volume 33 issue one

Engineers' Forum

magazine

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LETTER FROM THE EDITOR

Dear Hokies,

WELCOME BACK!

As the academic year of 2012 begins we veterans of this campus will get to see new faces walking and talking around us.

The September issue is an important issue. This is the issue that comes out during the Engineering Expo, which will take place on September 18th and 19th. I am sure that, like me, you have already begun making plans on what to do on these two days.

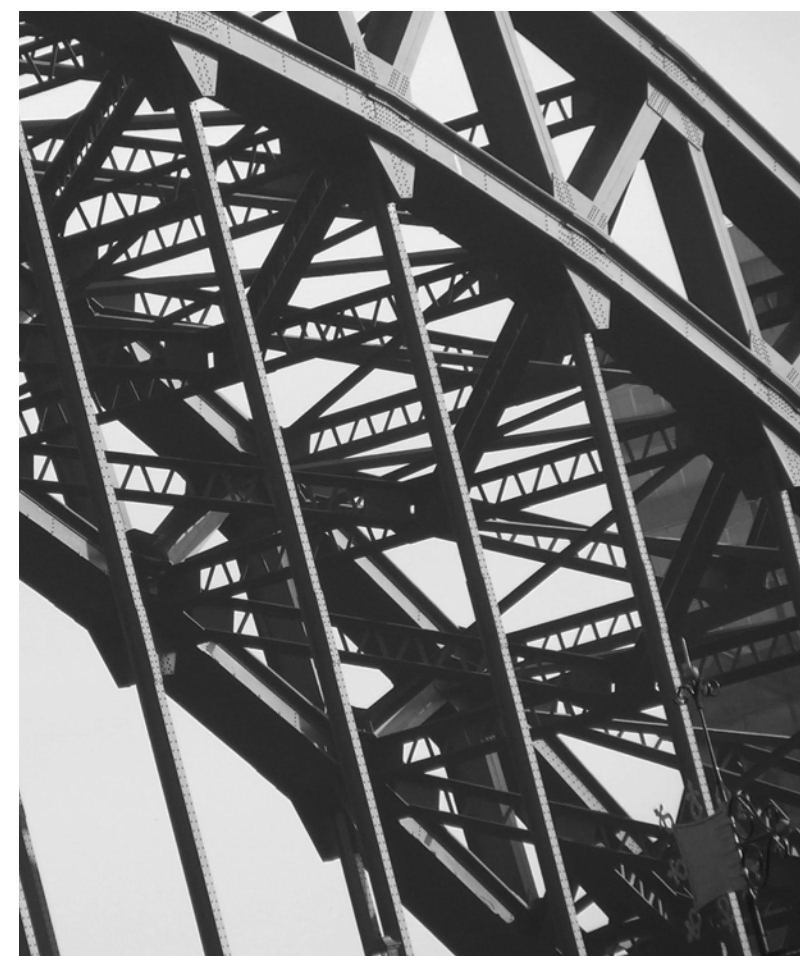
As with all our magazines, this issue also contains a wide array of articles. While Joe's article focuses on drones and ethics on the battlefield, Kyle's article sheds light on the Formula One team of Virginia Tech. For the students graduating in December or in May next year, Prudvi talks about life after graduation. Avery has written about both the success story of MSE alumni Alfred Knobler and the science behind his unique cameo glass technique. Be sure to see the photos of the beautiful glass lamps and pottery that are included in the cameo glass article.

As always I make an appeal to all writers, photographers, and business majors out there. The Business Manager position is open, and we are always looking to hire new writers and photographers. Please contact us through the website (ef.org.vt.edu) if you are interested.

Thank you, and enjoy the football season!

Sumedha

Sumedha Mohan



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ETHICS ON THE BATTLEFIELD

In a world where computers and high-tech processes and mechanisms are integral to the modern day, it is not hard to imagine that the field of robotics , and possibly artificial intelligence (AI), will expand greatly beyond its current scope in the coming decades. There has already been a great deal of progress in these fields in the past twenty years alone. For example, there are robotic vacuum cleaners that navigate autonomously and efficiently cover a great deal of space. There are unmanned aerial vehicles capable of navigating to a waypoint without a human pilot manning the controls. (In fact, some researchers and corporations are attempting to incorporate this technology into motor vehicles.)

In recent years, progress has been made in the realm of robotic technology for military applications. Many reconnaissance programs are centered on Unmanned Aerial Vehicles (UAVs). For example, the Predator drone, a UAV produced by General Atomics Aeronautical Systems Inc., can fire AGM-114 Hellfire Missiles. Later versions of the Predator, such as the Reaper (technically known as the Predator B) have enhanced capabilities, including weapons capacity.

While robotics and AI components are present in these military systems, it is important to note that when a system is capable of taking on an offensive mission (firing a missile, dropping a bomb, etc.), a human pilot on the ground has his finger on the trigger, so to speak. These systems do not have the capability to take offensive action without a human interface. However, as technology progresses, it is quite possible that the day will come when artificially intelligent robotic systems will be able to take offensive action if certain parameters are met without any human influence. In other words, the human component will no longer be integral to firing a missile, or dropping a bomb.

But what exactly is artificial intelligence? What is the difference between that and robotic systems? What affects the ethical use of such systems? It is important to answer these questions to understand the full scope of this technology.

According to Dr. Edward A. Fox, a Computer Science professor and the director of the Digital Library Research Laboratory as well as the director of the Networked Digital Library of Theses and Dissertations, the term robotics refers to "machines that can move intelligently." In effect, a complex algorithm and sensors allow a robot to sense the environment around it, and make a decision as to the movement it must make to complete a task in a predetermined way.

AI, he says, has many sub-domains, including the following: machine learning; computer vision; natural language understanding; speech recognition, generation, and translation; planning; game playing; and pattern recognition. He says that progress has been made in generating systems that "use any means they can to achieve the goal of acting intelligently." While the subject of AI is one that is extremely technical and experimental, the above is sufficient to generate a basic understanding of the difference between robotic systems and artificially intelligent systems and how the two interact, often intertwining, especially in the field of unmanned aerial vehicles.

For use in a military application, many of these subdomains would be of great use in controlling both offensive action missions or defensive missions, such as the anti-missile Phalanx Close-in Weapon System (CIWS). For example, AI planning can be used to map out a waypoint path, which is extremely important in UAVs. Pattern recognition could be used in understanding enemy infrastructure, patrols, encryptions, etc. The ability of such an automated system to move on its own would be the robotic component. The ability to change the direction of an aircraft, for example, could entail the use of robotic mechanisms. The capabilities of these systems are what make them appealing. The fact that current computers run thousands if not millions of times faster than the human brain suggests that these systems have much better reaction times. When timing counts, in certain applications, these systems would be thousands of times faster than a human. Not only this, but because the human body can only withstand so many G-forces, a UAV is capable of much tighter maneuvers than even the best and most experienced pilots.

So what is the big dilemma? Let us use the example of the Unmanned Combat Aerial Vehicle (UCAV) "EDI" in the movie Stealth (released 2005). In this movie, another flyer is added to a squadron of elite fighter pilots. This pilot is not human; it is an artificially intelligent robotic system, which has the ability to "learn" from its squad members. While this technology is almost certainly decades away, it is important to consider the consequences of the use of such a system. In the movie, "EDI" disobeys orders due to a lightning strike that cause its neural network to rewrite parts of its complex programming This ultimately leads EDI to fire on multiple unauthorized targets. While it's just a movie, and Dr. Fox says it is technically unlikely to occur, Stealth does highlight one possible result of a failure of such autonomous systems.

A real world example of an unmanned combat mechanism in which an AI system controls the motion and engagement of a target is the Phalanx CIWS. As mentioned above, it is a defensive, autonomous system. It is currently in use on US and allied naval ships to defend against enemy projectiles such as missiles. This system has several levels of criteria that determine whether it will engage a target. These systems are much quicker and more accurate in defeating offensive enemy fire than any human would be. However, there have been a few incidents in which the Phalanx did not operate properly:

On Oct. 11, 1989, a Phalanx CIWS system on the USS El Paso fired at a practice drone in a live-fire exercise. The system was successful in destroying the drone, but continued to engage the failing debris, and inadvertently shot at the USS Iwo Jima, killing a US Navy officer.

On June 4, 1996, a Japanese naval vessel used the Phalanx CIWS system to fire at a practice drone, which was being towed by a US A-6 Intruder aircraft, in a joint naval exercise. The Phalanx CIWS inadvertently targeted the A-6 instead of the practice drone, destroying the aircraft. Fortunately, the pilots ejected and were uninjured. However, it was concluded that the officer in charge of arming the system gave the order to arm before the A-6 was out of range.

It is important to note that the Phalanx CIWS is not completely autonomous. It requires a commanding officer to activate the system before it acts. Even so, these examples show that an autonomous system is not infallible. It is safe to say that no robotic system will ever be infallible, just as humans ourselves are fallible.

As technology progresses, and the use of robotic systems with artificially intelligent capabilities increases, the sophistication of such systems will increase likewise. There is the possibility that these systems will be given the capability to execute an offensive operation without the decision to fire coming directly from a qualified human being.

Mr. Jon Greene is the Director for National Security Research and Program Development at the Institute for Critical Technology and Applied Science here at Virginia Tech. He served in the United States Navy, and retired a Captain. He was a reactor officer on the USS Theodore Roosevelt, an aircraft carrier. He also has commanded the guided missile frigate, the USS McInerney, and the Naval Surface Warfare Center at Dam Neck. According to him, any current system with any level of autonomy, such as the Phalanx CIWS, there is a human interface component somewhere along the chain of operation. He states that this is likely to remain, even when the technology would allow for the autonomous operation of a system by an artificially intelligent computer. Greene notes that he does not foresee a time when human oversight of such a system would be terminated.

According to Greene, there is an essential question regarding these systems. At what point do we trust these systems more than we trust a human operator to fulfill the mission fully and without error? This is surely to be the guiding measure used to determine whether an autonomous system is appropriate for any military function, especially one where there is sure to be a human cost.

Joseph Pucci is a sophomore in General Engineering

Life After College

Perspectives from Recent Alumni Working in Industry and Graduate School

If you're in the same boat I am, graduation is coming, and it's coming fast. With less than a year left to graduate I'm quickly starting to realize how complicated and stressful preparing for life after graduation really is — making sure my resume looks up to snuff for potential employers, reviewing flash card after flash card in preparation for the universally feared critical reading section of the GRE, ensuring the right professors are comfortable writing my recommendations for graduate school, etc. While it's easy to get lost navigating the system while trying to focus on having the best possible application for whatever it is you want to do ("absolutely no idea", if you're anything like me), it's important to remember that by taking the path of either graduate school or a career in the industry, you will be transforming your life completely. You're no longer a college student with few responsibilities and enormous amounts of freedom.

I wanted to find out what awaited me, so I undertook this task the best way I knew how — by talking to people who're currently in these situations. To that end, I interviewed two graduates in order to better understand the potential situations I'm going to be putting myself in within the next year. Neil C. served as my industry interviewee, a 2009 graduate from the Charles L. Brown Department of Electrical and Computer Engineering at the University of Virginia currently working as a civilian electrical engineer for the US Navy. My graduate student interviewee was Kate Vance, another 2009 graduate of electrical engineering from the University of Virginia currently pursuing her PhD in electrical engineering here at Virginia Tech.

When asked to describe his position within the US Navy, Neil quipped "I generally hold meetings with contractors to discuss planning for current and future years. Three months of the year though, I spend fulfilling a budgeting role charting out predicted spending six years into the future every year." Kate, our graduate student replied, "I'm a graduate researcher in the field of power systems engineering working on improving the reliability of transmission within a power grid."

An important concern for life after college is how my time is going to be spent. Will I be working 24/7 in a cube farm with no time for myself, friends or family? Will my life remain essentially unchanged? Neil offered some insight, explaining, "I generally have flexible hours at work, as long as I log all my hours. Since I work for the government, there aren't any particularly late nights spent doing work. I usually have a good amount of time to myself which I spend playing for my soccer league or with my friends and other stuff." Graduate school however, is a completely different experience. Kate explains, "most of my time is generally spent focusing on research since I don't have to take as many classes anymore. Since a lot of my work is on the computer, I don't constantly need to be in the office so I have the liberty of working from home." When pressed on the topic of late nights, she says, "graduate school is usually what you make of it. My work can be done at any time of the day so it really depends on how I want to structure my life."

After getting a better understanding of what my life was going to look like within the next couple of years whichever side I chose to follow, I asked Kate and Neil about how they use what they learned in college in their respective fields. For Kate, "a lot of background theoretical concepts are important for understanding the work I do, so yes, I use what I've learned in school." Neil, however, shares a different experience, "I don't use a lot of the theoretical aspects of what I learned in school, but I do use the life skills I've learned such as problem solving and communication with my peers."

Since all work comes with pros and cons, I was curious to find out Neil and Kate's opinions on their own respective choices. Neil described his job as being fun and loved that he felt "empowered to make a difference in the lives of others." The constant travel, flexible hours, and cool coworkers also help make the job worthwhile. When asked what he disliked about his job, he answered "working for the government can be cumbersome. Navigating the bureaucracy isn't easy and you don't get rewarded financially for extra work that you do." Graduate school, being an inherently different experience, comes with its own set of pros and cons. "I love that my work is still intellectually stimulating. I get to work with really smart, interesting and motivated people in a formal learning environment." However, she adds, "I have less financial security than I would have had had I joined the industry, although I am comfortable in Blacksburg."

Looking for advice on how to best spend the remainder of my own college years, I asked each of my interviewees if they had any advice for their younger selves in the same position as me. "If I could go back in time and talk to my younger self my third year of college," says Neil, "I would tell him to take more classes and branch out. There's so much out there and it's good to be a well-rounded individual." Kate, however, has much more direct advice for her younger self, "I wish I had paid more attention in linear algebra my freshman year. It would've been so useful for my graduate research."

As I closed my conversation with both my interviewees, I felt a stronger sense of calm for my uncertain future, and a better understanding of the post-graduate world. I may not be closer to deciding what I want to do with my life, but I do have a better understanding of my options.

Prudvi Gaddam is a senior in Chemical Engineering.

Virginia Tech selects Eric Paterson to head aerospace and ocean engineering

Eric G. Paterson, a world-renowned expert in computational fluid dynamics, will join Virginia Tech as head of its aerospace and ocean engineering department, effective Aug. 10.

Paterson is currently a senior scientist at Penn State University's Applied Research Lab, the chief scientist of the computational mechanics division of the Applied Research Lab, and a professor of mechanical engineering.

His focus areas are ship and submarine hydrodynamics, renewable energy from hydro and wind turbines, cardiovascular fluid dynamics and heart-assist devices, and explosives trace detection.

"Dr. Paterson is particularly well-suited for his new position. His hiring instantly adds depth to both the aero and the ocean portions of the department's mission. In addition, Dr. Paterson has made noteworthy contributions to the field of bio-fluid mechanics," said Richard C. Benson, dean of Virginia Tech's College of Engineering, ranked in the top ten in the country for total research expenditures by the National Science Foundation.

Paterson is a three-time mechanical engineering graduate of the University of Iowa, earning his bachelor's in 1987, his master's in 1990 and his doctorate in 1994. He spent two years as a postdoctoral associate at the Iowa Institute of Hydraulic Research (IIHR) at the University of Iowa after receiving his Ph.D. In 1996, he was promoted to assistant research engineer, and four years later, to associate research engineer.

During Paterson's tenure at the institute, he developed fluid dynamics software for simulation of ship boundary layers, wakes, and surface waves. This work was sponsored by ONR, and the software is still used today by engineers in the U.S. Navy laboratories. In 2001 he joined Penn State.

Among his honors, Paterson received a best paper award in 2011 for an article he authored in the Journal of Fluids and Structures. In 2011 he also received a Royal Academy of Engineering Distinguished Visiting Fellowship to collaborate with colleagues at the University of Exeter on tidal turbines and image-based CFD meshing. Among his publications, he has authored chapters in three books.

His current research includes a $1.2 million grant from the Department of Energy to develop a "cyber wind facility" for simulation of offshore wind turbines, a $3 million grant from the Department of Energy that funds 10 graduate students in the field of hydropower, and a $3 million grant from the National Institutes of Health on the design of small blood pumps. He serves as a member of a team of several investigators on each of these projects. He is also the principal investigator on seven other current research grants, which largely focus on naval hydrodynamics and national security.

He is a member of the Society of Naval Architects and Marine Engineers, American Society of Mechanical Engineers, American Physical Society, and American Institute of Aeronautics and Astronautics.

ROBOJELLY

WHAT DOES IT MEAN FOR THE FUTURE IF TODAY THEY ARE WORKING ON ROBOTS THAT SEEM THE SAME AS JELLYFISH? WHAT WILL BE REPLICATED NEXT?

One of the U.S. Navy's newest, most talked-about creations isn't a high-speed torpedo or an invulnerable submarine; it's a jellyfish. Innovated by the U.S. Naval Undersea Warfare Center and the Office of Naval Research, the Robojelly is a mechanical device that not only resembles the real deal, but is virtually self-sustaining as well. It uses a very small amount of electricity, and most of its power comes from the use of memory metals or hydrogen. The Robojelly is designed to function underwater with hopes of being used to one day "patrol oceans, clean oil spills, and detect pollutants." The overall goal is for the Robojelly to replicate a jellyfish by both appearing and moving like one.

While the jellyfish is an excellent example of nature's efficiency, recreating it with science can be a struggle, requiring input from several universities. Virginia Tech is working on the Robojelly alongside University of Texas, Providence College, University of California, and Stanford University. With a little help from military grants, each university is working on specific tasks to improve the Robojelly. Led by Dr. Shashank Priya, The Department of Mechanical Engineering at Virginia Tech is diving right into the project.

Priya explains that the Robojelly is made from a silicon base and memory metals for the bell (extended body). As electricity is applied, the metals in the bell heat up and contract. This contraction in the Robojelly creates a thrust that moves it through the water. Just like a real jellyfish, this thrust is only able to move the Robojelly vertically, so it has to depend on ocean currents for horizontal movement. The Robojelly will be created in different sizes, ranging from the size of a human hand to over five feet wide. Larger sized Robojellies might be used for underwater surveillance while smaller sized ones might be used for pollution monitoring, oil cleaning, and studying migration patterns.

There are many videos of Robojellies on the internet, which are fascinating, but a bit creepy. What does it mean for the future if today they are working on robots that seem the same as jellyfish? What will be replicated next? The Robojelly could become the next tech craze, with its unique appearance and motion, but it will be a very long time before they do everything their creators envision.

I got the opportunity to sit down with Dr. Priya and ask him a few questions about the Robojelly. What follows is an abridged transcript of our conversation.

RF: What inspired you to do research in the RoboJelly? How long have you been working on it?

SP: *Jellyfish are attractive candidates due to attributes such as their ability to consume little energy owing to a lower metabolic rate than other marine species, survivability in varying water conditions, and possession of adequate morphology for carrying payload. Jellyfish inhabit every major oceanic area of the world and are capable of withstanding a wide range of temperatures and salinities. Most species are found in shallow coastal waters but some have been found in depths of 7,000 meters. Furthermore, jellyfish have a wide variety of sizes ranging from a few millimeters to over 2 meters in diameter as well as display a multitude of shapes and colors. They have the ability to move vertically but depend mainly upon ocean currents for horizontal movement. Jellyfish (Cnidarians) have no central nervous system (CNS) and they only use a diffused nerve net to control movement. Even then they are able to make complex functions.*

The program stems from the vision of ONR to utilize simple form of animals as inspiration to develop fundamental understanding of energy efficient propulsion in deep water.

RF: What sources did you use for help? Who helped you?

SP: *Four other universities are collaborating with us on this ONR sponsored program – University of Texas at Dallas (nanotechnology based actuators and sensors), Providence College (biological studies), University of California Los Angeles (electrostatic and optical sensing; and controls), and Stanford University (chemical and pressure sensing). In addition, the team is collaborating with scientists at Caltech, Roger Williams University,University of North Carolina at Wilmington, and Naval Undersea Warfare Center, RI. Our biologists have been studying tens of different species of jellyfish with variety of form factors grouped as "prolate" or "oblate" found all around the world. Most of these species adopt either rowing or jetting form of propulsion. We are investigating both these propulsion mechanisms.*

RF: What were the obstacles you faced in the way?

SP: *This program is true example of interdisciplinary research activity. It requires close integration of knowledge from materials scientists, mechanical engineers, biologist, chemist, physicist, electrical engineers, and ocean engineers. Nature has done great job in designing propulsion systems but it is slow and tedious process. On the other hand, current status of technology allows us to create high performance systems in matter of few months. The most challenging aspect of the program is finding artificial muscles that can provide adequate thrust, power density and deformation. Second most challenging aspect is finding power for the vehicles to achieve self-sustainability.*

RF: I found out that the Robojelly was powered mostly by the hydrogen in water, with a small amount of power coming from electricity. How much electricity (in relative terms) would it take to power a Robojelly for a year?

SP: *Shape memory alloys can be powered by hydrogen but not water. Hydrogen was not coming from water and that is a very different research topic. Average power consumption for Robojelly is in the range of 15 – 20 W. But it is difficult to estimate for one year as their propulsion cycle is mix of active and passive periods. Water current available in ocean help them to travel horizontally.*

RF: How much do the parts cost? How were you able to get funding from the Navy?

SP: *I am not sure about the cost as this is fundamental research program and goal is to provide understanding of propulsion. ONR has open solicitation each year and all the researchers in the field in this country submit their proposals.*

RF: Well, congratulations on your success with the Robojelly, and thank you very much for greatly representing Virginia Tech.

SP: *You're welcome!*

Robel Fasil is a sophomore in Industrial Systems Engineering.

GAINING MOMENTUM

VIRGINIA TECH'S FORMULA SAE TEAM

The Formula Society of Automotive Engineers (SAE) team has been a staple of fostering undergraduate engineering experience at Virginia Tech since 1988. Each year, the team designs, fabricates, and builds a new formula-style race car to send to the annual competition held in Brooklyn, Michigan. Over the years, the vehicle architecture has become increasingly complex and has required some of the brightest minds at Virginia Tech to take on the challenges associated with producing a race-caliber vehicle. To keep things organized, the team is broken into various sub-teams such as suspension, drivetrain, engine, electrical, and aerodynamics. The team has had checkered success (pun intended) in recent years, but is steady on the rise after seeing a 25-spot increase between the 2011 and 2012 competitions.

Currently under the watchful eye of faculty advisor Dr. Robert West, the team has been one of the most successful on the east coast bringing home 8 top ten finishes, 6 top five finishes, and one World Championship title in 1991 over the past 24 years of competing. Most recently, the VT Formula SAE team traveled to the Michigan International Speedway this past May to compete against 120 other teams from all over the world where they were judged in eight different categories: cost, presentation, design, acceleration, skid pad, autocross, endurance, and economy.

The 2012 team placed 8th in skid pad and 11th in both the design and acceleration portions of the competition but, after a brake light miscue during the endurance portion disqualified the car, only managed a 43rd place finish overall. "The car was putting up great lap times during the first half, but during a driver change, the officials disqualified the car for a malfunctioning brake light, and therefore disqualified the team from completing the second half of the race," says team leader Vincent Sorrento. Despite their unfortunate disqualification from the endurance event, the team is confident in their vehicle and feels that it will make a great foundation to build from for the 2013 competition. "I am looking forward to working closely with this group, from the seniors to the younger team members. You cannot be around these students and not be impressed with them both as young people with character and developing engineers with huge potential," says Dr. West.

Building off of their recent successes in Michigan this past May, the 2013 team is poised to give traditional powerhouses such as the University of Stuttgart and Global Formula Racing a run for their money. Under the leadership of Vincent "Vinny" Sorrento, the team has been hard at work during the summer months to get a jump start on the 2013 car. Vinny, originally from Northern Virginia, is a double major in mechanical and industrial systems engineering and a product of the Galileo Engineering program at Virginia Tech. Joining the team during his freshman year through a mentorship program, Vinny began his experience with Formula SAE as a volunteer and began performing 2013 Team Leader tasks in 2011. Vinny explains, "I really like how the program emphasizes engineering over outright cost and racing motives. For example, we don't have weight restrictions because they want us to pull out all the stops; still, it's always a juggling act between safety, cost, engineering performance, fuel economy, lateral grip, and ergonomics."

Heading up the engine sub-team is Michael Woodworth, a senior in mechanical engineering. Mike served as a volunteer member for the 2011 team, a junior member on the 2012 team, and is now a senior member for the 2013 team. Due to the time constraints inherently present between the design and build phases of the vehicle design process, the engine sub-team traditionally has no time to spare. However, since the 2012 team laid such a solid groundwork for the 2013 team to follow, more time can be spent refining and fine tuning the car that eventually makes its way to competition. To do this, the 2013 engine sub-team has created a model of the engine system using an engine and gas dynamics simulation software package from Ricardo Software known as WAVE. Mike states, "this year we have created a model of our engine system using Ricardo WAVE, which will allow us to accurately determine how we can produce the most power by changing things like intake and exhaust geometry; the results obtained from WAVE will then be verified using the dynamometer in Randolph."

Also new to the 2013 car is the increased emphasis on aerodynamics. Stevie Young doubles as both the aerodynamics sub-team leader and the head of testing, and is optimistic about the improvements the team will see in the 2013 car. He confidently proclaims that they will be in the running for a top 5 finish at the 2013 competition. The team expects a high ranking due in no small part to the addition of a full aerodynamics package to include an undertray, diffuser, front and rear wings, and side-pods; the 2012 car only had an undertray and diffuser. According to Stevie, "the team is finally serious about designing and manufacturing front and rear wings for the car. The Formula SAE competition has been heading in this direction for some time now, and with the wings and added down-force we will be more of a threat at competition."

Andrew Spencer, now an alumnus of Virginia Tech, was the 2011 Suspension Linkage Structural Designer and 2012 Lead Test Engineer and remains a proponent of the inclusion of an aero package. Andrew notes, "Our biggest struggle with the past few years has been making too many changes, resulting in having to tackle more unforeseen problems, and not being able to make the car robust." With such a solid framework in place from the 2012 car, the additional time and attention required to implement an aero package will not be counterproductive in other aspects of the car. "I think the 2013 team is wise to be taking the cautious approach that they are. A lot of them saw the issues we tackled in 2012, and by innovating the car from a detail-oriented perspective, they will therefore have a more refined product by competition," says Andrew.

"One of the things that really makes Formula SAE great is that it pulls everything we learn together," explains Mike, "there's deforms, dynamics, thermo, fluids, heat transfer, materials, vibrations, electrical, controls, manufacturing, and more. With the resources we have available on campus, this is priceless experience to prepare us for the real world. We get to design, build, and race a formula car—you can't beat that." Although Formula SAE is primarily an engineering competition, volunteers from all majors are needed: business majors for fundraising, marketing majors for team promotion, art majors for graphic design and sales video creation, and so on. Dr. West says it best: "It takes the committed spirit of many different talents to develop a team which competes at the very top year after year."

In addition to the annual competition in Michigan, the VT Formula SAE team plans to compete in the Lincoln, Nebraska event this year as well. The Lincoln event will provide the team another opportunity to showcase their expertise in the traditional combustion engine realm and familiarize them with the full electric side of the competition, which Virginia Tech hopes to be competing in by 2015. Andrew cryptically offers this on the subject: "Although it takes a year or two for a team to 'switch over' from a motorcycle power plant to an electric or hybrid power plant, keep an eye on the Virginia Tech Formula SAE team over the next few years. We might be working on something already…"

The VT Formula SAE team members are a tireless bunch that always seem to be doing something; whether it's volunteering with local Boy Scout troops in Lane Stadium or showing off new and old cars at E-Week, they're constantly on the move. They also host two of the three autocross events that the team participates in annually in the emptied on-campus residential parking lot known as the Cage. Interested in joining the team? Care to see the 2012 VT Formula SAE car top 75 mph and beat a Corvette's best lap time in the Cage? Check-out the team's website at www.vtmotorsports.com or attend the weekly team meetings on Thursdays at 6:30 PM in Randolph 120.

Kyle Caroncino is a senior in Mechanical Engineering

The 2012 Virginia Tech Formula SAE competition team at the Michigan International Speedway."

> YOU CANNOT BE AROUND THESE STUDENTS AND NOT BE IMPRESSED WITH THEM BOTH AS YOUNG PEOPLE WITH CHARACTER AND DEVELOPING ENGINEERS WITH HUGE POTENTIAL

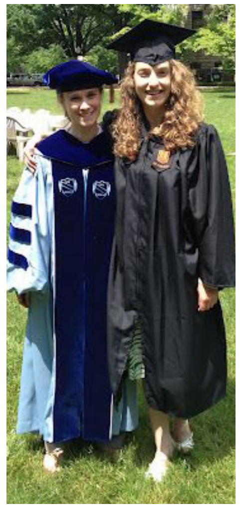
1 — WORLD CHAMPIONSHIP

6 — TOP 5 FINISHES

8 — TOP 10 FINISHES

SPOTLIGHT

LEIGH ANN KROMETIS



The Department of Biological System Engineering (BSE) recently hired Leigh-Anne Krometis as an assistant professor. After being fortunate enough to be in one of Dr. Krometis' Water Resources classes last semester, I had the privilege to interview her about her current research, as well as her educational background.

Dr. Krometis first visited Virginia Tech when she was 16 years old and immediately fell in love with the beautiful campus. After happily arriving as a freshman Hokie two years later, she decided to study engineering. This wasn't a tough decision, as she was already very interested in applied math and science, and her father was himself a proud engineer. She explained her decision to study BSE by stating, "I was a bit of a doe-eyed 'save the world' type and I was attracted by the systems/watershed-scale curriculum". After completing her bachelors, she decided to continue her journey at Virginia Tech by enrolling in Masters of BSE program. During her Masters, she became fascinated by microorganisms and disease ecology, which led to a study of the link between environmental degradation and human health risk.

After her masters, she moved to North Carolina and enrolled in UNC Chapel Hill for her PHD where she was able to continue her work in watershed management while learning about epidemiology and risk analysis. Her PHD research focused on understanding how waterborne pathogens in urban streams interact with suspended sediments.

In August 2011, she joined the BSE department as an Assistant Professor. In BSE, she writes grants to support her research lab, mentors graduate students, and teaches both graduate and undergraduate classes. She is currently busy doing work on various research projects relating to environment and human health which includes, "evaluating biological water quality impairments in central Appalachian Mining communities." For this specific project, she is partnering with Dr. Emily Sarver in the mining and minerals engineering department to look at links between sewage discharge and ecological and human health in mining communities. Among other things, she also conducts research within Stroubles Creek tracking fecal indicator bacteria.

The BSE department recently received grants from the National Science Foundation to conduct "Summer Research Experiences for Undergraduates" (REU) programs. The summer 2012 REU is run by Dr. Krometis and Dr. Hession, and is physically based inside the Stroubles Creek's StREAM Lab. Stroubles Creek is currently impaired due to unacceptable levels of sediment and E. coli bacteria. The focus of the StREAM lab to understand how land use affects the characteristics of the creek and surrounding ecology. During this past summer, 10 undergraduates from 7 different universities worked with faculty to conduct interdisciplinary research, focusing on multiple complex research problems associated with urban streams.

Despite being occupied by so much work, Dr. Krometis still advises group of students on their masters and PhD programs. Her graduate students are working on a wide range of projects relating to water quality. One of her students, Kelsey Pieper, is working on a project titled "Patterns of Water Quality in Private Water Supplies in Virginia". Another student, Hehuan Liao, is conducting a project focused on "contaminants of human health concern in urban stream sediments."

Aside from being involved in research and teaching, Dr. Krometis is the advisor for the BSE honor society Alpha Epsilon. When she's not working or advising students, she likes to spend a lot of time hiking, swimming, or biking in the mountains with her husband and 4 year old son. She is also a "fairly serious yogini" and often attends yoga classes in different studios around town.

Despite difficult economic times, the future of environmental and health based careers are still expanding. If you are interested in the environment or "Green Majors," BSE is a great department to look into. If you don't want to get degree in this field, you might want to consider a Green Engineering Minor. For non-engineers still concerned about the environment, you might want to check out a minor in Environmental Science or Watershed Management.

Aneela is a senior in Biological Systems Engineering

THE MIRACLE OF CAMEO GLASS

Glass is made by melting sand at 2600 degrees Fahrenheit. The sand is mixed with potash, soda ash, lime, and metallic oxides in various proportions to produce color. This process has been used for centuries, and the techniques involved have only become more sophisticated over time, making modern conveniences such as windows and scientific instruments possible. Glass was once rare and precious, but as production methods progressed, so did glass's availability. Nowadays, most of glassmaking is automated, more science than art, but handmade glass is still produced and sold. In the hands of glass artisans, thousands of years of old glass-making techniques are practiced and preserved, passed down from one generation to another. These were the ways used at Pilgrim Glass.

No two pieces of Pilgrim are exactly alike, as they are shaped by hand and blown by mouth. There are always variations of size, shape, and even color. Pilgrim Glass is unique among modern glass makers because it has worked to restore old techniques, long abandoned or lost in history. Most notable among these old glass techniques was the previously lost art of Cameo glass.

Cameo glass is a form of blown glass. The artisan would gather the glass by hand, layering glob on top of glob, creating at least two layers of different colored glass. These layered globs are then expanded and shaped to the artisan's preference. The completed form, called a "blank" is then allowed to cool in a lehr (a cooling oven). Once cooled, carving begins. The original processes were developed two thousand years ago by Romans between 25 BCE and 50 AD. Using these methods, which took years, required cutting away parts of the glass using acid and wheel engraving. A revival of Cameo glass in the late 1800s to 1910 in Europe used the ancient techniques. The completed piece might be a jar, vase, bowl, or plate with a three-dimensional image carved into its surface, revealing the layers of color beneath and creating a beautiful scene.

This gorgeous product was nearly impossible to successfully complete, as the creation of Cameo glass is fraught with risk. An artist could have partially completed the relief on his piece, closed his workshop, and arrived the next morning to find his art shattered into thousands of pieces. This destruction was not wrought by vandals or rival artists, but by the glass itself. As glass cools or heats, it expands and contracts. If the different layers have different coefficients of expansion, the piece will crack or explode during carving due to stress. Because of all these variables, the highest number of successful recorded Cameo layers was five. That is, until Kelsey Murphy came along.

Kelsey Murphy was a graphics designer from the Rhode Island School of Design. She worked as an entrepreneur out of Cincinnati, dealing mostly in antiques. One day in 1981, she was sandblasting some wood when she realized that she could use sandblasting to carve glass. She developed a business etching flat pieces of glass with sandblasting. A special masking material had to be developed to protect the glass that wasn't being carved away during blasting. The entire surface of the glass was covered in the masking material, and then the image desired would be precut into the masking material, exposing that glass to the blast. Along with Robert Bomkamp, a high-precision metal machinist who joined her in 1982, she invented machines and created a process to carve three-dimensional objects as well. The pieces were small at first, and the pair focused primarily on artistic glass eggs. Together, Bomkamp and Murphy created a small company called Glass Expectations.

1984, Glass Expectations and the Pilgrim Glass Corporation met for the first time. Pilgrim Glass was very interested in Glass Expectations' work, and Murphy had ideas to use sandblasting to revive the lost art of Cameo glass. By 1985, the two companies were working together. Murphy and Pilgrim employee David Davies began to create Cameo glass eggs of two layers.

In 1987, Murphy and Bomkamp went to work at the Pilgrim Glass Corporation in West Virginia, bringing all their techniques with them. They began experimenting with Cameo pieces. Over the next 12 years, they would work with other Pilgrim Glass artisans and the CEO of the company, Alfred Knobler, to perfect the Cameo glass process, making sure to sign each piece by hand. While in business, Pilgrim Glass was the only producer of Cameo glass in the world. In the beginning, 95% of Pilgrim's Cameo pieces shattered. By 2001, however, they had perfected the entire process, bringing the breakage rate down to a meager 4%. Nonetheless, there is still a significant amount of risk involved with each piece. According to Murphy, 24,270 things could go wrong from putting the sand and other materials in the "hopper" to the final carved piece cooling completely. If the glass got too hot, the color burned out. If the blank was heated for too long between layers, blisters, cords, or stones could develop, rendering the blank useless. If at any point during or before the carving process the temperature was not quite right, the piece would crack or shatter. If the glass was gathered unevenly while making the blank, holes would form during carving, rendering the piece useless. Cameo glass takes years of training to learn and involves hundreds of complex steps, and as a result, it will never be mass produced. Each piece is handmade and unique, a precious work of masterful artistry and science.

Murphy, for her knowledge of Cameo glass, also became the director of Pilgrim's Art Glass Division. By 1990, she was in charge of 22 decorators, each with 3 years of intensive training and practice. Along with Virginia Tech's MSE Research Professor Carlos Suchicital, Murphy worked with Professor Ronald Gordon to provide a permanent display of Cameo glass and other Pilgrim Glass pieces on the second floor of Holden Hall. Pilgrim Glass successfully produced pieces of up to 12 layers using the process they developed. Though sandblasting methods were once considered crude, artisans can now use it to accomplish minute detail and great depth on their pieces.

Alfred Knobler, the CEO of the Pilgrim Glass Corporation, admitted, "I never thought I would see a revival of Cameo glass in my lifetime. If it hadn't been for Kelsey, I wouldn't have the opportunity to be involved in something two thousand years old." As a Ceramics Engineer, Knobler was aware of the difficulties involved with Cameo Glass, and stated, "Engineers are problem solvers. I knew it was a big job, but it wasn't crazy. We lost a lot of money that first year, but we recouped it long ago, so it was good investment."

Kelsey shared similar thoughts on the art and science behind Cameo glass work. "Art and industry have never been able to get it together. Artists have never trusted industry and industry has always thought artists were screwballs. And it's such a shame, because they really need each other." Although Pilgrim Glass has closed, Kelsey Murphy and other artists continue to make Cameo glass art.

Avery Nelson is a sophomore in Materials Science Engineering. Many thanks to the MSE department for the use of their records and space for this article.

Alfred E. Knobler, circa 1965

THE SUCCESS STORY OF A VIRGINIA TECH ENGINEER: ALFRED E. KNOBLER & PILGRIM GLASS

In 1938, Alfred Knobler, a boy from the Bronx, graduated from the Virginia Agriculture and Mechanical College with a degree in ceramic engineering (a program that would one day be integrated into the materials science & engineering program at Virginia Tech). For a while, because the United States was deep into the Great Depression, he was unable to find a job.

While on the hunt for a nonexistent job opportunity all the way from Virginia to Chattanooga, Tennessee, someone suggested that Alfred work in sales. He decided to pursue the idea, despite the fact that working in sales would make little use of his degree as an engineer. Luckily, he came across a position as a traveling salesman. He was given small samples of glass and pottery wares, all of which he sold. Upon returning empty-handed, his company hired him as a permanent salesman. His natural knack for sales was evident, and he would use the skills he learned through that job for the rest of his life. After working as a salesman for several years, Alfred started his own national sales organization, Alfred E. Knobler & Co. in 1946.

In 1949, Knobler was visiting one of his sources, the Tri-State Glass Manufacturing Company in Huntington, West Virginia. Walter Bailey, the owner of the small factory, mentioned to Knobler that he was about to go out of business. Knobler quickly decided to become the company's sales representative. Upon examining the facility more closely, he determined that the building, basically a glorified warehouse, needed a direct source of gas in order to function properly. After talking to Columbia Gas Company, he had a line of pipe installed from the gas company to the warehouse without laying down a penny. Through a few conversations, he managed to convince the gas company that he was capable and trustworthy enough to pay them back later. Knobler bought the glass company that same year, renaming it the Pilgrim Glass Corporation, and naming himself the Chief Executive Officer.

At the time, Pilgrim's main product was "crackle" glass, glass that appears fractured but has a smooth surface. This was available in seven different colors and continued to be a staple item of Pilgrim Glass until 1970. Pilgrim's other early products included pieces with clear or satin finishes. Knobler eagerly encouraged his skilled artisans to develop new colors, different products, and better glass-making techniques, actively putting his ceramic engineering degree to use.

In the mid-1950s, Knobler recruited two brothers, Alessandro and Roberto Moretti. When they weren't working on pieces for sale, the Moretti brothers crafted glass animal sculptures and novelty items in their spare time. Knobler took notice, realized how well those items would sell, and glass animals were soon added to the Knobler catalogues. The Pilgrim Glass Corporation made most of their profits from these and later collector's pieces. Each of them was unique, presented as " [exceptional] handmade Pilgrim Glass…pieces, to be collected and treasured."

This collaboration between CEO and artisan would continue for the remainder of Pilgrim Glass's existence. This connection led to innovations that would help Pilgrim Glass thrive the 1990s, even when most hand-made glass factories had caved to cheaper automated glass production. By 1956, Knobler's small handmade glass factory had profited enough that Knobler was able to purchase land in Ceredo, West Virginia and open a larger facility. It also meant he could expand his small workforce of a mere seven employees.

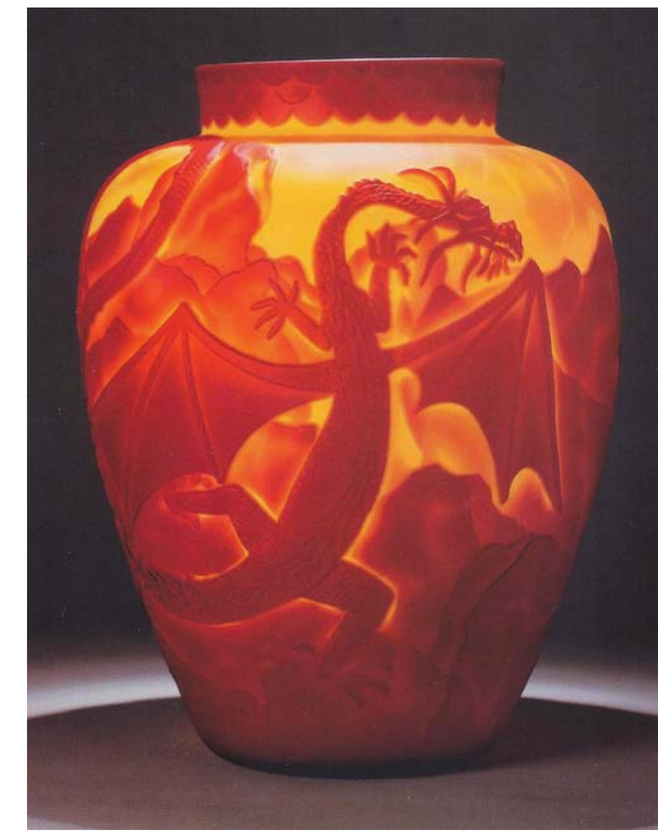
In 1965, he provided a large exhibition of Pilgrim's glass products, both practical and artistic, at the New York World's Fair, greatly improving his sales. Around the same time, the factory expanded and the workers unionized with encouragement and support from Knobler. The union and the subsequent health benefits it helped guarantee encouraged artisans to remain at the Pilgrim facility for decades, and often for their entire careers.

In 1968, Pilgrim Glass established itself as the largest producer of a certain shade of glass: cranberry. The delicate mixture combines gold and lead oxide, difficult to create successfully. If the mixture was slightly off, the color produced was an unsightly, liver-like shade instead of the intended rich, warm, wine-like hue.

In 1970, as the crackle pieces were discontinued, Knobler realized that Pilgrim Glass could sell more pieces if he introduced a line of practical glassware. The result was the Kitchen Chemistry line, attractive little glass jars, mostly clear, that were advertised as lovely pieces in which to store food items such as sugar, salt, olive oil, and other ingredients. In 1979, Knobler established Knobler International Limited, opening more glassmaking facilities in Surrey in the United Kingdom to serve souvenir shops in the British Isles and Europe. The color palette of Pilgrim Glass vastly expanded, and the company boldly stepped into the 1980s. Knobler began selling artistic glass eggs and high-priced unique art pieces produced by his artisans, a line aptly named "The Masterwork Collection." These pieces included Cameo Glass, a detailed layered etching technique exclusive to Pilgrim Glass, which would quickly bring the company fame. Once again, Knobler had made use of his artisans' talents and knowledge to advance the entire field of glassmaking.

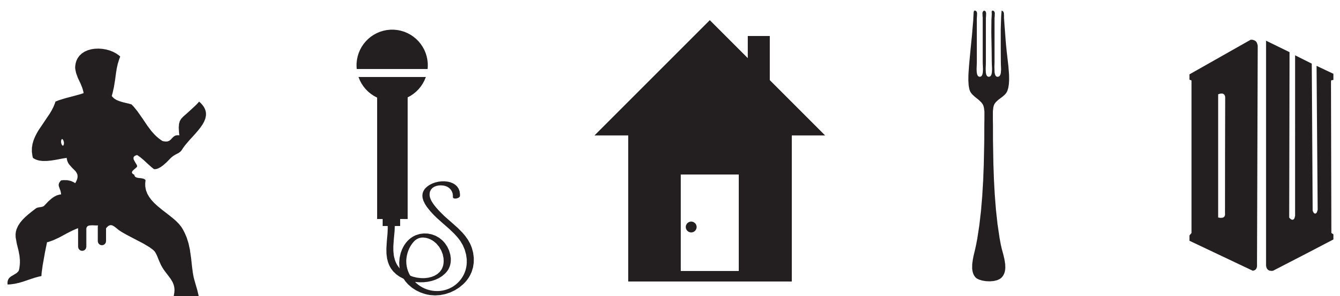
By the fall of 1998, Pilgrim Glass had 200 employees and served over 16,000 glass dealers and gift shops. At last in 2001, Alfred Knobler retired, and with no one to replace him as CEO, Pilgrim Glass unfortunately closed a year later. At the age of 92 in 2007, Knobler passed away. Pilgrim Glass's success was the result of Knobler's capable management, constantly shifting with public demand, and a skilled, loyal core of employees. Knobler was the perfect glass company manager, combining his expert engineering background and natural talent for marketing and sales. He was an engineer, a businessman, a manager, and above all, a daring and thoughtful man. Today at Virginia Tech, freshman engineers are taught that they must engage in a "life-time of learning." Knobler's story demonstrates the priceless value of such a philosophy. A collection of Pilgrim Glass's magnificent work is on display in a large case in the office of the Materials Science Department on the second floor of Holden. The next time you're passing by, take a minute to gawk at it.

Avery Nelson is a sophomore in Materials Science Engineering. Many thanks to the MSE Department for the use of their records and space for this article.



GRADUATE SPOTLIGHT

MIKE MILO



THINK FAST!

How many Ph. D students do you know who are also black belts, karaoke singers, home renovators, foodies, and Whovians? I only know of one: Mike Milo.

Mike, originally from Pittsburgh, PA, came to Virginia Tech to study Engineering in 2003. During his time as an undergraduate, he held internships at a variety of companies such as US Airways, Modea, and OWPR. When he wasn't studying or working, Mike remained active as an officer in the Tae Kwon Do club; unless it was Wednesday night, when he could often be found at Champs gracing the audience with his "finest" karaoke voice! Coming to Virginia Tech as an already accomplished musician, he found Vibration, Acoustics, and Signal Processing courses to be a natural fit. Mike is quick to credit his committee members, Doctors Mike Roan, Ricardo Burdisso, Marty Johnson, and Alfred Wicks for fostering his passion in these fields, noting his appreciation for their "no-nonsense" approaches and challenging projects.

Mike's undergraduate capstone project, which focused on the use of seismic sensors for perimeter security, marked the beginning of his involvement in the arena of security & intelligence. Also during his time as an undergraduate, Mike performed research under Dr. Marty Johnson analyzing mosquito wing beat frequencies, which served as his introduction to signal extraction and pattern recognition. The combination of his undergraduate research and capstone design project are what led him to pursue graduate school where he currently researches generalized anomaly detection programming. Also during his time as a graduate student, Mike was given opportunities to teach; most recently, this past spring as an instructor for the undergraduate level Vibrations course (ME 3504).

With plans to graduate within the academic year, Mike is continuing his research with his advisor Dr. Mike Roan on generalized anomaly detection, or establishing formal definitions for what is and is not "normal." To shed some light on the topic, he offers this brief explanation:

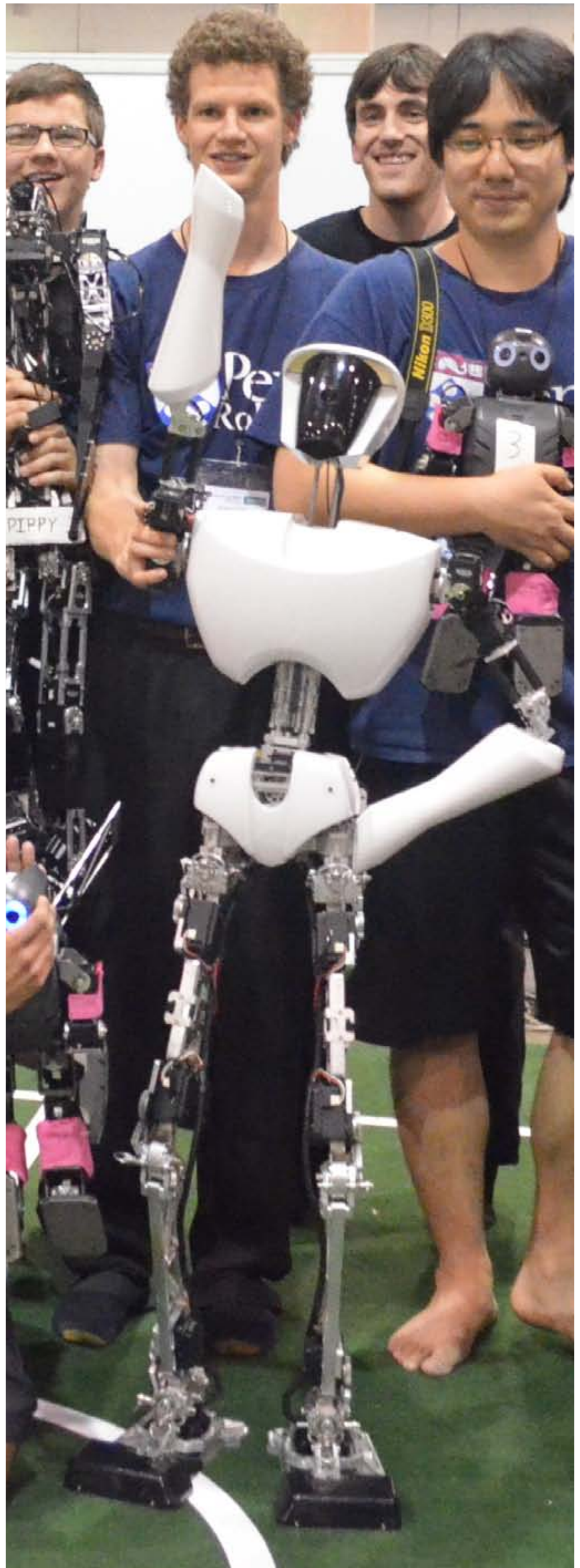
Anomaly detection is a hard trait to quantify, because humans do it so well, and we're often unaware that it's even happening. Imagine you're an early homo-sapiens and you're gathering food in the field – you feel the wind blow, see the bushes sway, and hear the leaves rustle. A few minutes later, you hear the leaves rustle and see some branches move, but without any wind. Since you've seen or felt them before, none of these experiences are new to you… but the hairs on the back of your neck stand up. You stay clear of that odd bush, and in doing, avoid becoming lunch for a hungry mountain lion! That innate ability to sense when something isn't quite "right," even when the stimuli are within normal bounds, is what keeps you alive to pass on your genes to the next generation who will be genetically better at anomaly detection, and so on. It's an evolved trait hardwired into us, so much so that a child watching Sesame Street's "one of these things is not like the others" game can outperform sophisticated computer models. We all know what it feels like to experience it, but how do you put that so-called "Spidey-sense" into words? How do you quantify it? It's an awesome problem to be working on.

Mike's research chiefly deals with programming machines to perform this kind of anomaly detection in the way that humans do, especially as it pertains to Mechanical Engineering. He knows that we're a long way from the ship computer on the USS Enterprise alerting us to tiny anomalies in the vastness of space, but he hopes that his work will help push the field forward. Mike's work is at the forefront of artificial intelligence and has applications in virtually every industry, including monitoring mechanical device health, aiding in biomedical test analysis, improving and automating security systems, and many others.

Since graduating with his B.S. in the Spring of 2008, Mike passed the PhD Qualifying Exam, obtained his black belt, went on to be an instructor with the Tae Kwon Do club, taught two undergraduate courses (and offered tutoring for several others), performed basic research and submitted multiple peer-reviewed journal papers, attended conferences and was published in their proceedings, and still finds time to spend with friends and cook new and interesting foods. When asked what his secret is to staying motivated and managing multiple projects at once, Mike has just one word to offer: "improvementality." You won't find it in the dictionary, but its meaning is easily understood: the mindset that, with hard work, just about everything can be made better. This idea of optimism tempered by humility drives both his research and his approach to life in general.

When asked if he had any advice or words of wisdom to impart on current undergraduates, Mike without hesitation offers: "It's important to know what you don't know." If you're open to the idea that you could learn more about something, you probably will. When asked what his favorite Hokie experience was, Mike refused to pick just one. He explains that, to him, the "Hokie experience" is an uncountable number of moments that you choose to form your own experience. His time at Virginia Tech has been great not because he's lucky, but because of a mindset capable of appreciating what each moment offers. Mike thanks everyone who's made his experience possible: his parents and family, for supporting and believing in him; his friends, for keeping him sane and social outside the lab; and his girlfriend Louise, for putting up with his work schedule and helping him remember to relax every now and then. He's now enjoying a period of focused work on his dissertation before classes begin again in the fall, and looks forward to his next big adventure after graduate school.

Kyle Caroncino is a Senior in Mechanical Engineering.



VIRGINIA TECH REPEATS ROBOCUP SOCCER WIN IN ADULT- AND KID-SIZED DIVISIONS

Virginia Tech's Robotics and Mechanisms Laboratory dominated RoboCup's international humanoid robot soccer competition for the second year in a row, once again wining the Adult- and Kid-sized humanoid soccer robot competitions.

The robotics laboratory, part of the Virginia Tech College of Engineering, took First place finishes in the Adult Size class with the 5-foot humanoid robot CHARLI-2 and the Kid Size class with the miniature-humanoid-robots DARwIn-OP. The latter team was a joint effort of Virginia Tech undergraduate and graduate engineering students and their counterparts from the University of Pennsylvania's College of Engineering in Philadelphia.

"This is two in a row," said an excited Dennis Hong, founder and director of the Virginia Tech robotics lab, and an associate professor of mechanical engineering, as he and his students cheered, hugged and posed for pictures at Mexico City's World Trade Center, where the 16th annual RoboCup competition took place. Added Jack Newton, a rising senior in mechanical engineering from Blacksburg, and a member of Team CHARLI: "It's amazing. Actually I'm kind of speechless."

Team DARwIn, in the final match of the Kid-Sized competitions, beat Japan's CiT Brians, 8-2, on June 23. Earlier in the day, Team CHARLI, comprised only of Virginia Tech students, won 3-0 over Tsinghua Hephaestus of China.

A combined Virginia Tech/University of Pennsylvania team also entered, for the first time, the Mid-Sized humanoid robot division, commonly referred to as Teen-Sized, but did not make final rounds. The robots were built from remainder parts of robots at the respective Blacksburg and Philadelphia campuses.

An earlier incarnation of CHARLI-2 won the Louis Vuitton Cup at RoboCup 2011 in Istanbul, Turkey, bringing it to Blacksburg, Va., and the United States, for the first time. This year, a German team was selected as the winner of the cup. During its stay at Virginia Tech, the cup was housed at Randolph Hall in a display case with the first version of CHARLI in the main lobby.

RoboCup is considered one of the most respected competitions in the robotics research community, and proposes a soccer match between full-size humanoid robots against the human World Cup human champions – and win – by the year 2050. In addition to the soccer portions, RoboCup also features competitions in robot rescue efforts, robotic simulation, and a robot dance competition for youth.

CHARLI-2 (that's for Cognitive Humanoid Autonomous Robot with Learning Intelligence) is the second in a series of adult-sized, autonomous humanoid robots build at Virginia Tech. The first version, known as CHARLI-L (the "L" is for lightweight) debuted in spring 2010, and made national headlines, appearing on the cover of Popular Science and Robot magazines. More recently, CHARLI-2 appeared on the cover of The Washington Post's Sunday magazine, in November 2011.

It is the second year in a row that RoMeLa has used and won with

The combined winning Team CHARLI and Team DARwIn at RoboCup 2012 in Mexico City, both headed by Dennis Hong, associate professor of mechanical engineering.

the DARwIn-OP humanoid robots, developed together with Purdue University, University of Pennsylvania, and the robotics company, Robotis Co., with sponsorship from the National Science Foundation. About 400 units are currently being used world-wide for robotics research and education, according to Hong.

DARwIn-OP proved quite popular at this year's RoboCup. A total of eight teams used the OP 'bots, which are a fully open source design – both software and hardware. All info on the hardware is to be shared on-line for free, including detailed plans and drawings, manuals for fabrication and assembly.

Hong started project DARwIn (that's Dynamic Anthropomorphic Robot with Intelligent) in 2003 to study human locomotion and humanoid robot design. DARwIn 1 was introduced in 2004 and was a revolutionary humanoid robot prototype at the time, and was followed by several incarnations since.

For more on RoboCup 2012, check out the Robotics and Mechanisms Laboratory's blog, with text photos and video from the event.

International scholar to head Virginia Tech's Department of Mechanical Engineering

Robert G. Parker, a past recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE), has accepted the position of head of the Virginia Tech College of Engineering's Mechanical Engineering Department.

"We had an extraordinarily strong set of applicants. The depth of the applicant pool reflects the excellent reputation of the department and the great work being done by the mechanical engineering faculty, staff, and students. Some might say that Dr. Parker has the unenviable task of following Ken Ball as department head. Instead, I would drop the 'un' and declare it to be one of the most enviable opportunities in academic leadership," said Richard C. Benson, dean of the college and the Paul and Dorothea Torgersen Chair of Engineering.

Parker is currently a Distinguished University Professor and the Executive Dean of the University of Michigan-Shanghai Jiao Tong University Joint Institute where he has worked since 2008. Earlier in his career, he was at Ohio State University where he directed its Dynamics and Vibration Laboratory and received many awards and honors for the excellence of his teaching and research on the dynamics and vibration of high-speed mechanical systems.

In addition to the PECASE award, Parker is an inaugural recipient of China's 1000 Person Plan award, the Chinese government highest distinction for foreign scholars. Parker also received a National Science Foundation (NSF) Career Award, an Army Young Investigator Award, the Gustus Larson Award from the American Society of Mechanical Engineers (ASME), the Ralph Teetor Educational Award from the Society of Automotive Engineers, the Outstanding Faculty Award from the American Society of Engineering Education, and Ford's Chief Engineer Award.

Parker holds the rank of fellow with both the ASME and the American Association for the Advancement of Science.

His reputation extends well beyond United States borders. He received the French government Poste Rouge Award and has been a visiting fellow at Risoe National Lab in Denmark, the University of New South Wales, the University of Sydney, Tokyo University, NASA Glenn Research Center, and the National Institute for Applied Sciences (INSA) in Lyon, France. He was invited by the National Academy of Engineering (NAE) to four Frontiers of Engineering Symposia in the US, China, Japan, and Germany.

He received his doctoral and master's degrees in mechanical engineering from the University of California, Berkeley in 1995 and in 1988, respectively. He earned his undergraduate degree in mechanical engineering in 1986 from the State University of New York at Stony Brook.

Due to continuing obligations with the joint institute, Parker plans to start his Virginia Tech appointment at the end of December.

With Ball's departure from Virginia Tech to become the dean of George Mason's College of Engineering, Stefan Duma will serve as the interim department head for the mechanical engineering department for the fall semester.