



A Final Message from the Director

Friends and Colleagues,

It is with mixed emotions that I now put pen to paper in an effort to say farewell without really saying goodbye. The needs of the Army call upon me to execute one more mission, and as a Soldier I feel it is both my Duty and Responsibility to respond. As a result, I will vacate my position as Director of the Telemedicine & Advanced Technology Research Center on April 15th, following five eventful years that seem more like five months in retrospect! Without a doubt, the opportunity I was granted to work with some of the best people I have ever met in my soon-to-be 34 year Army career will forever be etched in my mind as the hallmark of my career. To say that I am above all else proud would be a severe understatement. I am proud of all that we have accomplished in the past five years and most of all proud of where we are today. I am also so proud of all the men and women who have called TATRC home and their dedication to this noble mission of supporting America's warfighter. And lastly, I am as humbled today as I was five years ago when first joining this historic organization and will be forever grateful for this assignment. To our Alumni, I hope that we have and continue to do you proud, in building upon the incredible legacy you passed on to us. To our friends, colleagues, and partners thank you for your willingness to give us a chance and for the professional collaborations that allowed us to jointly advance the puck across military medicine. And to the men and women of TATRC: A warm and heartfelt thank you for allowing me the opportunity to be part of this incredible team. I will remain forever grateful. This is TATRC-6 signing out.



**COL Dan Kral, Director,
TATRC**

Daniel R. Kral
COL, MS

IN THIS ISSUE:

DIRECTOR'S MESSAGE	Page 1
OUR NEW MISSION & VISION	Page 2
LET'S GET SOCIAL!	Page 2
VHSO CONTINUES TO HELP ACHIEVE ARMY'S GOAL	Page 3
AAMTI RIF FUNDING IS STILL AVAILABLE FOR FY18!	Page 3
TATRC TEAM AT IMSH	Page 4
ENROLLMENT GROWS FOR HTIC'S TEAM FITNESS TRACKER	Page 6
mHIC PEER REVIEW ARTICLE PUBLISHED IN MILITARY MEDICINE	Page 7
AAMTI PROJECT SPOTLIGHT: FEASIBILITY STUDY OF A NOVEL NEUROFEEDBACK TECHNOLOGY FOR PERSISTENT POST-CONCUSSIVE SYMPTOMS IN SOLDIERS	Page 8
TATRC mHIC LAB LEADER RECEIVES DISTINGUISHED MARQUIS WHO'S WHO HUMANITARIAN AWARD	Page 9
BHSAI DEVELOPS SOFTWARE TO TRACK ANTIBODY RESPONSES TO VACCINES	Page 10
AAMTI PROGRAM MANAGER INVITED TO SPEAK AT BAMC	Page 11
EMPLOYEE OF THE QUARTER, MR. NATHAN FISHER	Page 12
HTIC TAKES ON A NEW TECHNICAL WRITER	Page 13
NEW WINDOWS SYSTEMS ADMINISTRATOR	Page 13
NEW P.O. TO JOIN OUR GROWING TEAM	Page 14
TATRC ADDS A NEW CELLULAR END USER DEVICE SOFTWARE ENGINEER	Page 14
TATRC'S NEW MULTI-MEDIA COORDINATOR	Page 15
TATRC'S NEW GRAPHIC DESIGNER & WEBMASTER	Page 15
FRONT ROW VIEW AT THE FUTURE OF ARMY WARFARE DURING RAS WORKSHOP	Page 16
TATRC VISITS BAMC'S VIRTUAL MEDCEN	Page 17
TEAM TATRC'S PERSPECTIVE ON HIMSS 2018 ON THE HORIZON	Page 18
AAMTI PROJECT SPOTLIGHT: ELECTRIC CELL-SUBSTRATE IMPEDANCE SENSING AS A MEANS OF DETERMINING THE VIRULENCE POTENTIAL OF BACTERIAL ISOLATES	Page 20
TATRC TO HOST 4TH ANNUAL TECHNOLOGY OPEN HOUSE	Page 22
BOB CONNORS RETIRES AFTER 38 YEARS	Page 23
TATRC PARTICIPATES IN THE FIRST USU SOM TELEHEALTH PROGRAM	Page 24
TATRC TRIVIA	Page 24



TATRC Announces New Mission & Vision



OUR MISSION:

Conduct Research & Development to address current and emerging capability gaps within Military Medicine focused around technology and innovation.

OUR VISION:

To be the premiere technology research organization and thought-leader focused on the needs and requirements of America's medical warfighter and the broader community of interest within the MHS.

Let's Get Social!



For more information on TATRC and its many initiatives, visit: www.tatrc.org
or call 301.619.7927

Don't Miss an Issue!
Sign up and get the TATRC
Times every Quarter!

To Subscribe and be added to our mailing list, please e-mail Lori DeBernardis at: lori.a.debernardis.ctr@mail.mil



TATRC's VHSO Continues to Help Others Achieve Army's Goal of Providing VH Capabilities Anywhere, at Any Time

Dr. Francis McVeigh, TATRC's Virtual Health Support Office (VHSO) Lead and Science Director, traveled to Regional Health Command-Europe (RHC-E) to participate in a meeting that focused on virtual health (VH) for building their VH Campaign Support Plan in Europe. Following the discussion, Dr. McVeigh visited the 4ID MCE at Poznan, and Role I sites at AMSC Powiadz, Poland, Torun and Bemowo Piskie Training Area (BPTA) Poland, which are part of the Atlantic Resolve mission.

During this site visit he observed that some of the providers were not using VH at all and that others were using a wide spectrum of VH modalities and programs such as telephones, personal laptops and cell phones, older Medical Communications for Combat Casualty Care (MC4) version laptops, 'Telehealth-In-A-Bag' kits, communicating through NIPR, SIPR, and local Wi-Fi modalities. BPTA personnel were using PATH/HELP and synchronous tele-Behavioral Health, but experiencing latency challenges. BPTA's regimental surgeon suggested that they begin to use the Advanced Operational Support for Operational Forces (ADVISOR) Program, which at that time had not been officially inculcated across the AMEDD. Some of the challenges observed included reliable connectivity, limited bandwidth, latency issues and lack of knowledge and training of available VH options.

Following his visit, Dr. McVeigh documented and disseminated his findings and made the following recommendations which include: 1) write an information paper discussing VH options,

training, challenges and solutions to be developed and disseminated by the Joint Surgeon to all COCOM Surgeon Offices; 2) pre-deployment training in similar deployment environments be developed and exercised; 3) MC4 reach out to these sites to provide assistance; and that RHC-E, who has demonstrated that they are the leaders in delivering VH in operational environments and are several years ahead of the Office of the Surgeon General VH projected glide path be funded to continue to deliver and expand VH.

MC4 has since reached out to RHC-E and Europe's Army Surgeon's Office and made recommendations, as well as made plans to visit Role I and II sites. TATRC's VHSO team has created a dashboard to keep track of ongoing pilots and demonstration initiatives in the deployed environments and has created one page instruction sheets on how to use selected VH capabilities such as, Army email teleconsultation, PATH/HELP, TH in a Bag and ADVISOR.

Dr. McVeigh stated that this visit identified similar issues and challenges as those that were discovered during the visit to the CENTCOM Area of Operations in February 2017. Some of the similar findings were that the providers and others were not trained and/or informed of the types of VH capabilities that exist, nor made aware of the challenging connectivity issues. "It is only by identifying and addressing these issues that virtual health usage will increase," Dr. McVeigh concluded. ■■■



Got a Bright Idea? AAMTI RIF Funding is Still Available for FY18!

In 2017, the AAMTI program introduced the Rapid Innovation Funding (RIF) program as an optional alternative program to the traditional AAMTI Extended Innovation Funding (EIF). Unlike the traditional AAMTI projects which are an average duration of eighteen months, AAMTI RIFs projects should be accomplished in 6 months or less. Last year there was a threshold of \$35,000 per project, but this year there is no set financial limit, and project funding requests should be commensurate with the effort required to evaluate the technology. As a reminder, AAMTI RIF projects must support the overall original AAMTI program aims by demonstrating advanced medical technologies and their impact on cost, access, quality, and safety of care and/or medical readiness.

Additionally, each funded RIF project is required to provide a one page final report and QUAD chart within 6 months of award detailing the uniqueness of the technology, methods of evaluation and recommendations for wider adoption or further evaluation in the AMEDD. Unlike the traditional AAMTI program, the RIF model gives a stronger chance of getting innovative ideas expeditiously into the hands of leadership with its 6 month evaluation component.

These AAMTI RIF projects provide senior AMEDD leadership

with medical tech-watch capabilities on the newest products that are commercially available on the market today and continue to encourage medical technology entrepreneurship by our leading innovators at our military medical treatment facilities. Shifting the AAMTI program to a rapid innovation model provides improved reporting on cutting edge technologies, fills the void between acquisition and research and promotes products that should be recommended for further evaluation or adoption at a larger scale.

Ms. Holly Pavliscsak, AAMTI Program Manager stated, "Rapid Innovation Funding is a chance for individuals in our local Army military treatment facilities to obtain start-up funding for technology proof-of-concept demonstrations that provide solutions to locally identified issues. These small scale demonstration projects provide invaluable information for leadership in the form of best practices for larger implementation, policy alignment and areas of efficiency."

If you have a great idea, there is still FY18 funding available for award through the AAMTI RIF program. Additional information is available at: <https://tatrc.amedd.army.mil/AAMTI/>, or at www.TATRC.org. The AAMTI Program Manager is Ms. Holly Pavliscsak who can be reached at holly.h.pavliscsak.ctr@mail.mil or 240-566-2378. ■■■



TATRC Participates in World's Largest Medical Simulation Conference



LEFT PHOTO: Harvey Magee with COL Jeffrey Mikita of Walter Reed National Military Medical Center at the IMSH DoD Government Row Exhibit Area. **RIGHT PHOTO:** Mr. Geoff Miller, MMSIC Lab Manager, kicked off and chaired the DoD Academic Program at this year's IMSH.

All eyes were on Mr. Jamie Hyneman as he walked onto the stage at the 2018 International Meeting on Simulation in Healthcare (IMSH) conference in Los Angeles, CA, 13-17 January. Mr. Hyneman is the legendary producer and host of the Discovery Channel's wildly popular show, *MythBusters*, who served as the opening keynote speaker at this year's event. He was greeted onstage by Dr. Dan Raemer, founding Society for Simulation in Healthcare (SSiH) member and host for this live interview. It's not every day that one gets to listen to a man who questions myths and urban legends and conducts live, and sometimes risky experiments to prove (or disprove) them. Many don't know, however, that Jamie developed a medical simulation prototype that became the Multiple Amputation Trauma Trainer, managed by the U.S. Army Research, Development and Engineering Command's Simulation Training & Technology Center in Orlando.

The IMSH conference is the world's largest healthcare simulation event sponsored by the SSiH. The theme for this year's conference was "Making the Impossible POSSIBLE." Approximately 2,600 people

attended from over 65 countries. Both large plenary sessions and small, interactive immersive courses were offered and the exhibit hall featured more than 100 organizations from ten countries.

Each year TATRC staff, as well as many other DoD healthcare personnel and medical simulation managers attend this conference because of the unique education and training opportunities that the IMSH provides in support of the mission of the Defense Health Agency. One key to developing and maintaining a medically ready force is effective training, from first responders through fixed facility healthcare providers. The Military Health System needs healthcare providers who are up-to-date on the most effective teaching and training strategies. IMSH's educational sessions added value to DoD attendees in many mission-relevant areas (e.g., leadership, learning theory, instructional methods, technical operations, assessment and outcomes, program administration, certification, and research and development).

For almost fifteen years, the TATRC team has demonstrated an integral leadership role at the IMSH. This year, Mr. Geoff Miller, Research Scientist and Lab



Manager of TATRC's Medical Modeling & Simulation Innovation Center (MMSIC), along with Mr. Harvey Magee, Technical Director, MMSIC, planned and executed two of four special events for the DoD.

Mr. Miller planned and chaired the DoD Academic Program, which provided seven presentations in total. Mr. Miller was also one of the opening plenaries for the Modeling & Simulation forum at the conference this year.

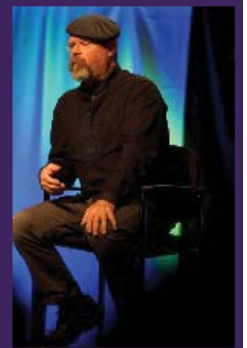
Mr. Magee facilitated the DoD's "Government Row," which was an interactive exhibit area. Sixteen DoD-funded Research & Development prototypes were exhibited by government, academic, and industry organizations, based on recommendations from various government managers. This exhibit fostered innovative dialogue among healthcare professionals from around the world. Colleagues and strangers alike discussed their perspectives about groundbreaking state-of-the-art ideas, research approaches, challenges, and opportunities for collaboration. Dr. Darrin Frye, Portfolio Manager for Medical Simulation and Training Technologies at Joint Program Committee-1, stated "This was my first time at IMSH, and it was an impressive experience to meet all the dedicated investigators and very rewarding to see and feel the tangible results of their countless hours of innovative research and developmental efforts."

Another featured event was the 8th Annual Serious Games & Virtual Environments Showcase and Arcade, an annual competition for new developments in medical simulation. The "Best in Show" was awarded to the *Perceptive Patient* project. Dr. Thomas Talbot, the Principal Investigator and one of TATRC's alumni, demonstrated an early version of the Perceptive technology at both the VR Showcase and the TATRC-organized "Government Row." The Perceptive Patient employs multisensory artificial intelligence in a new way that provides physicians teaching moments on bedside manner and patient trust.

On 16 January, almost 50 people attended the Federal Affinity group meeting, chaired by COL Jeffrey Mikita of Walter Reed National Military Medical Center. Informative updates, areas of shared interest and focus, and future opportunities were provided by simulation leaders in the Defense Health Agency, Army, Navy, and Air Force, Uniformed Services University (USU), as well as the Veterans Administration. Dr. Joseph Lopreiato, Director, Val G. Hemming Simulation Center, USU, and the 2018 President of the SSIH, provided an update, including the "Healthcare Modeling & Simulation Certificate" program (<https://movesinstitute.org/healthcare>) and USU's Master of Health Professions Education program.



IMSH's Opening Keynote was delivered by Mr. Jamie Hyneman, producer and host of the Discovery Channel's *MythBusters*. SSIH's Dr. Dan Raemer hosted the live interview that kicked off this impressive conference.



Mr. Harvey Magee, MMSIC Technical Director noted that "IMSH '18 was high-value, both for exhibitors and hundreds of attendees. Most attendees had no idea the DoD was leading the Nation in Medical Modeling & Simulation Research & Development. The conference was high energy and high value, and the IMSH leadership was fantastic in its support for participation by the DoD!"

The next IMSH meeting will be held in San Antonio, Texas, from 26-30 January 2019. ■■■



Team Fitness Tracker Study Enrollment Grows to Nearly 300 Volunteers!



From left to right: SSG Reckmeyer, SGT Christopher Scuteri, SFC Osby, SFC Jackson, SSG Worthy, Mr. Bob Connors, Ms. Stephanie Hutson, Ms. Ashleigh Simon, and SPC Beaver

Key staff from TATRC's HTIC travelled to the Florida Army National Guard Headquarters and Headquarters Company (HHC), 53rd Support Battalion, Infantry Brigade Combat Team (IBCT), in Pinellas Park, Florida, from 9 - 11 February to enroll 96 additional volunteers into the TATRC Team Fitness Tracker Study. Ms. Ollie Gray, HTIC's Lab Manager and Principal Investigator for the project, briefed the aims of the research study to interested members, and individually met with each volunteer to obtain their written consent per the Uniformed Services University Institutional Review Board protocol. Ms. Gray was accompanied by key members of her team, Mr. Robert Connors and Ms. Stephanie Hutson, who assisted with Fitbit and Garmin activity tracker assignment, inventory control, and other related logistics.

To date, TATRC has enrolled 296 Army National Guard (ARNG) volunteers into the Team Fitness Tracker study. In addition to the HHC 53rd, TATRC has enrolled 21

members of an ARNG remedial fitness group at Camp Blanding, Florida; 107 members of the Air National Guard 192nd Fighter Wing, Langley AFB, VA; and 72 members of the ARNG, Maryland, 410th Hospital Center (HC). HHC 53rd members will use their Fitbit or Garmin activity trackers for 30 days with access to the Fitbit and Garmin manufacturer portals, and then access the TATRC Team Fitness Tracker Application on 12 March 2018.

ARNG units are particularly interested in the capabilities of the TATRC Team Fitness Tracker portal, given that their members drill only once a month, have other jobs, and may not exercise as frequently as their full time active duty counterparts. The Army projects increased ARNG deployments in the future, so it is critical that ARNG members stay fit.

As a matter of background, "The Florida Army National Guard, is a component of the Army National Guard. The Army National Guard's federal mission is to maintain well-trained, well-equipped combat units available

for prompt mobilization during federal military operations."

The Team Fitness Tracker Research Study was funded by Joint Program Committee-1, Medical Simulation and Information Sciences. TATRC's HTIC Lab developed the Team Fitness Tracker to study whether members who used activity trackers, in combination with a corporate dashboard reporting group activity and competitions, could sustain activity levels, improve body measurements, and increase physical readiness test scores, contributing to increased ability to deploy. The TATRC Team Fitness application provides a means for units to engage in friendly competition amongst members, receipt of virtual awards, and a progress map simulating a walk across the U.S. The Team Fitness Tracker application also supports members by providing validated exercise routines, nutrition, and sleep information. It also provides team group views to help Master Fitness Trainers manage and motivate groups. While unit Commanders do not have access to individual member's data, the software will provide the capability to produce reports that analyze overall team fitness and thus, readiness. TATRC has partnered with the Uniformed Services University of Health Sciences (USUHS), Consortium for Health and Military Performance (CHAMP) for this research. CHAMP will be analyzing the data in relation to the study hypotheses.

What is unique about the Team Fitness Tracker application is its ability to provide an enterprise consolidation of tracker data from different manufacturers. This allows unit members who wear different manufacturer's activity trackers (such as Fitbit and

Team Fitness Tracker
continued on page 7



Team Fitness Tracker *continued from page 6*



TATRC and USU CHAMP Team with Army National Guard, Camp Blanding, Remedial Group Leaders During Recent Team Fitness Tracker Deployment (From left to right: Ms. Ashleigh Simon, SFC Robert J. Eads, USA, Unknown, Ms. Stephanie Hutson, Mr. Robert Connors)

Garmin) to challenge each other, unlike the Fitbit and Garmin manufacturer activity portals, who only allow Fitbit users to challenge Fitbit users, and Garmin users to challenge Garmin users. The TATRC Team Tracker application uses a third party application from Validic to consolidate cross-manufacturer activity tracker data. While Validic supports over 400 different types of activity trackers and other home medical devices, for the purpose of the study and due to licensing arrangements, the TATRC study only is comparing two types of manufacturer devices.

Due to recent potential safety concerns caused by the GPS tracking on activity trackers, TATRC is advising members who deploy to remote, isolated areas to turn in their devices prior to deployment. An official policy on the use of these trackers is pending the Department of Defense Chief Information Officer decision.

Ms. Ollie Gray stated, "It is exciting that what started as an internal TATRC challenge, is now being used to promote healthy behaviors for our Service Members. We are looking forward to the results and the potential for continued use of the Team Fitness Tracker by not only our Service Members, but all beneficiaries." ■■■

mHIC Peer Review Article Published in Military Medicine



On 28 December 2017, TATRC's Mobile Health Innovation Center (mHIC) had a peer review article entitled, "Does Mobile Care ('mCare') Improve Quality of Life and Treatment Satisfaction Among Service Members Rehabilitating in the Community? Results from a 36-Wk Randomized Controlled Trial" published online by Military Medicine. The article appears in the current version of the journal.

The article specifically examines whether Service Members who received a mobile health intervention had a difference in their well-being scores and care satisfaction. It also highlights the challenges of measuring these outcomes based on diverse populations with different healthcare issues. Participants and care managers who used mCare said that they found it useful. According to the study, "The fact that patients and care managers liked mCare, apart from no changes in outcomes, is important because health care is increasingly adopting mobile solutions."

Military Medicine is the official international journal of the Association of Military Surgeons of the United States (AMSUS); a professional association of healthcare professionals serving in the Active and Reserve components of the Uniformed services of the United States, as well as the Department of Defense and the Department of Veterans Affairs. Organized in 1891 and chartered by Congress in 1903, it is known as AMSUS, The Society of Federal Health Professionals. The objective of the journal is to promote awareness of federal medicine by providing a forum for responsible discussion of common ideas and problems relevant to federal healthcare.

The full article can be found online at the following link: <https://academic.oup.com/milmed/advance-article/doi/10.1093/milmed/usx035/4781299>



AAMTI Project Spotlight: Feasibility Study of a Novel Neurofeedback Technology for Persistent Post-Concussive Symptoms in Soldiers

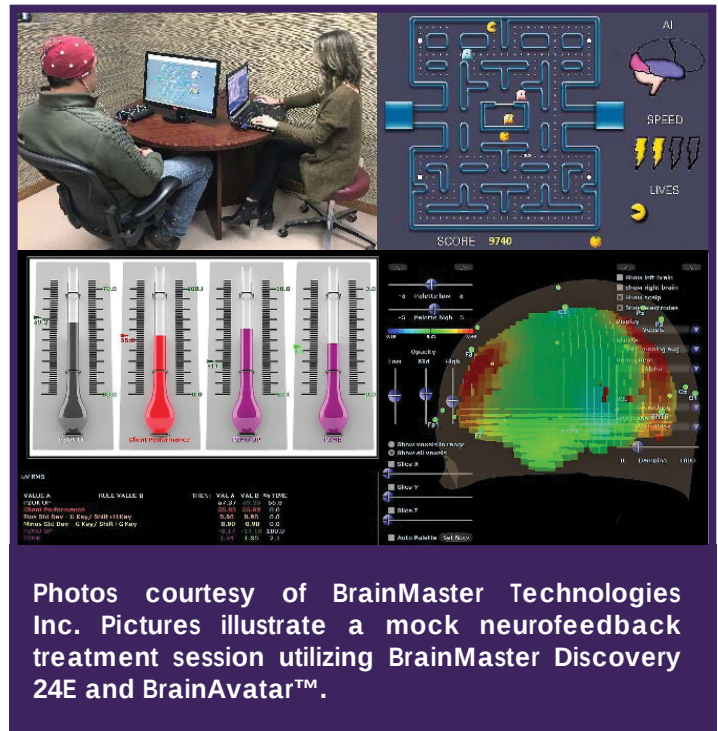
Lifetime history of traumatic brain injury (TBI) is present in over 60% of military personnel. While most of these events are mild and leave no complications, nearly 20% of individuals sustaining TBI experience persistent symptoms. The presence of somatic, cognitive and/or behavioral impairment may affect the service member's capacity to return to duty.

Neurofeedback is a treatment technique that uses real time visualization of brain activity through scalp electroencephalography (EEG). Current approaches require the involvement of highly trained individuals capable of identifying dysfunctional signaling and guiding the individual through strategies to modulate their brain activity. Neurofeedback effectiveness has been claimed for the management of several behavioral and somatic conditions including those commonly found in individuals with persistent post-concussive complications.

With this AMEDD Advanced Technology Initiative (AAMTI) funded project, the aim was to evaluate the operational feasibility of delivering an intense treatment program with Global Z-Score Neurofeedback Technology (GZNT) to Service Members or Veteran beneficiaries struggling with persistent post-concussive symptoms (PPCS). GZNT is a cost efficient, semi-automated system that utilizes sounds, graphs and computer animation to guide individuals towards EEG normalization.

Eligible participants received between 15 and 20 neurofeedback sessions over a 6-week period. Subjects were evaluated at baseline, treatment completion and 3 months after their final treatment visit. In addition to tolerance and adherence to treatment, participants were examined for electrocortical changes, symptom improvement as well as cognitive, emotional and vocational functioning.

Enrollment for the study reached completion during the Summer of 2017. Out of the almost 500 patients contacted for participation, 172 were invited for in-office screening. Seventy-five subjects met criteria for enrollment, but only 38 were eligible for treatment. Twenty-seven subjects completed treatment, and 23 made it to the 3-month follow up.



Tolerance and adherence to treatment were 89% and 82% respectively, proving the feasibility of GZNT use in this particular cohort. Neuropsychological testing and standardized surveys administered during the study evaluations evidenced acute improvement with sustained effect at 3 months for processing speed. Areas of executive function, including attention and working memory, showed improvement as well, but not to the level observed with processing speed. Subjects reported significant improvement in concentration, memory, mood stability and decision making; while sleep, pain, social relationships and mathematical performance remained unchanged. EEG and physiological response data collected during treatment sessions and evaluations are still under analysis.

Based on the findings, GZNT is a feasible treatment option for Service Members and Veterans experiencing PPCS. However, it is still premature to claim effectiveness

Novel Neurofeedback Tech

continued on page 9

TATRC mHIC Lab Leader Receives Distinguished Marquis Who's Who Humanitarian Award

In January 2018, Marquis Who's Who Publication announced that Ms. Jeanette R. Little, Lab Manager for TATRC's Mobile Health Innovation Center (mHIC), was one of the recipients of their most recent round of Humanitarian Awards and will be included in the 2018 Edition of the Marquis Who's Who biographical volume. Individuals profiled by Marquis Who's Who are selected on the basis of current reference value. Factors such as position, noteworthy accomplishments, visibility, and prominence in a field are all taken into account during the selection process.

The publication has been in existence since 1899, when A. N. Marquis printed the First Edition of Who's Who in America. Marquis Who's Who has chronicled the lives of the most accomplished individuals and innovators from every significant

field of endeavor including politics, business, medicine, law, education, art, religion and entertainment. Today, Who's Who in America remains an essential biographical source for thousands of researchers, journalists, librarians and executive search firms around the world.

This is the second time that Ms. Little has been recognized by the Who's Who organization. She was also highlighted in their publication in 1990 during her graduate school work under her maiden name, Jeanette Rasche.

Ms. Little stated, "I am deeply honored to be recognized again by this prestigious organization, but the true credit goes to my wonderful colleagues - it is their teamwork that has made all of our organizational successes possible."

The full press release on Jeanette's accomplishments that led



Ms. Jeanette Little, TATRC's mHIC Lab Manager, recognized by Marquis Who's Who.

to her award and selection for the 2018 publication can be found at: <https://worldwidehumanitarian.com/2018/01/03/jeanette-little/>

Team TATRC would like to Congratulate Jeanette on this prestigious recognition! ■■■

Novel Neurofeedback Tech *continued from page 8*

in the study cohort. We expect to be able to draw some conclusions once data analysis is completed within the next few months about whether we will move forward with a larger trial to explore optimal dosing (length of treatment, treatment interval, etc.) or re-evaluate the study course. While tolerance and adherence to the treatment was satisfactory, more studies are needed to determine efficacy of GZNT.

If found effective for the management of PPCS, GZNT can become a cost-effective, easily deployable, non-pharmacological intervention that can be administered by a variety of medical personnel such as nurses, occupational therapy assistants, physical therapy assistants, or medics, after a short training period. With a predicted dosing of 4 - 5 visits per week for 6 weeks, one trained therapist with one set of equipment could deliver treatment to over 75 Service Members per year in a single treatment room, potentially reducing the need for pharmacological intervention and the

burden on specialized care.

CDR Renee Pazdan, Commander at the United States Public Health Service and Senior Clinical Research Advisor, Defense and Veterans Brain Injury Center stated, "If standardized neurofeedback using GZNT technology can significantly reduce post-concussive and PTSD symptoms, thus avoiding disability status for the Service Member, the savings would be substantial in both fiscal and human terms." ■■■

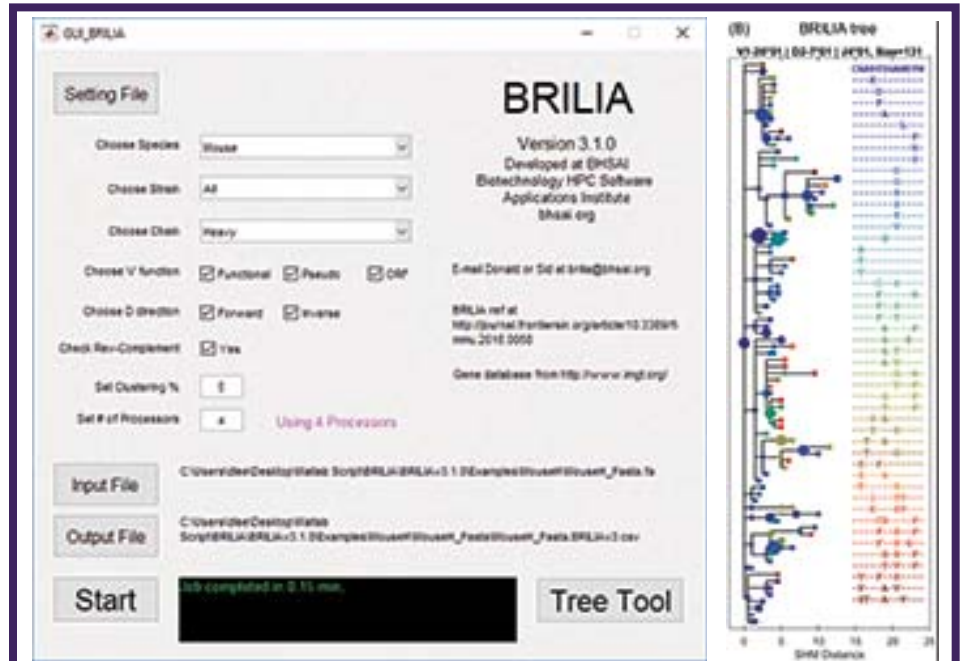


BHSAI Develops Software to Track Antibody Responses to Vaccines

Vaccines are a critical component in maintaining Force Health Protection by providing a first line of defense against infectious diseases or weaponized biological agents. The U.S. Army carries out pre-clinical and clinical vaccine research on a wide range of biological targets, from malaria and dengue fever to Ebola and Anthrax. However, the development of vaccines capable of durable, long-lasting protection remains a significant challenge. Recent advances in DNA sequencing technology have enabled researchers to characterize immune responses elicited by vaccines at an unprecedented level of detail. In a new Defense Threat Reduction Agency-funded research effort, scientists at TATRC's Biotechnology High Performance Computing Software Applications Institute (BHSAI), in collaboration with U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), have begun to identify features of vaccine-induced immune responses that are associated with efficacy and durability.

Many vaccines produce immune cells called B cells, which secrete antibodies that bind specifically to and neutralize an invading pathogen. The genes that code for antibodies are rearranged and evolved in a complex manner in response to an infection to produce a large repertoire of B cells that fight the infecting pathogen. However, despite the recent advances in high-throughput sequencing of antibody genes (i.e., immunosequencing) to characterize this process, the staggering number and diversity of B cells, and the complex genetic relationships between them, presents significant challenges in analyzing such immunosequencing data.

To address this issue, the BHSAI team led by Dr. Sid Chaudhury, developed a specialized software program called B cell Repertoire Inductive Lineage and Immunosequence Annotator (BRILIA), to convert DNA sequences



The Web-based server and user interface for the immunosequencing annotation tool BRILIA, which is available to all DoD vaccine researchers. The B cell lineage map on the right annotates the evolution of vaccine-induced antibody responses from the immunosequencing data.

into B cell lineage trees that track how the B cell repertoire evolves over time as a response to vaccination.

In collaboration with Dr. Chris Cooper from USAMRIID, Dr. Donald Lee at BHSAI analyzed data from mice vaccinated with Ebola vaccine candidates to pinpoint how the B cell development process differs under different vaccination conditions. Their results showed that vaccination regimens associated with long-term protection elicited B cell lineages that were highly evolved and focused on a distinct subset of shared antibodies sequences compared to less efficacious vaccine regimens which elicited broader, but less focused immune responses. They are currently working to understand how these shared antibodies sequences evolve over time and what role they may play in durable immunity.

The BRILIA software was designed as a generalized immunosequencing analysis platform that can be applied to a wide range of immunology and vaccine research efforts. The BHSAI team has developed a Web-based user interface for the software that enables DoD scientists to upload and analyze immunosequencing data from a range of sequencing platforms. In addition to research in Ebola, BRILIA is being used in a collaboration with the Walter Reed Army Institute of Research to analyze data from both pre-clinical and clinical studies in malaria vaccines.

Dr. Chaudhury stated, "BRILIA will allow us to rapidly profile antibody responses in human and animal vaccine studies and identify patterns of antibody responses that may be linked to vaccine efficacy and protection." ■■■



AAMTI Program Manager Invited to Speak at BAMC

Ms. Holly Pavliscsak, Program Manager for the AMEDD Advanced Medical Technology Initiative (AAMTI), was honored to be invited by Department of Clinical Investigation and the Graduate Medical Education department at the Brooke Army Medical Center (BAMC) in Fort Sam Houston, Texas to be the featured speaker at their Research Open House event on 31 January. In addition to Ms. Pavliscsak's presentation, the program also included an overview of the support services available through the clinical investigations department to support graduate medical students, including sessions dedicated to new Principal Investigators/Fellows that provided subject matter expertise on lab operations, statistics and research design and navigating the research funding process for grants and CRADAs.

Ms. Pavliscsak delivered a comprehensive overview of the AAMTI Program to approximately fifty participants attending the event at BAMC. During her visit, she educated and outlined the application, review, award and reporting processes for the AAMTI program's two funding options: the Extended Innovation Funding (EIF) and the Rapid Innovation Funding (RIF). She explained how the AAMTI Program facilitates bottom-up technology innovation while simultaneously informing top-down acquisition throughout Army Medicine. The AAMTI program execution encompasses small technology funding investments at the facility/individual level in two distinct



Ms. Holly Pavliscsak pictured with Dr. J. Shen-Gunther, MD, PhD, COL, MC, USA Gynecologic Oncology Chief, Dept. of Clinical Investigation at BAMC.

categories: RIF and EIF for which the period of performance for each category is limited to 6 and 18 months respectively.

While onsite, Ms. Pavliscsak visited with some of the existing AAMTI awardees to check in on their progress towards their project goals and deliverables, as well as resolve any issues they might be having. Over 20 AAMTI projects have been funded at BAMC since 2010. These onsite visits are informative and build connections between the AAMTI program and awardees. Many awardees also participate as peer reviewers in follow-on years to assist new Innovator's with preparation for potential challenges as they plan their prospective projects.

Ms. Pavliscsak stated, "AAMTI site visits provide a great opportunity to build trust at our local sites and allow for valuable face time with current and future AAMTI Innovators to discuss the award process and expectations first hand. We often have a surge in submissions from first time Innovator's after every site visit!"

The AAMTI program continually accepts proposals for the RIF program at <https://tatrc.amedd.army.mil/AAMTI/>. Additional questions should be directed to Ms. Holly Pavliscsak at 240-566-2378 or holly.h.pavliscsak.ctr@mail.mil.



At BAMC's Research Open House, Ms. Holly Pavliscsak educates attendees on the AAMTI Program, its processes and how to obtain funding.

Employee Spotlight

Congratulations to TATRC's Q2 Employee of the Quarter, Mr. Nathan Fisher!

Mr. Nathan Fisher, Project Manager for Medical Robotics and Autonomous Systems with TATRC's Operational Telemedicine Lab, has been selected the TATRC Employee of the Quarter for Q2.

During this quarter, Nathan Fisher essentially created the two new Army Science & Technology Research Task areas in Medical Robotics and Medical Autonomous & Unmanned Capabilities by developing a research timeline and preparing the necessary documents for submission through the Medical Simulation and the new Army S&T Task areas. He also initiated and participated in the submission of five intramural research proposals that include: Medical Robotics - Robotic Perception for Combat Casualty Care; Medical Robotics - Telesurgical Robotic Operative Network; Medical Autonomous & Unmanned Systems – ARES Medical Missions Module; UAS Medical Research Platform Laboratory; and Artificial Intelligent Medic Assistant. This was all accomplished in a matter of weeks, which was truly an exceptional effort. If these proposals are approved for funding, they will bring TATRC approximately \$6 Million in research dollars over the next 3 years. Additionally, Nathan wrote and submitted yet another P6.7 proposal aimed at integrating the Office of Naval Research's (ONR) Autonomous Aerial Cargo Utility System with the TATRC Operational Telemedicine System, and ONR's Autonomous Critical Care System for the purpose of inserting this integrated Unmanned Capability into the March 2019 Army Expeditionary Warfare Experiment at Fort Benning, GA.

During this same period, Mr. Fisher represented TATRC and USAMRMC at several high level presentations and demonstrations of TATRC's current, past and future medical robotic and autonomous systems research. These included presentations to Congressional members, the Office of the Secretary of Defense and Assistant Secretary of the Army (Acquisition, Logistics and Technology) (ASA(ALT)) representatives, NATO and other foreign visitors, as well as demonstrations at the ASAALT booth during the annual Association of the United States Army Convention. In every case, he presented the TATRC robotics story articulately, professionally, and effectively, which was a great credit to TATRC and USAMRMC.



Mr. Nathan Fisher, Project Manager for Medical Robotics and Autonomous Systems is EOQ for Quarter 2

Finally, Nathan represented the USAMRMC at the Army's Future Force Design IV workshop at the Army War College in Carlisle Barracks, PA. His contributions were instrumental in both 1) educating and informing the Army Capabilities Integration Center, U.S. Army Research, Development and Engineering Command, and AMEDD HCoE participants and the Army leadership on medical aspects of Robotics & Autonomous Systems (RAS) research as well as 2) documenting six medical mission RAS capabilities within the workshop final report and narrative.

These accomplishments and the efforts required to make them, are extraordinary and represent how dedicated Mr. Fisher is and how he truly goes above and beyond to make a difference.

Congratulations to Mr. Nathan Fisher for the well-deserved honor of being named TATRC's Employee of the Quarter! ■■■



HTIC Takes on a New Technical Writer



Mr. Ed Ort, Technical Writer

The HTIC Team is pleased to announce Mr. Ed Ort as their new technical writer, editor, and content developer based in Las Vegas, Nevada. Ed will provide a valuable service to not just the HTIC, but also to the entire TATRC organization. He will not only review draft publications,

but also be able to document the use of software tools developed and prepare succinct user documentation.

Mr. Ort comes to us with many years of written experience in medical and computer-related fields. Most recently, he created printed and web-based content for the Cleveland Clinic Lou Ruvo Center for Brain Health and for the University of Nevada, Las Vegas School of Medicine. Prior to that, Mr. Ort worked for computer companies, both big and small, such as IBM, Sun Microsystems, Sony Ericsson, and Mulesoft.

Mr. Ort loves the outdoors and takes advantage of the beautiful mountains that surround the Las Vegas Valley (Yes, there's a lot more to Las Vegas than slot machines and Cirque du Soleil!). Ed is excited to be a part of the TATRC team and looks forward to contributing to the leading edge work that the organization does. ■■■

New Windows Systems Administrator Joins the HTIC Team

Team TATRC is pleased to announce the latest technical addition to the HTIC team! Mr. Reginald Francois has joined us as the new Windows Systems Administrator and will be assisting by providing server support and maintenance for HTIC. Mr. Francois has been in IT industry since the early 2000's. Most recently, Reginald was working at the Department of State in Laurel. His responsibility was to maintain all of the appliances and tools used by the Computer Incident Response Team to detect security threats, both domestic and abroad.

Reginald graduated with a four year Bio-Premed degree from City College of New York, but later on fell into IT and realized that was the best career choice he could have made. Reginald loves technology and the fast-paced IT world and says that technology is constantly changing and that's what keeps things



Mr. Reginald Francois, Windows Systems Administrator

fresh and exciting.

Originally born in Haiti, Reginald moved to the United States in 1967 and was raised in Brooklyn, NY. He moved to Maryland in 1997 with his wife and daughter and after living here, has said that he would never go back to live in the

city! He is an avid fitness buff, and enjoys going to the gym daily. Reginald is the proud pet parent of a Lab/Terrier rescue puppy named Bentley and two cats, Chase and Stacha.

Team TATRC extends a warm welcome to Reginald! ■■■



Employee Spotlight

TATRC Adds a New P.O. to our Growing Team



*Ms. Teresa Guthrie,
Project Officer*

Ms. Teresa Guthrie has joined our TATRC team as a Project Officer, primarily supporting the Operational Telemedicine Lab. In this capacity, Ms. Guthrie works with the Program Managers to ensure various research requirements and deadlines are met, as well as updating internal and external project records.

Ms. Guthrie will also be supporting technology transfer efforts for TATRC. She comes with two and a half years of experience in laboratory research and one and a half in the transportation industry.

Born and raised on Long Island, New York, Teresa attended the University of Maryland, where she earned her Bachelor and Master of Science degrees in mechanical engineering. While earning her Masters, she worked at the U.S. Army Research Lab in Adelphi, MD, where she conducted original research on the combustion behavior of liquid hydrocarbon fuels. This work yielded four research papers published in peer-reviewed journals, and three presented at national conferences held by the American Society of Mechanical Engineers. After graduating, she moved back up to New York, where she worked for the New York City Transit (NYCT) Department of Buses, serving as an HVAC subject matter expert. This entailed providing engineering support to the bus maintenance facilities, as well as working with the bus/HVAC manufacturers to better meet NYCT's needs. She also consulted with the R&D team on projects involving fuel consumption and exhaust after treatment.

Teresa married her husband Andrew, last Memorial Day weekend at a beautiful historic inn in Stony Brook, NY. Together, they have two cats, Dennis and Dee. A former cheerleader, Teresa now enjoys performing on aerial silks, as well as traveling, SCUBA diving, painting, and spending time with her family.

Team TATRC is happy to have another diverse Project Officer to support our growing labs! ■■■

Tee Dockery Joins TATRC's Operational Telemedicine Team

Ms. Tee Dockery is a Cellular End User Device Software Engineer at TATRC, where she will be doing Android application development for the Operational Telemedicine Lab. Previously, Tee was developing Java/Oracle web applications for USAMRMC HQ and is no stranger to Fort Detrick.

She has been developing systems for the Army and Homeland Security since 2000, and has worked on standalone and web applications across multiple platforms for the Defense Information Systems Agency as well as the U.S. Army Medical Research Institute of Infectious Diseases. She has also provided software development and support for corporations as diverse as Citibank, AOL, Sony, and the



*Ms. Tee Dockery, Cellular End
User Device Software Engineer*

American Diabetes Association, among others.

Tee has an MBA with MIS emphasis from the University of Arkansas (go Hogs!). She grew up on two continents, and has lived on both coasts and in the middle of the U.S. When not working, she likes reading, running, listening to birds, breathing deeply

in a forest, exploring virtual worlds, and watching Jeopardy and baseball.

TATRC is delighted to welcome such an experienced developer to the mix! ■■■



New Multi-Media Coordinator, Brandon Grimes Joins the PAO Team



*Mr. Brandon Grimes,
Multi-Media Coordinator*

Mr. Brandon Grimes has joined the TATRC team as the new Multi-Media Coordinator. Brandon will be supporting the organization with his expertise in social media marketing to spread the good word about TATRC and the various projects and technologies being used to

support our folks in uniform. He will also be providing videography and photography support of TATRC through original content creation and coverage of our various events and conferences. He is very much looking forward to getting started here, and his door

is always open!

Having grown up most of his life in the Frederick area, Brandon is excited to be able to put his talents and work ethic to use so close to home.

Brandon comes from a technical writing background, having spent the past four years working at Hughes Network Systems. There he was responsible for a number of projects, most notably playing a large role in the successful launches of the EchoStar XIX, XXI, and XXIII satellites. However, his passion for media and marketing was developed through building his own media company on the side, providing clients with video and photo services both in the air and on the ground.

He and fiancé Nina have a wild and wonderful one-year old daughter, Lila. Together they enjoy all kinds of things, including hiking, cooking, music, and hiding the remote from Dad (mostly just Lila).

Brandon is excited to be turning his passion into a career, and Team TATRC is just as excited to have him on board! ■■■

TATRC Welcomes New Graphic Designer & Webmaster



*Mr. Ray Samonte, Graphic
Designer & Webmaster*

TATRC's Marketing & Public Affairs Office is excited to introduce Mr. Ray Samonte as the new Graphic Designer & Webmaster. Ray brings over 15 years of digital and print design experience to the team. He studied Graphic Design at Virginia

Tech and was fortunate to have worked with organizations such as The Washington Redskins, Hyatt, Georgetown University and the Global Environment & Technology Foundation.

Ray spent most of his career in a corporate setting and had been seeking new opportunities where he could use his skillset to make more of an impact. He is delighted to join TATRC and is eager to contribute to the organization's mission requirements in the best way possible. Ray will be providing creative support to all of TATRC's labs and key programs. He will also manage TATRC's website, collaborate on marketing initiatives and maintain the organization's brand and robust graphic assets.

Aside from design, Ray is passionate about technology, traveling and sports. He spends most of his free time keeping up with his son, whether it's playing baseball, football, basketball, hockey, going fishing or snowboarding.

Team TATRC is pleased to welcome aboard this wonderful new asset! ■■■

TATRC Gets a Front Row View at the Future of Army Warfare during Robotics Systems Workshop

Several members of Team TATRC were invited to Carlisle Barracks in PA to participate in a weeklong ‘deep dive’ into the topic of how the Army will employ robotics and autonomous systems (RAS) in a future operating environment using the Multi-Domain Battle (MDB) framework. The goal of the Future Force Design IV Seminar was to complete a set of RAS MDB concepts of operations narratives describing the operational application of RAS in the MDB battlefield framework and potential operational benefits, concept and capability implications, employment considerations, force design/organization implications and RAS system vulnerabilities. This RAS seminar was just one part of the larger Future Force Design program, whose goal is to determine how the Army operates as part of the joint force against an enemy who expands the conduct of war into multiple domains at extended distances; i.e. the MDB operating concept.

Dr. Gary Gilbert, the Capability Area Manager for TATRC’s new Autonomous and Unmanned Medical Capability/Medical Robotics Task Areas and Lab Manager of the Operational Telemedicine Lab, was accompanied by Mr. Nate Fisher, Project Manager and SME for Robotics, as well as Mr. Ron Yeaw, who is assisting in the development of TATRC’s other new Task Area portfolio in Virtual Health. The AMEDD C&S Health Readiness Center of Excellence (HRCoE) was represented at the workshop by 5 field grade officers from Fort Sam and one civilian from the Medical Evacuation Proponency Division at Fort Rucker. TATRC is working together with AMEDD C&S HRCoE in the area of exploring capabilities for medical RAS. According to Dr. Gilbert, “It was very encouraging to see the AMEDD C&S HRCoE send five officers and one civilian to this initial RAS capability needs identification effort; that level of commitment from our

AMEDD combat developers clearly signals that our AMEDD leadership is seriously considering robotics and autonomous systems as potential medical force multipliers in future combat scenarios.”

For Ron Yeaw, the opportunity to see how medical research fit into the perspective of the Army’s Go to War mission was fascinating. “Spending so much time at the MEDCOM level, it’s easy to lose perspective of just how much bigger the elements we are designed to support are. It was a truly humbling experience to have a periscope-up view of the big Army picture. In the big scheme of things, the medical sustainment of our Warfighters is a tiny, but incredibly important aspect.”

Nate Fisher appreciated the opportunity to work first firsthand with others from the RAS S&T community, as well as combat developers. “Discussing the implications of applying RAS technologies in the context of Multi Domain Battle with participants from a wide range of functional areas, served to highlight the importance of applying a comprehensive and integrated approach when employing RAS in the future battlefield. Medical is one of many functional areas that requires a shared understanding and visualization of the battlespace to properly utilize RAS assets,” stated Mr. Fisher.

Mr. Fisher and Mr. Yeaw were able to share their lessons learned from the Carlisle Barracks RAS workshop during a Professional Development session hosted by TATRC’s Science Director, Dr. Fran McVeigh. Mr. Yeaw stated, “COL Kral reminds us consistently that it’s critical to get out of our space and understand the perspective of the Army’s larger, and constantly evolving mission; i.e. this transition to the MDB. Blindly developing solutions without a context of the capability they are looking to fill is not effective. If you don’t understand the WHY, the HOW does not matter.” ■■■



TATRC Visits BAMC's Virtual MEDCEN

On Tuesday, 30 January, a multidisciplinary team from TATRC visited the newly established Brooke Army Medical Center's (BAMC) Virtual MEDCEN (VMEDCEN) at Fort Sam Houston, Texas in support of the Office of the Surgeon General's (OTSG) G3/5/7 Virtual Health Office. The all-day visit included a series of presentations from BAMC's VMEDCEN team about their future direction and goals. Team members from TATRC included: COL Dan Kral, Director; Dr. Francis McVeigh, Lead for the Virtual Health Support Office (VHSO); Ms. Jeanette Little, Mobile Health Innovation Lab Lead; and Ms. Holly Pavliscsak, AMEDD Advanced Medical Technology Initiative (AAMTI) Lead. The purpose of the visit was to discuss the VHSO's mission as given to them by the Army's Deputy Surgeon General, its accomplishments, and its focus on connecting the deployed providers with the garrison providers. Furthermore, TATRC offered its assistance to the VMEDCEN Team in helping them with the part of their mission as it relates to the VHSO's mission. Additionally, Ms. Little discussed her involvement in the Mobile Health Care Environment and the current capabilities of mCare's secure mobile app, as well as the lessons learned from secure messaging research. This proved to be extremely valuable as the VMEDCEN has a fairly new mission to begin Remote Home Monitoring programs. Lastly, Ms. Pavliscsak discussed the AAMTI Program with the BAMC providers, many of which are direct recipients of AAMTI funding.

While at Fort Sam Houston, COL Kral had the opportunity to meet with COL Steven Birchfield, U.S. Army Europe (USAEUR) Surgeon, which resulted in a near-term shift of

focus for the VHSO support team as we aim to provide direct assistance with Operational capability gaps in healthcare support directly tied to Operation Atlantic Resolve. The near-term objective will be to develop an Operational Needs Statement (ONS) for USAEUR Surgeon to staff, depicting the healthcare gaps and need for telehealth equipment at the various Atlantic Resolve operating sites. This gap remains persistent as our Army medical units are still not equipped with the necessary means of conducting synchronous and asynchronous healthcare in a virtualized environment. COL Kral stated, "We need to address those limiting factors that are making it difficult to perform virtual health in the deployed settings, and the ONS Process can begin to do this."

The VMEDCEN has been given the Army's mission to serve as the organizational structure by which providers deliver Virtual Health (VH) services using synchronous and asynchronous capabilities in both garrison and deployed settings across all roles of care. As a result of these productive discussions, it is anticipated that TATRC will be working even more closely with the team at Fort Sam Houston to ensure that they are able to leverage lessons learned from research studies and pilot demonstrations to ensure successful implementation of their VH efforts.

Dr. McVeigh stated, "It is imperative that the VHSO Team communicate with the OTSG's VH Office and the VMEDCEN, their findings, developed products, and initiatives so that together, we can efficiently and effectively achieve the best VH capabilities possible." ■■■



Brooke Army Medical Center (Photo Credit: EMIC Med Photo)



Team TATRC's Perspective on HIMSS 2018

"Predictive analytics will change healthcare." That was the core message behind former Google Executive Chairman, Mr. Eric Schmidt, at the opening keynote address of the 2018 Healthcare Information and Management Systems Society (HIMSS) conference in Las Vegas earlier this March. Artificial intelligence is evolving to become powerful assistants to medical providers in the future, not replace them.

"I want [providers] to use computers as data sources, along with their good judgment and colleagues, and so forth, and I want them to be in charge. In my vision, the doctor and the nurse — the clinicians — are more important. For things that are life-critical, I want a human in the loop," Schmidt said.

Schmidt also predicted that artificial intelligence would be better at predicting. "We have physicians inside of our company who believe that if our algorithms for prediction work, we can predict outcomes in the ER for example, 18 to 24 hours earlier than any other observation system."

These are powerful statements from one of the most innovative voices in information technology. This was actually Eric Schmidt's second time opening HIMSS, as he was also a keynote speaker at HIMSS in 2008. The annual HIMSS conference is the largest health IT educational program and exhibition center in the industry, bringing in over 40,000 health IT professionals, clinicians, executives and vendors from around the world. This year's conference brought in 44,000 people, which is a new record for HIMSS.

TATRC sent seven representatives to this year's conference. According to TATRC's Virtual Health Support Office Lead, Dr. Fran McVeigh, "attending HIMSS provides the opportunity for TATRC personnel to gain knowledge on current and future health IT focus areas both within the military and civilian environments; and meet with military and civilian leaders and innovators to discuss TATRC's interests and possible collaborations going forward."

Mr. Ron Yeaw, Deputy Lab Manager for the Mobile Health Innovation Center, noticed the strong trend this year towards artificial intelligence solutions. "For TATRC, it's not just about who is doing what in the commercial sector, it's also about how you see the market's overall portfolios evolving. Last year, everything was about augmented reality, this year we see much heavier investments in Deep Neural Network machine learning and in new AI areas, such as Reinforcement Learning.



TEAM TATRC participated in the HIMSS 2018 Conference. (Pictured left to right) Ms. Ollie Gray, Dr. Francis McVeigh, Mr. Larry Markins, Ms. Jeanette Little, COL Dan Kral, Mr. Rob Chewning and Mr. Ron Yeaw were all on hand for this innovative and impressive annual event.



COL Dan Kral (right) and Dr. Francis McVeigh (center) explored the HIMSS Exhibit Hall, which consisted of over 1300 vendors. The entire conference covered over 37 city blocks!

Recognizing that shift in the market is valuable in that it gives a good indication of where the commercial sector sees where the biggest values and breakthroughs in healthcare will be coming from."

Dr. McVeigh went on to say how impressed he was with the conference sessions this year. "The HIMSS sessions





Ron Yeaw, mHIC's Deputy Lab Manager, spent some valuable time in the Connected Health area of the HIMSS 2018 Conference exhibit hall. Here, he is seen with a virtual reality training demonstration for documenting Role 1 to Role 3 patient care.

focused on user needs, such as Telehealth's active programs ranging from NASA in space, to the VA keeping bi-directional lines of communication open to their patients no matter where they were, 24/7. Both were very impressive in their own right as they imparted challenges and solutions they developed to meet these challenges."

mHIC's Lab Manager, Ms. Jeanette Little also noted this year's conference was a step forward, "the HIMSS annual conference continues to expand and grow exponentially; it was an amazing event to experience this year."

TATRC Director, COL Dan Kral attended HIMSS with an eye towards civilian partnership. "As a general rule, I explore the HIMSS exhibits and briefings with an eye towards re-purposing commercial technology to solve Operational medicine gaps. For me, that is the value. It's hard to say in advance where those technologies might appear across all the specialties."

The 2019 HIMSS Conference returns to Orlando next year, and will take place 11-15 February. ■■■

On the Horizon...

Upcoming Events:

29 April - 1 May: American Telemedicine Association Annual Conference; Chicago, IL

14 - 17 May: SOMA Conference; Charlotte, NC

19 May: Armed Forces Day

28 May: Memorial Day



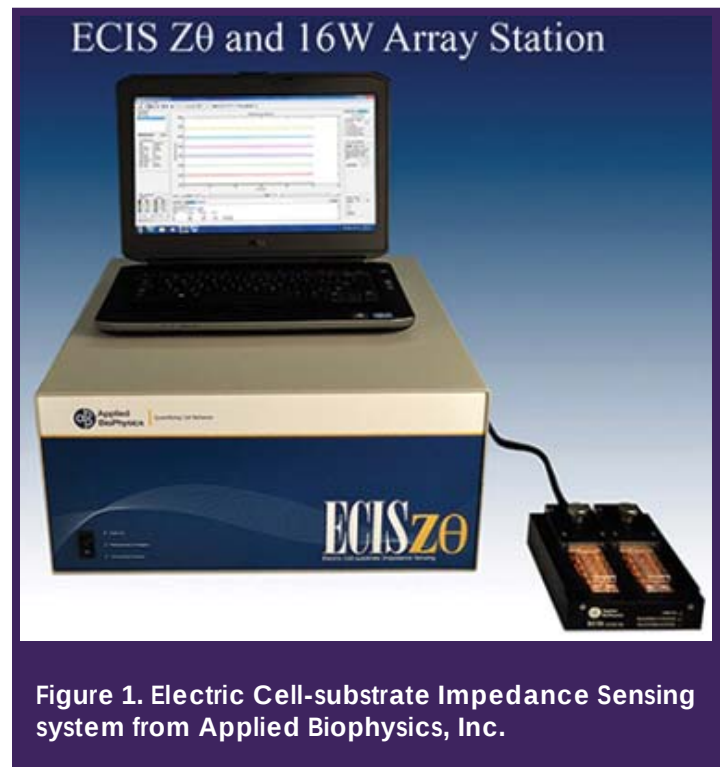
AAMTI Project Spotlight: Electric Cell-Substrate Impedance Sensing as a Means of Determining the Virulence Potential of Bacterial Isolates

The disruptive nature of war coupled with the degradation of barriers to infection resulting from combat and non-combat injuries predispose military personnel to bacterial infection. Bacterial infection is a significant cause of morbidity and mortality in the military healthcare setting. Historically, disease and non-battle injury have had a significant impact on military readiness and have led to more lost duty days than combat injuries. The recent emergence of drug resistant organisms in both community acquired and hospital-related infections has increased the significance of bacterial infection with respect to the full spectrum health protection and readiness. In addition, bacterial infections increase the overall cost of military health care by complicating mechanical trauma and lengthening hospital stays.

The ability of bacterial pathogens to disrupt and invade cell monolayers is a surrogate measure of virulence. This is due to the fact that virulent pathogens tend to degrade tissue barriers and disperse throughout the body. It has been shown that the ability of pathogens to invade host tissues is responsible for the spread and dissemination of these pathogens within the host. At present, the military clinical laboratory does not have the ability to monitor invasive phenotype of bacterial pathogens, to determine whether antimicrobial therapy is capable of blocking cell monolayer invasion, or to detect changes in the invasive phenotype of bacterial populations over time.

Using a system developed by Applied Biophysics, Inc. called Electric Cell-substrate Impedance Sensing (ECIS) shown in Figure 1, a Tripler Army Medical Center (TAMC) team monitored and recorded the invasive properties of pathogens *in vitro*. This study, funded by AMEDD Advanced Medical Technology Initiative (AAMTI), was conducted at TAMC at the Department of Clinical Investigation. The Principal Investigator, CPT Abu Nahid explained that “this study is the first to demonstrate ECIS technology in a clinical setting and follow-on studies will focus on full integration and validation in the clinical laboratory.”

Eighty archived isolates of four bacterial species: *Escherichia coli*, *Staphylococcus aureus*, *Enterococcus faecalis*, and *Pseudomonas aeruginosa* were evaluated



using ECIS. Electrode arrays consisting of 8 wells with 10 gold electrodes fabricated on the planar surface of each well were used for all assays. To form cell monolayers, poly-L-lysine treated ECIS wells were seeded with 250,000 human alveolar basal epithelial cells (A549 cells) in complete media. Cell adhesion and spreading was registered prior to and post pathogen introduction as AC impedance changes of the electrodes over 11 frequencies for at least 24 hours prior to introduction of pathogen. Bacterial strains were added to established A549 cell monolayers in antibiotic-free media. Controls included electrode and media only or pathogen-free cell monolayers. The ECIS analysis software was used to extract barrier function, alpha (a measure of cell-surface distance), and cell membrane capacitance values reflecting cell response to bacteria invasion.

The data revealed a significant difference in impedance values between A549 cells only and A549 cells exposed to pathogens as illustrated in Figures 2-4. Each bacterial strain showed unique impedance change patterns. Serial dilution series demonstrated



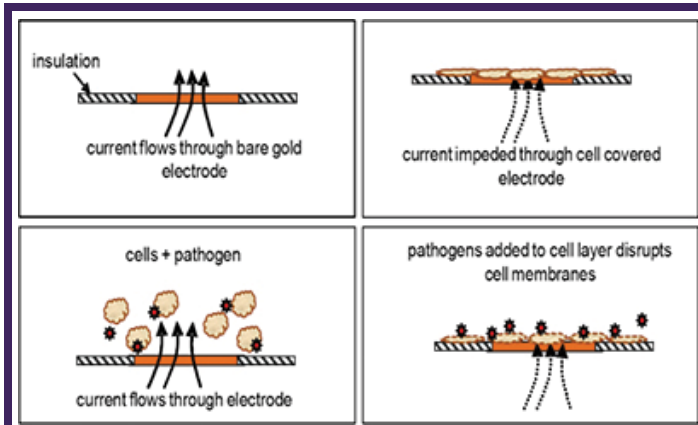


Figure 2. Illustration of current passing through the gold electrodes in the presence and absence of cells and pathogens.

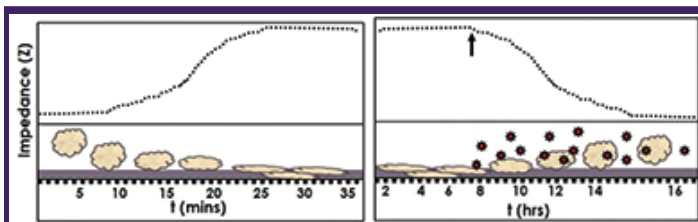


Figure 3. Illustration of impedance response during cell adhesion, spreading, and detachment on exposure to pathogens.

a correlation between pathogen load and impedance changes. Additionally, under the same condition, heat killed pathogens did not show significant change of impedance over 24 hours. The impedance response also reflected differences between pathogenic strains invading A549 cells. Initially in samples containing *P. aeruginosa*, the impedance increased significantly before subsequently decreasing. In contrast, *E. coli*, *S. aureus*, and *E. faecalis* samples induced a significant decrease in impedance and no initial increase was noted. Barrier function, cell membrane capacitance, and alpha, a measure of cell morphology, were extracted from the impedance values. Our findings indicate that ECIS provides a novel, automated, and quantitative method to distinguish pathogens rapidly in the clinical laboratory.

The introduction of the ECIS instrument into the clinical setting will provide previously inaccessible data regarding the invasive phenotype of bacterial isolates and the effects of antibiotic treatment on this phenotype. Since cell monolayer invasion is necessary for the spread

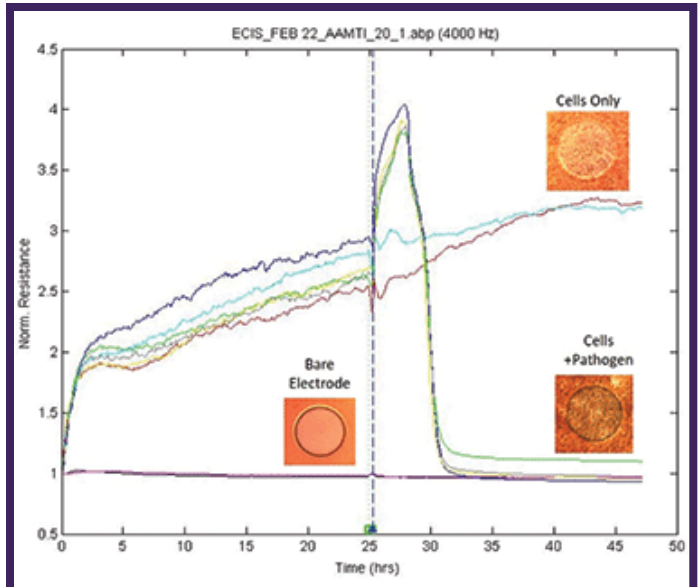


Figure 4. Raw data of normalized impedance for A549 cell covered electrodes, compared to cell-free electrode, and electrodes containing A549 cell layers exposed to pathogens.

and proliferation of the bacteria within the host, this data will allow the rational application of previously discarded antimicrobial and provide justification for dose modulation. In addition, surveillance of the invasive properties of bacterial isolates can alert health care providers to the presence of novel strains or the acquisition of increased virulence by previously described strains. The ECIS system thus has the potential to aid the physician and laboratory staff in increasing the readiness of the force while simultaneously reducing the overall cost of healthcare. The long term goal is to use ECIS as a tool to assess the virulence of unknown clinical samples that may help to guide and improve clinical treatment strategies. Additionally, the research results provide a foundation for using the ECIS system as a screening tool for assessing new and discontinued antimicrobial agents. This is a future application that the team plans to explore as well.

"This AAMTI funded study is the first of its kind in that it is the first to demonstrate ECIS technology in a clinical setting and follow-on studies will focus on full integration and validation in the clinical laboratory," said CPT Nahid. ■■■

»» » BACK BY POPULAR DEMAND

TATRC

HOSTS

4th Annual Technology OPEN HOUSE September 12, 2018

Due to the resounding success of last year's event, and record breaking attendance, TATRC will once again host its Annual Open House & Technology Demonstration! Please make a note and mark your calendars for Wednesday, 12 September 2018 and plan to attend this highly interactive and innovative event! We look forward to showcasing our exciting new initiatives here at TATRC this fall! Stay tuned for more details in the coming months.



Bob Connors Retires After 38 Years of U.S. Army TATRC & Military Health System Service



Mr. Robert E. (Bob) Connors, MS in IT, MHA, and long-standing TATRC Health Technology Innovation Center (HTIC) team member, retired on 14 March. Bob is no stranger to military medicine and has served the Military Health System in various capacities for 38 years. He served 20 continuous years on active duty as a Navy Medical Service Corps Officer (Healthcare Administration) and subsequently, for 18 years in Contracted, Civil Service, and Intergovernmental Personnel Act (IPA) positions involving Health Information Technology Program Management, Research Administration. He joined TATRC in 2006, and for most of the time since then, has supported the HTIC in numerous roles.

During his initial tenure at TATRC, Bob oversaw a portfolio of approximately 50 Congressional Special Interest applied research awards, many involving emerging and enabling health information technologies that had the potential to improve health access, availability, acceptability, continuity, cost-effectiveness, and quality. These projects included novel ways to acquire, execute, integrate, analyze, and visualize health data. He worked closely with Principal Investigators to shape these research projects for military relevance, and potential transition to production or acquisition in support of Military Health System beneficiaries. During this time, he collaborated with some of the foremost government, academic, and industry leaders in health information technology worldwide.

Bob was also a prolific writer of Defense Health Program Small Business Innovative Research Award Topics, including, "Virtual Medical Concierge Application;" "Methodologies and Tools for Securing Medical Device Systems in Integrated Clinical Environments;" "Methodologies and Techniques for Balancing Usability and Security for Medical Devices in an

Integrated Clinical Environment;" "Prototype, Open-Source, Universal Healthcare Exchange Language;" "Development of a Scalable and Extensible Enterprise Master Patient Index for the Nationwide Health Information Network;" "An Ontology-based Adverse Drug Event Alert Generation System;" "Civilian Medical Records Interface tool for AHLTA and VISTA;" and "Clinical Decision Support for Dermatology Diagnosis in No-Communications Theater Environments." Many of these projects were showcased in the Federal Health Architecture area in the Health Information Management and Systems Society Annual Meeting Interoperability Showcase, and at Defense Health Information Technology Conferences.

More recently, Bob has supported Ms. Ollie Gray, HTIC's Lab Manager, as a key author of proposals which helped secure funding for the Team Fitness Tracker and Joint Legacy Viewer, Linked Problem List research prototypes. In recent months, he has been a key proponent for investing demonstration and



validation of prototypes involving Blockchain, a revolutionary distributed ledger technology which will likely secure all Internet transactions in the future.

Bob and his spouse, Judy are looking forward to retirement at their new home on the golf course in Pennsylvania. They recently started a new VEGAN lifestyle called "Health Eating Adventure," <http://www.healthyeatingadventure.org/>, sponsored by Dr. Elizabeth George, MD, a local retired practitioner, so that they can stay fit in retirement!

TATRC will miss their favorite Irish Leprechaun and wishes him all the best in his retirement! Bob, thanks for your many years of valuable insights and vast knowledge in health IT. You will be sorely missed! ■■■

TATRC Participates in the First USU SOM Telehealth Program

On 20 February, TATRC was invited to participate in the first ever Uniformed Services University School of Medicine (USU SOM) Telehealth Program. The Dean of the USU SOM stated that the purpose of the program was to expose third year medical students to the world of telehealth to better prepare them for future missions.

TATRC Team was on hand to share their first-hand, real-world encounters with the attendees. The TATRC telehealth team consisted of Science Director, Dr. Francis McVeigh, LTC(P) Jeremy Pamplin and MAJ Dan Yourk. They were aided by Ms. Ondine Doore and Mr. Larry Markins who provided technical support. The TATRC Team presented on the capabilities, challenges, options and needs for using telehealth in austere environments in both deployed and urban settings. Following the presentations, MAJ Yourk provided hands-on training for the Transportable Exam Station, which demonstrates the peripheral devices and the system's capabilities. LTC(P) Pamplin demonstrated the Hololens-like spectacles that enables a remote telehealth consultant to guide students through performing procedures such as chest tube insertion and closing a wound.

The Connected Health team, consisting of Dr.'s Jamie Adler and Catherine Zebrowski, presented on Medical Practice in a Digital Age. Dr. Haney from the Old Dominion University gave a presentation on How to Conduct a Telehealth Encounter. These lectures were followed by simulations of two use cases utilizing telehealth.

The third and fourth year medical students, along with



(Pictured left to right) MAJ Dan Yourk, Dr. Francis McVeigh, LTC (P) Jeremy Pamplin, Mr. Larry Markins and Ms. Ondine Doore participate in the first ever USU SOM Telehealth Program and educate medical students about the world of telehealth.

the USU SOM staff and other presenters in attendance, left with a much clearer understanding of what the future Multi-Domain Battle field challenges will be and how the use of telehealth can help them meet some of these challenges to deliver care anywhere, at any time. Dr. McVeigh encouraged all the students to reach out to TATRC and the Virtual Medical Center before they deploy to find out what resources may be available to them in the area of telehealth. Dr. McVeigh stated, "By introducing telehealth early on to students in the medical school, it should ease the transition and promote its use by the students when they graduate and begin to practice, whether it be in a fixed hospital or in a deployed setting." ■■■

This Quarter's TATRC TRIVIA...



Question: Who was TATRC's Director with the longest tenure from the years of 1997-2006?

(Answer will be in the next edition of the TATRC Times.)

Answer to Last Issue's TATRC TRIVIA...



Q: Who was TATRC's original Main Conference Room named after and dedicated to at the Headquarters location in Ft. Detrick, MD?

A: Dr. G. Rufus Sessions, who served as a long time Senior Research Scientist at TATRC until his untimely death in 2003 from cancer.