THE NATIONAL ACADEMIES

RESEARCH ASSOCIATESHIP PROGRAMS

The Postdoc

Winter 2010-2011

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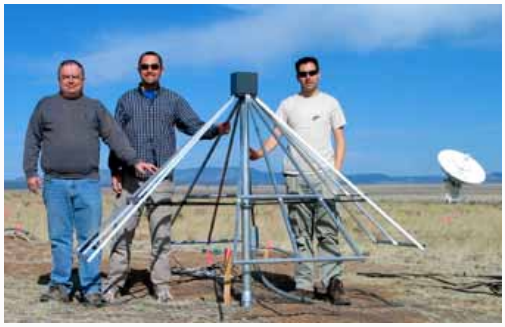
First Discovery Using Revolutionary Long Wave-Length Demonstrator Array



Standing next to a prototype of one of the anticipated 13,000 Long Wavelength Array dipole antennas are (left to right) Dr. Brian Hicks, Dr. Dr. Jake Hartman, NRC Associate, and Dr. Paul Ray, NRC Adviser, of the NRL engineering team. They are installing the latest generation NRL-designed LWA antennas in New Mexico. One of the twenty-seven 25-m parabolic dish antennas comprising NRAO's Very Large Array radio telescope appears in the background.

Scientists from NRL's Space Science and Remote Sensing Divisions, in collaboration with researchers from the University of New Mexico (UNM) and the National Radio Astronomy Observatory (NRAO) located in Socorro, N.M., have generated the first scientific results from the Long Wavelength Demonstrator Array (LWDA). The measurements were obtained during field tests and calibration of two prototype antennas for the much larger Long Wavelength Array (LWA), which will eventually consist of nearly 13,000 similar antennas. ***continued on pg. 13***

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

Suzanne White, Newsletter Manager

The NRC Research Associateship Programs Newsletter is published quarterly to highlight research and activities of NRC Associates and Advisers who participate in the programs with our many agencies and laboratories. All of our *Newsletters* are posted on our Web site Newsletter Web page in full-color PDFs. In addition, the full-color, high-gloss version is printed by the National Academy Press (NAP); and bulk orders of 10 or more are available from our office for distribution at agencies/laboratories, scientific meetings, NRC meetings, staff visits, and site visits. We accept articles throughout the year-- press releases, profiles, 1 – 2 page articles already written and/or submitted to other publications, images, photos, notices, awards, honors, etc.

Send all inquiries and submissions to Suzanne White (swhite@nas.edu)

NRC Associateship Programs Representation at 2011 Meetings

NAME OF MEETING	DATES	LOCATION
American Institute of Aeronautics and Astronautics	01/04/11-01/11/11	Orlando, FL
Joint Mathematics Meetings	01/06/11-01/09/11	New Orleans, LA
Society of Photo-optical and Instrumentation Engineers	01/22/11-01/27/11	San Francisco, CA
American Meteorological Society	01/23/11-01/27/11	Seattle, WA
Emerging Researchers National in STEM	02/23/11-02/26/11	Washington, DC
Biophysical Society	03/05/11-03/09/11	Baltimore, MD
Society of Toxicology	03/06/11-03/10/11	Washington, DC
National Black Graduate Students Association	03/09/20-03/13/11	Columbia, SC
Johns Hopkins Medical Institutions Biomedical Career Fair	03/16/11-03/16/11	Baltimore, MD
American Physical Society	03/21/11-03/25/11	Dallas, TX
National Society of Black Engineers	03/23/11-03/27/11	St. Louis, MO
American Chemical Society - Spring Meeting	03/27/11-03/31/11	Anaheim, CA
Experimental Biology	04/09/11-04/13/11	Washington, DC
American Association of Petroleum Geologists	04/10/11-04/13/11	Houston, TX
NYC-Louis Stokes Alliance for Minority Participation	04/13/11-04/15/11	New York, NY
National Organization of Black Chemists and Chemical Engineers	04/19/11-04/22/11	Houston, TX
American Society for Microbiology	05/21/11-05/24/11	New Orleans, LA
National Conference on Race and Ethnicity in American Higher Education	05/31/11-06/04/11	San Francisco, CA
McNair Scholars Conference-University of Buffalo	07/15/11-05/15/11	Niagara Falls, Canada
McNair Scholars Conference-Penn State	07/15/11-07/15/11	University Park, PA
Ecological Society of America	08/07/11-08/12/11	Austin, TX
American Chemical Society - Fall Meeting	08/29/11-08/31/11	Denver, CO
American Fisheries Society	09/04/11-09/08/11	Seattle, WA
Human Factors and Ergonomics Society	09/19/11-09/23/11	Las Vegas, NV
Florida Education Fund-McKnight Fellows Conference	10/01/11-10/01/11	Tampa, FL
Mexican American Engineering and Science Society	10/05/11-06/06/11	Oakland, CA
Geological Society of America	10/09/11-10/12/11	Minneapolis, MN
Society for the Advancement of Chicanos and Native Americans in Science	10/27/11-10/30/11	San Jose, CA
Hispanic Association of Colleges and Universities	10/29/11-10/31/11	San Antonio, TX
Annual Biomedical Research Conference for Minority Students	11/09/11-11/12/11	St. Louis, MO
American Indian Science and Engineering Society	11/10/11-11/12/11	Minneapolis, MN
Society for Neuroscience	11/12/16-11/16/11	Washington, DC
Society for Environmental Toxicology and Chemistry	11/13/11-11/17/11	Boston, MA
Materials Research Society	11/28/11-12/02/11	Boston, MA
American Society for Cell Biology	12/03/11-12/07/11	Denver, CO
American Society of Tropical Medicine and Hygiene	12/04/11-12/08/11	Philadelphia, PA
American Geophysical Union	12/05/11-12/09/11	San Francisco, CA
Nat'l Soc of Black Physicists/Nat'l Soc of Hispanic Physicists	fall-TBD	TBD
Sci & Engineering Alliance-Student Technical Conference	fall-TBD	TBD

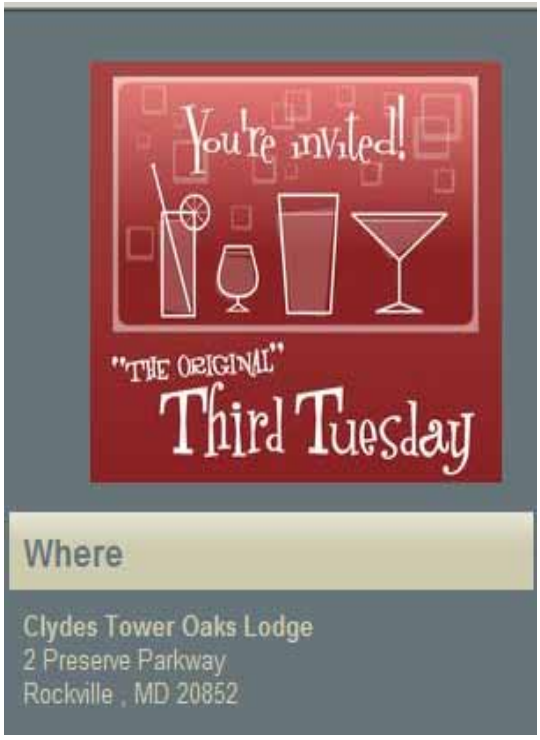
Information as of the date of printing — February 10, 2011

USA Science & Engineering Expo on the Mall

The Inaugural USA Science & Engineering Festival, hosted by Lockheed Martin, was the country's first national science festival, and it descended on the Washington, D.C. area in the Fall of 2010.

Opening on 10/10/10 with a gala concert of amazing science songs performed by over 200 children and adults at the University of Maryland, the Festival was as promised—the ultimate multi-cultural, multi-generational and multi-disciplinary celebration of science in the United States. The culmination of the Festival was the two-day Expo in the nation's capital that gave over 500 science & engineering organizations from all over the United States the opportunity to present themselves with a hands-on, fun science activity to inspire the next generation of scientists and engineers.

In preparation for next year, join the over 400 organizations that have already hosted an Expo exhibit. Become an official Festival Partner; organize a Satellite Event in your community; host a Festival Event; check out the school programs like Nifty Fifty and Lunch with a Laureate; volunteer; become a sponsor; participate in one of several contests; follow the blog, sign up for the bi-weekly e-newsletter. Be there next year when science takes over the National Mall.



The Original 3rd Tuesday Networking Extravaganza

Events average 300+ people.
NO CHARGE TO ATTEND
We'll be in the back bar. Just follow the signs.
It's a Cash Bar and Clyde's NEW GM, Ron Robbins, will select some delectable hors d'oeuvres for our group.
Great Opportunity for lots of "B2B" Networking and tons of fun.
Free Valet Parking is available.
Stay for dinner and enjoy Uncle Clyde's Lobster Special
http://thirdtuesdays.eventbrite.com/
Ron Dobransky, Angie Segal & Ron Robbins

Reminder to Advisers:

The 2011 Research Opportunity Update process is almost here. It's the second year of our online revision management tool to help you keep your opportunities current. In late April you will receive a link to the data base, along with your username, password, and a link to step-by-step instructions on how to revise your Research Opportunities.

Here are a few tips for a smoother process: (1) make a note of your password since you will also need it to update your contact information, (2) revise your opportunities within four weeks of receiving the E-mail, and (3) mark your opportunities as "complete" so your Laboratory Program Representative will know they're ready for his/her review. Even if you have no changes, you still need to view your opportunities, mark them as "complete", and then save.

Our goal is to keep the Web site up to date and this online tool should enhance that process. We appreciate all the work you do to help us make this new procedure a success.

Press Release

Natick scientists publish landmark book!

Scientists at the U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC) recently collaborated on a landmark book describing new developments in food processing procedures. The book, **"Case Studies in novel food processing technologies: *Innovations in processing, packaging, and predictive modeling"*,** published by Woodhead Publishing, was edited by **Dr. Christopher J. Doona, NRC Adviser**, and by Drs. Kenneth Kustin, . Florence E. Feeherry.

Many scientific innovations and advances in food preservation have come in support of the military. Novel food processing technologies have tremendous potential to improve food product quality and process efficiency so that foods will be healthier, safer, and more convenient for today's on-the-go Warfighters. Some of the technology is already being applied to combat feeding solutions for American troops in Iraq and Afghanistan.

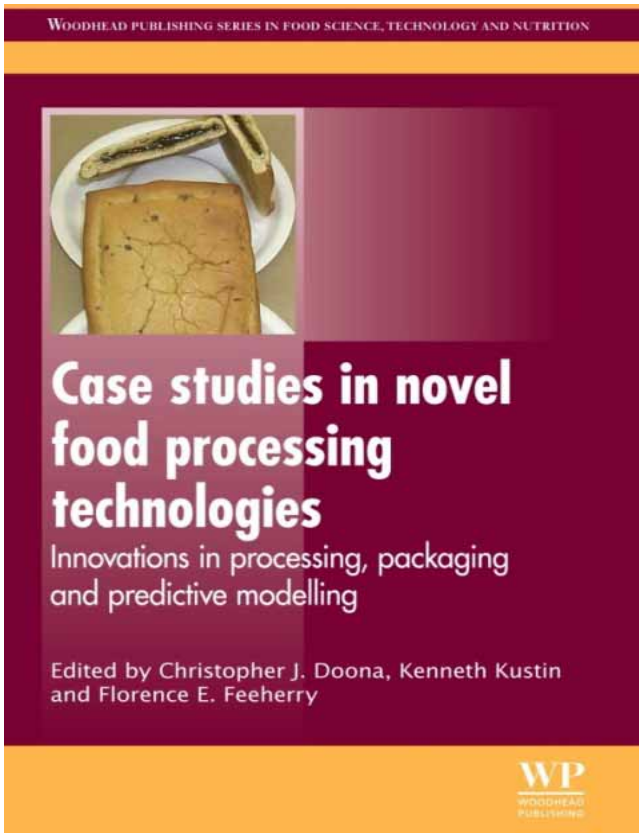
Dr. Doona, working in the Warfighter Science, Technology and Applied Research Directorate, along with Dr. Kustin, a Professor Emeritus of Chemistry from Brandeis University, and Dr. Feeherry, from the Department of Defense Combat Feeding Directorate, contributed the chapters of "*Case Studies"*.

The book features new information on high-pressure processing, pulsed electric field processing, dense phase carbon dioxide, ozone, ultrasonics, cool plasma, infrared, natural antimicrobials, time-temperature integrators, oxygen depleted storage atmospheres, advanced retort technology, microwave heating, and predictive modeling.

Natick scientists also described recent developments in nanotechnology toward the development of lighter weight, recyclable packaging for military rations.

Chris Doona, the book's lead editor, says, "***We were very excited to work on this book. With today's emphasis on innovation and bringing great science out of the lab and into industry and the marketplace, this book really shows the results of so many experts working together as a team***."

Dr. Christopher Doona, NRC Adviser, is a Senior Research Chemist at the US Army Natick Soldier Center, Warfighter Science, Technology & Applied Research Directorate, Natick, Massachusetts.



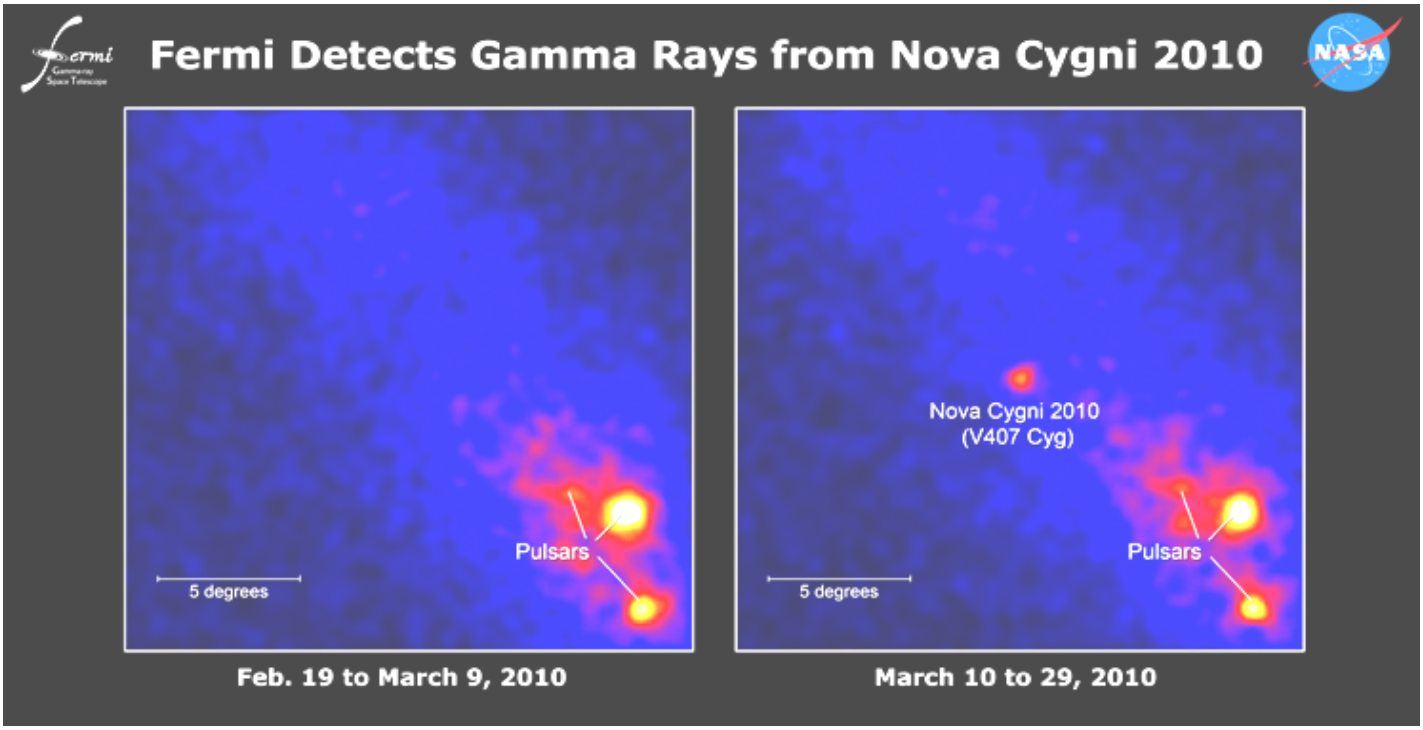
Novel food processing technologies have significant potential to improve product quality and process efficiency. Commercialization of new products and processes brings exciting opportunities and interesting challenges. This book provides insightful, first-hand experiences of many pioneering experts involved in the development and commercialization of foods produced by novel processing technologies.

Part I presents case studies of commercial products preserved with the leading nonthermal technologies of high pressure processing and pulsed electric field processing. Part II broadens the case histories to include alternative novel techniques, such as dense phase carbon dioxide, ozone, ultrasonics, cool plasma, and infrared technologies, which are applied in food preservation sectors ranging from fresh produce, to juices, to disinfestations.

Part III covers novel food preservation techniques using natural antimicrobials, novel food packaging technologies, and oxygen depleted storage techniques. Part IV contains case studies of innovations in retort technology, microwave heating, and Predictive Modeling. This section includes a model comparing thermal versus non-thermal processes, and it concludes with an evaluation of an accelerated 3-year microbial challenge test using the enhanced Quasi-chemical predictive model."

With its team of distinguished editors and international contributors, *Case studies in novel food processing technologies* is the essential reference for professionals in industry, academe, and government involved in all aspects of research, development and commercialization of novel food processing technologies.

US ARMY NATICK SOLDIER RD&E CENTER



Fermi's Large Area Telescope saw no sign of a nova in 19 days of data prior to March 10 (left), but the eruption is obvious in data from the following 19 days (right). The images show the rate of gamma rays with energies greater than 100 million electron volts (100 MeV); brighter colors indicate higher rates. (Credit: NASA/DOE/Fermi LAT Collaboration)

Using the Large Area Telescope (LAT) onboard NASA's Fermi Gamma-ray Space Telescope satellite, astronomers have detected gamma rays from a nova for the first time, a finding that surprises both observers and theorists. The discovery dispels the long-held idea that nova explosions are not powerful enough to produce such high-energy radiation. These findings are published in the August 13th edition of *Science* with Teddy Cheung, an astrophysicist at the Naval Research Laboratory, as the lead author.

A nova is a sudden, rapid increase in the brightness of a star. The explosion occurs when a white dwarf ignites in an enormous thermonuclear explosion. The newly detected explosion is equivalent to about 1,000 times the energy that the sun gives off every year. However, compared to what Fermi is capable of detecting, this exploding nova is a relatively modest event.

Gamma rays are the most energetic form of light, and scientists believe the observed gamma-ray emission arises as a million-mile-per-hour shock wave races from the site of the explosion. Fermi's LAT detected the nova for 15 days.

The nova explosion was first noticed on March 11, when amateur astronomers Koichi Nishiyama and Fujio Kabashima in Miyaki-cho, Saga Prefecture, imaged a dramatic change in the brightness of a star in the constellation Cygnus. They knew that the star, known as V407 Cyg, was 10 times brighter than it appeared in an image they had taken three days earlier. The amateur astronomers contacted Hiroyuki Maehara at Kyoto University, who in turn notified astronomers around the world asking for follow-up observations.

"***A few days later, automatic processing of data from Fermi's LAT alerted us to a new high-energy gamma-ray source at the same location as the nova***," said Dr. Chi "Teddy" Cheung, NRC Associate at NRL. "***When we looked closer, we found that the LAT had detected the first gamma rays at about the same time as the nova's discovery.***"

Dr. Chi Cheung, NRC Associate

The white dwarf star V407 Cyg lies 9,000 light-years away in the plane of our Milky Way galaxy. The system contains a compact white dwarf and a red giant star about 500 times the size of the sun. The red giant star's outermost atmosphere is leaking away into space in a manner similar to the solar wind produced by the sun, but with a stronger flow.

The white dwarf star captures some of this gas, which accumulates on the surface of the star. With the passage of time, the gas eventually becomes hot and dense enough to fuse into helium. This energy-producing process triggers a runaway reaction that explodes the accumulated gas. The white dwarf itself, however, remains intact.

The explosion creates a hot, dense, expanding shell called a shock front, composed of high-speed particles, ionized gas and magnetic fields. The spectra obtained by ground-based optical telescopes from this explosion reveal that the shock wave expanded at 7 million miles per hour -- or nearly 1 percent the speed of light.

The magnetic fields trap particles within the shell and whip them up to tremendous energies. Before they can escape, the particles reach velocities near the speed of light. Scientists say that the gamma rays likely result when these accelerated particles smashed into the red giant's wind. *continued on next page*

Dr. Soebur Razzaque, NRC Associate

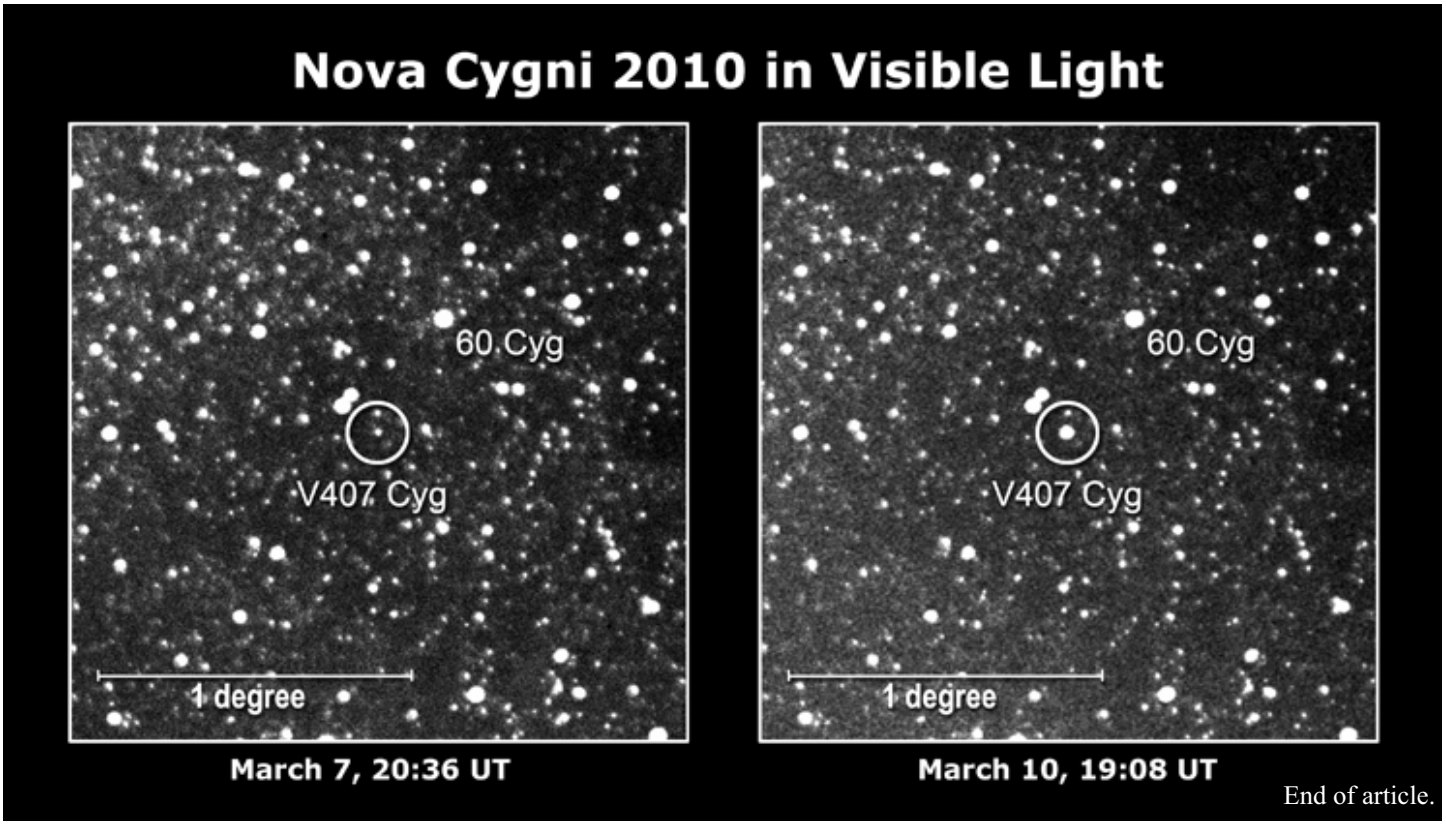
continued from pg 5

"***We know that the remnants of much more powerful supernova explosions can trap and accelerate particles like this, but no one suspected that the magnetic fields in novae were strong enough to do it as well***," said Dr. Soebur Razzaque, NRC Associate at NRL. Supernova remnants endure for 100,000 years and produce radiations that affect regions of space thousands of light-years across.

Dr. Kent Wood, NRC Adviser at NRL, compares astronomical studies of supernova remnants to looking at images in a photo album. "***It takes thousands of years for supernova remnants to evolve, but with this nova we've watched the same kinds of changes over just a few days," he said. "We've gone from a photo album to a time-lapse movie.***"

The calorimeter subsystem of the Fermi LAT was developed at NRL and the environmental testing of both the LAT and the full Fermi observatory was conducted at NRL under the guidance of LAT Co-Principal Investigator Dr. W. Neil Johnson and LAT Commissioner Dr. J. Eric Grove, both NRL astrophysicists. The LAT project is funded in the United States by NASA and the Department of Energy in collaboration with academic institutions and government agencies in France, Italy, Japan, and Sweden.

Dr. Kent Wood, NRC Adviser



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NRL a "Best Diversity Company"

Renard Communications, publisher of *Diversity/Careers in Engineering & Information Technology* magazine and Diversity/Careers website (www.diversitycareers.com), annually conducts an online readers' survey of best diversity companies. More than 100 companies are recognized by the engineering and information technology readers for their support of minorities and women, their attention to work/life balance and their commitment to supplier diversity. The survey asked *Diversity/Careers* readers and website visitors to rate the diversity strengths of corporations, government agencies and other organizations that employ technical professionals in the U.S. *"The chosen companies are all recognized by our readers as strong supporters of diversity. Our readers are the ones who know which companies support them best,"* said Diversity/Careers publisher and Renard Communications owner and president Roberta Renard, *"and we are pleased to share their perceptions with the public."*

Graphene yields secrets to extraordinary properties

Applying innovative measurement techniques, researchers from the Georgia Institute of Technology and the National Institute of Standards and Technology (NIST) have directly measured the unusual energy spectrum of graphene, a technologically promising, two-dimensional form of carbon that has tantalized and puzzled scientists since it was discovered in 2004.

Published in the May 15, 2009, issue of Science,* their work adds new detail to help explain the unusual physical phenomena and properties associated with graphene, a single layer of carbon atoms arrayed in a repeating, honeycomb-like arrangement.

Graphene's exotic behaviors present intriguing prospects for future technologies, including high-speed graphene-based electronics that might replace today's silicon-based integrated circuits and other devices. Even at room temperature, electrons in graphene are more than 100 times more mobile than in silicon.

Graphene apparently owes this enhanced mobility to the curious fact that its electrons and other carriers of electric charges behave as though they do not have mass. In conventional materials, the speed of electrons is related to their energy, but not in graphene. Although they do not approach the speed of light, the unbound electrons in graphene behave much like photons, massless particles of light that also move at a speed independent of their energy.

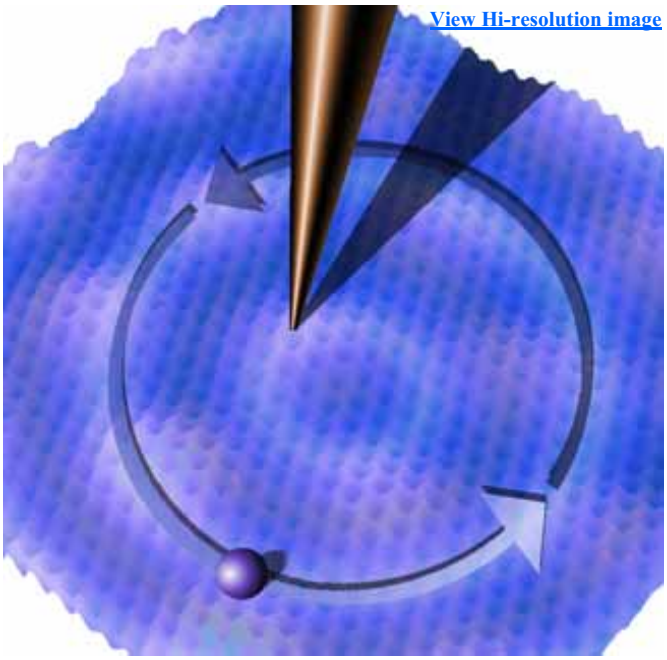
This weird massless behavior is associated with other strangeness. When ordinary conductors are put in a strong magnetic field, charge carriers like electrons begin moving in circular orbits that are constrained to discrete, equally spaced energy levels. In graphene these levels are known to be unevenly spaced because of the "massless" electrons.

The Georgia Tech/NIST team tracked these massless electrons in action, using a specialized NIST instrument to zoom in on the graphene layer at a billion times magnification, tracking the electronic states while at the same time applying high magnetic fields. The custom-built, ultra-low-temperature and ultra-high-vacuum scanning tunneling microscope allowed them to sweep an adjustable magnetic field across graphene samples prepared at Georgia Tech, observing and mapping the peculiar non-uniform spacing among discrete energy levels that form when the material is exposed to magnetic fields.

The team developed a high-resolution map of the distribution of energy levels in graphene. In contrast to metals and other conducting materials, where the distance from one energy peak to the next is uniformly equal, this spacing is uneven in graphene.

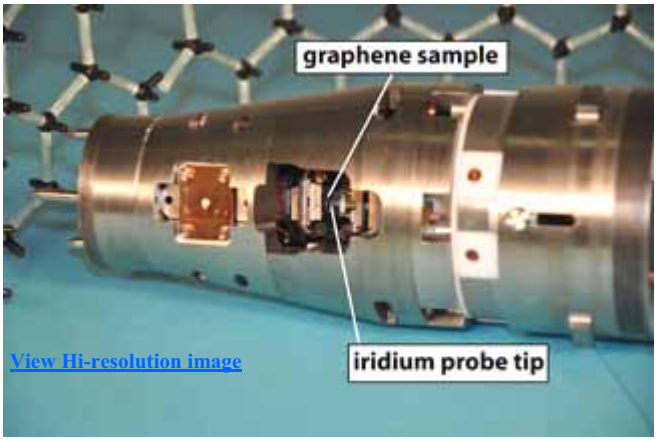
The researchers also probed and spatially mapped graphene's hallmark "zero energy state," a curious phenomenon where the material has no electrical carriers until a magnetic field is applied. The measurements also indicated that layers of graphene grown and then heated on a substrate of silicon-carbide behave as individual, isolated, two-dimensional sheets.

On the basis of the results, the researchers suggest that graphene layers are uncoupled from adjacent layers because they stack in different rotational orientations. This finding may point the way to manufacturing methods for making large, uniform batches of graphene for a new carbon-based electronics. The research was funded in part by the National Science Foundation, W.M. Keck Foundation and Semiconductor Research Corporation through the Nanoelectronics Research Initiative INDEX program, which NIST also supports.



View Hi-resolution image

Drawing represents a probe scanning and mapping the atomic contours of graphene, a single layer of carbon atoms arranged in a honeycomb-like array. Simultaneously applying a magnetic field causes electrons (ball) to organize in circular orbits, like a dog chasing its tail. Orbits hold clues to the material's exotic properties.Credit: Kubista, Georgia Institute of Technology



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NIST-built STM "shuttle" module contains the atomic-scale position-and-scan system. Graphene sample and probe tip are in the center opening. Shuttle moves between a room-temperature vacuum environment for loading to an ultracold environment for measuring. Model in background shows graphene's honeycomb structure.

D.L. Miller, K.D. Kubista, G.M. Rutter, M. Ruan, W.A. de Heer, P.N. First and J.A. Stroscio. ***"Observing the quantization of zero mass carriers in grapheme". Science. May 15, 2009.***

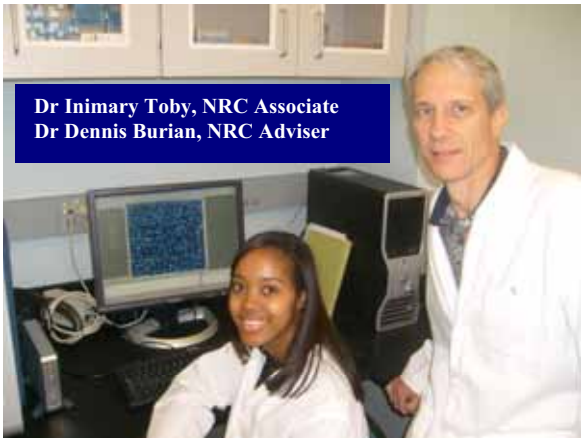
NIST
National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

Greg Rutter is a former NRC Associate at NIST working with Adviser, Dr. Joseph Stroscio
Center for Nanoscale Science and Technology
National Institute for Standards and Technology
Gaithersburg, MD

Effects of Cabin-Altitude Exposure on Gene Expression in Whole Blood

NRC Associate at the Federal Aviation Administration (FAA), Dr. Inimary Toby, and her NRC Adviser, Dr. Dennis Burian, are studying the effects of cabin-altitude exposure on gene expression in whole blood. Large number of patients with underlying pulmonary disease travel each year by air. These patients are at higher risk for developing complications due to susceptibility for their lungs to become hypoxic. At high altitudes, the lower air pressure makes it more difficult for oxygen to enter our vascular systems. The result of high altitude exposure is hypoxia or oxygen deprivation. In addition, aviators who fly above 12,500 feet in an unpressurized aircraft without supplemental oxygen may be susceptible to effects of hypoxia.

Though the molecular mechanisms of hypoxia are clear, it is unclear what determines an individual's response and subsequent compensation to the severity of hypoxia. Hypoxia contributes significantly to the pathophysiology of major categories of human disease, including myocardial and cerebral ischemia, cancer, pulmonary hypertension, congenital heart disease and chronic obstructive pulmonary disease.



Dr Inimary Toby, NRC Associate
Dr Dennis Burian, NRC Adviser

We enrolled a total of 62 participants comprised of three categories: 23 healthy, 18 cardiac-compromised, and 21 smokers. Our hypothesis is that moderate hypoxia occurring at cabin-altitudes of 7000 feet leads to alterations in gene expression that regulate production of important factors in the pulmonary vasculature. Utilizing a whole transcriptome approach via microarray analysis, expression changes over time will be assessed. In addition, differences due to gender and health status will be determined.

Multifactorial effects between gender and health status also will be determined. Quantitative polymerase chain reaction will be used to validate the microarray results and allow us to specifically target genes known to play a role in the response to hypoxia with this more sensitive assay. Additionally, we collected several physiological parameters including cardiac output, heart rate, blood pressure and pulmonary artery pressure.

We would like to examine these data for differences in response between non-smokers, smokers, and COPD participants and investigate expression correlations to these physiological parameters.

Our goal is to enhance the current understanding of how different individuals adapt to altitude exposure. Results from this study will be used to assess the risks of flying on the middle-aged to elderly passenger common in today's flying population and help us determine whether the health compromised are under any increased risk at cabin-altitude when compared to their healthy counterparts.

In addition, the markers we discover through this and other work will be used to develop assays for forensic applications and assist in the accurate determination of accident causality.

NRC Program Coordinator, Jason Thornhill

Jason Thornhill is a Senior Program Coordinator for the NRC Research Associateship Programs working with the following federal laboratories: AFRRI, AMRMC, CBD, MMC, NIH/NIST, NMRC/NHRC, and NOAA. Jason began working at The National Academies in July 2002 with the Office of the Chief Financial Officer. He then transitioned into his next endeavor as a Travel Coordinator with the NRC Associateship Programs, and from there into his current post as a Senior Program Coordinator. Jason, along with his Coordinator colleagues, received a **PGA Associateship Program Coordinators Group Distinguished Service Award** in 2009. His hobbies include travel, reading, and playing basketball—that is if he has time for hobbies! Jason is an awe-inspiring coworker with his additional full-time "job" as husband and father of a three-year old daughter and seven-month old twins (son and daughter)!

The Associateship Program Coordinators are the primary points of contact for more than 600 NRC Research Associates who hold fellowships awards each year in U.S. government laboratories. The Coordinators manage all aspects of the tenure of these postdoctoral fellows including assistance in relocation to the laboratory, making sure their award package is administered correctly, and addressing a multitude of questions that help them in getting established in their research programs.

"Jason is a great resource! I'm glad he's just a phone call away. All the best!"
Jimmy Pendergrass, LPR AFRRI
"...very efficient and timely collaboration…"
Georgeta Crivat, NIST/NIH Associate

NRL researchers study galaxy mergers

Scientists at the Naval Research Laboratory have solved a long-standing dilemma about the mass of infrared bright merging galaxies. Because galaxies are the largest directly observable objects in the universe, learning more about their formation is key to understanding how the universe works.

Dr. Jacqueline Fischer, NRC Adviser, with Dr. Barry Rothberg, NRC Associate

Dr. Barry Rothberg, NRC Associate, and Dr. Jacqueline Fischer, NRC Adviser, both of the Infrared Submillimeter Astrophysics & Techniques Section in the Remote Sensing Division of the Naval Research Laboratory (NRL), used new data from the 8-meter Gemini-South telescope in Chile, along with earlier results from the W. M. Keck two 10-meter, and University of Hawaii 2.2-meter telescopes (both in Hawaii), and archival data from the Hubble Space Telescope, to solve the problem. They have published a paper on their research findings on galaxy evolution in the Astrophysical Journal (March 20, 2010 Volume 712).

Galaxies in the Universe generally come in two shapes, spiral, like our own Milky Way, and elliptical, in which the stars move in random orbits, Rothberg explains. The largest galaxies in the Universe are elliptical in shape and how they formed is central to our understanding how the Universe has evolved over the last 15 billion years. The theory has been that spiral galaxies merge with each other forming most of the elliptical galaxies in the Universe.

The University of Hawaii 2.2-meter telescope

Spiral galaxies contain significant amounts of cold hydrogen gas. When they merge, the beautiful spiral patterns are destroyed and the gas is converted into new stars. The more gas present in the spiral galaxies, the more stars are formed and with it, large amounts of dust. The dust is heated by the young stars and radiates energy at infrared wavelengths.
merge, the beautiful spiral patterns are destroyed and the gas is converted into new stars. The more gas present in the spiral galaxies, the more stars are formed and with it, large amounts of dust. The dust is heated by the young stars and radiates energy at infrared wavelengths.

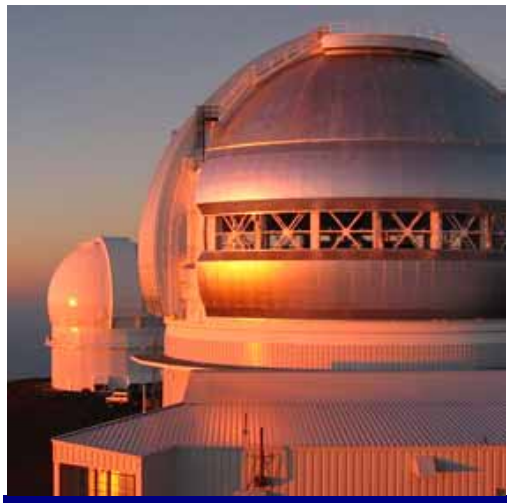
Until recently scientists thought that these infrared bright merging galaxies were not massive enough to be the precursors of most elliptical galaxies in the Universe. The problem lay in the method of measuring their mass. The conventional method of measuring mass in dusty IR-bright galaxies uses near-infrared light to measure the random motions of old-stars.

The larger the random motions, the more mass is present. Using near-infrared light makes it possible to penetrate the dust and see as many of the old stars as possible.

However, a complication occurs when spiral galaxies merge, because most of their gas is funneled to the gravitational center of the system and forms a rotating disk. This rotating disk of gas is transformed into a rotating disk of young stars that is also very bright at near-infrared wavelengths. The rotating disk of young stars both outshines the old stars and makes it appear as if the old stars have significantly less random motion.

In contrast to this conventional method, Rothberg and Fischer instead observed the random motions of old stars at shorter wavelengths effectively using the dust to their advantage to block the light from the young stars. Their new results showed that the old stars in merging galaxies have large random motions, which means they will eventually become very massive elliptical galaxies. The next step for NRL researches is to directly observe the stellar disks in IR luminous mergers using 3-dimensional spectroscopy. Each pixel is a spectrum, and from this the researchers can make two-dimensional maps of stellar motion and stellar age. This will allow them to meas-

W. M. Keck 10-meter telescope



Gemini 8-meter telescope

Aberdeen Proving Ground, MD

ECBC's Valdes receives Presidential Rank Award

Dr. James Valdes, NRC Scientific Advisor for Biotechnology at the U.S. Army Edgewood Chemical Biological Center's (ECBC), was awarded a "Meritorious Senior Professional Rank Award" as part of the 2009 Army Presidential Rank Awards held recently.

Valdes, along with 25 other distinguished career executives and senior professionals, was presented with the most prestigious recognition afforded to Army civilians during a ceremony at the Women in Military Service for America Memorial.

"***We are truly, truly fortunate to have such wonderful civilians, such highly accomplished individuals helping to lead the Army during what I know we all understand are very, very challenging times, and times of great change***," said Secretary of the Army John McHugh.

Dr. James Valdes, NRC Scientific Advisor for Biotechnology at the U.S. Army Edgewood Chemical Biological Center's (ECBC)

Valdes was recognized for his work on the Tactical Garbage to Energy Refinery (TGER), a hybrid waste-to-energy system that combines two complementary technologies — advanced fermentation and thermal decomposition — to convert a broader range of waste products such as plastic, paper, food scraps and styrofoam into synthetic gas or hydrous ethanol.

The TGER can consume about a ton of waste per day and was designed to produce electricity for the local power grid or heat for showers while disposing of waste generated by more than 600 people with a 60 kilowatt generator.

"***The TGER is best suited for a post-[Hurricane] Katrina, post-combat or expeditionary military operation situation. One where there is a lot of garbage, but no power***," Valdes said when asked to describe the benefits of the system.

U.S. ARMY
EDGEWOOD CHEMICAL BIOLOGICAL CENTER
Public Affairs Office 410-436-3610
www.ecbc.army.mil

Dr. Valdes was previously recognized with the "Meritorious Senior Professional Rank Award" in 2003 for his conceptual and technical breakthroughs in the field of "biosensors," a discipline which he helped to establish and define a strategic direction for at ECBC and throughout the Joint Services. McHugh said the Army's success is due "...***in no small measure to the civilian awardees -- who work in such fields as contracting, procurement, research, installation management and Iraqi reconstruction and training ... and that their efforts have resulted in a "more efficient and cost-effective Army.***

Awardees, who must be nominated by the secretary of the Army, evaluated by boards of private citizens and approved by the president, received between 20 and 35 percent of their base pay in addition to the framed certificate signed by President Obama

ECBC is the Army's principal research and development center for chemical and biological defense technology, engineering and field operations. ECBC has achieved major technological advances for the warfighter and for our national defense, with a long and distinguished history of providing the Armed Forces with quality systems and outstanding customer service. ECBC is a U.S. Army Research, Development and Engineering Command laboratory located at the Edgewood Area of Aberdeen Proving Ground, Md. For more information about the Edgewood Chemical Biological Center, please visit our Web site at http://www.ecbc.army.mil/ or call (410) 436-7718.

The team standing in front of the Tactical Garbage to Energy Refinery (TGER) at Camp Victory in Camp Liberty. Left to right: Drs. Richard N. Martinez, Joel Ricklefs, Jay Valdes, NRC Adviser, Jonathan Felas, Kevin Forshee, and Alan Easterling

NRC/ASEE Postdoctoral Research Publication Awards

There were 145 NRC and ASEE postdoctoral associates on board during 2009. Twenty-four papers published by these postdocs were considered for this award, and six were selected for recognition. They represent 211 authors. The names of the authors with the titles and abstracts of their publications are listed under their respective research divisions.

NRL has a continuing need for scientists and engineers in many fields of research. For this reason, NRL conducts postdoctoral fellowship programs to provide postdoctoral scientists and engineers of unusual promise and ability the opportunity for research in areas of interest to the Navy. These bright, highly motivated, recent doctoral graduates provide great impetus to the Navy's research programs.

Dr. Aous Abdo
NRL/NRC Associate
Space Science

Dr. Christopher Chervin
NRL/NRC Associate
Chemistry Division

Dr. Joseph Helmboldt
NRL/NRC Associate
Remote Sensing

Dr. Serguei Maximenko
NRL/NRC Associate
Electronics Science and Technology

Dr. Lena Mazeina
NRL/NRC Associate
Electronics Science and Technology

Dr. Mansoor Nasir
NRL/NRC Associate
Bio/Molecular Science and Engineering

And 173 other authors

CONGRATULATIONS

Dr. Aous Abdo
NRL/NRC Associate
Space Science

Dr. Christopher Chervin
NRL/NRC Associate
Chemistry Division

Dr. Joseph Helmboldt
NRL/NRC Associate
Remote Sensing

Dr. Serguei Maximenko
NRL/NRC Associate
Electronics Science and Technology

Dr. Lena Mazeina
NRL/NRC Associate
Electronics Science and Technology

Dr. Mansoor Nasir
NRL/NRC Associate
Bio/Molecular Science and Engineering

NRL researchers receive seven "Top Scientists and Engineers Awards"

Karen Swider-Lyons, NRC Adviser at the Naval Research Laboratory (NRL), was one of seven NRL researchers who received the prestigious 2009 Dr. Delores M. Etter "Top Scientists and Engineers of the Year Award".

The Honorable Dr. Delores Etter, former Assistant Secretary of the Navy (Research, Development & Acquisition), established the award in 2006 to recognize Navy civilian and military personnel for superior scientific and engineering achievements, and to promote continued scientific and engineering excellence.

A total of 15 group and individual "Top Scientists and Engineers of the Year Awards" were presented this year, representing 18 scientists and engineers.

Nearly 35,000 Navy scientists and engineers are eligible to receive the award. The honorees represent various commands across the Department of the Navy. Nominees must have demonstrated exceptional scientific and engineering achievement in their field during the preceding calendar year of the award.

This year's honorees were recognized at a ceremony at the Pentagon. The Honorable Sean J. Stackley, Assistant Secretary of the Navy (Research, Development & Acquisition) gave the opening remarks. The Honorable Zachary J. Lemnios, Director, Defense Research & Engineering, Department of Defense, was this year's invited speaker.

NRL recipients represent five NRL divisions. There were seven NRL researchers named as "Top Scientists and Engineers" —four individual awards and a group award.

March 1986 until June 1992, Dr. Judith Nyquist was with the Walter Reed Army Institute of Research (WRAIR) in Washington, DC, as the Director of the Office of Research Management and was in charge of the Institutional Review Board that performed the ethical review of all research involving human subjects. In addition, Judy was the Laboratory Program Representative for the National Research Council's (NRC) Postdoctoral Research Associateship Program, serving as the liaison between the NRC and the Research Associates at WRAIR.

June 1992-July 2010 Dr. Nyquist was with the NRC Research Associateship Programs as Program Administrator and Deputy Director.

We miss you Judy!

Travels with Judy

By Sara Rothman, Dep. Sci. Dir., Walter Reed Army Institute of Research

Judy and I traveled to Kenya and Thailand, twice each, and once to Brazil, where we had a lab that has now been closed for many years.

On both trips to Kenya, Judy and I took a day at the end to go on safari into the Serengeti. The first time we were fortunate enough to witness the migration of the gnus (wildebeests) who, accompanied by all kinds of other animals--zebras, elands, etc.--could be seen stretching from one end of the horizon to the other with no end in sight. We saw lions eating a gnu, we saw wild dog pups playing outside an enormous ant hill where they were living (the ants had left), we saw ostriches, giraffes, elephants and leopards, cheetahs, impalas, hyenas, buffalo, hippos. We came close to a rhinoceros with her baby, but had to beat a fast retreat when one of the tourists jumped up and started shouting at the mama rhino to come closer so he could take a picture--not a good idea! From our camp we could see hippos close up as they were bathing in the river just outside the fence. For happy hour, the camp hung a dead rabbit from a tree within our sight and, right on schedule, a leopard came to feed. In our camp on the next trip, the bathroom was open air and we had to bring our toothpaste and soap into the room with us as the baboons liked to swing in and steal whatever they could!

When we flew into Nairobi the first time, the lab commander met us and told us never to leave the hotel on our own. So the last day of our trip, we sneaked guiltily out to do last minute shopping at a store down the street. Judy was out of cash (not the last time) and I had to rescue her. The same thing happened when we went to the vast weekend market in Bangkok--she couldn't pry money out of an ancient ATM--Sara to the rescue once again.

To go back to our rooms from an elegant dinner at a fancy hotel in Bangkok, Judy and I had to rent the hotel Mercedes as it was pouring and the streets were flooded over the sidewalks--out of our window we could see a man who had solved the problem--he was riding down the sidewalk while sitting on top of an elephant.

On our very first site visit to Nairobi, the site visitor who accompanied us was such a curmudgeon that Judy had to change him out and on most of our trips we were accompanied by Ray Kuhn from Wake Forest, a delightful individual.

I wish I had time to send you more stories--Judy was a delightful traveling companion--serious about the work--but ready to have fun and adventures when the work was over.

Face of retirement: Dr. Judith Nyquist, former Deputy Director, NRC Research Associateship Programs

continued from front cover

Utilizing radio emissions from the approximately 300 year-old Cassiopeia A (Cas A) supernova remnant (SNR) -- one of the brightest astronomical radio sources in the sky -- to establish baseline measurements, NRL scientist and National Research Council (NRC) Associate Dr. Jake Hartman utilized the Using NRAO's Very Large Array (VLA) radio telescope. Former NRC Associate, Dr. Joseph Helmboldt, produced research that showed that the gradually weakening Cas A displays signs of a "softer" smooth, secular decrease and an apparent shorter term variability at frequencies below 100 MHz.

"***Cas A has long been known to be fading, but the slower, seemingly irregular decrease at frequencies lower than 100 MHz has remained controversial,***" said Dr Namir Kassim, NRC Adviser astronomer and LWA project scientist at NRL. "***Dr. Hartman's discovery reaffirms this supposition and provides strong support that more frequent time sampling will be needed to determine whether the shorter term variations contain a non-random component.***"

Dr. Helmboldt's measurements were able to significantly improve constraints on the smooth secular decrease, confirming earlier indications that the decrease was slower than originally determined several decades ago. He was also able to verify earlier indications of variations on shorter timescales, including the possibility that they might contain a sinusoidal component. Scientifically, these new measurements taken by Dr. Hartman are significant because they must be explained by diffusive shock acceleration theory, which helps describe how the blast wave from a relatively recent supernova explosion like Cas A is able to accelerate relativistic particles and generate radio emission. The theory must account both for the relatively smooth, longer-term rate at which the emission is gradually fading, as well as the shorter-term variability that is likely related to the properties of the region into which the SNR is expanding.

"***The result is exciting because it represents 'first science', and is increasingly intriguing as it is based on measurements from only two dipole antennas, as compared to the more than 13,000 that will eventually comprise the full LWA,***" said Dr. Paul Ray, NRC Adviser astronomer at NRL. "***For a project whose broader goals encompass engaging and training a next generation of young radio scientists we are proud that this first astronomical result emerged from the work of two NRC Associates, neither of whom were experts in this area of research.***"

Once completed, the LWA will provide an entirely novel view of the sky in the radio frequency range of 20-80 MHz, currently one of the most poorly explored regions of the electromagnetic spectrum in astronomy. The LWA will be able to make sensitive high-resolution images, scanning the sky rapidly for new and transient sources of radio waves that may represent the explosion of distant massive stars or detect emissions from planets outside of our own solar system and previously unknown objects or phenomena. "We're now laying the infrastructure for the first LWA antenna station," said Joe Craig, LWA system engineer, UNM. "***It's really an exciting period for everyone involved.***"

LWA will also provide an unparalleled measure of turbulence and waves in the Earth's ionosphere, together with unique diagnostics of phenomena manifested through the Sun-Earth connection also known as "Space Weather." Dr. Hartman's work describing his LWDA-based measurements has been published as an LWA technical memorandum, while Dr. Helmboldt's paper on the secular decrease of Cas A, based on the combined VLA and LWDA data, will appear in the September 2009 issue of the *Astronomical Journal*.

Science · Technology · Engineering · Math
Postdoc Conference & Career Fair

Recruit Local Talent at S.T.E.M. 2011

A MUST-ATTEND career fair for companies seeking top science, technology, engineering and math talent

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www.PostdocConference.org
June 15, 2011 | 8 a.m. - 4 p.m.
Bethesda North Marriott

For more details contact Amanda Wilson at Rockville Economic Development, Inc. at Wilson@RockvilleREDI.org or (301) 315-8096.

S.T.E.M. 2010 Postdoc Conference and Career Fair

The fifth annual STEM 2010 Postdoc Conference and Career Fair was held in July at the Montgomery County Conference Center. It drew 455 postdocs from agencies including NIST, NIH, FDA, NIAID, Naval Research Lab, NASA, Army Medical, Air Force, USUHS, Defense Threat Reduction Agency, and EPA. Postdocs also came from universities including Georgetown, GMU, JHU, VCU, UMD, GWU, Virginia Tech, UVA, Howard, Carnegie Institution for Science, University of Delaware, Penn State, Pitt, and from as far away as Drexel, NYU, Tulane, and the Universities of Vermont, Colorado, and California.

Postdocs attended sessions on interviewing skills, choosing a career, and finding a job. Through expert panels, they explored career options including working in an established company; working for a start-up or starting one themselves; and working in the fields of journalism, law, government or in the non-profit world. Many of the speakers and panelists were former postdocs themselves, and were able to share the benefit of their experience.

Attendees also had the opportunity for one-on-one interviews with "resume doctors" who had cures for the too-long or too-detailed resume. International fellows had the opportunity to consult individually with immigration attorneys.

The centerpiece of the event was the very active and crowded career fair. Attendees met 25 hiring companies and 18 resource companies there, and a number of postdocs scored interviews with companies for possible employment. 100% of the exhibitors who responded to a follow-up survey noted that the conference was a good value for them.

Rockville Economic Development, Inc. (REDI) has served as conference organizer since the first event in 2006. Together with the conference planning committee, composed of representatives from federal agencies, economic development organizations, and private industry, they are currently evaluating the conference in to inform the plans for next year's event. For photos and more information on STEM 2010, please visit www.PostdocConference.org

SAVE THE DATE
www.PostdocConference.org
June 15, 2011 | 8 a.m. - 4 p.m.
Bethesda North Marriott

Thermal Imaging — Army Night Vision

Well known for the development of the "night vision goggles," the Army Materiel Command (AMC) Research Development and Engineering Command (RDECOM), Communications-Electronics Research Development and Engineering Center's (CERDEC) Night Vision and Electronic Sensors Directorate (NVESD) does more than just make goggles.

In the late 1960's real-time thermal imaging technology started to show promise to providing long range detection and recognition capability at night. For more than 40 years, NVESD has continuously conducted advanced exploratory research with a focus to provide Soldiers with the necessary sensor technology and innovative products to gain the advantage of being able to maneuver effectively under the cover of darkness.

NVESD's research focuses on further exploring and expanding the utilities of thermal imaging. Under the guidance of **NRC Adviser, Dr. Joe Pellegrino, NRC Associate, Dr. Neil Baril** is investigating the surface chemistry of a new material system for thermal imaging with potential to outperform the present state of the art material.

Although some historians feel that the discovery was accidental, its significance led to a variety of technologies to include thermal imaging. Thermal energy became an imaging technology in the years just following World War II. Forward Looking Infrared, or FLIR, technology originated as a sensor system for fighter aircraft. Thermal imaging systems, imagery produced by measuring and recording electronically the thermal radiation of objects, became much in demand for all weapon system platforms.

Visible | Near Infrared | Thermal

Infrared imaging sensors or FLIRs have become the sensor of choice day or night for most combat platforms, air and ground. FLIR systems have become a real influence on the battlefield and were used during the initial invasion of Iraq, where there was significant night fighting.

FLIR systems are designed to operate at one of two wavelengths – 3 to 5 microns (mid-wave infrared) or 8 to 12 microns (long-wave infrared) – or atmospheric windows where water vapor in the air is less of an issue. In layman terms, FLIR technology senses heat emitted by a person or an object. Incorporated into a sophisticated optical system, this technology provides greater stand-off range and reduces the Warfighter's exposure time.

Sensor systems that utilize FLIR technology to provide the advantage of seeing not only at night but also through smoke, fog and other obscured battlefield conditions. Early attempts at this type of battlefield sensing produced sensors that were large and mounted in a fixed position facing forward – thus the name "Forward Looking."

Operation Desert Storm as well as current US efforts in Iraq and Afghanistan has substantiated beyond any doubt that night vision technology was, and continues to be, the force multiplier. Targeting systems using FLIR technology were particularly important to the major weapon systems due to their ability to see through dense smoke, dust, fog, and haze, at great distances.

Left: NRC Associate, Dr. Neil Baril, and NRC Adviser, Dr. Joe Pellegrino, looking at a thermal evaporator used to deposit thin films for passivation

Over the years, we have experienced a paradigm shift in the development and manufacturing of sensor components. Today, infrared sensors have become the sensor of choice for several combat platforms including tanks, troop movers, and tactical aircrafts. The development of uncooled infrared has paved the way for FLIR imagers to be smaller, more compact, and cheaper, allowing the individual Soldier and unmanned platforms to take advantage of the technologies.

Since its inception, the directorate has actively pursued domestic technology transfer and has compounded the use of the nation's most advanced technology, to incorporate the health and medical fields. Today, medical professionals on the battlefield are utilize FLIR technology to help save lives. Military doctors and nurses are employing a FLIR device to help diagnose severe conditions like Acute Compartment Syndrome. Medical personnel are able to determine the presence or a impediment of blood flow in the extremities of wounded personnel. This valuable information helps to prioritize the wounded for immediate evacuation and treatment.

In the future we will see intelligent sensor systems that utilize advanced Focal Plane Array (FPA) technology that can see farther and penetrate all aspects of the dirty battlefield. This will be made possible through an innovative technique known as Dual Band Focal Plane Array Manufacturing (DBFM). These large formats, dual band staring FPAs will allow the operator to select to operate simultaneously in the mid-wave infrared (MWIR) and long-wave infrared (LWIR) regions.

The payoff of this revolutionary breakthrough will give the Warfighter a combat overmatch. The paradigm shift that this technology brings will enable the Soldier to fire upon his adversaries without being seen. This technology will allow the Warfighter to identify the threat before the enemy can even detect our soldiers presence, resulting in increased survivability by being able to rapidly search wide areas while on-the-move, and reduced crew burden due to aided search and detection for surveillance tasks and difficult targets.

As our sensor technology matures, the current path forward will lead to the miniaturization of components and sensor packages. The sensor package you see today on larger, tactical vehicles will be combined in small miniaturized gimbals that can be placed on remote-controlled ground and air platforms.

NRC Associate, Dr. Neil Baril, and NRC Adviser, Dr. Joe Pellegrino

CREWS/ICON stations record passage of hurricane Earl

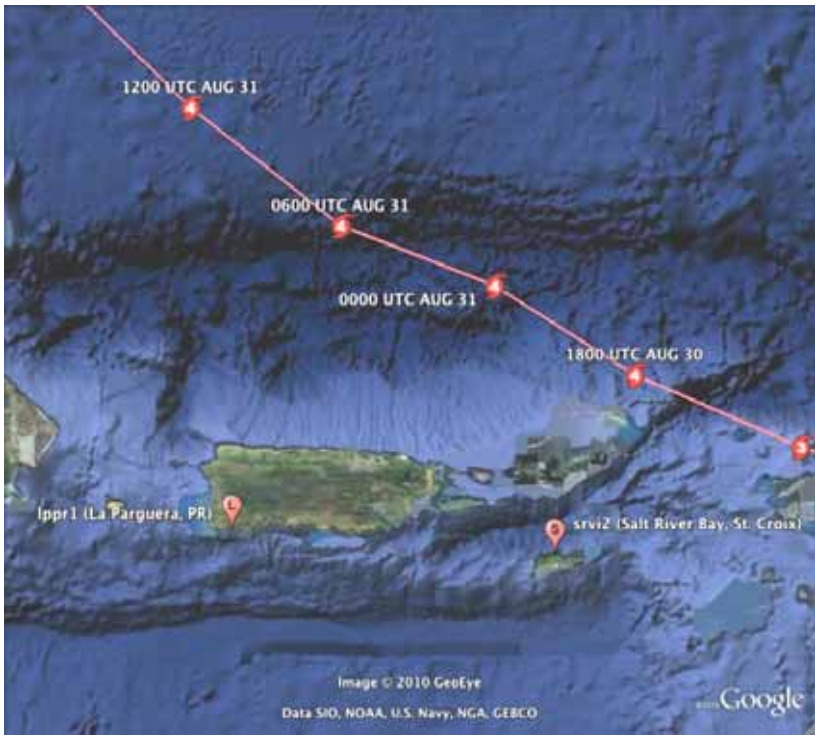
On August 30th-31st, Hurricane Earl, the 2010 Atlantic hurricane season's second major hurricane, passed quite close to two of the Coral Reef Early Warning System (CREWS) stations in the Caribbean that are part of the Integrated Coral Observing Network (ICON). Researchers at AOML manage the CREWS/ICON stations in support of the Coral Health and Monitoring Program.

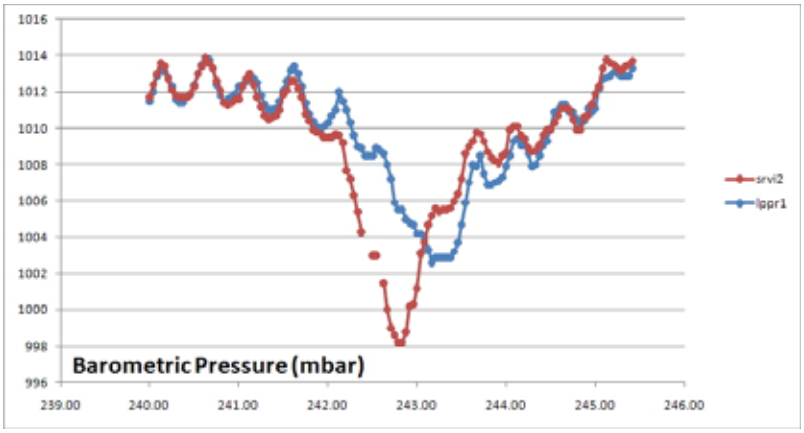
The first station impacted by Earl was the station designated as SRVI2 on the northern coast of St. Croix, U.S.Virgin Islands, while the second station impacted was LPPR1 on the southwest coast of Puerto Rico (see map at right).

Both CREWS/ICON stations survived the experience unharmed, and both of them recorded data including barometric pressure, air temperature, dew point, and winds that are of potential interest to hurricane scientists.

With winds of between 120-135 mph, Hurricane Earl passed within 90 miles of the St. Croix station at about 18 UTC on August 30th and within about 150 miles of the Puerto Rico station at about 6 UTC on August 31st. Both stations recorded gale-force winds during this period.

Except for 16 dropped transmissions from the St. Croix station and four dropped transmissions from the Puerto Rico station, all of the ICON data were transmitted in near-real time to the National Data Buoy Center in Mississippi where they became part of the National Weather Service's operational data stream and were assimilated into the models used by forecasters at the National Hurricane Center. Since the passage of Hurricane Earl, both the St. Croix and Puerto Rico CREWS/ICON stations have continued to operate normally.





Upper right: The location of the two CREWS/ICON stations in the Caribbean are denoted by red balloons, while the path of Hurricane Earl is denoted by a red line.

Lower right: Barometric pressure as recorded by the St. Croix (red line) and Puerto Rico (blue line) CREWS/ICON stations during the passage of Hurricane Earl.

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Atlantic Oceanographic and Meteorological Laboratory

Welcome aboard, Ruben!

National Research Council post-doctoral scientist Dr. Ruben van Hooidonk joined the staff of AOML's Ocean Chemistry Division in August. van Hooidonk is a biologist from the Netherlands with a passion for diving and coral reefs. He earned a M.S. degree by studying coral reef ecology on the Caribbean Island of Curaçao and then completed a Ph.D. in earth and atmospheric sciences at Purdue University in Indiana as a Fullbright Scholar. van Hooidonk's doctoral research focused on the prediction of coral bleaching events and verification of these predictions. During his time in Miami, Florida at AOML, Ruben will work to further refine coral bleaching prediction schemes and investigate the thermal tolerance of different coral species.

Dr. Ruben van Hooidonk, NRC Associate at NOAA AOML

St. Croix CREWS/ICON station receives makeover

In early August a team from AOML visited the Coral Reef Early-Warning System (CREWS)/Integrated Coral Observing Network (ICON) station near Salt River Bay, St. Croix, U.S. Virgin Islands to replace equipment, upgrade electronics, and clean the station of biofouling. AOML researchers worked in collaboration with staff from the St. Croix East End Marine Park, who coordinated all of the logistics for the station's maintenance operations and provided boating services.

Barnacles and other marine growth are visible on the support chains that anchor the St. Croix station to the ocean floor, as well as on one of the subsurface instruments.

The St. Croix station's last annual visit by AOML was in July 2009, at which time several equipment problems were noted. The last scheduled cleaning for the station occurred in September 2009, after which its local maintenance contract expired.

As expected from having been unattended for 11 months, the station was found to be badly biofouled and in need of attention. AOML divers conducted five dives of approximately 60-70 minutes to swap out underwater instruments, document the station's condition in photos, and complete an extensive cleaning of all surfaces, spectra lines, support chains, and lashings.

The station's shallow CTD (conductivity temperature depth) instrument was found to have lost its power feed from the main station. Although the CTD continued transmitting its data, on April 10, 2010 with its local battery power reserves completely drained the instrument went offline.

noaaresearch

The station's deep CTD also experienced a malfunction and stopped recording its data on January 4, 2010. These equipment failures were diagnosed and repaired, and both the shallow and deep CTDs are now functioning properly.

All of the station's electronics were subsequently replaced, including the control electronics and antennae that have been operating at the site since September 2006. A new navigation light with high-intensity light-emitting diodes (LEDs), which increased the light's range from 3 to 4 nautical miles, was also installed. Additionally, the station's 64-MB flash memory card was replaced with a 1-GB card to increase the capacity for data storage, and nonfunctional instruments—an air temperature sensor, wind monitor, and electronic compass—were all replaced.

NOAA Corps officer of AOML works to clean away marine growth and other debris at the base of the St. Croix pylon.

Left: NRC Associate, Dr. Ruben van Hooidonk (and NRC Adviser, Dr. Jim Hendee, not pictured) will utilize his expertise in climate change research, as well as statistical analysis of satellite sea surface temperatures, to help increase the accuracy and geographic coverage of coral bleaching models and ecoforecasts which are the hallmark of the ICON program

Cooperative Communications for Cognitive Wireless Networks

NRC AFRL Adviser, Dr. John Matyjas, and NRC AFRL Associate, Dr. Weifeng Su, win the 2010 IEEE International Conference on Communications (ICC) Best Paper Award.

Drs. Matyjas and Su received the 2010 IEEE International Conference on Communications (ICC) Best Paper Award in Signal Processing for Communications for their work on ***"The Outage Probability and Optimum Power Assignment for Differential Amplify-and-Forward Relaying."***

The award ceremony took place during IEEE ICC 2010 on 25 May in Cape Town, South Africa. IEEE ICC is the premier, longest-standing, flagship conference of the IEEE Communications Society.

Dr. John Matyjas, NRC/AFRL Adviser to the "Cognitive Radio-Based Wireless Networks" topic and co-author on IEEE ICC 2010 Best Paper Award

Dr. Weifeng Su, NRC/AFRL Associate, presented with the IEEE ICC 2010 Best Paper Award on 25 May 2010 in Cape Town, South Africa

The awarded work proposes a novel differential cooperative relaying protocol which is appealing in next-generation wireless network design due to its high performance and low implementation complexity. In this approach, "cyber smart" amplify-and-forward techniques are proposed in lieu of traditional decode-and-forward packet relaying strategies. As such, intermediary nodes are not required to decode the packets they are relaying. This minimizes information broadcast/disclosure and inherently mitigates potential vulnerabilities associated with cooperating mobile ad hoc nodes. This contribution may revolutionize how unmanned-aerial vehicles (UAVs) (or other air/space assets) are used as wireless relays to support end-to-end wireless network communications.

Approved for Public Release; Distribution Unlimited: 88ABW-2011-0176 dated 19 January 2011.

In contrast to conventional point-to-point wireless communications, cooperative communications enable different users/nodes in a wireless network to share resources (where/when applicable) and cooperate to establish and maintain robust end-to-end communication links through a distributed, resilient, and integrated transceiver strategy that exploits the dynamic nature of the ground/air/space network topology. To this end, the cooperative transceiver design optimizes signal transmissions from both the physical and medium-access control (MAC) layers, whereby each user's information is transmitted not only by the node itself, but also by cooperating users/nodes. Figure 1 shows an illustrative wireless network example where node A would like to send information to node D. If the channel link between nodes A and D is congested or in deep fade, then it would not be possible for node A to communicate with node D in terms of traditional point-to-point wireless communications. However, if nearby nodes B and C can assist node A by forwarding the information to node D, then communications between nodes A and D becomes possible. In such a way, it is inherently more reliable and robust for the destination to receive the transmitted information from node A through multiple communication paths. As a result, cooperating nodes create a virtual multi-input-multi-output (MIMO) system that can significantly increase the link capacity and realize a new form of spatial diversity, also known as cooperative diversity. This novel communications concept has great potential to increase the capacity and throughput/delay performance of future wireless networks.

Drs. Matyjas and Su continue to conduct research and development on this emerging cooperative communication concept to design cognitive wireless networks for future integrated air, space, and terrestrial communications.

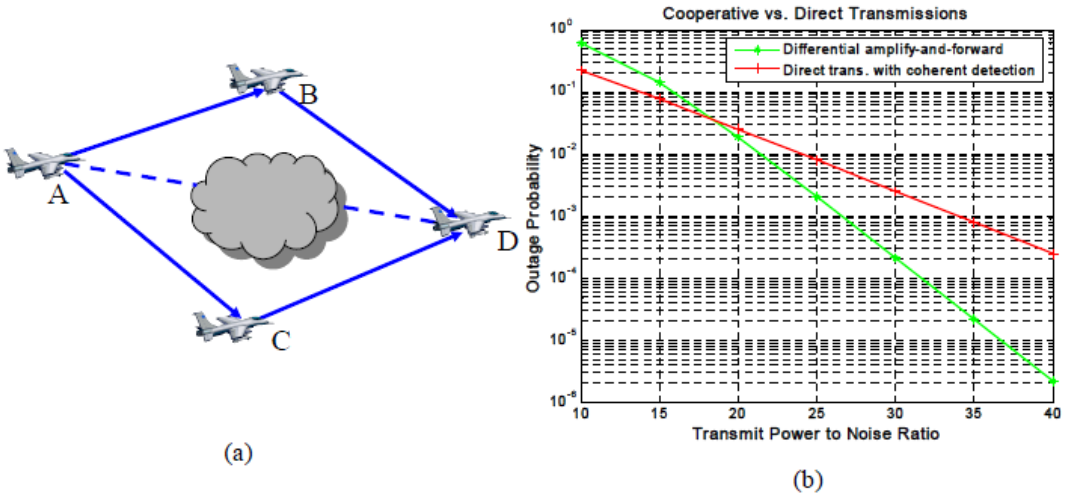


Figure 1: (a) An illustration of cooperative communications with source node A, relay nodes B and C, and destination node D; (b) Comparison of cooperative amplify-and-forward relaying with differential modulation/demodulation versus direct transmission with coherent detection.

Agencies / Laboratories Participating in the NRC Research Associateship Programs

Air Force Research Laboratory	AFRL
Armed Forces Radiobiology Research Institute	AFRRI
Army Aviation & Missile Research, Development, & Engr Center	AMRDEC
U.S. Army Medical Research & Materiel Command	AMRMC
U.S. Army Research Laboratory	ARL
Army Research Laboratory - U.S. Military Academy	ARL/USMA
U.S. Army Research Office	ARO
Chemical and Biological Defense	CBD
U.S. Army Edgewood Chemical Biological Center	ECBC
U.S. Environmental Protection Agency	EPA
EPA/Faculty Fellowship Program	EPA/FFP
FAA-Civil Aeospace Medical Institute	FAA/CAMI
Federal Highway Administration	FHWA
Institute for Water Resources, US Army Corps of Engineers	IWR
Marine Mammal Commission	MMC
Naval Marine Mammal Program	MMP
National Energy Technology Laboratory	NETL
Methane Hydrates Fellowship Program	NETL/MHFP
NIH (NIBIB)/NIST Joint Sponsorship Program	NIH(NIBIB)/NIST
National Institute of Standards & Technology	NIST
Naval Medical Research Center/Naval Health Research	NMRC/NHRC
National Oceanic & Atmospheric Administration	NOAA
Naval Postgraduate School	NPS
Naval Research Laboratory	NRL
U.S.Army Natick Soldier Research, Development & Engr Center	NSRDEC
U.S. Army Res, Dev & Eng Com/Armament Res, Dev & Eng Ct	RDEC/ARDEC
U.S. Army Research, Development & Engineering Command--NVESD	RDEC/NVESD

2011 SCHEDULE

February Review

February 1	Application deadline
February 15	Support doc deadline
March 10-11	Panels/Review Board
March 18	Results available to applicants

August Review

August 1	Application deadline
August 15	Support doc deadline
Sept 23	Review Board
Sept 30	Results available to applicants

May Review

May 1 (2)	Application deadline
May 2	LPR Meeting
May 15 (16)	Support doc deadline
June 16-17	AFPAC & Review Board
June 24	Results available to applicants

November Review

Nov 1	Application deadline
Nov 15	Support doc deadline
January 6, 2012	Review Board
January 13	Results available to applicants

File your TER electronically

The National Academies now supports a web-based reimbursement system. Associates who are U.S. citizens and permanent residents should use the web-based system for travel expense reports (TERs) at this time (nonresident aliens should continue to use the TER in Excel format). Once your Travel Authorization has been approved by NRC, your Program Coordinator will notify you with instructions, user name, and password to file your expenses via concursolutions.com. For more information visit our website www.national-academies/rap; and if you have specific travel questions contact raptravel@nas.edu.

The 2011 World Materials Summit will host its inaugural **Student Congress**, a program for active graduate students and postdoctoral scholars in fields directly related to energy and environmental science, engineering and/or policy, October 8-12, 2011 in Washington, D.C. Using a competitive application process, 50 student and post-doctoral participants from around the world, the best and the brightest next-generation scientists, engineers and leaders, will be invited to join the Summit and work alongside today's energy experts.

The Student Congress is a collaborative initiative of three materials research societies: the Materials Research Society (MRS), the European Materials Research Society (E-MRS) and the Chinese Materials Research Society (C-MRS). For additional information on the Student Congress, including eligibility criteria and online application, go to www.mrs.org/2011WMS. A candidate statement, CV and three letters of reference are required. The deadline to apply is February 1, 2011.

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