report (NTR), I won't be able to control how and by whom my software is used.***

4. ***I have some contacts outside of NASA who will want to test out my software right away, so I can begin the software release process with them to help speed things along.***

5. ***I'm not sure if anyone outside of NASA would be interested in my software, so it's a good idea to talk to some industry contacts about the software before I decide whether to report it.***

6. ***Reporting my software won't protect my invention since civil servants cannot own a copyright on software.***

Answers:

1. False. For the purposes of technology reporting, software is considered to be the same as any other Goddard innovation. In order to protect NASA's intellectual property (IP), the innovation must be reported to the IPP Office using an NTR.

2. False. All new innovations developed should be reported using an NTR, regardless of the original intended application. Even if your software only has one intended use, the IPP Office can help determine if the innovation has other potential commercial uses and/or strategic value for Goddard.

3. False. In fact, reporting your software via an NTR is the best way to ensure that its distribution and use are controlled. Plus filing the NTR makes your innovation eligible for many NASA and non-NASA awards. For more information about the IPP Office's awards program, visit: http://ipp.gsfc.nasa.gov/awards-info.html

4. False. You should never release a software invention to anyone before you have reported it via an NTR. Doing so may result in an inability to secure IP protection. Once reported, your software will be handled by IPP Office personnel who can determine the best software release process and evaluate commercial and strategic potential.

5. False. You should report any new invention—including software—as soon as you recognize that you have a new innovation. It is important to report the software before you speak with anyone outside NASA about it so that the IPP Office can secure appropriate protection for the innovation and control information distributed about it.

6. False. While civil servants cannot own copyrights on software, software applications developed by civil servants may be patentable. Therefore, you should report your software innovations so that the IPP Office can help determine if patenting is possible and appropriate. ■

Get in the Know: **Sign Up for Tech Transfer Training Now!**

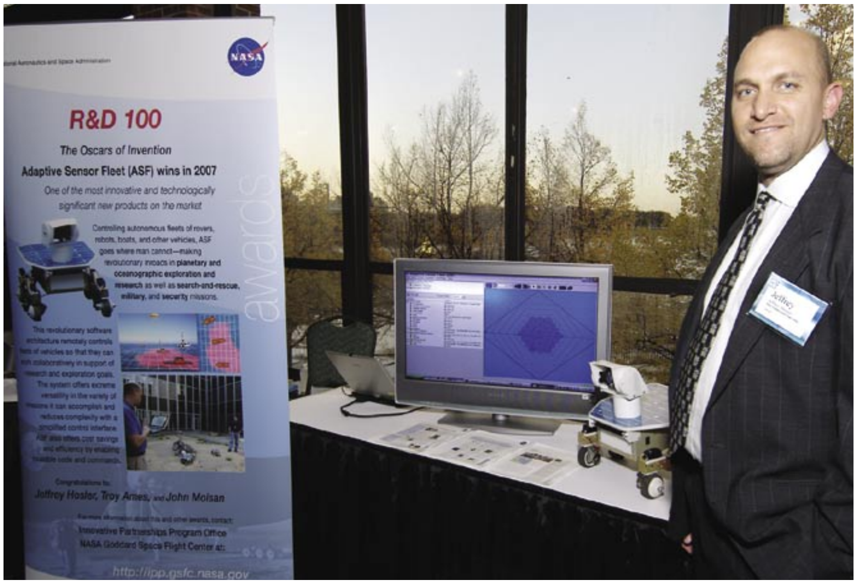
what:
Tech Transfer Overview Course—a comprehensive must-attend course covering when, how, and why to file NTRs.

when:
Thursday, November 15
9:00 a.m.–12:00 p.m.

where:
Goddard Building 1
Room E100B

information: Civil servants can register online at https://satern.nasa.gov/elms/learner/login.jsp. Contractors can register by contacting **Dale Hithon** (301-286-2691), who can also provide further information about the training.

Adaptive Sensor Fleet Receives R&D 100 Award



For the second year in a row, a Goddard technology has been recognized by *R&D Magazine* as one of the top 100 most innovative and technologically significant new products of the year. Dubbed the "Oscars of Invention" by the *Chicago Tribune,* the R&D 100 awards are annually bestowed upon technologies that have the potential to greatly impact further scientific discovery, human life, and society.

Goddard's Adaptive Sensor Fleet (ASF) technology, one of this year's winners, has already made significant inroads into oceanographic and simulated planetary research—and its breadth of capabilities has the potential to benefit science missions ranging from oil-spill detection to search-and-rescue operations.

The revolutionary ASF software architecture employs a unique, simple interface to remotely control vehicles (such as boats, satellites, rovers, robots, etc.) to work collaboratively in support of many scientific goals. "There really are very few limits to the types of research and exploration goals ASF can be used to accomplish," said **Jeff Hosler**, head of the ASF development team at Goddard. "The system can control and monitor boats to study weather phenomena, or detect oil and chemical spills. It could control rovers or robots in space, or unmanned vehicles on Earth for military, mining, search-and-rescue… the possibilities are really quite vast."

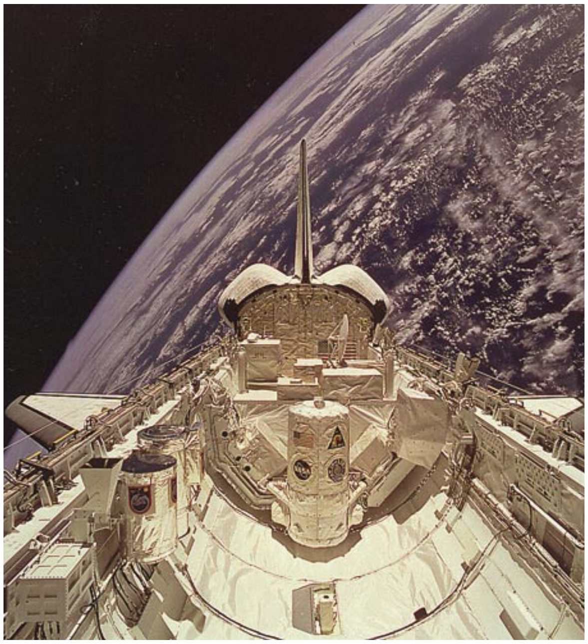
While hypothetical examples of ASF's applications abound, several significant applications have already been demonstrated with great success. Under a joint effort funded by NASA and the National Oceanic and Atmospheric Administration (NOAA), NASA oceanographer **John Moisan** led a team that developed six low-cost, fully instrumented "aquabots" that used ASF to direct them in autonomously and collaboratively gathering near-real-time observations of various ocean phenomena, such as algal blooms, ocean currents, temperature, salinity, and other measurements.

(continued on next page)

IPP Office Represents Goddard at IAC 2007

"It is very important for Goddard to have a consistent presence among other professionals in the international aeronautics community.

— Nona Cheeks
Chief,
Goddard's
IPP Office"

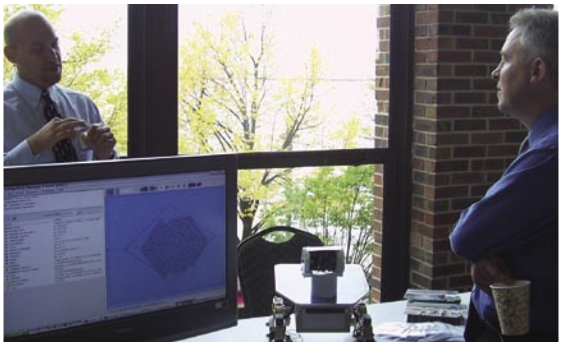


IPP Office Chief **Nona Cheeks** attended the 58th International Astronautical Congress (IAC) in Hyderabad, India September 24–28. Hosted by the Indian Space Research Organisation (ISRO) and Astronautical Society of India (ASI), the event's theme was "Touching Humanity: Space for Improving Quality of Life." The week-long event hosted space professionals, journalists, and students from all corners of the globe. Representing Goddard, Cheeks co-chaired a session entitled, "Innovating Through Technology: Spin-In and Spin-Off." The session provided a global perspective on best practices for technology transfer and the facilitation of innovative partnerships.

"The IAC provides us an ideal opportunity to identify partners to meet NASA infusion needs, to network with potential future collaborators and to learn new business processes and tactics," said Cheeks. ■

ASF's capabilities have also been demonstrated through a collaboration with NASA's Multi-Purpose Exoterrain for Robotic Studies (MERS) project. Using three rovers from Carnegie Mellon University (CMU), Jeff Hosler and his team successfully demonstrated the use of ASF to control the vehicles autonomously in this simulated Martian landscape.

"I am very proud of what the ASF team, managed by Jeffrey Hosler, has achieved," said Goddard's Acting Assistant Chief for Information Systems Technology, **Jacqueline Le Moigne**. "Not only is ASF going to be of significant benefit to NASA, but it also has the potential to impact life on Earth."



ASF innovator Jeff Hosler demonstrates his solftware at the R&D 100 awards ceremony.

Other managers at NASA are singing the praises of the technology as well. "We are very grateful and pleased to be recognized by R&D again this year for the outstanding innovation that is happening at Goddard," said **Nona Cheeks**, chief of Goddard's IPP Office, which nominated ASF for the R&D award. Goddard Director **Edward J. Weiler** echoed this sentiment commenting, "It is our hope that technologies like ASF will continue to be of significant impact both within and beyond the walls of NASA."

Along with IPP Office representative **Enidia Santiago-Arce**, ASF team lead Jeff Hosler attended the R&D 100 Awards ceremony October 18 in Chicago where he accepted the award on Goddard's behalf. ■

NASA Inventions and Contributions Board Awards

The following awards were issued by ICB during the fourth quarter of FY07.

Software Release Awards

HDFEOS XML DTD and Schemas by Muhammad Rabi (Code 423)

Mercury Shopping Cart Interface (MSCI) by Robin Pfister (Code 417)

Integrated Test and Operations System Release 7-3 by Warren Thompson (Code 584)

Core Flight Executive (cFE) by Alan Cudmore, David Kobe, Susanne Strege, Lonnie Walling, Jonathan Wilmot, Maureen Bartholomew, Jane Marquart, Michael Blau, and David McComas (all Code 582)

Core Flight Executive (cFE) Application Program Interface (API) by Susanne Strege, Maureen Bartholomew, and Jane Marquart (all Code 582)

Modular Integrated Solution Toolkit (MIST) by Ernest Quintin, Christopher Shuler, and Robert Zepp (all Code 584)

Integrated Lunar Information Architecture for Decision Support (ILIADS) by Julia Loftis (Code 588), Karin Blank (Code 586), Carl Hostetter (Code 588), Peyush Jain (Code 588), Richard Mullinix (Code 541), Stephen Talabac (Code 586), and Jeffrey Hosler (Code 588)

Board Support Package For The RTEMS Real Time Operating System On The Motorola MCF5307C3 Processor Board by Alan Cudmore (Code 582)

HDF-EOS2 And HDF-EOS5 Compatibility Library by John Bane, Jinglie Yang, and Richard Ullman (all Code 586)

HDF-EOS Web Server by John Bane, Jinglie Yang, and Richard Ullman (all Code 586)

Swift Burst Alert Telescope (BAT) Engineering Flight Software by Stephen Leake (Code 582), Larry Shackelford (Code 590), Bruce Trout (Code 590), and Steve Mann (Code 590)

Real-Time Software Receiver by Mark Psiaki, Paul Kintner, and Steven Powell (all Code 573)

GMSEC API by John Bristow (Code 583)

Integrated Vision-Based Systems for S/C Attitude and Topology Determination for Formation Flight Mission by Raymond Zenick and Aaron Rogers (both Code 567)

PFUnit by Thomas Clune and Brice Womack (both Code 610)

Simple, Scalable, Script-based Science Processing Archive by Christopher Lynnes and C. Wrandle Barth (both Code 610)

Astronomer Proposal Tool by Tony Krueger (Code 600)

JAVA Astrodynamics Tool Kit (JAT) by Tobias Berthold and Norika Tanabe (both Code 600)

Tech Briefs Awards

Micro-Resistojet for Small Satellites by Kurt Hohman and John Duggan (both Code 597)

Planetary Balloon: Balloon Design Software by Rodger Farley (Code 546)

Mole Spectrometry by Barbara Zukowski (Code 543)

Sprag Handle Wrench by John Vranish (Code 543)

One-Dimensional Synthetic Aperture Microwave Systems by Terence Doiron (Code 555)

Simple, Cost-Effective Method of Mounting Filters for Cryogenic Applications by Jason Hylan (Code 551), Wahid Zewari (Code 544), and Raymond Ohi (Code 551)

Simple, Scalable, Script-based Science Processing Archive by Christopher Lynnes and C. Wrandle Barth (both Code 610)

Flow Solver for Incompressible 2-D Drive Cavity by Virginia Kalb (Code 614)

Advanced Autonomous Lidar Instrument for Airborne Remote Sensing by Matthew McGill (Code 613), Vibart Scott (Code 694), and Luis Izquierdo (Code 694)

Flow Solver for Incompressible 2-D Rectangular Domains by Virginia Kalb (Code 614)

Stabilization of a POD-based Dynamical System by Virginia Kalb (Code 614)

Parameterization of the POD-based Dynamical System Coefficients by Virginia Kalb (Code 614)

For more details, contact **Dale Hithon** at Dale.L.Hithon@nasa.gov or visit: http://ipp.gsfc.nasa.gov/awards-info-NASA.html ■

metrics

Tech Transfer Metrics

New Technology Reports: 102

†Software

July 1, 2007 to September 30, 2007

Low Outgassing Photogrammetry Targets by Jason Gross (Code 551)

A DNA-Inspired Encryption Methodology for Secure, Mobile Ad-Hoc Networks (MANET) by Harry Shaw (Code 562)

Fast Low Power ADC with Integrated Digital Data Processor by AdSantec

Radiation Tolerant Ultra Low Power 32-bit ColdFire Processor by Univ. of Idaho

Advanced Adhesive Bond Shape Tailoring for Large Composite Primary Structures Subjected to Cryogenic and Ambient Loading Environments by James Pontius (Code 542)

Giovanni V3: Goddard Interactive Online Visualization ANd aNalysis Infrastructure, Version 3† by ADNET

Radiation Hard Space Wire Gigabit Ethernet Compatible Transponder by AdSantec

Superconducting Thin-Film Interconnects for Cryogenic Photon Detector Arrays by Luxel Corporation

Ka-band 5 Watt Solid State Power Amplifier (SSPA) by Jeffrey Jao and Michael Powers (both Code 567)

High Data Rate Telemetry Adaptive Baseband Equalization Using Adaptive Cable Equalizer Integrated Circuit by Steven Bundick, Amy Davis, and Paul Acuna (all Code 822)

Device for Maintaining a Secure Grip on a Hand Railing Preventing a Fall Down a Flight of Steps by Michael Wilks (Code 597)

Lunar Reconnaissance Orbiter Dynamic Model† by Nightsky Systems (Code 595)

Bit Plane Encoder for Space Image Compression by Univ. of New Mexico (Code 564)

Handheld Longwave Infrared Camera Based On Highly-Sensitive Quantum Well Infrared Photodetectors by QmagiQ

Low Density Parity Check Custom VLSI Encoder by Univ. of New Mexico

High Speed Radiation Tolerant Discrete Wavelet Transform Processor by Univ. of Idaho

Windows Based 4 Port BAE ASIC SpaceWire Test Card† by MEI Technologies

Enhancements to a Reconfigurable Data Path Processor by Univ. of Idaho

New Radiation Tolerant Combinational Logic by Univ. of Idaho

Reconfigurable Memory Module by Univ. of Idaho

Photochemical Carbon Dioxide Sensor by Anasphere

Method to Measure Volume Scattering Function of Water by Sequoia Scientific

Secure Peer-to-Peer Networks for Scientific Information Sharing by SciberQuest

Negative Feedback Avalanche Diode by Princeton Lightwave

Stratospheric Deployment Parafoil by Pioneer Astronautics

James Webb Space Telescope (JWST) Wavefront Sensing Software† by Jeffrey Smith, Bruce Dean, and David Aronstein (all Code 551)

Homogeneous Bioluminescence Resonant Energy Transfer for High Density Array on Imaging Chip by Univ. of Idaho

Reaction Wheel Disturbance Modeling Extraction Software (RWDMES)† by Nightsky Systems

SpaceWire Reliable Data Delivery Protocol Software† by MEI Technologies

High Rate Base-Band Multi-Modulator by Univ. of Idaho

Nano Electronic Biosensor by Univ. of Idaho

Method for Enhancing the Sweep Speed of a Spectrum Analyzer for Radio Frequency Emitter Detection Applications by Ohio State Univ.

Highly Efficient, Compact, Wavelength Converters for Pulsed and CW Laser Sources Used in Lidar-based Remote Sensing and Ranging Systems by AdvR

Severe Environment Translation Stage by Sharon Straka and David Hughes (both Code 545)

Lightweight High Spatial Frequency Active Mirror Using E-Beam Control by Xinetics

Lightweight Magnetic Cooler with a Reversible Circulator by Creare Incorporated

Graphical Annotations and Domain Objects to Create Feature Level Metadata of Images† by Innovative Decision Technologies

Fast Fortran Transformation Toolkit† by Northrup Grumman (Code 610)

Aquarius Digital Processing Unit† by Joshua Forgione, et al. (Code 564)

Switching Fabric Based on Multi-Level LVDS Compatible Interconnect by Advanced Science and Novel Technology

Magnetorheological Fluid-Based Conformal Gripper by NASA Student (Code 695)

Directed Flux Motor Utilizing Concentric Magnets and Interwoven Flux Channels by NASA Student (Code 695)

Actuated Ball and Socket Joint by NASA Student (Code 695)

Bi-Stable Magnetic Switch and Circuit to Control Magnetic Flux by NASA Student (Code 695)

Improvements to the Walk and Roll Robot by NASA Student (Code 695)

Gyro Bias Stabilization Algorithms by Milli Sensor Systems and Actuators

Spring Joint Package with Overstrain Sensor ("OS Sensor Joint") by Peter Phelps, et al. (Code 695)

GSS XML Adaptor for JWST PRD† by CSC

Optical Navigation System by Princeton Satellite

High Stability Thermal Control by ManTech International Corporation

Filter Control Program—A Means for Executing On-the-Fly Subsets in the FTP Server† by George Mason University

James Webb Space Telescope (JWST) Integrated Ground Support System (IGSS) R3.0† by SAIC

Parca Software for Adaptive Mesh Refinement Using Paramesh Within the Cactus Framework† by Decisive Analytics Corporation

Free Fall Mass Spectrometer by Fred Herrero (Code 553)

Single Photon Sensitive HgCdTe Avalanche Photodiode Detector (APD) by Voxtel

Fast, Accurate, Miniaturized Ozonesonde for UAV Applications by QEI Technologies

A Two-axis Direct Fluid Shear Stress Sensor Suited for Aerodynamic Applications by Muniz Engineering

GSFC Capacitive Shunt RF MEMS Switch by Eric Simon (Code 555)

Deployable Boom for Rigid Panel Support by Foster-Miller

Curved Grids for Antenna Reflector Support by Foster-Miller

Pulsed Single Frequency MOPA Laser by SVT Associates

FUSE Mission Planning Tools Using the Sustainable Objective Valuation and Attainability Algorithm† by Jim Lanzi, et al. (Code 598)

convert2netCDF: Converts HDF and Binary Files to netCDF Following the Net-CDF Climate and Forecast (CF) Metadata† by RSIS

Quantum Calorimeters Based on HgCdTe Alloys by EPIR Technologies

A Digitally Controlled Circuit For Brushless DC Motors by MEI Technologies

Kameleon Software Suite† by Marlo Maddox

A Bellows-Free, Completely Fluid-Filled Passive Nutation Damper for Small Spin-Stabilized Spacecraft by Andrew Maynard, et al. (Code 596)

Vertically Integrated Quantum Dot Infrared Photodetector (QDIP) and Quantum Dot Optical Amplifier (QDOA) for Long-wave Infrared (LWIR) Focal Plane Array by OPIN Technologies

Using a Virtual Environment Simulator to Test Dynamically Executing Flight Software for Enhanced IV&V Coverage† by Triakis Corporation

Pressure Controlled Heat Pipe (PCHP) For Pricision Temperature Control by Advanced Cooling Technologies

Pseudo-Noise Code Modulation using Return to Zero pulses for Ranging, Altimetry and Communications by Xiaoli Sun, et al. (Code 694)

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Goddard Tech Transfer News

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- Filing required New Technology Reports on eNTRe (http://entre.nasa.gov)
- Pursuing partnerships to accelerate R&D
- Finding new applications for space-program technology
- Identifying innovative funding sources
- Communicating partnership opportunities via conferences, workshops, papers, presentations, and other outreach efforts
- Seeking recognition by applying for technology-related awards

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