

RESEARCH ASSOCIATESHIP PROGRAMS

The Postdoc

Summer 2011

Harold Brown Award

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The Harold Brown Award recognizes significant achievement in research and development that led to or demonstrated promise of a substantial improvement in operational effectiveness of the U.S. Air Force. The award's namesake was a physicist who served as Air Force secretary from 1965 to 1969 and as Defense secretary from 1977 to 1981. Dr. Lynch is the first female recipient of the award since the program began in 1969.

"The NRC Associateship research at AFRL was a wonderful opportunity for me. It led to a permanent position, and to the highest level award from the Air Force to a scientist!"

Candace Lynch



Secretary of the Air Force Michael Donley (left) presents the 2010 Harold Brown Award to Dr. Candace Lynch (right) during a ceremony in the Pentagon on Dec. 15, 2010. The award was named after Harold Brown who served as Secretary of the Air Force from 1965-1969. Dr. Lynch is the first female recipient of the award since its inception in 1969.

A senior scientist from Hanscom Air Force Base, Mass., received the 2010 Harold Brown Award for her breakthrough research in pioneering new infrared technology that will augment aircraft defense and impact numerous Defense Department systems.

Dr. Candace Lynch strengthened aircraft protection from heat-seeking missiles by developing counter-measure device technology involving laser material, specifically with the growth of orientation-patterned gallium arsenide. The research physicist extended her technology to generate terahertz sources used in future imaging systems that enable the warfighter to see through brown-out conditions during helicopter landings or to image concealed weapons through clothing.

"Dr. Lynch's technology breakthrough is not only a national asset, but a testament to her dedication to science with a focus on national security," said Dr. David Jerome, the director of the sensors directorate in the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio. *"Dr. Lynch's efforts as part of the sensors directorate supported the science and technology necessary for superior U.S. air and space systems in intelligence, surveillance, reconnaissance, precision engagement and electronic warfare,"* Dr. Jerome said.

Dr. Lynch received her Bachelor of Science from Massachusetts Institute of Technology in Cambridge, Mass., and her doctorate of philosophy from Brown University in Providence, R.I., and was a NRC Research Associate 2005–2006.

"The Postdoc" highlights research and activities of NRC Associates and Advisers who participate in the agency/laboratory programs with the NRC. Our newsletters are available in print and on our website: http://sites.nationalacademies.org/PGA/RAP/PGA_047804. 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	07/16/11	Niagara Falls, Canada
McNair Scholars Conference-Penn State	07/16/11	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	9/21-11-9/24/11	Austin, TX
Sci & Engineering Alliance-Student Technical Conference	fall-TBD	TBD

Information as of the date of printing

National Research Council Participates in STEM 2011 Postdoc Conference and Career Fair



The sixth annual STEM 2011 Postdoc Conference and Career Fair was held in



June at the Montgomery County Conference Center. It drew approximately 475 postdocs from agencies including NIST, NIH, FDA, NIAID, Naval Research Lab, NASA, Federal Highway Administration, and USDA. 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 SUNY Binghamton, North Carolina A&T, and Yale University.

Dr. Frank Douglas, President and CEO, Austen BioInnovation Institute in Akron, Ohio served as the conference keynote speaker. His inspirational address was courtesy of the conference lead sponsor, the Ewing Marion Kauffman Foundation.

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 and government. 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 30 hiring companies and 17 resource companies there, and a number of postdocs scored interviews with companies for possible employment.

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, REDI is 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.

National Research Council of the National Academies is represented by, left to right: Dr. Eric Basques, Program Administrator, Jane Dell'Amore, Outreach Manager, and Kevin Kocur, Program Promotion.



Postdoc Conference and Career Fair organizing committee received 2011 FLC STEM Award



Members of the Postdoc Conference and Career Fair planning committee receive the Federal Labs

The Rockville Maryland Economic Development, Inc. (REDI) 2010 Postdoc Conference and Career Fair organizing committee received the 2011 Federal Laboratory Consortium for Technology Transfer's (FLC) STEM Award. This award recognizes the committee's outstanding work in support of science, technology, engineering, and mathematics (STEM) education. The conference committee, composed of federal laboratory leaders, economic development officials and private sector partners, was competitively selected from among 13 submissions for the award. A formal award ceremony will take place at the FLC national conference in Tennessee this May.

The committee was recognized for developing a content-rich conference and career fair with inspirational and educational seminars; workshops and presentations from technology leaders and entrepreneurs; and information about traditional and non-traditional career opportunities for STEM postdocs. The annual event also offers sessions on resume writing and interviewing skills. In total, more than 2,250 federal and university laboratory postdocs have been attracted to the conference over a five year period, and more than 151 companies have participated to recruit this top science, technology, engineering and mathematical talent.

In 2010, all 25 recruiting companies and 18 resource organizations called the conference "a good value". More than 450 post docs attended the 2010 event. The Postdoc Conference organizing committee is led by Sally Sternbach, REDI Executive Director, and her staff. *"This conference leverages our local economic development assets and matches local STEM talent with local companies looking for the best candidates,"* says Sternbach. *"The conference program content provides postdoctoral fellows with insight into local business, entrepreneurial and non-traditional career paths and spurs dialogues that keep national and international talent local and help us to expand our economic base."*

Sternbach added, *"On more than one occasion, companies who have recruited onsite have brought those young employees back the following year to help recruit additional talent, a true testament to its value. We are very proud of this award and this dedicated group of volunteers from across the STEM universe who produce it each year."*

The conference committee members honored with the winning of this award are: Gerald Aldridge, Montgomery Works; Mojdeh Bahar, National Institutes of Health (NIH);

Eric Basques, National Research Council (NRC); Ashley Beasley, National Institute of Standards and Technology (NIST); Lynne Benzion, Rockville Economic Development, Inc. (REDI); Brianna Blaser, American Association for the Advancement of Science (AAAS); Amy Cassidy, NIST; Lori Conlan, NIH; John Emond, NASA; Steven Ferguson, NIH; Cathee Johnson-Phillips, National Postdoc Association; Ron Kaese, Maryland Technology Development Corporation (TEDCO); Srinagesh Koushik, NIH; Clifford Lanham, REDI.; Jonathan Lefman, NRC/NIST/NIH; Terry Lynch, NIST; Judith Nyquist, NRC/ National Academy of Sciences; John Pettibone, NIST; Anne Rosenblum, Fairfax County Economic Development Authority; Al Rubenstein, IASTA, Inc.; Tony Stanco, National Council of Entrepreneurial Tech Transfer; Sally Sternbach, REDI; Amanda Wilson, REDI.; and Susan Zeisler, NIST.

"This is an exceptionally talented and dedicated group of volunteers who believe strongly in the value of this education effort, and have collectively devoted hundreds of hours to it," said Mojdeh Bahar of the NIH. *"I am proud to be a part of this team and to see the fruits of our efforts year after year."*

The conference is funded by sponsors, recruiters, and supported by nominal post doc registration fees. The Montgomery County Department of Economic Development donates the use of the Bethesda North Marriott Conference Center to this effort. The 2011 Postdoc Conference and Career Fair will be held on June 15. Sponsors and recruiters are being accepted at www.PostdocConference.com. To become a member of the organizing committee or to learn more, contact Amanda Wilson at [REDI \(wilson@rockvilleredi.org\)](mailto:wilson@rockvilleredi.org)

The mission of Rockville Economic Development, Inc. (REDI) is to assure the City's future economic vitality. From accessing funding sources to workforce development — from educational programming to market intelligence, from advisory services to introductions to key decision-makers—REDI helps companies grow by providing knowledge, access, resources, and direction to companies at all stages of growth. REDI offers its resources to the community free-of-charge, and welcomes inquiries and referrals. For more information contact www.RockvilleREDI.org

Best Wishes, Marley!



Thank you, Marley, for *your* three years of energy, innovation, and leadership within our NRC Fellowships Office over the past years. We send to you our best wishes as you move forward into the position of Financial Consultant for Accenture

Marley McDermott joined The National Academies in September 2008 as a Financial Associate for the Fellowships Office. She worked primarily with the Ford Foundation Diversity

Marley McDermott, NRC Research Associateship Programs

Fellowship Program, the Jefferson Science Fellowship Program, and Associate Programs with the EPA and Air Force.

Marley graduated from Lehigh University with a B.S. in Accounting and M.S. in Accounting and Information Analysis. She is a Certified Public Accountant (CPA) and worked as an auditor with a public accounting firm prior to joining The National Academies. Outside of work, Marley is actively involved in charitable work with the Avon Foundation and Higher Achievement. Program. (see page 7)



*"Dear Friends,
I am truly grateful to have worked with such a wonderful group of people and for the experiences I have had in the Fellowships Office. Thank you for the support, guidance and encouragement you have provided me during my time at the Academies. I wish you all the best in your future endeavors. Please stay in touch."*

Marley McDermott

The Original 3rd Tuesday Network

NO CHARGE TO ATTEND

It's a Cash Bar with delectable hors d'oeuvres
Great Opportunity for lots of "B2B" Networking
Free Valet Parking is available.

<http://thirtuesdaysevents.eventbrite.com/>

[Ron Dobransky, Angie Segal & Ron Robbins](#)

Where

Clydes Tower Oaks Lodge
2 Preserve Parkway
Rockville, MD 20852

Reminder to Advisers:

The 2011 Research Opportunity Update process is going on right now. It's the second year of our online revision management tool to help you keep your opportunities current. If you haven't already, you will soon 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.

Say it ain't so, Joe!

6

"The retirement of Joe Finan is not a welcome event. In fact, the last three times I was told that Joe was retiring, it didn't happen. And I am told that his colleagues insisted he stay because only he knew how to help them get their jobs done. That's my definition of an indispensable staff member. I do think, however, that this retirement may stick, because he has 'outlived' the technology for which he was responsible, and which provided the data backbone of the office. Joe, almost none of us can aspire to accomplish that. For that achievement, you deserve a long and fulfilling retirement.

I do bring greetings and thanks from the leadership of the National Research Council, as well as the handsome present that you see on the table. Frankly, this present is an inadequate expression for the loyalty and diligence you demonstrated in this organization over decades. The intangibles you brought to the job – your work ethic and dedication, your unfailing cordiality towards colleagues, and your fascination with the complex problems that were presented to you – are what we will remember. We may be able to cover your job requirements, but we will never replace those human qualities that were part of the glue that held together the Fellowship Office. Thank you, Joe."

Rich Bissell, Exec. Dir.
Policy & Global Affairs

Joe Finan provided programming and systems analysis support for the RAP program, including the online application process, booklet site, and in-house tracking system for following associates on tenure. In retirement, Joe remains a recreational biker, great cook, bread baker, and is still learning to play the piano. But now he is also enjoying more 'quality time' with his dear wife, Kate, and more traveling to see their children and grandchildren.

"Joe is truly one of the brightest people I have met while working at the Academies. He's professional, courteous and easy to get along with. Our lunch outings at Chadwick's were legendary and thanks to Joe, I put on a few extra pounds while working at the Georgetown office. If I ever needed any assistance he was the first one to provide it. Developing DataRap could not have happened without his guidance and desire to make a great application for OSEP staff be his top priority.

He will be sorely missed & want to wish him a wonderful retirement and start of many new and exciting adventures in the future."

Raed Turkmani
Information & Technology Services



"I worked with Joe for many years, and he is by far one of the nicest people you would ever want to know. He is a fantastic teacher, and has patience beyond belief. He's quick to see the humor in anything. He always listened intently, helped solve problems, gave credit to his co-workers, and could multitask like no other!"

Joe's funny stories about his family, his kids, and now his grandkids kept us laughing all the time! Even though he warned me long ago about his plan to retire in 2011, I still cried at his retirement party. But, I was able to keep it together when everyone was saying their final good-bys by just saying ... 'Have a great weekend, Joe; see you on Monday!'"

Maria Crocco
Associateship Programs

"Words that come to mind when I think of Joe: dedicated, brilliant, professional, humorous, intelligent, approachable, tolerant

You have taken us out of the 20th century from mainframe to mag-card to Wang to pc and beyond.

A man of few words like 'All righty then', you let me do things to learn on my own, yet you were there if I needed help. You were quick to assist in any situation at any time!

This office will not be the same without you! Your dedication, professionalism, and your genius intelligence has worked magic to make everything work properly. You have always been approachable and a multi-tasker. In my book, that is key to the foundation of a working office!

Joan Rosenthal
Fellowships Office

"Joe is a wonderful person and I couldn't have asked for a better co-worker. He made my job easy—always there to answer my every question, even the really dumb ones. When we were first transitioning from booklet to Web processing, he wrote all the scripts and programs that made it a smooth transition. I couldn't have done it without him. Whenever there was a problem, he always managed to find a solution. He had a lot of patience and never seemed to get frustrated. On the personal side, he always told the most interesting stories. He's a great cook and has baked many delicious treats for the office."

Marla Allentuck
Associateship Programs

Joe, we hope your future is a wealth of joy — with your wife, Kate, your children and grandchildren, travel, music, entertainment, creativity, food, drink, memories, laughter. We thank you for all you have done here at the Fellowships Office, and we look forward to reports of happy times! We wish you the very best!

Your National Academies' family

“Joe and I started before computers on every desk, before internet, before Metro, definitely before Facebook and Twitter and Skype and Webex and Google. I was hired to do clerical coding of information that would become data in large scale employment and education databases, which are still in great use and demand today. Meeting Joe at that time, when offices were on the verge of a quantum leap in how work was performed, was so beneficial to me. I needed to figure out what I should learn in order to maintain and hopefully improve my employment choices in the future, and Joe helped me see my way through this.”

As a liberal arts major freshly out of college who had worked in a fabric store before coming to the Academy, I was clueless about my role in an organization like NAS. I was really only interested in a paycheck back then, to be honest, and the occasional happy hour. But now with a few years of wisdom behind me, I can appreciate how Joe really helped so many non-technical staff get a good foundation of appreciation for data processing theories and practices. He helped the paper pushers see the advantages of automation and technology in our jobs, and how it could make some of our tedious clerical tasks more streamlined. Then he made it work and showed us what we needed to learn to be a part of it.

Joe was endlessly patient, but did expect some effort from us and wanted to see progress and results. And because he was so earnest, I did not want to disappoint him. So I figured out concepts and became open-minded about how technology can change the workplace one task at a time, and tried to apply myself, and I can honestly say I still use those same skills 35 plus years later. As Julie Clarke and I agreed at Joe’s retirement party last month, ‘We wanted Joe to think we were smart.’ That was a great gift from a very generous man, how much faith he had in us and all that knowledge he shared.



God Bless Joe and keep him safe in his new adventures!

Eileen Milner
Office of Administration

Our best wishes, Liz!

Thank you, Liz, for your three years of energy, innovation, and leadership within our NRC Research Associateship Programs over the past three years. We send to you our best wishes as you move forward into a graduate degree in International Relations at Johns Hopkins University.

Liz Decker started working for the Fellowship Office of The National Academies in September 2008. As a senior program associate, she worked on a variety of programs and projects. She focused her time on the administration of the Jefferson Science Fellowship and the Vietnam Education Foundation program, coordination of selection processes, organization of conferences and events, and management of the programs’ day-to-day progress. Liz was also a program coordinator for the Research Associateship Program with NIST (ARRA), and she maintained the Fellowship Office website while serving as the assistant to the Fellowships Director, Dr. Ray Gamble. Prior to her time at the National Academies, Liz worked at the German Marshall Fund of the United States and at a small public relations firm in Washington. She enjoys traveling, gardening and volunteering with youth in DC.



Liz Decker, NRC Research Associateship Programs

Best wishes, Liz, and thanks!

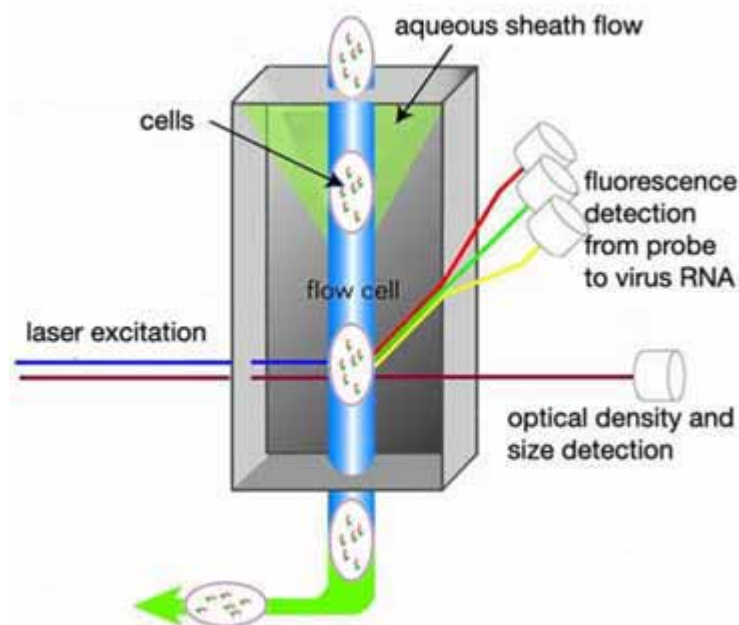
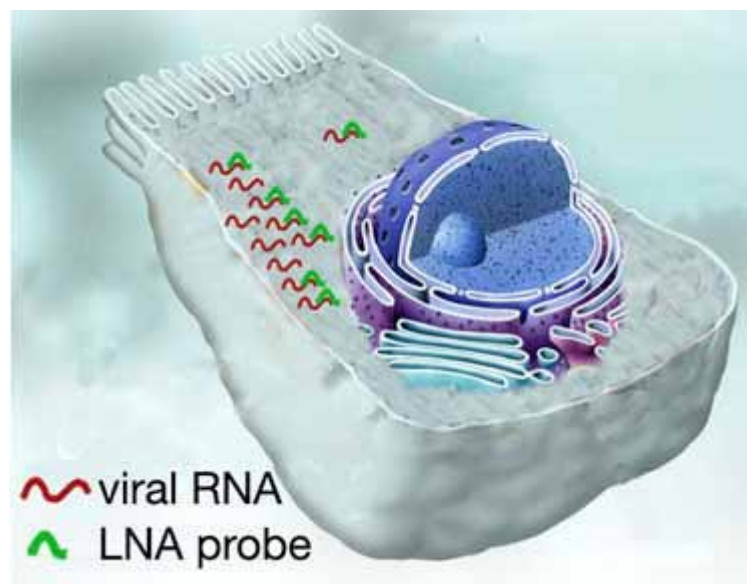


“The National Academies (NAS) recently established a Community Fund, to which the Presidents of the NAS have designated \$20,000 per year to assist local community organizations where NAS employees volunteer. Twice per year, the fund plans to distribute \$2,500 to four community organizations, based on requests by staff. In the inaugural effort of the fund, the community organization of two Fellowships Office staff was chosen to receive funds. Ms. Marley McDermott and Ms. Liz Decker both submitted applications for the Higher Achievement program, an after-school and summer academic program that challenges middle school students to meet their full potential in three key areas: academics, social skills, and leadership. Both Marley and Liz have volunteered as mentors to small group of middle school students for the last three school years. They find it both rewarding and challenging, and look forward to seeing the great places their students go as a result of their experiences in the Higher Achievement program. The generous donation from the Community Fund will be used to sponsor several students in the coming school year.”

<http://www.higherachievement.org/>

Technique tracks viral infections, aids development of antiviral drugs

Scientists at the Naval Research Laboratory Center (NRL) for Bio-Molecular Science and Engineering have developed a method to detect the presence of viruses in cells and to study their growth. Targeting a virus that has ribonucleic acid (RNA) as its genetic makeup, the new technique referred to as locked nucleic acid (LNA) flow cytometry-fluorescence in situ hybridization (flow-FISH), involves the binding of an LNA probe to viral RNA.



Top: An LNA probe binds to complementary viral RNA inside an infected cell. Thousands of these cells are then run through a flow cytometer

Bottom: As the cells pass through a laser, they are excited and the probe fluorescence is measured. *Chemistry Pictures (2006), Union Biometrica (2010)*

In collaboration with researchers at the NRL Lab for Biosensors and Biomaterials.

Individual parts of the technique have been developed previously, but **Dr. Kelly Robertson, NRC Associate, and Dr. Eddie Chang, NRC Adviser**, demonstrate for the first time that the combination of LNA probes with flow-FISH can be used to quantify viral RNA in infected cells. This also allows the scientists to monitor the changes in viral RNA accompanying antiviral drug treatment.

Once the probe is bound to the viral RNA inside mammalian cells, it is tagged with a fluorescent dye, then thousands of these tagged cells are measured rapidly by **flow cytometry** - a method for counting and examining microscopic particles, such as cells and chromosomes, by suspending them in a stream of fluid and passing them by an electronic detection apparatus.

"The ability to rapidly measure thousands of cells for the presence of virus, sets this technique apart from currently used methods to monitor viral replication," said Robertson. Traditionally, antibodies used to detect viruses must be produced and calibrated for each specific strain and are highly susceptible to viral mutations. Assays commonly used for quantifying viral loads and for drug development can be time consuming and rely on visible signs of cell damage, which is not produced in all viruses and can take long periods of time to occur.

Techniques such as quantitative reverse transcription-polymerase chain reaction (qRT-PCR), microarrays, and enzyme-linked immunosorbent assays (ELISAs), while highly sensitive, involve the lysis [the breaking down] of cells prior to measurement and are therefore unable to provide information about cellular viability, infected cell phenotypes, percentage of infected cells or the variation in infection among a cell population. The LNA probe differs from traditional nucleotide probes by binding more tightly to its target RNA.

LNA-flow FISH presents a fast and easy way to screen for compounds with antiviral activity and could be adapted for monitoring infections in the blood for vaccine therapy and development. This method adds a necessary tool for several emerging areas in cell biology that enables the use of high throughput measurements for entire populations and improves statistical analyses.

"This method can be expanded by adding more than one kind of LNA probe to enable multiple detection of different viral and host RNA," adds Robertson. *"The multiplexing enhancement can be used to better understand infectious agents, allowing this technique to be used to aid in the development of antiviral drugs for a variety of viruses."*

LNA flow-FISH offers an advantage over other techniques due to simplicity and superiority. Methods involving genetic recombination of the virus to express a fluorescent protein as a means to mark the presence of virus can utilize **flow cytometry** for large-batch analysis of infected cells. However, an exception to this approach is viral strains that have not acquired genetic mutations, known as wild-type viruses (such as strains of Human Immunodeficiency Virus-HIV), which would require a large initial investment of labor for engineering each virus of interest.

Associates honored at NRL Annual NRC/ASEE Postdoctoral Publication Awards Ceremony

★ *Forty-Third* ★

ALAN BERMAN

RESEARCH PUBLICATION AND EDISON PATENT AWARDS AND
THE SIXTH ANNUAL NRC/ASEE POSTDOCTORAL
RESEARCH PUBLICATION AWARDS



RECEPTION AND DINNER

Friday, March 25, 2011

Joint Base Anacostia-Bolling
Officers' Club

On Friday, March 25, NRL hosted its Annual Research Publication Awards Dinner (ARPAD) at the Joint Base Anacostia-Bolling Air Force Base Officers' Club. Now in its 43rd year, ARPAD recognizes the authors of the best NRL scientific publications of 2010. ARPAD was established in 1968 to recognize the authors of the best NRL publications each year. These awards not only honor individuals for superior scientific accomplishments in the field of naval research, but also seek to promote continued excellence in research and in its documentation. In 1982, the name of this award was changed to the Alan Berman Research Publication Awards in honor of its founder.

There were 136 NRC and ASEE postdoctoral associates on board during 2010. Twenty-one papers published by these postdocs were considered for this award, and six were selected for recognition. They represent 40 authors. The names of the authors with the titles and abstracts of their publications are listed under their respective research divisions.

Sarah Glaven

Bio & Molecular Science & Engineering

Kelly Robertson

Bio & Molecular Science & Engineering

Adam Friedman

Electronics Science & Technology

Rachel Snider

Bio & Molecular Science & Engineering

Barry Rothberg

Remote Sensing

Zhongqing Wei

Chemistry Division

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.

Of the 289 papers considered for the 2010 awards, 33 were selected for recognition. They represent 165 authors. The names of the authors with the titles and abstracts of their publications are listed under their respective research divisions.



Dr. Barry Rothberg, NRC Associate

NRL also recognizes patents as part of its annual publication awards program. The NRL Edison (Patent) Awards were established in January 1991 to recognize NRL employees for outstanding patents issued to NRL by the U.S. Patent and Trademark Office during the preceding calendar year. The awards recognize significant NRL contributions to science and engineering, as demonstrated by the patent process, that are perceived to have the greatest potential benefit to the country. Of the 88 patents considered for 2010, three were selected, representing 11 inven-



Dr. Kelly Robertson, NRC Associate

tors and three patent attorneys. They are listed under the NRL Edison (Patent) Awards.

Distinguished ARPAD guests this year included **Dr. H. Ray Gamble**, Director, NRC Associateships Programs and his wife **Corrine**; **Dr. John Montgomery**, NRL Director of Research; and **CAPT Paul Stewart**, NRL Commanding Officer, and his wife **Sunny**.

Following the reception and dinner, Dr. Montgomery gave the annual ARPAD remarks. NRL Commanding Officer, Capt. Paul Stewart, presented the awards as Dr. Montgomery called the recipients to the stage.



Dr. Rachel Snider, NRC Associate

Nature's Kidneys — wetlands project between Wright State University and Air Force Institute of Technology

Scientists at Wright State University and the Air Force Institute of Technology (AFIT) of the Air Force Research Laboratory (AFRL) at Wright-Patterson Air Force Base in Dayton, Ohio are conducting an experimental project at Wright-Patterson Air Force Base (WPAFB) to demonstrate how wetlands can help clean up the environment by removing toxic compounds from the groundwater and soil.

“Our findings show that microbes are destroying very toxic chlorinated, organic compounds in our research site,” said Dr. Abinash Agrawal, associate professor in Wright State’s Department of Earth and Environmental Sciences and principal researcher of the wetland project. ***“Many wetlands have been established by scientists throughout America to control sediments and nutrients, but ours is the only wetland that I am aware of that has been established to investigate destruction of toxic organic compounds.”***

Agrawal said the goal of this project has significant economic implications. ***“Chlorinated organic compounds are widespread groundwater contaminants that cause most of the groundwater pollution in this country,”*** he explained. ***“This contamination affects drinking water quality at hundreds of thousands of sites in the United States. Since the cost of cleaning up these sites by existing techniques range in tens of billions of dollars, a passive treatment approach by natural processes using the wetland is a cost-effective approach for groundwater remediation and site cleanup.”***

In this cooperative venture between Wright State and AFIT, Agrawal works closely with Dr. Michael Shelley, professor of environmental science and engineering at AFIT and NRC Adviser to NRC Associate, Dr. Garrett C. Struckhoff, who is intricately involved with this project along with Dr. James Amon, Wright State professor emeritus of biological science.

“In humans, our kidneys function to filter out the toxins from our body, and we are finding the wetland to be nature’s kidneys that filter out toxic pollutants present in the water passing through it,” explained Agrawal, a biogeochemist with more than 15 years of experience in studying the environment, particularly wetlands, water quality, and groundwater contamination. According to Shelley,



Wright State environmental scientist Dr. Abinash Agrawal, (right) and Dr. Michael Shelley at their wetland site at Wright-Patterson Air Force Base. The white tubes in the background represent some of the 200 monitoring wells where the researchers are studying how microbes can remove toxic compounds from groundwater and the soil. Drs. Shelley and Struckhoff work together

“The wetlands are really nature’s way of cleaning up many contaminants.”

This experimental wetland research site is a small 70-by-100-foot parcel in Area C at the Air Force base. The project started in 1999 with conversion of the vacant land into a wetland marsh, dominated by standing water and brush and sponsored and funded by several government agencies. The contaminated water in the experimental wetland flows upwards to optimize the treatment process. Some 200 monitoring points have been established within the wetland, and a team of scientists from diverse disciplines is investigating the process of pollutant destruction in the shallow soil and groundwater.

“We are looking at the interactions between microbes and soil and water from a chemical and biological perspective,” Agrawal said. ***“Microbes are present everywhere in our soil and water, but they are more active in a wetland environment, probably because of the greater availability of food and moisture content these swampy areas possess.”***

Agrawal said seed funding for the laboratory work prior to building the wetland research site was provided by the Dayton Area Graduate Studies Institute. Further funding for field research is provided by AFIT annually. The funding for this project started out in the range of \$40,000 annually but now involves annual allocations in the \$200,000 range, in addition to analytical instruments and support for post-doctoral fellowships. ***“Over the years, the grant total the project has received is between \$2 and \$3 million,”*** said Shelley, who explained that over time the project would save millions of dollars for the Air Force and billions of dollars for industry across the country.



Dr. Garrett C. Struckhoff, NRC Associate

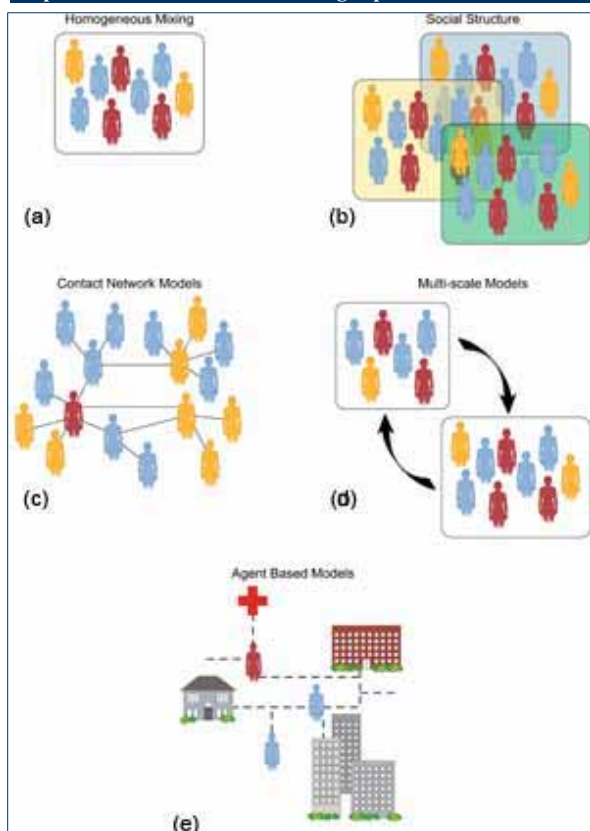


Figure 1: Increasingly structured and complex ways to model the spread of a disease in a population. Each color represents a disease stage: susceptible, infected, or recovered. (a) Homogeneous mixing models treat each individual at a given disease stage in the same way as the average of all others at that disease stage. Structure can be added by decomposing populations into distinct demographic groups (b), where the spread of a disease will depend on the particular group. (c) In a contact network model, links connect individuals while multiscale models (d) involve connections between subpopulations. (e) Agent-based models can track individuals in very large populations on the order of cities the size of Chicago.

Rewiring for adaptation

The idea behind adaptive behavioral epidemiology is that groups and individuals respond to the knowledge of a disease threat by changing their habits to avoid interactions with those who are contagious. Network-based models take this adaptive behavior into account by allowing the network to “rewire” its connections.

Epidemics of contagious diseases have the potential to wipe out entire populations. While medicine is making enormous advances in finding ways to treat and cure many of these diseases, it is perhaps equally important to develop ways to curtail their spread by disrupting infectious contacts. Effective vaccine distribution, particularly when resources are scarce, as well as educating groups and individuals on how to react to the presence of a disease threat, can radically diminish the chance of a disease epidemic.

In this respect, epidemic models can be enormously helpful in understanding the rate at which diseases spread and how to control them. For these models to be most effective, however, they have to be able to take into account that individuals

and groups will adapt their behavior as they gain more information. This is an increasingly relevant factor as radio, television, and the internet speed up the rate at which people learn about a disease threat and how best to avoid catching and spreading it further. If the latest scare over the H1N1 (swine flu) virus is any indication, people appear to be more conscious than ever of epidemics. Whether the information that is delivered by the media is accurate is in itself an important issue, but regardless, it is clear that in many cases, people will attempt to reduce their chances of infection by taking actions to eliminate contact with contagious individuals, or through available vaccination. This sort of social adaptation on the level of an individual can change the dynamics of the social contact network, which in turn alters the progression of disease.

Behavioral epidemiology is defined here to be the study of the effects of social response to the threat of disease. In this article, we will discuss recent progress in designing network models that can account for “adaptive behavior” and tackle the

problem of the spread of infectious diseases in a dynamic population. We start by giving an overview of simpler models, where the population is assumed to be homogeneous, and show how to progressively make these models more complex and realistic: first by considering that distinct demographics may behave differently, then that interactions along particular “links” in the network may change with time, and ultimately, allowing the network itself to “rewire” to

reflect the way humans modify their social contact behavior.

These networks are designed to model the real-world problem of disease spread, but at their roots are the computational tools developed in the fields of mathematical biology and statistical physics. The spread of an epidemic is often assumed to be a stochastic process, and just as in a many-body statistical system, it is possible to find phase transitions. (As an example, the phase transition, or “threshold,” at which diseases begin to spread across the entire network is often approached via percolation theory.) For this reason, epidemiological models rely on progress in solving problems in statistical physics and, since the models can be tested against real observations from data, also provide important feedback on these physics ideas.

In the presence of a disease—especially those that are highly publicized—individuals and societies will adapt their behavior. For example, during the 2002–2003 SARS outbreak in China, people began washing their hands more often and wearing masks and those who were sick sought out health services more frequently. In the language of networks, these can be considered behaviors that, respectively, reduce the effective strength of links between individuals and change the contact network itself.

New models of epidemics that make use of the adaptive behavior of the population will be able to make better

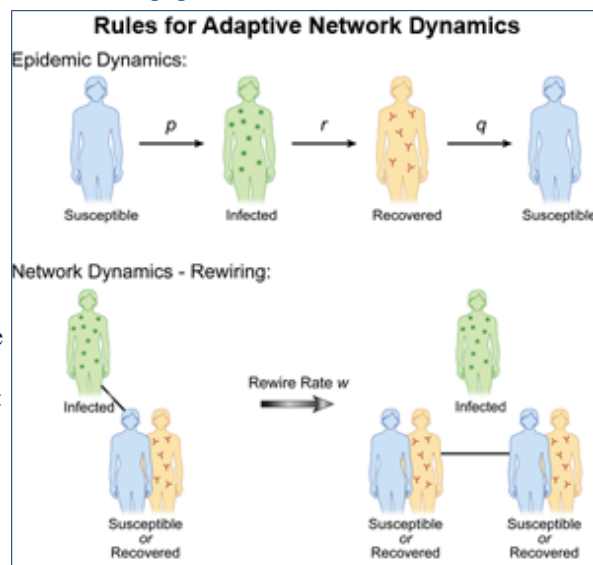


Figure 2: The basic components of an adaptive network model describing disease spread. (Top) The rates at which a susceptible individual becomes infected, an infected individual recovers, and a recovered individual becomes susceptible again are given by p , r , and q , respectively. In an adaptive network (bottom), the links between individuals at different stages of the disease can change (rewire) to reflect the fact that, for example, a susceptible may avoid contact with an infective. The rate at which the network can rewire is described by the parameter w .

predictions of when an outbreak will occur. Preliminary analysis of the effect of vaccine controls that work synergistically with the rewiring of the contact structure may indeed lead to better strategies for eradicating diseases. This may be especially true in the presence of limited resources. We expect that combining adaptive networks with other more complex population models will help us better predict and avoid epidemics. Moreover, we expect that understanding adaptive responses to a disease in a population will lead to new research directions and contributions to the field of behavioral epidemiology. *End*

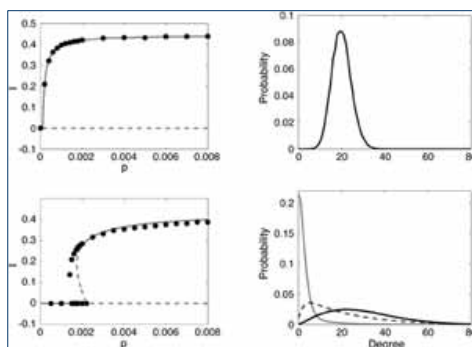


Figure 3: Rewiring in an adaptive network affects the rate at which individuals become infected. On the left, rewiring (bottom left) reduces the fraction of infectious individuals I in a finite population for a given infection rate p compared to the case where there is no rewiring (top left). Rewiring also introduces bistable behavior. On the right, rewiring (bottom right) will also lead to different probability distributions in the number of connections (the degree) associated with an infective (light grey), susceptible (black), or recovered (dashed). For example, with no rewiring (top right) all disease stages have approximately the same probability for a given degree, but with rewiring, infectives are most likely to have a lower degree than susceptibles or recovered.

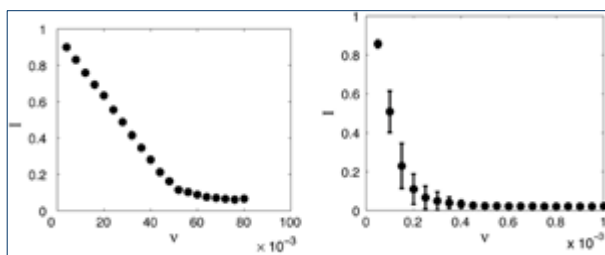


Figure 4: Adaptive network models suggest that vaccinations can be delivered at a lower frequency (v). The plots show the average infected fraction I versus v for no rewiring (left) and rewiring (right). Two orders of magnitude less vaccine is needed to suppress infection in the adaptive network.

This "Postdoc" newsletter captures only the introduction and the conclusion of this wonderful paper. Please see the entire article with larger images on <http://physics.aps.org/articles/v3/17>

Acknowledgements: Office of Naval Research, the Army Research Office, and the Air Force Office of Scientific Research, National Institute Of General Medical Sciences or the National Institutes of Health.

Best Paper Award at FLAIRS-24

Dr. David Aha, NRC Adviser, and Matt Molineaux, GMU Ph.D. candidate holding "Best Paper Award"



A team of researchers from the Naval Research Laboratory (NRL) received the "Best Paper Award" at FLAIRS-24 (the 24th Florida Artificial Intelligence Research Society Conference), sponsored by the Association for the Advancement of Artificial Intelligence. The paper, *Active and Interactive Learning of Goal Selection Knowledge*, describes NRL's research on goal-driven autonomy.

Goal-driven autonomy, or GDA, is a meta-reasoning model of high-level autonomy that permits agents to self-select their goals. The researchers' paper describes algorithms in which a GDA agent dynamically interacts with a subject matter expert to acquire and confirm knowledge that maps goals to be formulated in response to encountering different types of operational situations.

The researchers focused their study on demonstrating the utility of this approach in the context of scenarios defined using the Tactical Action Officer (TAO) Sandbox, a training simulator used at the Surface Warfare Officers School. Future objectives for the research include assessing GDA approaches for controlling unmanned underwater and unmanned sea surface vehicles.

The authors on the paper were Jay Powell, NRL's Summer Employment Program; Matt Molineaux, Knexus Research Corporation and George Mason University Ph.D. candidate, and **David Aha, NRC Adviser in the Information Technology Division.**

This collaboration was supported by a project, titled "Evaluation Support and Event Discovery for Case-Based Active Transfer Learning," that is sponsored by ONR as part of the Active Transfer Learning Program. Powell collaborated on this project through NRL's Summer Employment Program during the summer of 2010 and has recently received his doctorate from Indiana University.



Leah Shaw received her Ph.D. in physics from Cornell University in 2004. Her research included generating and analyzing new biophysical models for protein synthesis and chemotaxis in bacteria. She was awarded a National Research Council Associateship to work at the Naval Research Laboratory, where she made discoveries in synchronization of delay coupled nonlinear systems, with applications to semiconductor and fiber laser arrays, one of which is patent pending. Currently a professor in the Applied Science Department at the College of William and Mary, she studies population dynamics, nonequilibrium statistical mechanics, and biologically inspired stochastic dynamical systems. She has made significant inroads in studying the spread of multistrain diseases on large populations, as well as the spread of epidemics on networks.



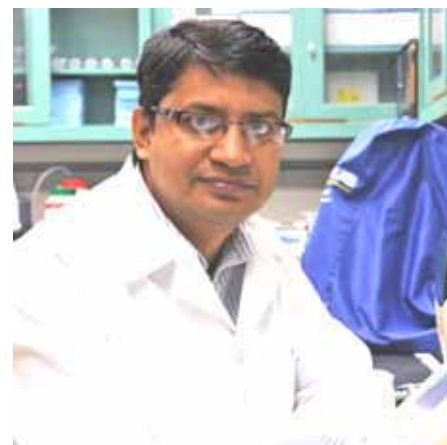
Ira Schwartz received his Ph.D. in applied mathematics from the University of Maryland in 1980. He then was awarded a National Institutes of Health fellowship to work in mathematical biology, during which he studied chaotic systems in population dynamics with an emphasis on epidemiology. His current position at the Naval Research Laboratory is head of the Nonlinear Systems Dynamics Section, coordinator of the Applied Mathematics Task Area and NRC Adviser. The main themes of his work have been mathematical and numerical techniques of nonlinear dynamics and chaos, and most recently, nonlinear stochastic analysis and control of coupled systems and networks. He has received numerous awards, including the US Navy Technology Transfer Award for Nonlinear Control and Tracking of Nonlinear Systems. Several of his theoretical discoveries developed in nonlinear science are currently patented, or patent pending.

Tocopherol succinate protects mice against radiation-induced gastrointestinal

The purpose of this study was to elucidate the role of α -tocopherol succinate (TS) in protecting mice from total-body irradiation-induced gastrointestinal syndrome. CD2F1 mice were injected subcutaneously with 400 mg/kg of TS 24 h before exposure to different doses of ^{60}Co g-radiation and 30-day survival was monitored. Jejunum sections were analyzed for crypt and villi, and apoptosis (terminal deoxynucleotidyl transferase dUTP nick end labeling - TUNEL). The crypt regeneration in irradiated mice was evaluated by 5-bromo-2-deoxyuridine (BrdU). Bacterial translocation from gut to heart, spleen, and

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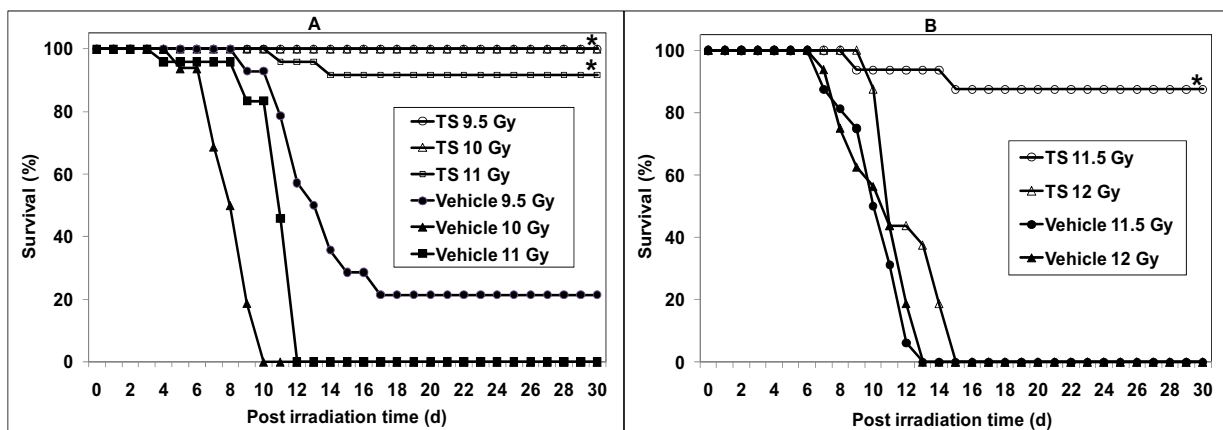
liver in TS-treated and irradiated mice was evaluated by bacterial culture on sheep blood agar, colistin-nalidixic acid, and xylose-lysine-desoxycholate media. Our results demonstrate that TS enhanced survival in a significant number of mice when irradiated with 9.5, 10, 11, and 11.5 Gy ^{60}Co g-irradiation. TS also protected intestinal tissue of irradiated mice in terms of crypt and villus numbers, villus length,



Pankaj K. Singh, NRC Associate, AFRRRI

and mitotic figures. TS treatment decreased the number of TUNEL-positive and increased BrdU-positive cells in jejunum compared to vehicle-treated mice. Further, TS inhibited gut bacterial translocation to heart, spleen, and liver in irradiated

mice. Our data suggest that TS protects mice exposed to high doses of radiation-induced gastrointestinal damage by inhibiting apoptosis, promoting regeneration of crypt cells, and inhibiting translocation of gut bacteria.



Kaplan-Meier Survival curve: Dose responses of TS for radioprotection are shown when administered 24 h prior to ^{60}Co g-irradiation



Left to right : Samuel Emery (NRC Associate), Brian Little (NRC Associate) and family, Sam's wife Jenna, Uttam Chakravarty (NRC Associate)

Happy Hour: tonic for Elgin Air Force Base NRCs

continued on next page

There is a common disease among post-docs brought on by spending WAY TOO MUCH TIME alone in their laboratories. Symptoms include voluntary sleep deprivation, pale skin, red eyes, and an obsession with data analysis. If left untreated this disease leads to a complete loss of social skills. Fortunately the NRC post-docs (and former NRC post-docs) working for the Air Force Research Labs at Eglin Air Force Base in Florida have re-discovered a simple and relatively painless cure. The treatment protocol, suggested by the alternate Laboratory Program Representative Dr. David Jeffcoat, is to gather for a group treatment session at a local establishment that hosts a social phenomenon known as the "Happy Hour". While ingesting ½ price appetizers and their beverage of choice the post-docs discuss their career plans, their research, the quirks of their mentors, and any lingering pain and suffering caused by the completion of graduate school. The first group treatment was organized by Dr. Jennifer Talley and held on the 17th of February 2011 at The Boathouse Landing in Valparaiso, Florida. This restaurant faces Tom's Bayou off the Gulf of Mexico and libations can be consumed at the water's edge. This particular day brought a dense wall of fog, but many of the group braved the conditions to gather together for fried pickles, hush puppies, calamari, beverages, and good conversation. They were, unfortunately, out of oysters. The AFRL post-docs plan to attend bi-monthly group therapy sessions, heroically exploring the surrounding area scavenging for good "Happy Hours".

Jennifer Talley
Former NRC Associate



Left to right
Emily Fossum
former NRC Associate

Uttam Chakravarty
NRC Associate

Jennifer Talley
former NRC Associate

Ben Dickinson
former NRC Associate

Adam Rutkowski
former NRC Associate

Samuel Emery
NRC Associate

Brian Little
NRC Associate

NRC will be represented at the ...

2011 EPA STAR Graduate Fellowship Conference

The 2011 EPA STAR (Scientists to Achieve Research) Graduate Fellowship Conference will take place at the Georgetown University Hotel and Conference Center, Washington, DC, September 19-20, 2011. Every other year, EPA's National Center for Environmental Research sponsors a conference that provides an opportunity for STAR Fellows to meet and exchange ideas, present their projects and results to date, grapple with real-world environmental decision-making issues, and meet influential officials from EPA and other public, private, and non-governmental organizations. (202) 687-3200 or (888) 902-1606; www.acc-guhotelandconferencecenter.com

tạm biệt và cảm ơn bạn, Peggy— “goodbye” and “thank you”!

Dr. Margaret (Peggy) Petrochenkov will be leaving her position as Program Officer at the National Academies on August 25, 2011.

Peggy began working in the Fellowships Office (FO) of the National Academies in 1989, and, over the past twenty-two years, she has worked diligently on many programs and projects, including assembling evaluation panels for various fellowship and Research Associateship programs.



Dr. Petrochenkov in the Fellowships Office of the NRC

Over her long tenure with the Fellowships Office, Peggy has represented the FO at numerous professional meetings, developed and refined program guidelines, worked on publicly and privately funded programs, improved and expanded the FO web presence, and maintained lists of sources of fellowship support for those visiting the FO web site.

Peggy devoted expertise and energy, for years, to the semi-annual meeting of the Fellowship Roundtable. Participants of the Roundtable are administrators of various graduate and postdoctoral fellowship programs. During her direction of the Roundtable, the list of Fellowship Roundtable participants expanded to approximately 100 participants. The Fellowship Roundtable addresses issues of importance to program administrators. Topics include current funding levels, advancements in the use of technology, assessment practices, and other topics such as the most cost-effective means of evaluating applications.

In 2009, Peggy received an Individual Distinguished Staff Performance Award for her role in producing “The Changing Face of Science,” a publication highlighting career achievements of researchers who bring diversity to the academy and to research. The three Presidents of the National Academies – the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine - endorsed the production of this attractive and timely publication.

We wish every success to Peggy Petrochenkov who assumes an important role as Program Officer of the Vietnam Education Foundation. The Fellowships Office will miss her dedication and knows that VEF will be enhanced and enriched by her employment there.



Peggy in award-ceremony photo



Peggy with Ron Mickens, Ford Fellow, Clark Atlanta University, and Randy Higgins, NRC

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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

2011 World



Materials

Summit-STUDENT CONGRESS

Keck Center of the National Academies and L'Enfant Plaza Hotel, Washington, D.C., October 8 – 12, 2011

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. (Sandra DeVincent Wolf, Ph.D., Materials Research Society, 506 Keystone Drive, Warrendale, PA 15086; Phone: 724-779-2731; Fax: 724-779-8313; swolf@mrs.org; or www.mrs.org)

Reimbursement via eConcurSolutions online

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 concur.solutions.com. For more information visit our website www.national-academies.org/rap; and if you have specific travel questions contact raptravel@nas.edu.