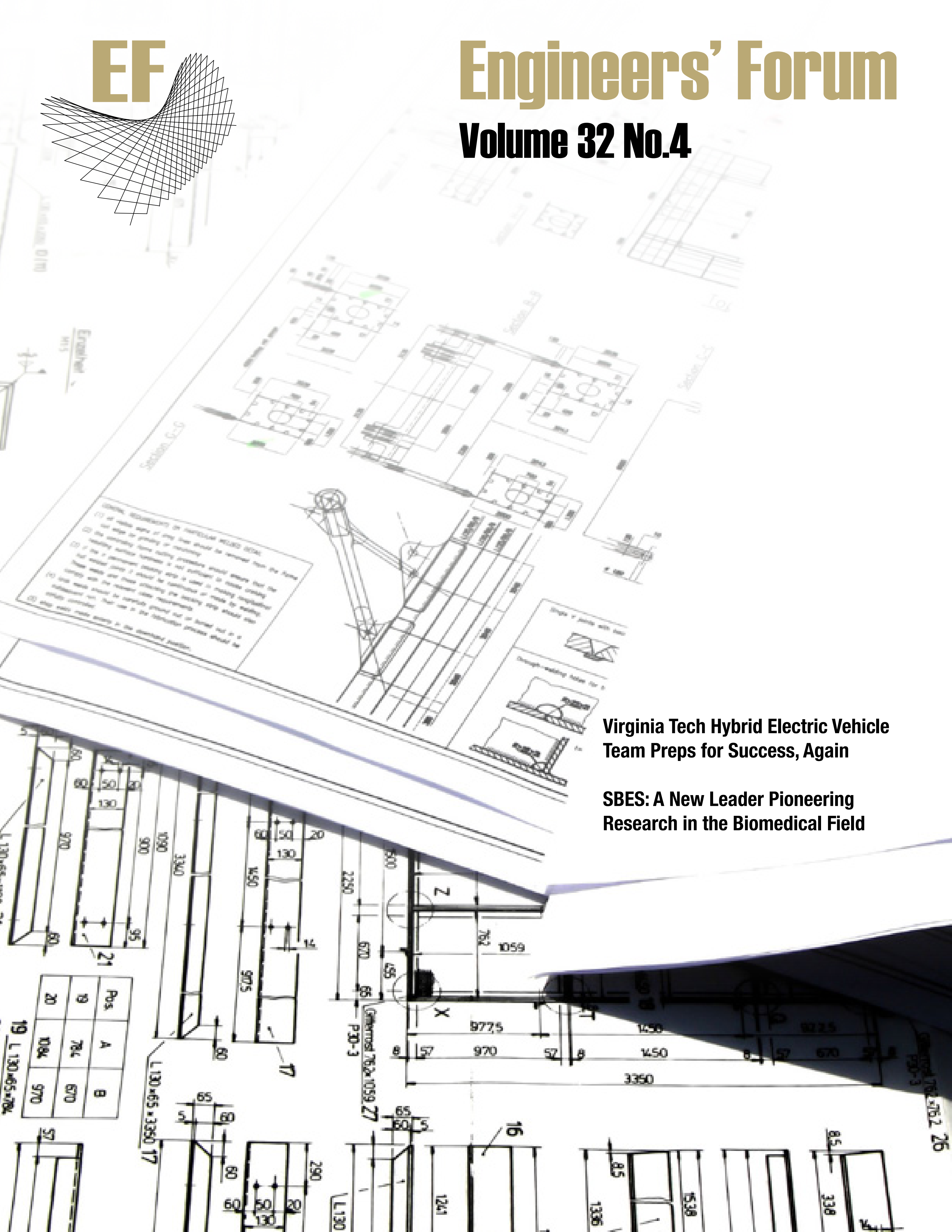

EF

Engineers' Forum

Volume 32 No.4

Virginia Tech Hybrid Electric Vehicle Team Preps for Success, Again

SBES: A New Leader Pioneering Research in the Biomedical Field

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223 Femoyer Hall Virginia Tech
Blacksburg, VA 24061
Phone: 540-231-7738
Email: forum@vt.edu

Letter From the Editor

My dear Hokies,

As spring continues and transitions into summer, we bring to you the final issue of the semester; it may be the last but it is certainly not the least!

This issue contains articles covering a wide range of topics, including interviews of both Dr. Paul Torgerson, and Dr. Alma Robinson as part of our new feature. This issue is the first of many to come that will include a faculty member as a featured article. We're not one to leave the device geeks behind though, so there is an article about something new from Japan. For those considering what minor to take after reading our last issue, please have a look at the Green Engineering article. It gives a good overview about this increasingly popular and interdisciplinary area of study.

Engineers looking for an opportunity to learn more about what is happening in the WARE Lab should have a look at the HEVT article. For those wanting to expand their general knowledge about the diversity at Tech back in the 80s, the Monica Barnes' article is worth looking into. I could go on and on about the issue, but that would not leave you with much surprise.

To attract more writers we have begun a campaign of web articles. Writers can have their articles up on our website, which will be updated frequently with articles, some of which will be exclusive to the web. To all you writers out there, this enables us to publish more articles than ever, so please send us your work! It might just be featured on our website!

Thanks and take care of those allergies!

SUMEDHA MOHAN

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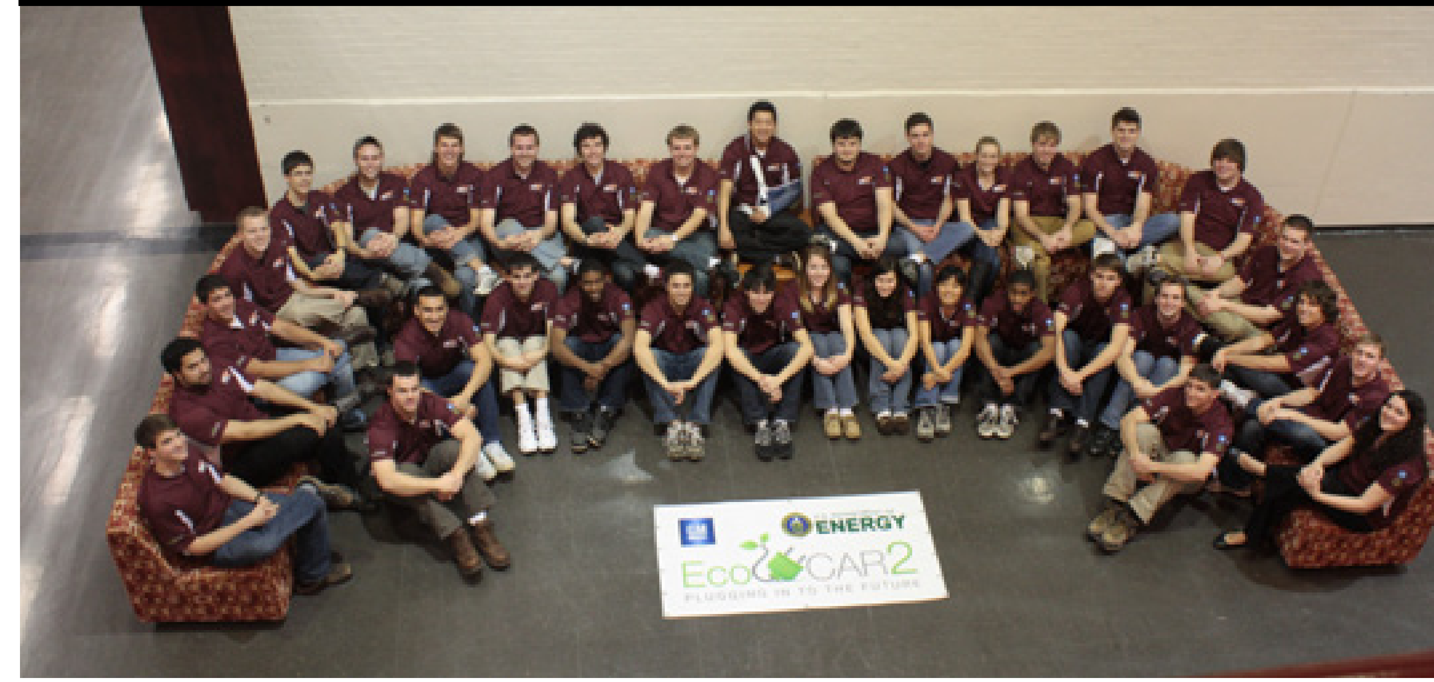

The 2011-2012 Hybrid Electric Vehicle Team of Virginia Tech.

Virginia Tech Hybrid Electric Vehicle Team Preps for Success, Again

"Virginia Tech wins 1st Place overall in year three of EcoCAR Challenge!" The avid EF reader may recall a similar article from the September 2011 issue, touting the numerous successes the Hybrid Electric Vehicle Team (HEVT) of Virginia Tech had at EcoCAR:The Next Challenge. I'll spare you the list of 14 different top 3 finishes the team was awarded: let's just say they set the bar pretty high. With sweeping successes in such a recent event, you may find yourself wondering, "What's next?" The answer is EcoCAR 2: Plugging In to the Future. EcoCAR 2, like its predecessor, is a three-year competition in which 15 teams from the United States and Canada take a gasoline powered vehicle and implement an assortment of advanced propulsion technologies and alternative fuels, simultaneously increasing fuel-efficiency and reducing greenhouse gas emissions. The HEVT is comprised of five different sub-teams: mechanical, electrical, controls, business, and outreach. When asked to identify a few of the largest challenges that EcoCAR 2 poses as compared to last year's competition, the first answer out of the team leadership's mouth: "SPACE." For the EcoCAR challenge, teams were provided with a 2009 Chevy EcoCAR, a roomy crossover SUV with plenty of passenger seating and cargo space to spare—not the case for EcoCAR 2. This time around, General Motors will provide each of the teams with a 2013 Chevy Malibu. The new sedan platform is an improvement in aerodynamics and customer acceptability, but offers significantly less space to house all of the subsystems necessary to bring this hybrid to life.

Eli White, a senior in mechanical engineering from Thaxton, VA is the mechanical sub-team leader and has been charged with packaging and integration. Chief among the list of space consuming components is the nearly 500 pound battery pack, provided by A123 Systems. Despite the added weight, a full charge will enable the vehicle to travel 45-50 miles without ever starting the engine. Not only does this battery help the team complete the 200-mile endurance test as sanctioned by the EcoCAR 2 competition, but it also demonstrates the practicality of a plug-in hybrid electric vehicle (PHEV). According to AutoObserver.com, "72 percent of American drivers travel less than 40 miles a day, and 95 percent drive less than 100 miles a day." Considering such statistics, as well as the persistent increase in electric vehicle charging station sales, widespread adoption of PHEVs could significantly reduce greenhouse gas emissions currently being produced by traditional combustion engines.

A particularly interesting new addition to the Virginia Tech design is the employment of what is known as a P2

Continued on page 4

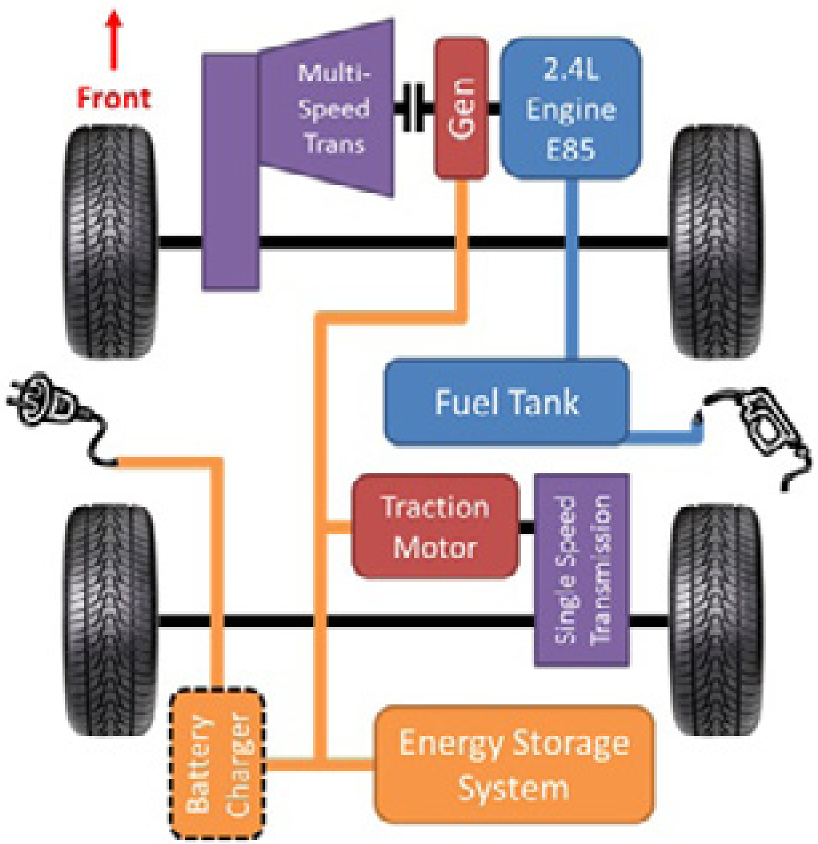

Figure 1 – Series-Parallel Hybrid Drivetrain

Diagram Courtesy of Jesse Alley from Virginia Tech's HEVT

generator motor. This custom motor, which will be designed and donated by Kollmorgen, will be positioned between the engine and transmission (labeled "Gen" on Figure 1) and will therefore require modification of the stock bellhousing on the Malibu. The P2's primary job will be to draw energy from the engine and use that energy to boost the charge-sustaining fuel economy and power the assortment of on-board electrical components, all while maintaining the battery state-of-charge. Due to its location, the P2 will also have the added benefit of providing a smoother ride for the passengers, acting as a medium between the engine and driveshaft. According to Jon King, an MSME candidate and GRA for the controls sub-team, "the decision to incorporate the P2 motor is an aggressive one and does not come without risk—if the P2 does not run correctly, the vehicle could be immobilized."

Dr. Doug Nelson, the faculty advisor for the HEVT of Virginia Tech, explains "The P2 is what gives us the series parallel switching capabilities. Series mode is very useful for transient, lower-speeds, where the P2 is run as a generator to maintain battery state of charge. Parallel mode, on the other hand, is more useful at highway speeds where it is advantageous to draw energy from the engine and put that power directly to the wheels." Drawing on the experience of Dr. Nelson and lessons learned from past competitions, the team is confident that this calculated risk will pay off.

Adam Broda, a native of Lynchburg, VA and a senior in mechanical engineering, heads the electrical sub-team. Accordingly, he is responsible for taming the high voltage system at the heart of the car. The battery pack consists of seven modules hidden entirely out of sight from the car occupants. "One of the most interesting things about this car is that you could walk right past it and not be able to tell that there is a 350 Volt battery pack in the back," says Adam. This concealment not only improves overall vehicle aesthetics, but also keeps the passengers safe. While the battery pack may be out of sight, it is definitely not out of mind. The 2013 Malibu has a curb weight approximately 700 pounds lighter than the Chevy EcoCar. However, even despite the cramped frame, the Malibu is still expected to handle the additional 500 pounds brought on by the battery pack and associated hybrid components. Accurate weight distribution calculations are paramount in successfully predicting the dynamics of the vehicle and will govern performance categories such as acceleration, stopping distance, and efficiency to name a few.

Also of utmost importance to maintaining consumer acceptability is the interaction of the aforementioned mechanical and electrical components—enter Richard Gonzalez. Gonzalez, also a senior in Mechanical Engineering, is the controls sub-team leader and has been using a dSPACE Simulator to test the Hybrid Vehicle Supervisory Controller (HVSC), which acts as the car's central control hub. The dSPACE Simulator is

A 2013 Chevy Malibu will be used in the EcoCAR 2 competition.

part of a Hardware-in-the-Loop (HIL) system that allows different driving conditions to be modeled without actually hooking up to the Malibu. According to Richard, "Using the HIL system is a great opportunity for our team since this same hardware is used in industry for controller testing." The transmission of the 2013 Chevy Malibu is another source of excitement for the controls sub-team. Now featuring a 6T40 6-speed transmission, as compared to the 4-speed transmission used on the Chevy EcoCAR, the controls team is expecting increased efficiency and functionality.

The HEVT of Virginia Tech is currently in the Year 1-design stage of the competition. The team has been busy partnering with such local businesses as Kollmorgen of Radford, VA and Shelor Motor Mile Chevy of Christiansburg, VA in preparation for the Year 2-build stage, scheduled to begin early next fall. General Motors, as a headline sponsor since the FutureCar Challenge in 1996, maintains a strong presence in the HEVT of Virginia Tech.

"It's pretty astounding that we are getting access to this particular platform because we started our design work on this car before it even launched…It really speaks to how seriously GM takes this competition and how invested they are in the education of the next generation of automotive engineers," says Jesse Alley, the HEVT Team Leader and second-year MSME student from Kingsport, TN.

The HEVT of Virginia Tech is always looking for new faces. "Being involved in this competition is something that has really transformed my educational experience…it's been great to get out of the classroom and build something real" said King. Those interested in getting involved are invited to the official team meetings, every Monday at 7:00 pm in Randolph 120.

Kyle Caroncino is a Junior in Mechanical Engineering.

National Science Foundation Grant to Study Student Motivation in Engineering

When people think of Virginia Tech, they usually think of engineering, and for good reason. Numerous reports have shown that this school is one of the top public universities in the country to get an education in engineering, and it's all thanks to people like Dr. Holly Matusovich. Currently a faculty member in the Engineering Education Department, Matusovich teaches both graduate and undergraduate courses, and I was lucky enough to take one of her classes during my freshman year. I recently sat down with my former professor to talk about her newly awarded grant from the National Science Foundation. The purpose of the grant is to study how students are motivated to learn difficult engineering thermodynamics concepts, as well as faculty motivation in teaching those same concepts.

Dr. Matusovich's journey to her current "dream job" was a long road with a variety of different engineering experiences. She obtained her undergraduate degree in Chemical Engineering and began her career as an air pollution control consultant. After four years of writing reports, she followed in the footsteps of her father and got her master's degree in Material Science with a concentration in metallurgy. After completing her master's, she worked for Alcoa in Indiana at a facility that manufactures aluminum extrusions for aerospace applications. Even though she enjoyed working for Alcoa, she didn't feel that it was what she wanted to do for the rest of her career. The aspect of her job she enjoyed most was talking to people and explaining concepts. Because she was already located in Indiana, she enrolled in a PhD program in Engineering Education at Purdue University, which she completed in 2008.

For her dissertation, she focused on student motivation towards earning engineering degrees and associated engineering student identities. Matusovich brought her research to Virginia Tech where she expanded her base to include student engagement in the classroom, student learning of difficult concepts, and faculty motivation towards teaching. She believes that student motivation is an important factor in being successful in class, as well as faculty and student interactions.

In recognition of her hard work, the National Science Foundation awarded Matusovich with a Faculty Early Career Development Grant. The five-year grant will consist of a three-phase project to study and bring together student and faculty motivation in both learning and teaching difficult engineering concepts. The study will be conducted among Chemical and Mechanical Engineering students who have taken thermodynamics. She chose thermodynamics because research has shown that graduating seniors in Chemical Engineering often do not understand basic thermodynamic concepts, even though they can crunch numbers and get a numerical answer. Thermodynamics are difficult to understand conceptually, and students often have to work hard just to wrap their heads around its basic ideas. Matusovich will study how and why students are motivated to learn those concepts. In her research, she will also include a study of faculty in order to understand how professors teach these difficult engineering concepts and what they are thinking about while teaching. The students' understanding of conceptual thermodynamics will be tested using the Thermal and Transport Concept Inventory.

The study will be broken into three phases. In the first phase, data will be collected using traditional methods of surveys and interviews to measure motivation and conceptual understanding. In the second phase, real time data collection will be conducted using smartphones and online applications. The students who volunteer for the project will have surveys sent to them right after their thermodynamics class, focusing on what they have just learned that day, as well as other pertinent questions. Finally, in the last phase of the research, all of the data obtained will be pulled together, and Matusovich will share the data with faculty, partnering with them to talk about classroom applications. Ultimately, Matusovich hopes to apply what she learns in her research to develop ways professors can teach thermodynamics in an atmosphere where students will be more motivated to learn these difficult engineering concepts. Many professors have been teaching the same way for a long time, so it can be difficult to change their teaching style, but there's no arguing with the data that this study is sure to produce. Virginia Tech's engineering program is already impressive, but Matusovich hopes her research will help make it even better.

Aneela Mousam is a Junior in Biological Systems Engineering.

Speech Jammer

Do you ever get tired of your parents telling you the same thing over and over again? Does one of your professors have a voice that makes you want to pass out? Do bullies ever make fun of you? If so, these problems might end in the near future, thanks to innovators in Japan.

Two Japanese researchers, Kazutaka Kurihara and Koji Tsukada, have made a device called the Speech Jammer. Simply put, the device can stop a person's speech by "reflecting" the speaker's speech back towards him at a delay of a fraction of a second. When a person hears their own voice with that delay, it "freezes" or confuses their brain, and to avoid the mental discomfort, they quickly stop speaking.

The device is still a prototype, and it has not been released for commercial use, but the creators are working hard to change that.

The Speech Jammer is a portable device that looks like a gun out of an old sci-fi movie. The boxy device is made up of a distance sensor, laser pointer, directional microphone, directional speaker, and a trigger attached to a sturdy handle. Using the laser pointer to focus its accuracy and the distance sensor to calculate the correct timing, a pull of the trigger will cause the Speech Jammer to play a person's speech back at them with a specifically-timed delay designed to confuse them into silence. The inside of the device contains the battery and the mainboard, which holds the CPU or "brain" of the device, responsible for calculating the delay and operating the device.

When people are subject to delayed auditory feedback (DAF) while talking, they talk slower, due to the confusion in their brain. The person who is having their speech stopped feels no physical pain, just a slight mental exhaustion that ends once he or she stops talking. Even better, due to the focused nature of the speakers, only the person talking will be able to hear the delayed playback. However, the effects of DAF are not the same for everyone. On average, men make far more mistakes when reading aloud than women do. They also tend to read slower and stutter more than women when affected by DAF.

The Speech Jammer can be used in some practical situations, such as a regulated debate, to eliminate the chance of debaters talking over one another. When it comes to classrooms or one-on-one conversations though, I don't really see this being used in today's world. More than anything else, this would offend the person with their speech jammed. If you couldn't stop them from talking before, whipping out a Speech Jammer will only make matters worse. Additionally, the Speech Jammer is useless in any situation with enough background noise to drown out the device's speakers.

If you're interested, the creators have released a video of their device in action on YouTube, and it's interesting to see the effect of the gun on its targets. When the Speech Jammer is pointed at the person, they stutter and look confused for a moment before they stop talking. The gun-like appearance of the device combined with a very obvious laser pointer make it far from discreet, though, so its uses are still limited.

While this Speech Jammer seems impractical for today, I think that it might be the first step towards a more inconspicuous and less offensive Speech Jammer in the future.

Robel Fasil is a Freshman in Industrial & Systems Engineering.

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Virginia Tech's School of Biomedical Engineering and Sciences: A New Leader Pioneering Research in the Biomedical Field

When you ask the average freshman engineer here at Virginia Tech to list all the engineering majors that the school offers, he or she will likely rattle off what they learned in their introduction to engineering classes: "chemical, mechanical, industrial, civil, environmental, electrical, computer, and mining." However, many students don't seem to realize that Virginia Tech also contains a School of Biomedical Engineering and Sciences (SBES). While there isn't an undergraduate program for it yet, SBES is becoming an increasingly popular field for master's and PhD degrees.

So what exactly does a biomedical engineer do? We already have doctors to do all the medical stuff for us, right? Well, a biomedical engineer's job is to make the tools that help your doctor do his or her job correctly. The list includes everything from Band-Aids and inhalers to complicated, life-saving devices like pacemakers and artificial hearts. Biomedical engineers are even working on regrowing entire internal organs using stem cells for tissue transplants. To give you an idea of just how groundbreaking biomedical engineers' work can be, a team of researchers in Italy have already developed corneal transplants using stem cells to help those with chemical burns, literally giving sight to the blind.

To get a closer idea of how Virginia Tech's biomedical school and its affiliates work, I talked with Satyavrata Samavedi, a graduate student in the Department of Chemical Engineering affiliated to SBES. Samavedi is doing research in the field of tissue engineering for Dr. Goldstein, an associate professor appointed by both the Chemical Engineering department and SBES. According to Goldstein, "PhD students can either take up a post-doctoral position or a job at a biotech company upon graduation. Students pursuing the post-doctoral route usually end up being professors, and those that pursue a job at a company end up in the R&D division as a research scientist." For those interested in a master's degree, he adds "the job usually involves an entry-level position with scope for development after sufficient experience in the company."

Virginia Tech's SBES program has been in existence since 2003 and brings together three important schools in the American southeast — the Virginia Tech College of Engineering, the Wake Forest School of Medicine and the VA-MD Regional College of Veterinary Medicine (also known as VT Vet-Med). The program currently boasts over 50 core tenure-track faculty members, and over 60 affiliate faculty appointments. SBES is continuously broadening its horizons, churning out research and paving the way for the future of biomedical engineering. As a graduate student, Samavedi brings a lot of insight into the inner workings of the department. "[It] has a very clear vision and is working very hard towards expanding," he explains. "[SBES] has excellent collaboration going on, and they have been very successful with external funding. I believe that this department will grow into one of the top-ranked programs in the country over the next several years."

If you're interested in pursuing a career in the biomedical field, Samavedi has some wisdom to share. "The first step is to understand that biomedical engineering encompasses a wide range of disciplines such as materials science, chemistry, biology, physics and engineering." He adds, "[the students] should consider talking to professors ... and [BMES] grad students to gain some insights about the field. This is especially important to get into grad school for BME." For students who are serious about getting some exposure to some biomedical engineering during their undergraduate career, he advises students to "take relevant undergraduate BME courses and see if they actually like them. Sometimes, we think we like something until we actually experience it. Another option is to work in a BME lab and gain experience with working on BME projects."

This spring semester offered the first instance of "Introduction to Biomedical Engineering." The class was created to introduce interested students to the various pertinent issues in the field, as well as bring in guest speakers to provide real-world insight into the discipline's inner workings. With all the innovative work coming out of Virginia Tech's faculty and students involved in biomedical research, it's safe to say that SBES is truly sticking the age-old Virginia Tech motto — "invent the future."

Prudvi Gaddam is a Junior in Chemical Engineering

Virginia Tech
Wake Forest University
School of Biomedical Engineering and Sciences

Green Engineering Minor

Green Engineering Minor: it's a self-explanatory name. Even if you've never heard of this minor before, you can guess part of its focus. (hint: It starts with "envi-" and ends with "-ronment.") Nonetheless, there's much about the minor that you probably don't know: how it started, what's required, and whether or not it's the right fit for your engineering education.

This article, the first in my series on Engineering Minors, will fill those gaps in your knowledge.

The green engineering minor began as a major concentration in 2001, initiated by a small group of faculty from the College of Engineering, and it evolved into a fully-fledged minor in 2008. However, it is not under the jurisdiction of any one department. It is both separate and interdisciplinary. Correspondingly, Dr. Sean McGinnis is the Program Director, and every major has an advisor in green engineering.

Dr. Sean McGinnis came to work at Virginia Tech at the beginning of the 2005-2006 academic year. The Green Engineering position, as he put it, "was a perfect fit, since it allowed me to focus on this topic full time as well as teach the concepts to the next generation of engineers."

As an undergraduate, Dr. Sean McGinnis studied Chemical and Materials Science Engineering at the University of Minnesota; he received a PhD in MSE from Stanford University. His green engineering background came less from his formal education, and more from his seven years of employment at the Spectacle Lens Group, where "it was a corporate priority to consider energy use, emissions to air and water, health and safety of chemicals in products and processes, and green engineering to reduce risk, reduce costs, and improve the product and processes." That was where he became fascinated with the subject, "I really wanted to find ways to incorporate these concepts into my work full time since I felt it was critical work that was mostly overlooked in engineering."

The minor is designed to be flexible. It only requires 18 credits, or roughly six classes: two required core courses, two engineering electives, and two interdisciplinary electives (non-engineering courses). The two core courses are Intro to Green Engineering and Environmental Life Cycle Assessment & Materials Selection. The engineering electives tie green engineering into specific engineering disciplines, and the non-engineering courses are meant to broaden students' environmental perspective to "economic, social, and political issues."

Both engineering electives and interdisciplinary electives conveniently overlap with major requirements and CLE requirements (respectively). With careful selection, a student with a green engineering minor will only take two extra classes in order to fulfill the green engineering minor. Some majors even allow the core green engineering courses to fulfill elective requirements, in which case the green engineering minor could potentially add no extra hours to your education.

Introduction to Green Engineering, ENGR 3124, is just that: an introduction to green engineering and global environmental issues. Most of the course covers the impact that engineering has already had on the environment, and how to minimize and prevent those effects in the future. You will learn about pollution, energy sources, mass and energy flows, and efficiency.

Environmental Life Cycle Assessment, ENGR 3134, teaches students about the practical application of life cycle assessment (LCA) to engineering products, processes, and systems. This course is ALL about LCA. Students will spend the entire semester learning about everything LCA in the real world. LCA is, as Dr. McGinnis puts it, "a way to quantitatively analyze the environmental impacts associated with product, processes, and systems."

Dr. McGinnis teaches both core courses, as well as Materials Selection and Design (due to his extensive formal education in MSE). He says that to do well in the core green engineering classes, "students need some intellectual curiosity to research beyond the material presented in class." He also says, "The concepts in the core green engineering classes are not particularly difficult, but the application of them is not always as straightforward as one might imagine. There are… few black and white answers." Are you intrigued yet?

As for the elective courses: Students' options vary based on their major. Aerospace and Ocean Engineers, for example, have only one elective available in their area of study. Civil and Environmental Engineers have a staggering 15 options. Most of the engineering elective courses are actually just courses within the major with a special emphasis added on green concepts.

Senior capstone design projects (although not all listed on the electives list) can often formally incorporate green engineering, allowing the project to have a distinctive spin to it that many other students in the major won't have.

The interdisciplinary electives include everything from Green Chemistry to Nature and American Values. They are suggested by departments and students and evaluated based on environmental content. The point is to give the student an understanding of "green" outside the realm of engineering.

So, how will a Green Engineering Minor benefit you in the long run? First of all, you'll learn things that most other engineering students won't study. According to Dr. McGinnis, having the minor not only increases your career options but changes the way students look at their career path. Students think about their interests in a new light even as new paths open to them.

Part of the Green Engineering mission is to "facilitate the collaboration of Virginia Tech engineering faculty with government, industry, and other academic institutions." Businesses and industries are more interested in environmental responsibility now than ever before. The Green Engineering is interesting, flexible, useful, and pertinent to any major. So why doesn't everyone take it? Who are the students that do?

Most of the students in green engineering are either Mechanical, Civil & Environmental, or Industrial Systems Engineers. At the moment, 300 students are enrolled in the minor.

About 150 students are currently planning to graduate with a minor in Green Engineering in the spring of 2012. The first group to complete the minor (2008-09) was a mere 25 students in size. Enrollment has increased at incredible speeds. That's why students are required to declare the minor (it must be on your DARS) before registering for the core classes: They do not have the capacity to fit anyone else. As the courses have become more interactive, learner-oriented, and team-based, they also become more crowded. Unfortunately, the registration requirement and the crowding might put some students off.

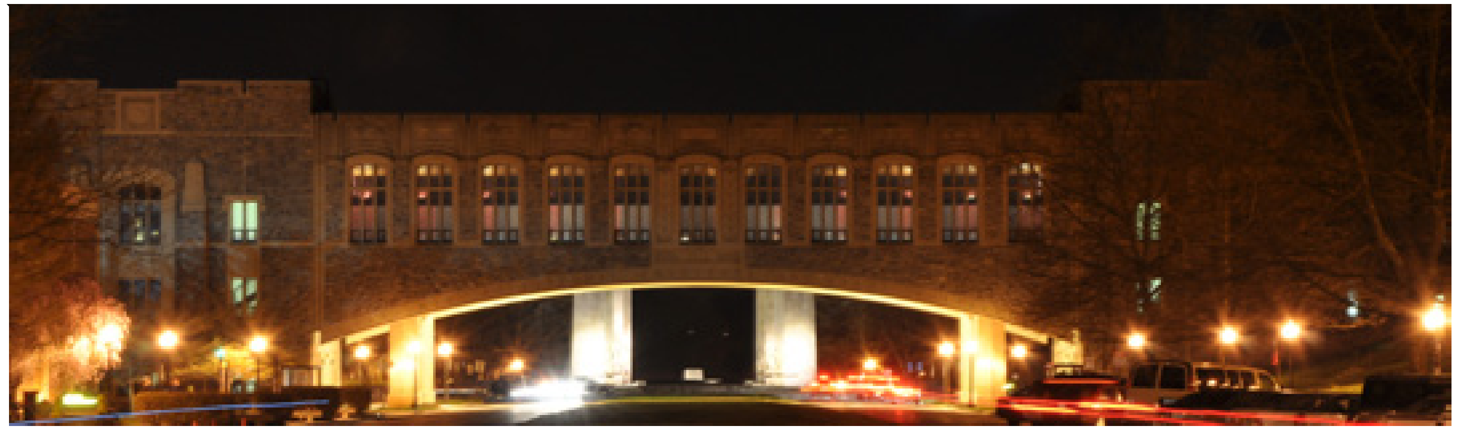
Dr. McGinnis said, "Students who pursue the Green Engineering Minor are interested in differentiating themselves from other students in their major and often have a general interest in environmental issues."

Green Engineering is convenient, interdisciplinary, and perhaps most importantly, distinctive. Declaring a minor in Green Engineering is the kind of decision that will shape a student's education as well as their life. Even with the slightest interest in sustainability or the environment, it's worth trying.

Finally, a parting bit of advice from Dr. McGinnis: "Pursue the Green Engineering minor, or any class or program because it interests you deeply and can add to your skills for your career goals, not because it looks good on your resume."

So, what interests you deeply? Is a Green Engineering minor right for you?

Avery Nelson is a Freshman in General Engineering.



A Living Legend

During his time here at Virginia Tech, Dr. Paul Torgersen has affected the school in many ways spanning over 40 years. Many students will recognize his name from Torgersen Hall and Torgersen Bridge on campus — a large Engineering and Communications building, as well as the landmark bridge that houses a quiet study area inside. What may not be as widely known is the fact that Dr. Torgersen is the only person still currently living (and teaching!) who has a building named in his honor at Virginia Tech.

Dr. Torgersen has been actively involved with Virginia Tech for many decades. In 1967, he became the Department Head of Industrial and Systems Engineering (ISE) here at VT. He says he planned on keeping that position for about 10 years, and then teaching part-time until his retirement. Plans changed to his surprise, however. In the spring of 1970, Dean of Engineering Willis Worcester was unexpectedly killed in a plane crash, after which Torgersen was then appointed as the new dean. In 1990, he became president of a new research park — the Corporate Research Center. In the fall of 1993, Torgersen was promoted to Acting President, and then became president of the entire university. During his tenure as Interim President, Acting President, and President of Virginia Tech, Dr. Torgersen personally signed 62,191 diplomas for Virginia Tech graduates. Even among this impressive workload, for the last 45 years, he has committed to teaching at least one 3-hour course every semester. Starting in January of 2000, Torgersen taught part-time for 12 years, focusing on one course, The Theory of Organization. This course deals with organizations and people, and how they affect each other. It is an engineering elective; enrollment is limited to about 110 students, and as Dr. Torgersen affirmed, "it is always full." Torgersen was enrolled in a course of similar subject matter at Oklahoma State, and decided to tweak it a little and bring it to Virginia Tech to teach it himself. In addition to the lecture, his Theory of Organization class includes a small recitation of about 20 students. The TAs are students from semesters past who really enjoyed the course, and at the end of each semester, the professor hosts a picnic at his home for his hardworking students.

When asked about how Tech has changed over the years, Dr. Torgersen said that it has all been gradual. He noted that the Engineering Department has grown bigger, more technology has been added, and there have been more research and scholarship opportunities for undergrads. While he was Dean of the College of Engineering, Dr. Torgersen helped Virginia Tech to become the first college to require its students to have personal laptop computers, bringing our school up to speed with the latest advances in technology. In addition to advances in technology and numbers, Torgersen also feels that the quality of students is steadily increasing. College, especially engineering, can be difficult at first to adjust to. It's a tough major and requires a lot of dedication in order to stick with it and be successful. Dr. Torgersen offered some worthwhile advice for incoming students, "Study hard and get your first year under control; enjoy yourself after getting respectable grades."

As mentioned before, Dr. Torgersen is the only living namesake of a campus building. While acting as University President, a recommendation for a new building to be named after him was brought up and voted on by the Board of Visitors. Torgersen Hall and Torgersen Bridge are both home to cutting-edge technology, an excellent study area, and facilities for both engineering and communication. When asked about how he feels about having a building named after him, Torgersen very modestly replied that it is "very nice."

Torgersen is still active in the Industrial and Systems Engineering (ISE) Department today. At the age of 80, he still teaches part-time. As far as retiring is concerned, Dr. Torgersen stated that he has thought about it every summer for a while now, but each year his wife tells him, "the students will tell you when it is time for you to retire." When asked what he will miss most when he does leave, Torgersen replied, "the students!" without hesitation.

Kristin Sorenson is a Sophomore in Spanish & Professional Writing

Hunter Places First at NTA Symposium

-by Kathy Edwards

Monica Hunter, a Langley co-op student and a junior majoring in electrical engineering at Virginia Tech, was the first place winner at the National Technical Association's (NTA) Student Technical Symposium held July 27 through July 30.

Hunter was one of 12 students from various states who traveled to the Orlando Hyatt in Kissimmer, Fla., and presented papers at the 55th annual convention. The topics of the papers presented at the symposium included physics, engineering, chemistry, biology and computer science.

The major objective of the symposium was to provide the Development of the Pushbroom Microwave Radiometer," which is being considered for publication in the NTA's national publication, the **Journal.**

Hunter has been working in the Spacecraft Controls Branch of the Flight Dynamics and Control Division this summer, but was working in the Antenna and Microwave Research Branch of the Flight Electronics Division last winter, where she assisted in the calibration and testing phases in the development of the Pushbroom Microwave Radiometer. It was here that she got the background for her winning paper.

Four other NASA student engineering trainees participated

Jacocks, a junior majoring in

Leader of the Pack

It's hard to imagine that just one person could win first prize in the National Technical Association's Student Technical Symposium in 1983, earn the Collier Aeronautics Trophy in 1997, and graduate Virginia Tech Electrical Engineering program in 1986.

This person is real, her name is Monica H. Barnes, and she was also Virginia Tech's first African-American female to graduate from the college of Electrical Engineering. She went on to further her education at Old Dominion University, earning a master's degree in Engineering Management in 1991. After completing various courses in the Engineering Management PhD program, she went on to work at NASA Langley Research Center (LaRC) in the Ground Facilities and Testing Directorate (GFTD).

In my interview with Dr. Barnes, she explained that her department tests a variety of things, including "…airbags for space capsule landings, technologies to allow aircrafts to fly at supersonic and hypersonic speeds, or studying Earth's atmosphere to better understand global climate change … NASA Langley remains on the leading edge as it has since 1917." When reflecting on her past as Hokie, Barnes reflects, "I made a decision to participate in the Virginia Tech pre-co-op program at NASA or to go to the Air Force Academy.[…] There may have been two or three girls in a class of forty." Barnes recalls, "It was a very challenging program and we just kind of all hung in together and encouraged each other. [...] A lot of us were the first to do a lot of things: the first to establish the National Society of Black Engineers, I was a charter member of that, the first to found the Black Student Alliance."

When asked what inspired her most of all, Barnes replied, "Of course you know having huge support from home and my parents were extremely supportive of my career here during the whole time…[which was] really awesome."

Not everyone at Virginia Tech was pro-Barnes, however. "I had a professor who told me, kind of behind closed doors that, he told me 'you people don't belong here'. So I used that as a fuel to basically prove him wrong. And so I was very excited about trying to excel in my career to basically prove that I did belong and that I could make a difference in engineering and for other females and students to go through the program as a trailblazer. So I used that as my own fuel to create my piece of black history."

She closed our interview by saying:

"I encourage everybody to go out and actually mentor someone, to y'know, to talk to the younger people and encourage them to go into science, technology, and math and to y'know, pass it on. Even if we had to go through certain things, we can make a difference with everyone by passing the torch on and being encouraging to these younger students."

After all, we are 'inventing the future.'

Mia Simms is a Senior in Communciations and Africana Studies.

Meet Your Professor! An Interview with Alma Robinson

Avery Nelson: What was your major at college? When did you choose it, and why?

Robinson loved elementary school, but in middle school, that changed. "At some point [school] becomes something that you do and it's not fun anymore… I didn't dislike school, but I wasn't excited about school. For a while, it wasn't a bad place to be, but it wasn't exciting."

Then, in 11th grade, she took a physics class.

"Up until that point… I remember that in my science classes and my math classes… a lot of [my teachers] couldn't tell me when [the information] would be useful. I remember asking my biology teacher and my chemistry teacher, 'Why does this happen?' And they would say, 'Cause that's how reactions happen,' or, 'That's how biological systems work.' …They never really gave me a good answer. …Then I got to physics."

Robinson would ask, "Why does this happen this way?" and the response would be, "Let's figure it out!"

All of sudden, I started seeing physics everywhere in the world. I couldn't do anything without thinking about physics… and so l loved it."

"This is the first time I thought about school outside of school in a long time. I was at swim practice… we were getting tired so our strokes were getting really sloppy. Our coach was [saying], 'Elbows up, guys, elbows up!' When he said that, I was like, 'Oh yeah, because that would decrease my rotational inertia', and then I thought, 'Who are you? You were never a nerd! When did you become a nerd?'"

That's when she decided she should study physics.

In class, she realized that physics "clicked" for her in a way it didn't for other students. While helping her classmates, she realized that teaching physics was a lot of fun.

When she arrived at Virginia Tech, that was her plan, and, "for some crazy reason, it actually stuck."

Along the way, she started taking philosophy classes. Philosophy sparked the same interest in her that physics had; its thought processes paralleled physics'. Both involved analytical thinking. Both involved being given premises and building up to logical conclusions. As a result, she also got a philosophy degree.

AN: When did you graduate?

Robinson earned her undergraduate degree in 2002 and her master's in 2003.

She wanted to finish her master's in a year through an accelerated program, partly to keep up several friends staying at Virginia Tech an extra year before graduating.

During her year as a graduate student, she was also a graduate teaching assistant. "Since I already had a good reputation in the Physics Department [at Tech], they let me be a physics teaching assistant. … I was getting paid a small stipend to be student."

According to Robinson, "GTAs [get] free tuition and a stipend… That's the great the thing about the physical sciences. You can go to graduate school, generally speaking, for free. In physics, it's pretty unheard of to pay for your [graduate] education."

While looking back at her time at a student, Robinson was also surprised to realize that all this occurred 10 years ago!

AN: When did you realize what you wanted to do after college? Did those plans change?

Physics was set in her mind very early, but Robinson wasn't one hundred percent sure that she wanted to be a teacher by the beginning of college.

She participated in Physics Outreach, a program at Virginia Tech where science and engineering students go to local schools, kindergarten through grade 12. Robinson and the other students would "do demonstrations and show really fun physics shows," often including using liquid nitrogen, which is always great entertainment.

"I realized I really enjoyed it. I had a lot of fun."

She also realized, after a few research experiences, that her interests were more in physics education than physics research.

"I really wanted to teach physics to people who hadn't learned physics yet. Whenever I tell people I'm a physics teacher, I get [one of] two reactions: 'Oh, I hated physics,' [or], 'I love it!'"

Most people don't fall in between.

AN: How did you end up teaching at Virginia Tech?

After Robinson graduated, she worked at Wakefield High School in Arlington, Virginia, for 8 years. The neat thing about Arlington is that the schools are really diverse, and they offer 5 different levels of physics, including physics without math.

Recently, VT became part of a program called PhysTEC. PhysTEC is an umbrella group that helps individual schools create programs to increase the number of physics teachers in the United States. There simply aren't enough good physics teachers in the world.

Robinson and PhysTEC want to get schools like Virginia Tech to recruit future teachers and train them. Future teachers need to learn that usually, students are passive and not engaged, especially in lectures. Lecturing is generally pretty ineffective, because students aren't interacting with the information or each other. The material is more memorable if students work with problems in class and "articulate their ideas." Robinson encourages her students to do exactly that both during class and during office hours.

Robinson taught her high school students by giving them objects to play with, such as balls and springs, to help her students figure out the physics behind them. Because of how college physics halls are set up, however, she has had to settle for demonstrations and iClickers.

Virginia Tech put in a grant to be part of PhysTEC. When Beate Schmittmann, the Department Chair of Physics found out the good news, she called Robinson and said, "We [just got] this great program. We would love you to be a part of it. Will you be our teacher in residence?"

To which Robinson said, "I was like, 'Heck yeah!'"

Robinson now teaches a physics pedagogy class (a class to help future physics teachers teach physics) as well as Physics 2305 at Virginia Tech.

"I'll be here for two years getting this program off the ground, and then someone from a another district will come, and then someone else…" Her hope, and the hope of PhysTEC, is that physics teachers will be recruited and created in a chain reaction of school districts.

"To me, it seems ridiculous that physics is usually limited to the top-tier students or the upperclassmen."

Physics is everywhere, in every job, and, "It should be there for everybody… It's really important for everyone to have a basis [in physics]. If you are trying to reach out to non-scientists, I think that the idea of having a subject that they can really see all the time is the way to get them involved in science."

AN: How long have you been teaching at Virginia Tech? How much longer will you be?

Robinson started last August.

This was her "first go" at teaching a 150-person class in a lecture hall. She says, "[It was] very odd and weird and intimidating at first."

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She'll be here the rest of this semester and the 2012-2013 academic year.

AN: What's is your favorite part about teaching?

Getting kids excited about stuff or getting to influence someone who used to lack confidence in math and science.

"When [students] realize that they can do it, and they can solve problems, and that they've worked through something, that's the best [feeling]… They've figured out something that they thought was really difficult."

AN: What is your least favorite part about teaching?

Not knowing whether she is connecting with certain individuals.

"I have no idea if I'm able to take you out of your comfort zone."

At the university level, it's especially difficult to make a connection with the students.

Trying to get apathetic students to care, however, is the most frustrating part of teaching for Robinson.

AN: What is your favorite area within physics?

As an undergraduate, Robinson's favorite was astrophysics. However, since then, her favorite has become physics education research, or PER.

There are people doing a huge amount of research on how to teach physics. They test everything, including how students' preconceptions do not match physics reality. For example, many students come into physics for the first time thinking that if a truck and fly collide, the truck exerts a greater force on the fly than the fly on the truck. According to Newton's third law, this is, of course, not true. They actually exert equal forces on each other.

Physics is on the cutting edge of education research, and Robinson is well-read and excited about the subject. She knows what research has happened, who did the research, and how to teach physics well, based on the research results.

The best thing for learning, apparently, is to articulate yourself in words. Robinson says that she didn't really start understanding physics until she taught it. Students have to be active learners.

AN: What are your goals or aspirations?

Right now, Robinson's goal is to simply get people excited about the idea of teaching physics, to set off a chain reaction of awesome physics teachers in Virginia and hopefully beyond.

She doesn't know what she will be doing in a few years. Perhaps Robinson will be teaching in Arlington again, but she's not sure.

AN: Are you involved with any extracurricular activities?

She swims with a group of master swimmers at Virginia Tech, though unofficially.

When she was a physics student, she was really involved with the Society for Physics Students, and now she's the advisor for the SPS chapter at Virginia Tech.

AN: Anything else you would like to share?

Robinson is really glad to be back in Blacksburg. "It's changed a lot. The culture has stayed the same, but the actual city has changed. Like, Main Street is completely different."

They built Torgersen while she was here! "Eventually we had this gorgeous bridge! I was like, 'it's so pretty!'"

"Nobody had laptops. A few techy people had laptops. In Torgersen Bridge, they had these plugs so you could plug in your laptop and then also a plug so you could plug in your Ethernet [cable]. I was like, 'Whoa, that's so cool, you can get internet in this random building!'"Robinson also remembers shops that no longer exist. For example, Moe's used to be a record shop. It couldn't survive in that location, so it moved to where India Garden is before finally going out of business.

The community is still the same in that it's pedestrian and biker-friendly. She explained, "I like that easygoing feel," and that the laid-back, outdoorsy feel of Blacksburg and campus has not changed.

AN: Do you have any advice for the students at VT?

"I totally encourage you [to take unusual classes], especially at college, 'cause there's hardly any other time in your life when you're going to study something so out of the realm of your normal, everyday thing… In a university, take weird classes that you would not be able to take outside of this environment. "Get to know your professors, learning about their research, and try to be involved in research."

She encourages students to constantly ask themselves questions while listening to their professors or reading textbooks.

Lastly, she adds:

"[Try] to be a real scientist or a real engineer instead of just a student of science or engineering."

Many thanks to Alma Robinson for the interview and awesome teaching!

Avery Nelson is a Freshman in General Engineering.

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