

The R&T Connection Newsletter

A Publication for the Research and Technology Directorate

Winter 2012

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R&T Connection

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ECBC Chief Scientist Discusses Toxicology in the 21st Century

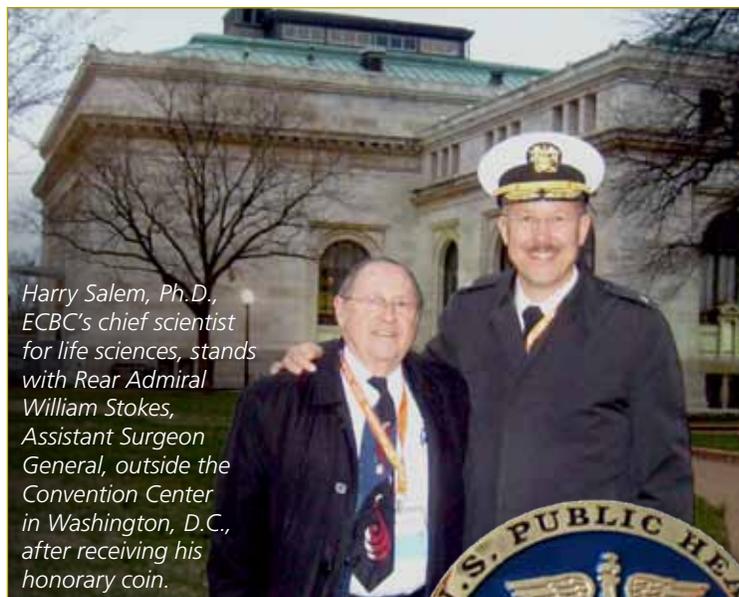
Harry Salem, Ph.D., has been on the cutting edge of toxicology studies for more than 50 years. His career began in academia and transitioned to the pharmaceutical industry and directing contract labs before he came to ECBC in November 1984 as the chief of the toxicology division. Currently, as the chief scientist for the life sciences at ECBC, Salem oversees numerous toxicity testing programs and is working in the area of stem cell

research, which is a key element of his long-standing goal of combating diseases while finding alternatives to animal testing. In recognition of his commitment to finding alternatives to animal testing, Salem was awarded an honorary coin from the U.S. Public Health Service at the March 2011 Annual Meeting of the Society of Toxicology.

"For toxicity testing to advance, we need to be able to develop high-throughput screening methods," said Salem. "Currently, there is a backlog of more than 50,000 chemicals that have not been tested, and testing on animals is a low-throughput, high-cost and time-consuming method of testing."

In an effort to more effectively and efficiently study potential toxicity of chemical agents in humans, life scientists working under Salem at ECBC have been experimenting with stem cells, which have already yielded some promising results.

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Harry Salem, Ph.D., ECBC's chief scientist for life sciences, stands with Rear Admiral William Stokes, Assistant Surgeon General, outside the Convention Center in Washington, D.C., after receiving his honorary coin.



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Senior Scientist Advises NATO Panel on Sensing, Builds International Collaboration Opportunities

Augustus W. Fountain, III, Ph.D., the U.S. Army Edgewood Chemical Biological Center's (ECBC) senior research scientist (ST) for chemistry, is garnering international recognition for ECBC while helping to advance defense science and technology.

Fountain was appointed in 2009 by Thomas Killion, Ph.D., then the deputy assistant secretary of the Army for research and technology, to serve a three-year term as the U.S. representative at large to the NATO Research and Technology Organization (RTO) Sensors and Electronics Technology Panel. One of just five U.S. representatives to the panel, Fountain advises NATO countries – as well as members of the Partnership for Peace – on technical approaches to chemical, biological, radiological, nuclear and explosive (CBRNE) sensing.

"Participating on the Sensors and Electronics Technology Panel provides a great forum for us to identify international opportunities for collaboration and cooperation," said Fountain.

Fountain serves as the panel mentor for a biological background study that is being led primarily by Norway. "The United States, Canada, Germany and Turkey are participating, and Australia is also involved," said Fountain. "We're about a year into the study, and the group is putting together a report to provide NATO with guidance on future of biological aerosol sensing." ECBC's Dottie Paterno is the U.S. representative on the study.

"Loosely defined, sensing is an augmented or instrumented ability to detect the presence of a material of interest that is either undetectable by the unaided senses or is in an enhanced form that could be detected by sensors," said Fountain. A material of interest may be enhanced to make it more clearly stand out from the background, allowing people to observe it from a distance for safety reasons.

Service on the Sensors and Electronics Technology Panel involves semiannual meetings accompanied by frequent virtual



Augustus W. Fountain, III, Ph.D., second row, second from the left, poses with other NATO RTO members at the Cardiff, Wales meeting.

communication throughout the year. The meetings focus on a theme, such as autonomous sensing and multi-sensor integration, and involve a technical conference, RTO business, and collaboration discussions. Discussions focus on technology needs.

"At the fall 2011 meeting, I was asked to write a technology watch paper on graphene-based sensors for chemical sensing," Fountain said. "Technology watch papers focus on topics of interest that help advise NATO on what technology areas they should be monitoring – whether for defensive reasons, their own advantages or new capabilities that a nation is trying to propose."

The meetings usually occur in Europe. "We traveled to Cardiff, Wales, for our fall 2011 meeting," Fountain said. "I was very interested to learn that, because of their new limited autonomy, there's been a resurgence in the Welsh language. In fact, 26 percent of the population – mostly the younger generations – speaks Welsh as their primary language. It's an ancient, very difficult language, very different than anything I've ever heard." Fountain noted that everyone speaks English, so communication was not a problem.

The next meeting is scheduled for April 30 – May 4, 2012, in Quebec City.

"This effort is an excellent opportunity for ECBC to be better known as a trusted expert internationally," said Joseph L. Corriveau, Ph.D., director of Research and Technology at ECBC. "I'm very happy that Dr. Fountain is such an integral member of the panel and is building international collaboration."



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Portrait of an ECBC Postdoctoral Associate

One of the most recent additions to the National Research Council's (NRC) Postdoctoral Resident Research Associateship Program (RAP) is Dan Angelini, Ph.D., a senior research associate in ECBC's Research and Technology (R&T) Directorate.

Angelini received his Ph.D. in Pathology from University of Maryland, Baltimore in 2004, where he examined the role of tumor necrosis factor alpha in the regulation of the pulmonary vascular endothelial paracellular pathway as it related to the acute respiratory distress syndrome. Before coming to ECBC, Angelini worked at Johns Hopkins University in the Department of Anesthesiology and Critical Care Medicine from 2005 to 2011.

Since coming to work at ECBC, Angelini has been working under the direction of Harry Salem, Ph.D., chief scientist for the life sciences. RAP postdoctoral associates are accepted for one year, with an option for renewal for another year. During the year of postdoctoral work, Angelini will complete a scientific journal article for peer review and work on a number of other research projects under the direction of Salem.

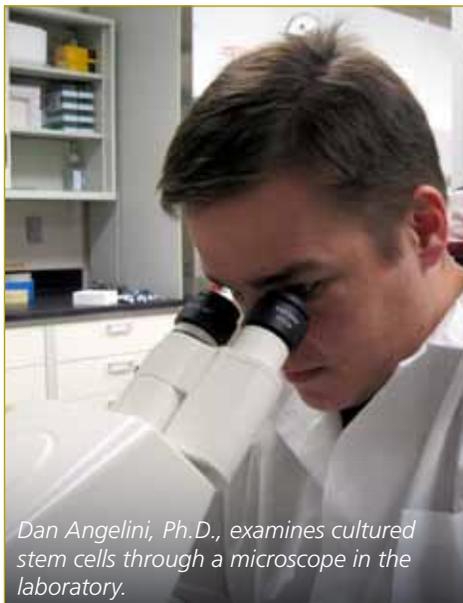
"The NRC Postdoctoral Program is a great way of recruiting new young and motivated scientists for our research programs," said Salem. "They come to us with the latest technologies from the best academic institutions with cutting-edge science. It's a two way street – it gives the new postdocs the opportunity to evaluate us and for us to evaluate them."

Angelini's work for ECBC has been focused on stem cell research, primarily the use of stem cells to examine the pulmonary toxicity of chemical warfare agents and other chemical/biological agents.

"I would say that I spend about 40 percent of my time in the lab, 40 percent of my time writing papers and articles and 20 percent of my time doing administrative things, like going to meetings and travelling," Angelini said. "Being in a postdoctoral program is really a continuation of your training, but more independent than graduate studies. You want to publish as many papers as possible, which will help you with the career path you've chosen and the kind of research with which you'd like to be

involved. Eventually, I'd like to be in the position to be a Principal Investigator (PI)."

A PI is the lead scientist or engineer for a particular project and is responsible for designing experiments, writing proposals and papers, managing technical efforts and meeting milestones and objectives.



Dan Angelini, Ph.D., examines cultured stem cells through a microscope in the laboratory.

"Right now, I'm working on a review article of stem cells in the lung," said Angelini. "I've been working in the lab with mesenchymal stem cell cultures, which are adult stem cells that are primarily derived from bone marrow. These cells could be used for in vitro toxicology assays."

An "assay" is a procedure in molecular biology for testing or measuring the activity of a drug or biochemical in an organism or organic sample.

Angelini said that he chose to study and work in pathology because the field offers ample opportunities for innovation and finding solutions to problems. "It's like solving a mystery," said Angelini. "I like feeling like I'm trying to figure out something that nobody's done before. After the postdoctoral program, my goal

is to be able to do this type of work permanently. One great thing about being at ECBC has been the friendly, supportive environment on the team and throughout the directorate, all the way up through branch and division chiefs. They have a great network across the board. One of the best aspects of the team here is that there are so many different kinds of scientific expertise, so there's always someone who can answer any questions you may have."

The NRC, which is part of the National Academies, promotes excellence in scientific and technical research by offering graduate, postdoctoral and senior-level research opportunities at sponsoring federal laboratories and institutions. Since 1985, ECBC has sponsored 63 postdoctoral associates through its Postdoctoral Resident RAP.

For more information about the NRC's Research Associateship Programs, visit <http://sites.nationalacademies.org/pga/rap/>.



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Branch Chief Bids Farewell After 32 Years of Service

After 32 years, Alan Zulich bid farewell to federal service in a retirement ceremony on Dec. 15 attended by dozens of U.S. Army Edgewood Chemical Biological Center (ECBC) staff, as well as his wife, Billie.



Steve Lawhorne, left, deputy director of Research and Technology, presents an award to Alan Zulich, as Zulich's wife, Billie, looks on.

Zulich, who served most recently as chief of ECBC's Chemical and Biological Point Detection Branch, was recognized with many honors during the ceremony, including certificates from Maryland Gov. Martin O'Malley, U.S. Sen. Ben Cardin, U.S. Rep. Andy Harris, M.D., Harford County Executive David Craig, U.S. Army Maj. Gen. Nick Justice and ECBC Technical Director Joseph D. Wienand.

"I've been around here a long time," said Zulich during the ceremony. "I started at the Quonset huts and worked my way through numerous buildings. During that time, I've met some really wonderful people. It's been a great tour, and I thoroughly enjoyed working with each of you. I also want to thank my wife for all her support over the years."

"It's been an extreme pleasure working with you," said Cindy Swim, chief of the Chemical Biological Detection Division. "Thank you very much for all of your contributions."

Zulich graduated from Ohio State with a B.S. in biology in 1972; he later earned an M.S. in biology from Towson State University. When Zulich began his career at Edgewood, he served in the Army for 2 1/2 years, stationed at what is now the U.S. Army Medical Research Institute of Chemical Defense (MRICD), focusing on snake bite research. After he was honorably discharged from the Army, Zulich worked at Johns Hopkins University for three years studying E. coli; he then moved on to the University of Maryland and worked at its cancer center.

Zulich's career has revolved around microbiology. "The lion's share of my work was for assay development to make detectors for biological agents," he said.

Zulich led the development of the first biological detector to be used on the battlefield, part of what is now called the Joint Biological Point Detection System. "It was truly a challenge

in the 1980s to develop an instrument that could detect and identify biological agents," he said. "During the five years that I was chief of the Point Detection Branch, the branch was successful in developing a system that can identify biological agents via mass spectrometry. This effort seemed so difficult in the early 1980s that it almost got shelved because it didn't seem feasible. I am really pleased to be a part of this success story."

The quality of the science ECBC performs has increased significantly during Zulich's tenure, he said. "We had good science back in the 1980s, but I've seen much advancement. As technology advanced, so did the people here. It's gratifying to see that the proper people were here applying their skills to get the job done. Our infrastructure has improved with the times too."

Zulich's team members recognize him for his management style in addition to his scientific abilities.

"Working for Al was seamless because he trusted the scientists and allowed them freedom to do what they are good at," said microbiologist Rabih Jabbour. "His management of the projects in our teams was very helpful and sustained our branch through rough financial cycles. He showed professional conduct in his communication and eagerness to find sources of funding for the branch."

Microbiologist Samir Deshpande also commented on Zulich's results-focused management style. "His favorite quote was 'show me the results and data supporting it' and 'how much is it going to cost us?' His management style was open door. He would engage with me to discuss new ideas on the algorithms that I was working on and accurately go over the reports to make sure we never went over budget," Deshpande said.

Secretary Gwen Vick said that the branch will miss him. "We all wish him the best of luck in his new chapter in North Carolina."

In addition to his work as a scientist, Zulich built on his snake bite research at MRICD and bred snakes and lizards for three decades. He and his wife have given up this avocation to simplify their lives and in a nod to the current economy. They still have two adult children, one dog, three cats and a love bird to keep them busy.

As for his retirement, Zulich and his wife are moving to North Carolina where he plans to learn to play golf, fish and relax. Zulich said he has enjoyed his work and will explore returning to the business, possibly as a part-time consultant.



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ECBC Trains Cambodian Military in Chemical and Biological Defense

Scientists from the U.S. Army Edgewood Chemical Biological Center's BioSciences Division and the Advanced Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) Training Team returned from a successful week-long training exercise held in September with Cambodian National Counterterrorism Special Forces. The Defense Threat Reduction Agency's (DTRA's) Research & Development Division sponsored the trip and asked ECBC's Peter Emanuel, Ph.D., Jim Carney, Ph.D., and Carrie Poore, Ph.D., to join their training team for the special event.

The exercise provided the Cambodian elite forces with their first training in chemical and biological defense. Thirty soldiers spent five days learning the basics of chemical and biological threats and participating in a series of hands-on activities with gear shipped from the United States. The soldiers were predominantly from an explosive ordnance background, but the Cambodian Ministry of Defense was eager to augment their skills as part of the expanding cooperation between the United States and Cambodia.

Poore and her team have conducted hundreds of training programs over the years, so the partnership between the teams was a natural fit. "The cooperation between our divisions is something Peter and I have talked about for awhile, and it's great to see it finally happening. The Cambodians

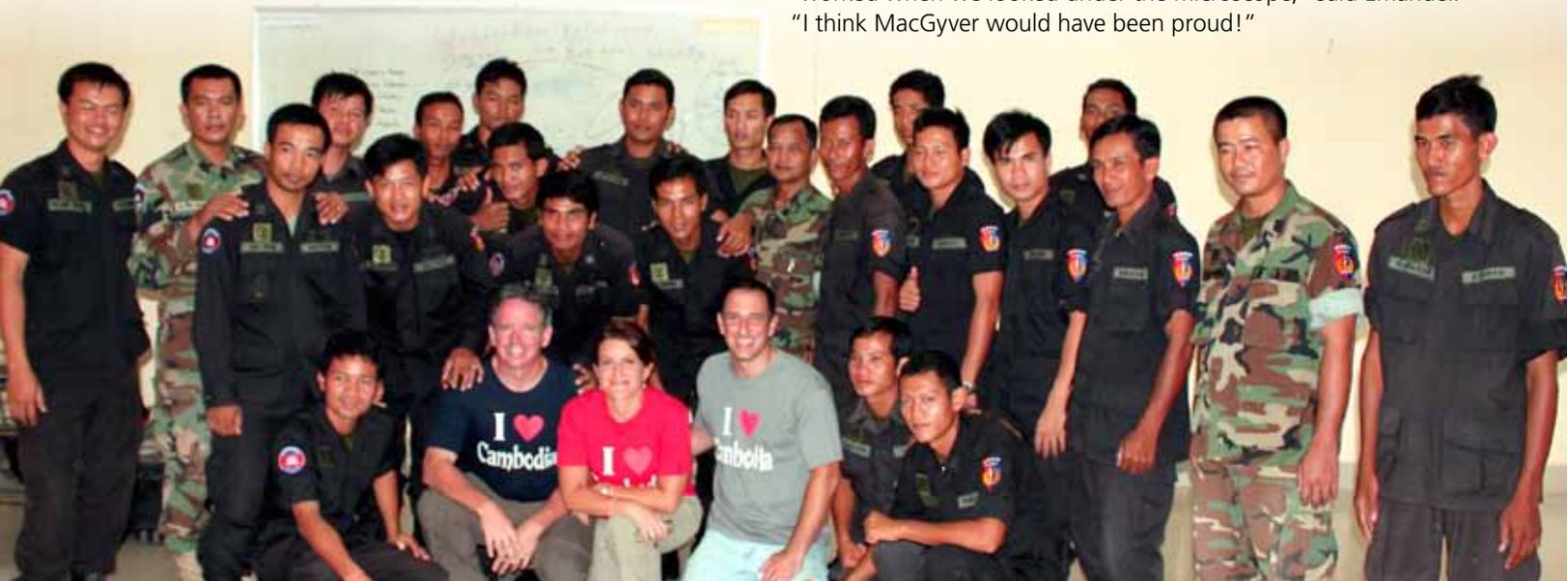


genuinely seemed interested in learning, and they asked a lot of questions."

Training materials were written in Cambodian; the classes were aided by a translator provided by the U.S. Embassy.

"I found it a unique experience to work with a translator," said Emanuel. "The trick was to teach in bursts of 15 words or less fewer so we didn't get too far ahead of the translator. It was helpful to use our hands a lot and also to remember that they aren't familiar with things we take for granted like ketchup and Star Wars."

The trip had some hiccups due to the distance and the monsoon season, and some items did not make it to the training site. One exercise on staining bacteria on microscope slides almost did not happen when it was discovered the dyes were nowhere to be seen. Carney (who has since left ECBC), Emanuel and Poore quickly searched through their knapsacks and managed to prepare training slides using alcohol, a magic marker and some cherry-flavored drink mix. "I was surprised at how well that worked when we looked under the microscope," said Emanuel. "I think MacGyver would have been proud!"



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Research Physicist Retires After 30 Years

Research physicist Jerry Bottiger retired in December after 30 years with the U.S. Army Edgewood Chemical Biological Center (ECBC). He started at ECBC in the summer of 1981 after spending a year as a post-doctoral fellow in physics at Texas A&M University.

Bottiger, a member of the Aerosol Sciences branch, was first attracted to ECBC after attending a conference about light scattering. "Ed Steubing, who retired last year, invented and coordinated the conference," he said. "In fact, he pretty much invented the Aerosol Sciences branch. The topic was interesting to me because light scattering was my thesis. I met a lot of folks I admired and thought they would be great to work with. And they were."

Bottiger said that light scattering is the scattering of light off small particles, such as aerosol particles. When the particles pass through a beam of light, they become visible. "Small particles scatter light," he said. "If you examine the scattered light from a distance, you can identify – from the patterns, intensity and polarization – the properties of the scatterer, the particle that is doing the scattering. That was a very challenging effort, but we made some progress."

He has seen ECBC significantly evolve in the past three decades. "In 1981, the Russians were our adversary. They were a high tech adversary, and we were doing a lot of important research. Our mission has changed to focusing on chemical and biological defense, as the Soviet Union disintegrated and we became more engaged with the Middle East. ... And we applied many of the same approaches to the problem of biological aerosols that we had to obscurant (light scattering) aerosols. Light scattering was still important. Interaction with light was important, now especially with fluorescence rather than with scattering."

Bottiger said that the branch found its niche in the biological warfare defense program as a testbed for instruments being developed by large government projects – such as the Joint Biological Point Detection System or for the Department of Homeland Security.

"These were new instruments with claimed sensitivities that had never been heard of before," he said. "We tested these instruments as they were being developed to see if they did what they claimed they could and if they could be improved. It was for that purpose that I started making equipment that could challenge the instruments."



Jason Edmonds, right, chief of the Aerosol Sciences Branch, presents certificates of appreciation to Jerry Bottiger upon his retirement.

One piece of equipment is the inkjet aerosol generator, which Bottiger built specifically to make very low-level challenges on instruments. "We used very low level but accurately known quantities of aerosol," he said. "We would challenge instruments with a total aerosol that was so small you couldn't see it without a microscope. That has proven itself to be very useful."

Bottiger also made "the calliope," so named for its resemblance to the musical instrument, for the testbed. The calliope makes up to five different, dynamic aerosols simultaneously. "'Dynamic' means that you vary the concentration in time so you can

simulate what might happen if an aerosol cloud flew over a location," he said. "And you're able to put up a background and a challenge – up to five different challenges – with independent time variations. So you're able to simulate almost any outdoor scenario you can imagine. You can write scripts to program the instrument to carry out the dynamic challenge. We found a lot of uses for that too as we tested other people's equipment."

Knowing that Bottiger built two calliopes and about 65 inkjet aerosol generators during his time at ECBC, one would be justified in asking how a physicist gained the engineering experience to build this equipment. Bottiger credits his undergraduate alma mater, Lehigh University. "Although I majored in physics, the physics department had the idea that you needed to do more than scribble things on pieces of paper," he said. "They required all the physics majors to take a shop course. That gave me the confidence to realize that I could make things with my hands, and that's been very handy – the idea that you can conceive what you need and cut it out, make it, screw it together. You don't have to draw it and hand it to someone else to make. That's enjoyable."

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BioSciences Division Holds Collegial Competition

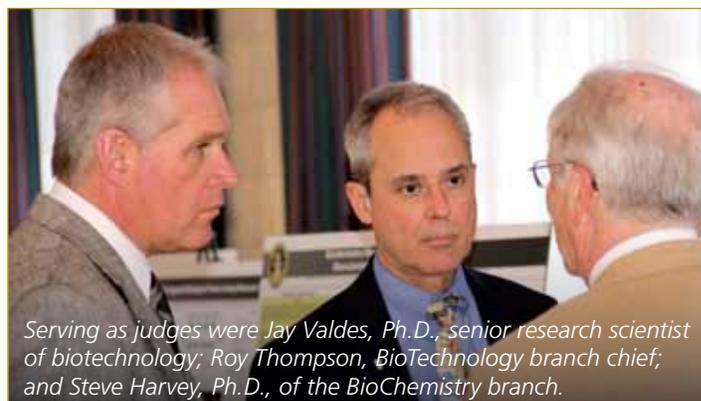
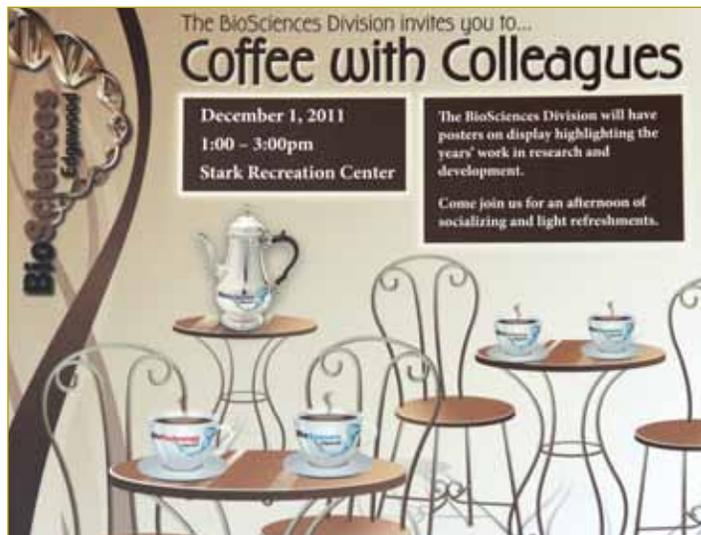
The U.S. Army Edgewood Chemical Biological Center's BioSciences Division held its second annual Coffee with Colleagues in December highlighting the year's work in research and development. Approximately 25 scientific posters were displayed, and each scientist was allotted four minutes to present to the judges in a spirited competition emceed by Peter Emanuel, Ph.D., BioSciences division chief.

And the winners are...

- **1st Prize:** Genetic Barcodes for Specific Detection of Spore Simulants (Patricia Buckley)
- **2nd Prize:** Emerging Multiply Drug-Resistant Human Pathogens Containing Highly Mobile Genetic Elements Encoding the NDM-1 β -Lactamase: A Genomic Analysis (H. Sandy Gibbons, Ph.D.)
- **Three Honorable Mentions:**
 - Antigen-Directed Development and Characterization of Antibodies Against Emerging Pathogenic Threats (Jeff Ballin, Ph.D.)
 - Identification of Novel Ligands Against Biological Toxins Using Molecular Display Technologies (Steven Blum but presented by Jorge Maciel, Ph.D.)
 - Modular Approach for Identification of Viral Pathogens (Sofi Ibrahim, Ph.D.)

Serving as judges were Jay Valdes, Ph.D., senior research scientist of biotechnology; Roy Thompson, BioTechnology branch chief; and Steve Harvey, Ph.D., of the BioChemistry branch.

"It was challenging to judge as all of the projects are outstanding," said Valdes. "When you do research, you tell a story from start to finish. That's one of the things we looked for – was there a story here that was persuasive?"



Serving as judges were Jay Valdes, Ph.D., senior research scientist of biotechnology; Roy Thompson, BioTechnology branch chief; and Steve Harvey, Ph.D., of the BioChemistry branch.

Mary Wade, Ph.D., acting chief of the BioDefense branch, expressed gratitude to participants and planners. "Thank you everyone for attending our second annual competition, thanks to the judges and congratulations to the winners. We especially appreciate Janet Better, Lisa Smith and Saumil Shah, who coordinated this event."



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R&T Directorate Staff Recognized for Length of Service Awards and Patents

Commander's Award for Civilian Service

Horace Pearce

Patents

Patent # 7,997,300 –
Aerosol Inlet Flow Modulator
Daniel Wise

AMC Fellows Program Completion

Michael Retford

Length of Service Certificates

5 Years

April Grimm

10 Years

Alex Balboa, Ph.D.
Karen Coyne, Ph.D.
Frances Foley
George Hondrogiannis, Ph.D.
Waleed Maswadeh, Ph.D.
Jacqueline Scotto
Jennifer Sekowski, Ph.D.

20 Years

Janet Jensen
Michael Kierzewski
David McCaskey

25 Years

H. Dupont Durst, Ph.D.
John Mahle, Ph.D.
Geraldine LaRue

30 Years

Ann Brozena
James Buchanan
Steven Christesen, Ph.D.
Raymond Jablonski
Lawrence Procell
David Sickenberger



Horace Pearce, associate director of Research and Technology, left, receives his Commander's Award from Joseph L. Corriveau, Ph.D., director of Research and Technology.

Pearce was cited for his "outstanding contributions to the U.S. Army during the period December 1989 to present as Associate Director, Plans, Programs and Analysis, Research and Technology Directorate, Edgewood Chemical Biological Center. His achievements and exemplary performance as an engineer, technical manager and supervisor are of the highest tradition and reflect positively upon himself, the U.S. Army Research, Development and Engineering Command, and the Department of the Army."

"I've very much enjoyed my years at ECBC, and I'm honored to receive this award," Pearce said.

Upcoming S&T Conferences/Meetings

R&T staff get around! This list is a sampling of the conferences and workshops we will be supporting in the coming months.

- **2012 CBRN Conference and Exhibition**
March 12-14, 2012, Baltimore, MD [link](#)
- **National Bio-Threat Conference**
March 27-29, 2011, Denver, CO [link](#)
- **Sample Prep 2012**
May 3-4, 2012, San Diego, CA [link](#)
- **2012 CBW Delivery Systems and Consequence Assessment Modeling Conference**
May 7-11, 2012, Charlottesville, VA
- **International Conference and Exhibition on Biosensors & Bioelectronics**
May 14-16, 2012, Las Vegas, NV [link](#)
- **2nd World Congress on Proteomics and Bioinformatics**
July 2-4, 2012, Las Vegas, NV [link](#)
- **2nd World Congress on Virology**
August 20-22, 2012, Las Vegas, NV [link](#)
- **World Congress on Forensic Research and Technology**
October 15-17, 2012, Chicago, IL [link](#)
- **International Conference on Biothreats & Biodefense**
October 16-17, 2012, San Francisco, CA [link](#)



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ECBC Chief Scientist Discusses Toxicology in the 21st Century

"The most exciting work we're doing right now at ECBC is our work with stem cells in collaboration with Johns Hopkins University," said Salem. "All organs and tissues have stem cells, which are programmed to repair certain parts of the body. Stem cells can be formed into lung cells and even nerve cells, and that's just the periphery of the potential application of using stem cells. Eventually, we want to be able to mobilize stem cells to repair the body without having to inject them into humans."

Salem said that the most significant challenge facing ECBC right now is procuring adequate funding to pursue major programs.

"Stem cells are a relatively new field of research," Salem said. "There many potential applications of the research, and until we try them, we won't really know how we can use them. For example, stem cells can be used to regenerate tissue, but if they are overstimulated, they can develop into tumors. Controlling the growth and activity of stem cells is just one of many factors that we need to be able to study. Our ultimate goal is to be able to 'build a human on a chip,' but even the most sophisticated

model is a poor imitation of the real thing. Even on a chip, we don't get to see the interaction of the body's systems. We're trying to make models that are as close as we can get to actual human beings so that we can limit animal testing."

In addition to his work for ECBC, Salem has been one of the official representatives to the Interagency Coordinating Committee for the Validation of Alternative Methods, a visiting professor of chemical toxicology at Rutgers University, the author of 13 books and the director of ECBC's National Research Council Research Associateship Program.

"ECBC is a great place with great opportunities for working with bright young people," said Salem. "We have a lot of good people who do good work here."

For more information about the National Research Council's efforts to improve toxicity testing, visit http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/Toxicity_Testing_final.pdf.

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Research Physicist Retires

One of Bottiger's best experiences at ECBC was the opportunity to spend a year (1989-1990) at Porton Down, ECBC's equivalent in England. He moved his wife and two sons (one of which now works at ECBC) there and enjoyed traveling in England and Scotland when on vacation.

Now enjoying retirement, Bottiger said he'd like to explore returning to ECBC as a part-time contractor. "I've enjoyed working here to the extent that I'd like to continue half-time as a contractor – keep my mind sharp, do something useful and have some time off," he said. He is also anticipating having the time to read, take courses and travel.

"On this team, people really enjoy their work; it's not as much a job as an interest," Bottiger said. "There is work to be done, research to be carried out. People who work here want to do it, and they do their best quality work – they do it automatically because that's how they're made."

Bottiger's many contributions to the branch are recognized by his colleagues.

"Jerry is an inspiration for any young scientist and sets the high standard any scientist should strive for," said Jason Edmonds, Aerosol Sciences branch chief.

"Jerry's guidance and wisdom have been invaluable to me over the past few years," said physicist and researcher Tiffany Sutton of the Aerosol Sciences branch. "His solutions to technical issues have been described by many as creative and often elegantly simple. His impact on the scientific community is immeasurable, especially to the people who have the privilege of knowing and working with him. Jerry is a rare combination of brilliant yet practical, hardworking yet easygoing, and just all around delightful. He will be missed by a great many people in his retirement, and we all wish him the very best!"

