

September 22, 2014

NTSSC This Week



U.S. Army Garrison Fort Belvoir Public Affairs Office



Also inside:



2013 Department of Defense Thomas Jefferson &
U.S. Army MG Keith L. Ware Award-winning Digital Publication



Director's Chair

Laurel Allender, Ph.D.
Director, Natick Soldier RD&E Center



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Thank you ...

NSSC Team,

This is a thank you message to the entire NSSC Team. On a personal note, thank you for welcoming me to be part of the team during my six-month tenure as acting technical director of the Natick Soldier Research, Development and Engineering Center. I had the opportunity to meet many of you, to see your labs, to hear about your accomplishments, to share in NSSC-wide planning, and to join you in ceremonies that were both celebratory and somber.

It was immediately clear to me that you were a community brought together by your commitment to the Soldier, Sailor, Airman, and Marine, to include our Coast Guard brethren. Your work spans fundamental science, technology innovations, product development, and delivery and sustainment of those products in the field.

A key part of your efforts are the links to the community through STEM and outreach, collaborations with academia, efforts with industry partners, and importantly, the way the NSSC story is told. Just over the last six months, NSSC has been host to many, many VIPs, each one duly impressed with your work. Putting the message out there is also evidenced by this very publication, a must read.

Let me thank you in advance for welcoming Dr. Pat Baker, who will be assuming the position of acting technical director of NSRDEC Oct. 1. Like me, Dr. Baker hails from the Army Research Laboratory, another part of the RDECOM family.

Finally, I want to thank you for your service and your dedication to the Warfighter.

Most sincerely,

Laurel Allender, Ph.D.
Director, Natick Soldier RD&E Center



NSSC This Week

NSSC

Senior Commander
[Brig. Gen. William E. Cole](#)

Garrison Commander
[Lt. Col. Brian Greata](#)

Command Sergeant Major
[Command Sgt. Maj. Robert Beausoleil](#)

Public Affairs Officer
[John Harlow](#)

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About this newsletter

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Under secretary says Natick 'powers' Army

Carson sees science behind the Soldier

By John Harlow, USAG-Natick Public Affairs / NATICK, Mass. (Sept. 10, 2014)

The afternoon started with a fireball, and finished with Under Secretary of the Army [Brad Carson](#) chatting with senior non-commissioned officers about the science behind the Soldier.

Carson learned about the flame retardant testing done on uniforms at the [Ouellette Thermal Test Facility](#) here.

The 8,100-square-foot facility, which opened in 2008, features four labs and a propane test cell, where four-second flash-fire testing can be done, with eight burners on a full-scale

manikin. There are 123 channels. Each channel has a sensor attached to it. Test results are run through computer models to predict second- and third-degree burns.

Carson spoke with researchers from the [U.S. Army Research Institute of Environmental Medicine](#) and the [Natick Soldier Research Development and Engineering Center](#) about the challenges they face going forward.

"This is what I have been looking forward to seeing," said Carson during his meeting with researchers. "This is a place where you do the

work that powers our Army. We are a people centric service. The Soldier is the end all, be all of our own service. The work that you guys do is extremely important."

At the [Doriot Climatic Chambers](#), the Under Secretary toured the facility that is a unique Army asset. He toured a rigid wall shelter being tested in -50 degree temperatures. The chambers can simulate almost any weather condition in the world, ranging from -70 degrees to 170 degrees, with sustained winds at 40 miles per hour. The chamber also has the ability to rain at the rate of four inches per hour.

The rigid wall shelter is the next generation in base camp systems. During testing earlier, at [Fort Benning](#), Ga., it showed better comfort for the Soldiers, and the shelter requires less energy to maintain comfortable living or working conditions inside.

He received a demonstration on Female Body Armor that was named one of the best inventions by Time Magazine, in 2012. The improved outer tactical vest, known as the IOTV, was designed specifically for women, and was first worn in combat by Soldiers from the [1st Brigade, 101st Airborne Division](#) (Air

Assault). The new armor was designed to offer better protection and to prevent bruised hip bones that women experienced when wearing IOTVs meant to fit men.

With the Soldier as the centerpiece of every Army platform, protecting that Soldier in combat is what drives everyone at the [Natick Soldier Systems Center](#).

The Helmet Electronics and Display System-Upgradeable Protection, or HEaDS-UP, has been a four-year effort at Natick, to provide mounted and dismounted troops with a more fully integrated headgear system. HEaDS-UP has focused on developing a Technical Data Package of design options and tradeoffs to build a modular, integrated headgear system. Some of these technologies include: improved ballistic materials; non-ballistic impact liner materials and designs; see-through and projected heads-up display technologies; better eye, face and hearing protection; and communications.

It was Carson's first visit to Natick since becoming the 31st under secretary of the Army, earlier this year.

Carson challenged Natick's senior NCOs in a round-table discussion to think about problems they see in the Army, challenges they see in the Army and things the Under Secretary can do to help.

The majority of the discussion was the loss of talented officers and NCOs.

"We have an exodus it seems of captains and majors and NCO's getting out of the Army today," said Carson. "These are people with tremendous amounts of combat experience. They have led men and women in many different circumstances, [and they] are getting out."

"This is a great concern to me as how we keep the best talent in the NCO corps and junior officers," Carson continued.

Carson also gained knowledge of how squads receive aerial re-supply through the Joint Precision Airdrop System. The JPADS system can very precisely deliver supplies, from 10 pounds to 42,000 pounds, through GPS-guided technology.

In his brief visit to Natick, Carson received a quick glimpse of the science behind the Soldier.

"It was fascinating to see the work that you do here," said Carson.



Photo: Tazanyia Mouton, USAG-Natick Public Affairs

NSSC town hall held Cole recounts busy summer

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass.

The [Natick Soldier Systems Center](#) experienced a busy summer and looks forward to even more activity this fall, the NSSC senior commander told a town hall audience on Aug. 28.

"We've done a lot this summer. We have a lot coming up here," said [Brig. Gen. William E. Cole](#). "We've done a great job showing off the installation and the great (people) that work here every day."

Among the summer activities cited by Cole were VIP visits, the U.S. Army Research Institute of Environmental Medicine change of command, the Army Birthday celebration, the groundbreaking for improvements to Kansas Street, Organization Day, and the remembrance ceremony for Maj. Gen. Harold J. Greene, NSSC's former commander. Cole also highlighted the Science, Technology, Engineering and Mathematics, or STEM, and Gains in the Education of Mathematics and Science, or GEMS, programs.

"Developing those partnerships, planting those seeds early is a very smart thing for us to do and we've done a lot of it this summer," said Cole, adding that GEMS and STEM were "very well received, not only with the children, but also by the educators, the teachers that teach our kids. They become advocates for Natick and the Army."

"Developing those partnerships, planting those seeds early is a very smart thing for us to do and we've done a lot of it this summer."

Brig. Gen. William Cole

Cole was followed by Lt. Col. Brian Greata, U.S. Army Garrison Natick commander, who gave updates on the Kansas Street construction; energy conservation measures; sustainability, restoration and modernization projects; and significant upcoming events. Greata said the garrison experienced a "very good year" taking care of the installation.

In closing, Cole said: "I'd like to thank you for all the great work that you've done over the summer showing the great things, the great capabilities we have here."



Natick remembers 9/11

Patriot Day is observed

Col. Thomas Eccles, U.S. Army Research Institute of Environmental Medicine commander, speaks during the Sept. 11 Patriot Day observance.

By Kelly Field, USARIEM Public Affairs / NATICK, Mass. (Sept. 11, 2014)

During a [Patriot Day](#) ceremony at Natick Soldier Systems Center, Soldiers, first responders and civilians united to observe and reflect on the unforgettable events of 9/11.

First, Chief James G. Hicks of the Natick Police Department read the [Presidential Proclamation](#) to those gathered, reminding them that the sacrifice of so many has forever shaped our nation, and we have emerged a stronger, more resilient America.

Next, [Col. Thomas Eccles](#), commander of the [U.S. Army Research Institute of Environmental Medicine](#), spoke to the crowd and urged them to reflect on the day's tragic events while focusing on America's resolve.

"Thirteen years ago at this hour, on a morning very much like this, terrorists attacked symbols of America's economic and military strength," Eccles said. "They claimed thousands of innocent lives in the worst terrorist attack on U.S. soil in the history of our nation.

"Although nearly three thousand people died on 9/11, we did not falter. We did what Americans do best. We stood up to serve,"

"Although nearly three thousand people died on 9/11, we did not falter. We did what Americans do best. We stood up to serve. All of you here today stood up to serve, developing and constantly improving technology to protect and sustain our service members, enabling them to win in any environment."

Col. Thomas Eccles, USARIEM Commander

Eccles said. "All of you here today stood up to serve, developing and constantly improving technology to protect and sustain our service members, enabling them to win in any environment."

Eccles urged those gathered to remember to take care of one another and focus on the resilience Soldiers and their families possess.

"In September, we call special attention to our ongoing efforts to build individual resiliency during the Army's observance of Suicide Awareness Month," Eccles said. "This year's theme reinforces our pledge to not only build resilience, but to support those in need, all aimed at building a stronger force."

At 8:46 a.m., the precise moment American Airlines Flight 11 struck the north tower of the World Trade Center in New York City, NSSC observed a moment of silence followed by a bell tolling 11 times.

"As we reflect on the present and look at the challenges America faces in the future, it is important for us all to remember that our Army and our Soldiers are strong, and by working together, we can be even stronger," Eccles said. "We will continue to strengthen our profession by empowering those around us to build a culture of resilience.

"Together, we can and will keep fighting for a safer and stronger future," Eccles said. "That pledge, that commitment, makes it clear that no one who died on that terrible day died in vain."



Little GEMS

Natick gives kids hands-on experience in science

By Kelly Field, USARIEM Public Affairs / NATICK, Mass. (Sept. 2, 2014)

Oil spills, crime scene investigations and DNA sampling. Usually, these words would send an organization into a tailspin, but this is just another day of summer camp for Massachusetts middle school students.

This summer the [U.S. Army Research Institute of Environmental Medicine](#) once again sponsored the [Gains in Education of Mathematics and Science](#), or GEMS, program at [Natick Soldier Systems Center](#) here. The GEMS program is an extracurricular summer science education program that enables middle-school-aged students to experience science in a real laboratory setting.

GEMS has a multidisciplinary educational agenda, and students take part in grade-appropriate, hands-on activities relating to science, engineering, mathematics, computational sciences, computational biology, biomedical sciences, chemistry and biology.

Capt. Carrie Quinn, the GEMS lab champion for USARIEM, said her main goal for GEMS is to get students enthusiastic about science and math while fostering a sense of community.

"Our main objective was to take science and math out of the classroom and put it in a real-world setting," said Quinn, who is also

a research physiologist for USARIEM. "The kids got to see things here that they wouldn't be able to experience anywhere else. They get to truly see how science and math are everywhere — even in the Army."

Now in its fourth year, the program has grown from four sessions with 100 children to six programs, GEMS I, II and III, with nearly 200 students in attendance. Each GEMS session allows students to return the following summer, slowly building on the lessons learned the summer before and encouraging future scientific leaders.

Advanced high school- and college-aged students called "Near-Peer Mentors" lead the GEMS programs, and serve as role models for the students. Near-Peer Mentors completed extensive training at a science boot camp prior to the student interns' arrival. The mentors learned how to conduct and teach the GEMS experiments.

"The Near-Peer Mentors are in charge of the curriculum and instruction for the summer GEMS program; they are the driving force behind this program," Quinn said.

While exploring the GEMS program this year, the students investigated problem-

solving, estimation, water properties, physics/forces of motion, forensics, and even got to see a helicopter land.

Collin Newman, a middle school student, participated in the GEMS program. He said his favorite parts of GEMS were the hands-on experiments he doesn't normally get to do in the classroom.

"You get a big experience in science," Newman said. "Plus, it is really fun. I like the hands-on experiments it takes to do GEMS."

The Army has a long history of recognizing that a scientifically and technologically literate citizenry is this country's best hope for a secure, rewarding and successful future.

"We created the GEMS program as part of this realization that science and mathematics (are) important to instill in the younger generations for future prosperity," Quinn said.

GEMS began as a single program at then-Walter Reed Army Medical Center, in 2005, and has expanded to 12 programs across the major Army research installations, including the one at USARIEM, which runs annually in July and August.



“Now that I have seen (Natick), I think there’s a phenomenal group of people who are really trying to help our Army get better. And it was really impressive.”

Sgt. Maj. of the Army Raymond F. Chandler III

On the 13th anniversary of a day etched in the nation’s collective memory, the Army’s highest-ranking non-commissioned officer visited the [Natick Soldier Systems Center](#), or NSSC.

[Sgt. Maj. of the Army Raymond F. Chandler III](#) began the day by participating in NSSC’s Patriot Day Ceremony, which recalled the terrorist attacks of Sept. 11, 2001.

“This is a day that we should recognize and remember,” Chandler said at a town hall later in the day. “What we do today and over the last 13 years has been predicated on events that happened (on 9/11).”

Chandler pointed out that he had joined the Army 34 years ago.

“But it’s a different circumstance than you that have chosen to join after 9/11,” Chandler said. “You make up one percent of the American population. You’re the top one percent. You’ve chosen to do something that 99 percent of the American people are either unwilling or unable to do.”

After attending the ceremony, Chandler toured Natick’s unique facilities and learned more about research underway around the installation. He heard about the [Physical Demands Study](#), which will determine the physical requirements for combat-related jobs; received a combat rations overview; visited the High Performance Fiber Facility and the Thermal Test Facility; and was briefed on operational energy and base camp technologies.

During demonstrations related to the Physical Demands Study, Chandler told Soldiers from the [U.S. Army Research Institute of Environmental Medicine](#) how important their work was.

“What you’re doing now is going to make a difference in what we do for physical training,” Chandler said. “You’re making history for the Army, because out of this will come change. I’m excited about what you’re doing.”

Chandler added that the study was helping to bring about “transformational changes in the Army.”

Following lunch with Natick Soldiers, Chandler held his town hall, in which he spoke about the “plague” of sexual assault and suicide on the Army that “we, as Soldiers and civilians, can solve.”

Before departing from Natick, Chandler took a moment to talk about what he had seen during his visit, including “capabilities that I had no idea the Army even had. The ability to take a polymer and turn it into a material that could be developed to lighten the Soldier’s load or provide them better comfort in extreme weather — to me, that was one of the most impressive things I saw today.”

Chandler, a Massachusetts native, said it took him three and a half years to get to Natick as sergeant major of the Army.

“But now that I have seen it, I think there’s a phenomenal group of people who are really trying to help our Army get better,” said Chandler, “and it was really impressive.”

Top: Sgt. Maj. of the Army Raymond F. Chandler III shakes hands with a Soldier after a demonstration of the Physical Demands Study at Natick Soldier Systems Center. Center: Chandler listens to Jeremy Whitsitt during a visit to the Combat Fielding Directorate. Bottom: Chandler, left, speaks to Col. Ross Poppenberger, Product Manager Force Sustainment Systems, second from right.



Inset photos: Top: Sgt. Don Vetch, Massachusetts Army National Guard

SMA visits Natick

Talks of ‘transformational changes’ in Army

By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (Sept. 11, 2014)



NSSC This Week Video News Release:
Tazanyia Mouton reports on the Sergeant Major of the Army visit to Natick.



Wheels That Heal

Natick Soldier continues his 'Ride 2 Recovery'

Even as they make painful physical demands on their riders, bicycles can be conduits of psychological freedom — two-wheeled, mobile therapy sessions, if you will.



“Getting on the bicycle clears my head. It takes away all of the negative thoughts that I’m having. All I concentrate (on) is either the person in front of me riding or the road ahead of me.”

Staff Sgt. Eric Murray



Photo: John Harlow, USAG-Natick Public Affairs



By Bob Reinert, USAG-Natick Public Affairs / NATICK, Mass. (Sept. 16, 2016)

Even as they make painful physical demands on their riders, bicycles can be conduits of psychological freedom — two-wheeled, mobile therapy sessions, if you will.

A certain mental clarity comes with the suffering in distance cycling. If you doubt this, consult with Staff Sgt. Eric Murray.

“Getting on the bicycle clears my head,” Murray said. “It takes away all of the negative thoughts that I’m having. All I concentrate (on) is either the person in front of me riding or the road ahead of me.”

Murray, a 36-year-old combat arms NCO with the [Natick Soldier Research, Development and Engineering Center’s Headquarters Research and Development Detachment](#), needed the release from worry after he was badly injured in an IED explosion near Sadr City, Iraq, in September 2006.

“I was on a patrol investigating a vehicle-borne IED, and I told somebody that I thought I saw somebody on top of the roof,” Murray said. “After I said that, the next thing I knew I was on the ground screaming for a medic. What I was told was that I was coded three different times and that I was in pretty bad shape.”

During his recovery from wounds to his lower extremities, Murray began drinking and, eventually, he and his wife divorced.

“I had to figure out some way to get up off my rear end and figure out how I was going to function as a single man with injuries,” he recalled.

Murray discovered “[Ride 2 Recovery](#),” known as R2R, an organization that helps service members and veterans to heal physically, mentally and emotionally through cycling. Each year, R2R holds a number of multi-day challenge rides of up to 450 miles that bring

veterans together in various parts of the country and overseas.

“I (hadn’t) been on a bicycle in about 25 years until last year,” Murray said. “I decided because I’m an infantryman I didn’t need to really train. I found out real quickly I needed to start training a lot more than what I did.”

Murray also needed something lighter and faster than his mountain bike, so R2R gave him a road bike.

“They’ve just been, in my eyes, an awesome (organization) to allow me to continue to heal, mentally and physically,” Murray said.

Murray has done five challenge rides since July 2013. His most recent was the “[Minute Man Challenge](#),” a 365-mile trek from Waltham, Massachusetts, to Fort Lee, New Jersey, Sept. 6-13. He was one of 150 cyclists on the ride, including Lt. Col. Brian Greata, the U.S. Army Garrison Natick commander.

“Colonel Greata did the whole ride with me, except for one day,” Murray said. “He was motivating me and pushing me throughout the whole time. Having somebody from here understand what these things (are) all about was really awesome for me.”

Murray occasionally had to rest in the support vehicle when his physical condition warranted, but he always got back in the saddle.

“I’m not a guy that rides hills very well,” Murray said. “I’ve got what they call drop foot. So it bothers me a little bit more. I had to get in the vehicle a couple times because of my ankle.”

And if Murray or others needed assistance on the bike, they didn’t have to look far.

“We go up and down these hills. We help each other out,” Murray said. “If somebody’s struggling, somebody comes up from behind you and starts pushing you. We just take care

Photo: Candice Snoto Raap



of each other as if we’re one big, cohesive military unit.”

That camaraderie and shared sense of purpose will keep Murray coming back for these healing rides.

“They’re struggling with the same stuff that you are,” Murray said. “We just come together, and we’re just like one big, happy, dysfunctional family. And it works for us.”

Strangers for years, he and the bicycle are as one these days.

“Psychologically, this is the best thing I’ve ever found,” Murray said. “I don’t have to worry about anything. All I have to worry about is the direction I’m going.”

For Murray, that continues to be forward.

Gut Check

Natick investigates gut bacteria to improve Soldier rations, performance

By Jane Benson, NSRDEC Public Affairs / NATICK, Mass. (July 31, 2014)

It takes guts to research Soldier nutrition and performance—or, more specifically, it takes gut bacteria.

Researchers at the [U.S. Army Natick Soldier Research, Development and Engineering Center](#), or NSRDEC, are investigating gut bacteria and its effects on Soldier performance. Natick's research is in the early stages but could eventually be used to improve rations to help Soldiers combat the effects of stress and to improve their overall performance.

“What's really created this wave of interest (in gut bacteria) is the Human Microbiome Project,” said Ken Racicot, a food technologist/nutritional biochemist in NSRDEC's [Combat Feeding Directorate](#). “What came out of that is not only a lot of great research but also the tools—the tools to study in this area. There is a huge wave of interest, partly because the tools are now allowing us to study it better.”

The Human Microbiome Project is a [U.S. National Institutes of Health](#) initiative. The goal of the project is to identify and characterize microorganisms, or bacteria, that reside in the human body in order to gain insights into human health and well-being. In terms of actual numbers, there are approximately 10 times the number of bacterial cells in the body as human cells, but the bacterial cells are much smaller than the human cells.

The gut microbiome, specifically, refers to the gut microbe system. Gut bacteria has an impact on the immune system and is also believed to play a role in obesity and several diseases, including diabetes. It may also affect cognitive and physical abilities. The type of gut bacteria a person has is determined at a very early age, but researchers believe that it may also be influenced and altered somewhat by diet or physical and emotional stress.

“We're at the early stages of this work,” said Racicot. “We're doing basic research, and

we're establishing in-vitro models to evaluate the influence of dietary input on the gut microbiome and how that can influence biological function—specifically, local inflammation and immune function. Our long-reaching goal, ultimately, is to be able to gain insight into dietary inputs that improve all of those functions and to develop combat rations in a way that can lead to those improvements.”

Racicot is working with Steve Arcidiacono, a microbiologist, and Jason Soares, a research chemical engineer. Both Arcidiacono and Soares work for NSRDEC's [Warfighter Directorate](#). The [U.S. Army Research Institute of Environmental Medicine](#), or USARIEM, is also an important collaborator in the research.

“Soldiers are facing physiological, psychological, cognitive and physical stress,” Soares said. “Anytime you are carrying a load, you are creating physical stress. Physical stress and mood have been linked to changes in gut microbiome. These studies are being done in the civilian sector, but there isn't really a lot of work being done for Soldiers, and that's where our work comes in. We think we have a great opportunity to tailor some of this work specifically toward the Soldier, because the Soldier is subject to a lot of different stresses than you and I are.”

Racicot's focus is on the nutritional aspect of the work in terms of optimization of Soldier performance through diet and immune function.

Soares and Arcidiacono are focusing on the bio-fermentation aspect—essentially trying to mimic the action of the human colon.

“Steve and I are trying to create a model of the human gut where we can also look at other aspects that are connected to nutrition, but more in terms of human performance,” said Soares. “So, external stresses specific to a Soldier, such as sleep deprivation. Or certain cognitive stresses that a Soldier will get that

no one else will get. Those external stresses have been linked to changes in the gut microbiome. So what we're interested in is trying to develop a model where we can see some of those changes. Then we work with Ken and the Combat Feeding Directorate and see if through dietary intervention, if we can overcome that external stressor to reinstate the Soldier's original level of performance under that particular stress condition.”

“Ultimately, the goal is to improve performance in multiple areas where performance can hopefully be improved by dietary additives,” Arcidiacono said. “Perhaps, it will help Soldiers overcome stress or fatigue from load carriage or no sleep—those kind of things.”

“So we're putting the bacteria in (the reactor), and working with Ken, we are also putting in the dietary inputs and seeing how that bacteria breaks down that dietary input,” said Soares. “The samples then go to Ken and he analyzes them in the human cell lab. He can look at the immune function of that dietary input. And we can look at how the population changes because of that the dietary input. For instance, does the dietary input increase beneficial microbes or change the balance of the gut bacteria?”

“It's a good opportunity for us to really make an impact here,” Arcidiacono said. “It's been great working with Combat Feeding, because they operate with that path to the Soldier, with transitions is mind.”

Racicot initiated the collaboration with Soares and Arcidiacono. The three researchers share a special chemistry, a great enthusiasm for pointing out one another's unintentional puns, and an even greater enthusiasm for their work.

“Bacteria is my life,” said Arcidiacono.

“Working in an emerging field is exciting,” Racicot said, “It is fulfilling to be part of this early wave.”



Photos: Jeff Siso, NSRDEC Public Affairs

Steve Arcidiacono of NSRDEC's Warfighter Directorate peers into a microscope at a Natick laboratory.

The Future is Now

Students gain presentation skills at Natick

By Jane Benson, NSRDEC Public Affairs / NATICK, Mass. (Aug. 12, 2014)

The 8th Annual Future Workforce Poster Presentation, hosted by the [Natick Soldier Research, Development and Engineering Center](#), or NSRDEC, proved that every poster definitely tells a story. All 32 displays told a story of college students and their NSRDEC mentors

using science, technology, engineering and mathematics, or [STEM](#), to improve life for the nation's warfighters.

"The Future Workforce Poster Presentation event brought together students hired through the Pathways program, Oak Ridge Institute for Science Education program fellows, and student volunteers through UMass Lowell's [Harnessing Emerging Research Opportunities to Empower Soldiers](#) program," said Kelly Mitchell, a lead staffing analyst, Workforce Development, NSRDEC. "All three of these programs are vehicles for students to contribute to our mission of support to the Soldier."

The posters were manned by student presenters, an opportunity that helped them further hone their professional speaking skills.

"The annual poster day is an important event at NSRDEC," said Sharon Menard, NSRDEC Workforce Development manager. "It promotes collaboration, and it gives them the chance to network and make a lot of

connections. The event also gives the students the chance to present in a safe and supportive environment. It preps them to present in their field further down the road."

Two University of Massachusetts Lowell students, both studying plastics engineering, worked together on a really "cool" NSRDEC project. David Van Schalkwijk, who is in Pathways Program, and Stephen Burbine, who is in the HEROES program, were involved in testing of the Multi-Temperature Refrigerated Container System. The two students also created drawings of subcomponents. Both feel the experience greatly enhanced their skills using a computer-aided design software program called SolidWorks. There was

Melissa Tobin, NSRDEC

also the added benefit of helping the Soldier. "I've worked in private industry in a co-op (job) before this," Van Schalkwijk said. "The part I like about here is that I feel like my work has a little bit more meaning by working in public service."

Another participant in the event, Shalli Sherman, graduated from Northeastern University in December and was a co-op student last year. She has returned to NSRDEC as an ORISE contractor and is working on



multifunctional textiles. She is working with coatings on fabrics, including focusing on antimicrobial coatings for textiles.

Sherman said she enjoys working at NSRDEC because of the collaborations with academia and because NSRDEC works continuously to improve life for the Soldier.

"That's my favorite part about working here," Sherman said.

The event itself was coordinated by a student working at NSRDEC, Melissa Tobin. Tobin, a business major at Stonehill College, has worked on NSRDEC's Workforce Development Team for the past three summers and during winter break. Mitchell is her mentor.

"It is so great to see how enthusiastic our students are about their research and how they are truly dedicated to the mission of supporting the Soldier," said Tobin. "The poster presentation not only allows the students to show off their hard work, it is also a great

way for them to network with the workforce, which creates great opportunities for the students as well as NSRDEC as a whole. We always get a lot of positive feedback from the rest of the workforce about this event, as it leaves the impression that the future of the installation is in good hands."

Thomas DiPasquale, who is in the UMass Lowell HEROES program, feels what he experienced at NSRDEC will help him in his field.

"I did a lot of chemistry," DiPasquale said. "I learned a lot about fiber extrusion. I learned all types of procedures. I feel really fortunate."

Jason Soares, a research chemical engineer at NSRDEC, is one of DiPasquale's mentors.

"Thomas worked on the incorporation of metallic nanoparticles into polymeric fibers," said Soares. "The metallic nanoparticle fibers will be made into a knitted or nonwoven

material that will be the basis of a chemical sensor being co-developed with UMass Lowell through a HEROES collaboration. It is always a pleasure to mentor future scientists and engineers and provide a peek into a real research lab setting. . . . We can make the connection of research to real-world applications and products to show students how science can impact our Soldiers."

Quoc Truong, a physical scientist at NSRDEC, is committed to mentoring young people. Last year, he mentored two UMass Lowell students. This year, he is working with three UMass Lowell students and a postdoc student developing advanced chem-bio protective materials.

"I feel so blessed with having a job at Natick for the past 30 years, working among extremely bright, gifted colleagues," Truong said. "As I become older, I think it's extremely important for me to pay back for the bless-

Dr. Laurel Allender (left), NSRDEC acting director, recognizes the work of Shalli Sherman, a recent Northeastern University graduate, with a certificate of participation and appreciation at the Natick Soldier Research, Development and Engineering Center's Eighth Annual Future Workforce Poster Presentation.

ings I've received, through passing on the knowledge that I have gained in working here to younger, talented and energetic colleagues and friends. I sincerely hope that they will do the same when they become older."

Dr. Laurel Allender, NSRDEC acting director, summed up the spirit of the day.

"So, we have called this the "Future Workforce Poster Presentation," but what I am seeing is that these people aren't waiting for the future — it is happening now," Allender said. "They are doing that work now, and it is just very exciting. I have definitely learned a thing or two."

No Bones About It

The search for shock wave defense

By T'Jae Gibson, ARL Public Affairs /
ABERDEEN PROVING GROUND, Md. (Aug. 12, 2014)

Shock waves from battlefield explosions are invisible threats for U.S. Soldiers and their top-of-the-line combat helmets, but with new studies in synthetic human physiology, researchers are learning how to lessen blast wave effects on the brain.

Exactly how, and to what degree, these waves cause brain damage is what the [U.S. Army Research Laboratory](#) scientists and engineers and a group of university partners are trying to answer as part of a multi-year, multi-disciplinary research project.

In a related research project, Army researchers are investigating new material development for helmet padding systems, and from this research, they expect greater insight and innovation in addressing what is likely to be the next big development in head protection: strategies for mitigating the effects of blast.

They're creating synthetic cranial bones that look and behave like the skulls of 20- and 30-year old Soldiers that will be tested in laboratory experiments that mimic combat-like blast events in hopes of improving military helmet pads, shells, and other protective equipment.

Dr. Thomas Plaisted, materials engineer in the Materials and Manufacturing Science Division at the ARL, said even though synthetic bones are commercially available, they're used primarily by doctors to practice surgical procedures. But, their design prevents them from "behaving like real human bones when subjected to blast tests."

"The mechanical properties of the human skull change with age and depend on the health of the individual. Donor skulls that may be available for testing would typically come from older people, and the properties of those skulls can be highly variable and may not have the same response as the average skull of the Army Soldier population," said Plaisted.

He said this is among the variables that "add uncertainty when trying to evaluate head protection devices, like helmets."

"So we are developing our own synthetic bone, [and] capturing material and architecture response, specific to the human skull."

A simulated skull ARL researchers are developing is made of synthetic materials, with the goal of creating a uniform response that is representative of the Soldier population to use in tests to understand how to best protect the head during exposure to blast waves and blunt impact.

"The cranial bones have a highly-graded structure, from a tough outer layer, a spongy inner section, to a more brittle inner layer, which together are responsible for how it responds under impact conditions, he said.

Slice-by-slice images taken from a CT scan help researchers get the geometry and structure of the skull right. ARL composite materials, combined with these images, and 3-D printing technology, produce models of bone-like surrogates that ARL researchers will use to test new helmet padding materials in simulated blast and impact conditions. The goal is to determine how the pads and helmet shell materials protect the head from injury, Plaisted said.

"We are developing new helmet padding materials to improve the impact protection afforded by the Army's helmets. The helmet can withstand impact at a certain velocity, while protecting the head from accelerations that would lead to injury. In the extreme case, excessive acceleration may lead to skull fracture," he said.

"We are using computer modeling of head and helmet impacts to understand how tailoring the padding properties can reduce acceleration at various impact locations around the helmet," Plaisted explained. "Then, those properties are engineered into materials and tested in the laboratory to validate what we are seeing in the computer models. The research is giving insight on optimal material structures and material combinations that achieve increased energy absorption while still being comfortable to wear."

Earlier this year, ARL evaluated the base material of the synthetic bone by hitting it



Photo: U.S. Army

at a high rate, and comparing the fracture properties to human bones tested by the same technique. They've determined it to be a "close match" to human bones, he said.

"Our next step is in determining the limits of resolution we can achieve with the 3-D printing, and how fine the resolution needs to be to capture the properties we are looking for."

He said he expects to start printing synthetic skulls with 3-D technology by the fall.

"Part of ARL's mission is to take varying levels of risk in finding state of the art science and developing the technologies that could potentially provide the Soldier with more protection, more capability, or both," said Dr. Shawn Walsh, who leads ARL's Agile Manufacturing Technology Team. "What is equally important is that ARL strategically reduce the risk of these new technologies so that centers, such as the [Natick \[Soldier Research, Development and Engineering Center\]](#), can begin to think about how they would integrate into a larger Soldier "system." Many of ARL's material, processing, and conceptual technologies were transitioned and demonstrated in NSRDEC's "HEaDS UP" program."

"[Dr. Plaisted's] efforts are unique in that he is bringing fundamental material science and modeling to the dual problem of accurately representing biological systems (for example the skull) and coupling this biological model to a materials model to provide better insight on how impulses are transmitted during an impact to the helmet and head. Such insight will lead to new and quantifiably proven methods for reducing the adverse effects of violently applied forces to the head and helmet system," Walsh said.



Photo: Jane Benson

Hot & Green

Natick cooks up energy-efficient kitchen appliances

By Jane Benson, NSRDEC Public Affairs / NATICK, Mass. (Sept. 3, 2014)

The [Natick Soldier Research, Development and Engineering Center](#), or NSRDEC, is revamping the Expeditionary TRICON Kitchen System, or ETKS, with energy-efficient appliances.

The goal of the appliance conversion is a 50-percent reduction in energy usage, all while maintaining the quality and functionality of the current high-performance appliances.

The ETKS was developed by [Product Manager Force Sustainment Systems](#)' Force Provider team to meet the needs of Soldiers deployed to remote locations in Iraq and Afghanistan. The container-based kitchen provides Soldiers with an all-electric kitchen, equipped with commercial appliances and capable of feeding three meals a day to 150 to 300 Soldiers.

"It's absolutely important for us to meet the capability that we have currently," said Joe Quigley, the project engineer and operations research analyst in NSRDEC's [Combat Feeding Directorate](#), or CFD. "The top priorities are that it's reliable, maintainable, efficient,

and that it enables Soldiers to accomplish their mission. So we want to meet the current level of capability but reduce the energy usage associated with whatever meal is being prepared. We want to use less energy and maintain quality of life."

The ETKS, with its new appliances, is currently undergoing joint testing by CFD and PM-FSS. A demonstration is planned for October 2014 at the [Base Camp Integration Laboratory](#), Fort Devens. Another demonstration is planned for June 2015, as part of the Technology Enabled Capability Demonstration 4a — Sustainability and Logistics-Basing.

"We are going to be doing a lot of testing using operational rations," Quigley said. "It's important because we want the laboratory environment to reflect the operational environment, so part of our testing regimen will involve preparing the same meals Soldiers will prepare in an operational environment, which will allow us to verify the performance and capacity of our prototype appliance suite. So, we basically want to make sure that re-

Project engineer and operations research analyst Joe Quigley steps into the kitchen of the future at the Natick Soldier Research, Development and Engineering Center. This prototype has been outfitted with modular, energy-efficient appliances.

gardless of the meal being prepared, Soldiers will have the right equipment to prepare the meal and do so in a reasonable amount of time."

The new, more energy-efficient appliance choices have been made possible by the Rapid Innovation Fund Broad Agency Announcement program, or RIF BAA. The RIF supports innovative science and technology solutions to challenging problems.

"RIF BAA has enabled us to do some really good work," said Quigley.

The appliance technology is being developed by Advanced Mechanical Technology, Inc., or AMTI, under NSRDEC direction.

Same stove, different kitchen

CFD/PM-FSS joint testing of the new ETKS appliances is part of an ongoing collaborative modular appliance development program. One of the aims of the program is to develop a suite of appliances that can be integrated into any Army field kitchen.

"Uniformity makes life easier," said Quigley. "Basically, the idea behind a modular appliance is that you can use the same appliances in different field kitchens. Right now, there are a lot of different field kitchens out there with very specific parts that you can't interchange. We want to get it to the point where we can use the same ovens, skillets, cabinets, drawers, etc., and make them standard across all platforms. The number of appliances can then be increased or decreased, depending on the required capacity of the kitchen."

Quigley believes that the uniformity of appliances in different kitchens will benefit the warfighter.

"Soldiers could train in one kitchen, and then step into another kitchen that uses this suite of appliances — and it would be the same appliances they've always used," Quigley said. "Ultimately, they won't have to learn multiple systems. Furthermore, there will be fewer national stock numbers that the Army will need to store, which reduces life-cycle costs associated with Army field kitchens.

"I really enjoy knowing that I am developing something that will make it into the hands of the Soldier and that they'll benefit from that."



*Inset photos: 1st Sgt. Don Veitch,
Massachusetts Army National Guard*

Looking Back ...

A memorial flag is illuminated Sept. 11, 2007, near the spot where American Airlines Flight 77 crashed into the Pentagon six years earlier. The attack on the Pentagon killed 125 people. Natick held its 2014 Patriot Day ceremony Sept. 11 near the flagpole.

See page 6.

Photo: Petty Officer 1st Class Branden W. Shulze, Army News Service