Engineers' Forum

February 2019
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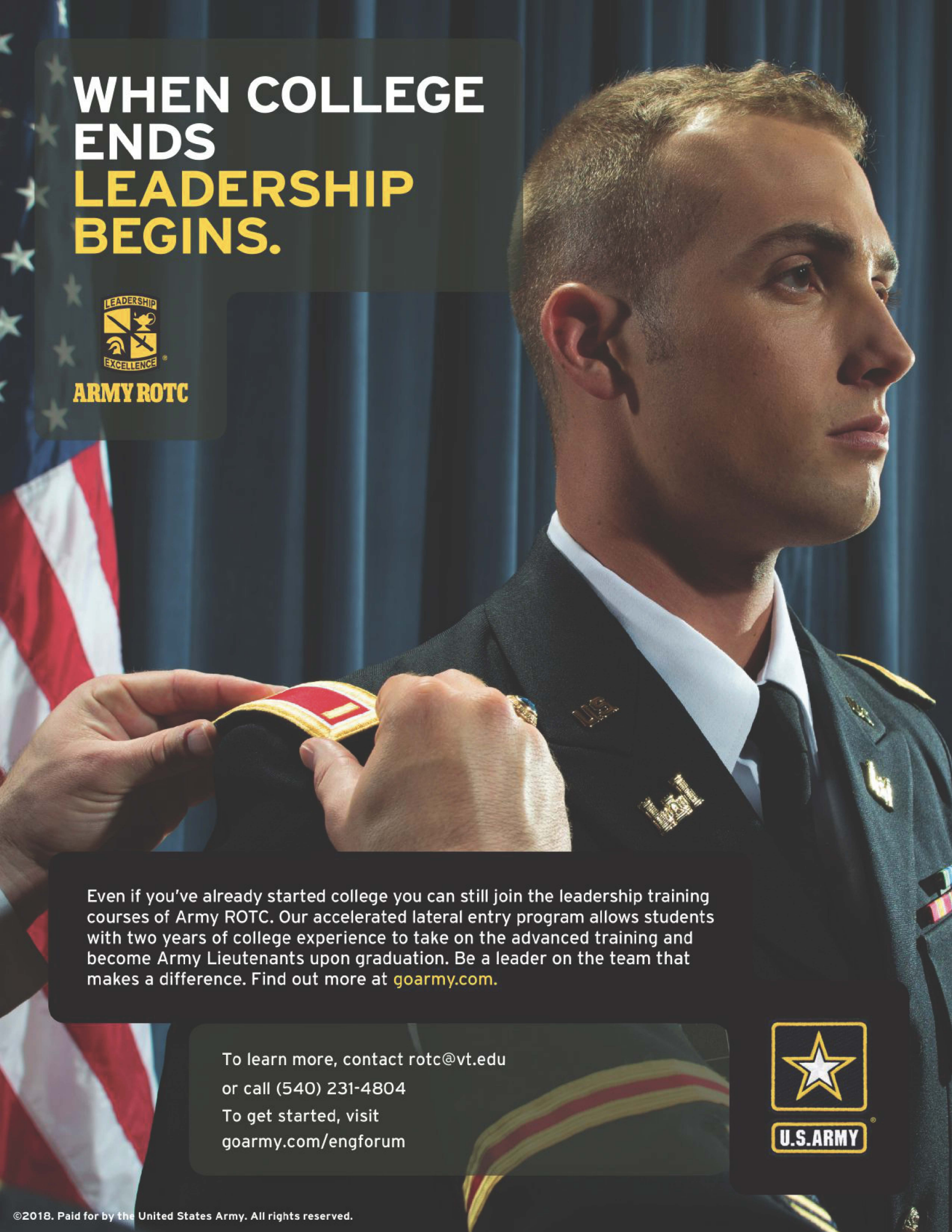

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On the Cover
Student Enjoys Writing at VT Science Fest
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Features:

Letter from the Editor

After a long break from school for the winter semester, *Engineers' Forum* returns this February with several articles focused on extracurriculars and the student experience of the Virginia Tech Engineer!

First, début writer Luke Quinn interviews Dr. Godmar Back of Virginia Tech's Department of Computer Science and programming team. Dr. Back breaks down what it takes to be on programming team. More importantly, he makes the case that everyone should consider it.

Next, another new writer, Elisabeth Robb, presents an opinion piece on the most important things to consider when making the transition between Virginia Tech's General Engineering program and a particular engineering discipline (and eventual career).

Lily Chen is back this issue, teaming up with new writer Melanie Do to provide behind-the-scenes insight into the making of a hackathon that self-identifies as one of the largest in the Southeast. Check out their article to find out why this event is sponsored by technology industry behemoths like Microsoft, and to meet the hardworking Computer Science senior who is making sure it runs smoothly!

On page 18, veteran writer Jin Tian Acton takes us into the lives of some of Virginia Tech's many engineering alumni. You'll want to hear he words of wisdom these graduates can offer.

Mehak Kamal joins us for her first article, a short profile of Virginia Tech's newest engineering major: Biomedical Engineering. Get a glimpse at the new addition to the VT engineering family through Mehak's report.

Alex Petsopoulos returns to us this issue to report back on the Virginia Tech Science Festival, which the Engineers' Forum team participated in for the first time this year. Read his account to find out why "science is bigger than you think"!

Finally, new team member Julia Pimentel gives a profile of something important to her: being an engineer who passionately claims membership in the Marching Virginians. Learn about how such students balance their time (and reminisce about how important the MVs are on game days)!

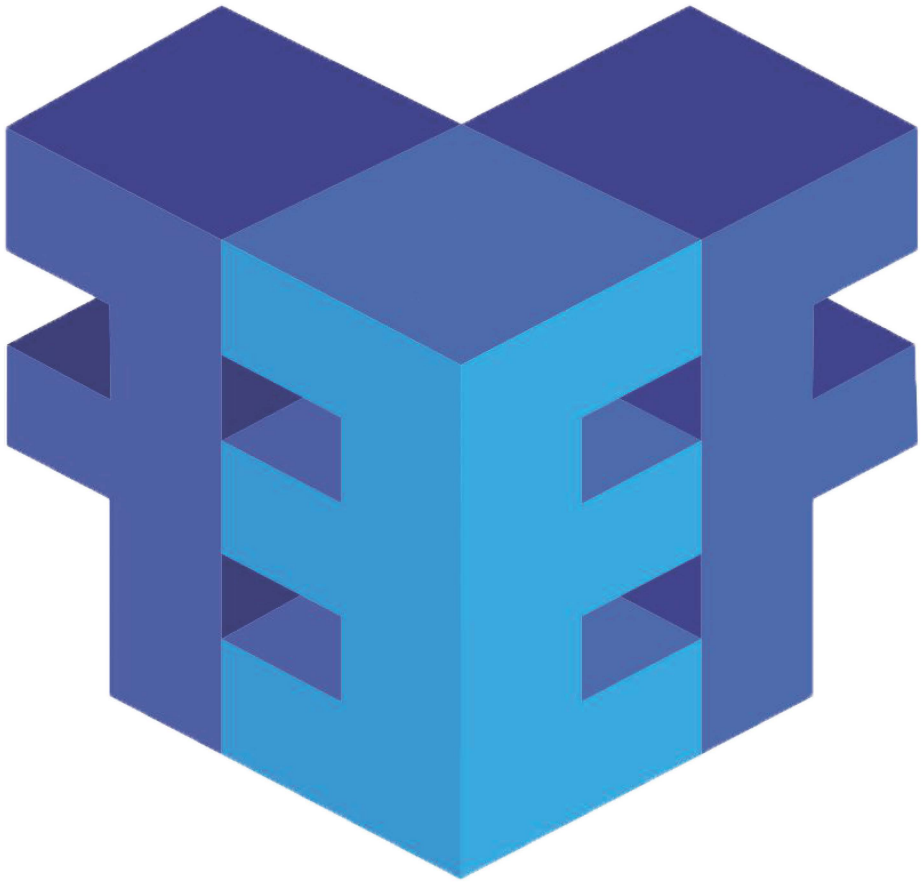
Thank you to the readers of Engineers' Forum - we can't do it without you!

Sincerely,

Arianna Krinos

Editor-in-Chief

Engineers' Forum



Want to write, edit, design, or photograph about engineering...***and get paid for it***?

Contact akrinos@vt.edu to get involved!

Programming Team: Regionals

LUKE QUINN

***Above**: The typical contest takes control of over half the Math Empo and fits about 50 teams. Teams are made of 3 members who must share 1 computer to solve the problem sets. The rules are very strict and require you to ask even to go to the bathroom!*

The business world today is abuzz with thousands of problems that need solving, and solving these problems often takes a dash of ingenuity, dedicated problem solving, and a cup of coffee. In fact, the need to have thinkers who can tackle complex problems led to the creation of the International Competitive Programming Competition (ICPC).

While one may think that programming is only something Computer Science and Computer Engineering majors do, this simply isn't true. The ICPC is needed to assist in developing both interest in and ability for tackling the problems of the 21st century. I had the pleasure of both interviewing and competing with the coach of the VT programming team, Dr. Godmar Back, who elaborated more on what the ICPC and programming team at Virginia Tech are all about!

How would you describe programming team to someone who does not know how to program?

The name programming team is a bit misleading, because it's not about programming - it's about problem solving, especially at the intermediate to advanced level. You solve problems such as decision or optimization problems with the help of a computer, and you're asked to produce an accurate and sufficiently efficient solution that works when thoroughly tested. The problems you solve are usually simplified versions of real-world problems, such as path finding, scheduling, or searching. At the beginner level, the problem involves usually only input and output and some kind of data processing.

When students compete in a competition (which can last over 5 hours), they are given a set of 8-16 problems ranging from easy to very hard. It's not expected that teams will solve every problem in fact when my team competed in the regional competition this year we were only able to solve 2 problems (although some teams did solve them all). However, in the 2018 world finals, which is a collection of the best student teams, the best team only managed to solve 9 of 11 problems. With only the number 1 team solving the 9th problem. So as you can imagine, these problems get tough, however, they are not unsolvable.

Programming can be a challenge for some people, but do you think all students have the capacity to do it? What are some steps they should take?

I have no doubt that most if not all students have the ability to do programming. After all, the day-to-day work in many professions, particularly of the scientific or technical kind, involves some kind of programming. The

***Left**: Here, the team chats after the contest. As you can see, Virginia Tech hosts the regional contest and invites several other teams, including our rival school, UVA. Lunch and dinner this year were Subway and pizza!*

difference lies in the complexity and quality of the programming you do.

What is the typical student who gets involved with programming team like? Are there particular traits that make a student more likely to be successful?

There's no such thing as a typical student, but let's focus on students that will eventually be successful (for some definition of success): they'll get involved early in their career and, most importantly, stick with the practice. To compete at a high level takes multiple years of practice, so perseverance is definitely a trait that helps to be successful. Another trait is to have a strong interest in problem solving and mathematics.

What do you think is the most important skill students need in programming team?

The ability to accurately model problems abstractly and quickly translate this model into data structures and algorithms, combined with a sufficient attention to detail to implement.

Do you think learning to program is something that the average student at Virginia Tech would benefit from?

Obviously, yes. What's less obvious is to find the optimal degree for each student: which aspects of programming to learn, which tools, at what level of abstraction. I don't have a good answer for this - certainly most students don't need to be at the level the programming team students are at. In addition, in many practical uses, different tradeoffs are made. For instance, in a real world use case, that naive algorithm that times out on a million data items in a contest might be just fine with a real world data size of a few hundred items.

Virginia Tech has been competing at a high level in the ICPC for a long time, with showings in the world championship 5 times in the last 8 years. (The ICPC is a tier competition requiring teams to win their region to advance to the world stage). This year Tech missed worlds by a small margin. Our best achievement was making 56th place in the 2017 World Finals.

***Left**: The 2016 World Finals team, "PriorityQueues", for President team with its members left to right Andriy Katkov, Chris Wu, Peter Steele and the rightmost is the coach Dr. Godmar Back. You can notice that in Andriy's hand are 4 balloons which represent the 4 out 11 problems they solved to win 56th place in the competition. The team is always looking for new members of any major: as long as you bring your brain, you have chance of competing, and earning balloons, and making lifelong friends. Check out the team's webpage for more details at https://icpc.cs.vt.edu/#/faq*

How many years have you been coaching the programming team?

I've been involved in earnest since about 2012, when there was an effort by a group of interested students to resurrect our team. (The Virginia Tech Team had been very strong for over 20 years, ending about 2007 when their coach Sally Henry retired). This group of students lobbied the department for support, and we started doing more formal practices. It was also necessary to restore the institutional knowledge of the kinds of problems and algorithms that contestants should know.

What makes you decide to continue as the coach each year?

It's mainly a matter of student interest. It's exciting to see a group of motivated students wanting to get better at what they do, and learn in the process.

What was the most exciting competition you attended?

Difficult to say. Some I remember fondly include the 2013 regionals, when we first qualified for the world finals again, beating 5 of 6 other schools by time and taking 2nd regionally. Also, our best showing at the World Finals while I was coach in 2017 in Rapid City, where we placed 56th in the world. Of course, what makes competitions exciting is solving problems. Now beyond just competing, the Virginia Tech Programming Team also follows our motto of *Ut Prosim* and gives back to our community in many ways.

In what way do you think the programming team at Virginia Tech embodies the motto *Ut Prosim*?

Probably in 2 ways. First, we are also serving our regional community by hosting a site (this

year at the Math Emporium). Together with Prof. Barnette I organized this, so that teams from other schools could come to Blacksburg. The second way is our outreach effort in the form of the VTHS Virginia Tech High School contest, which I started 5 years ago. Every year in December, we hold an online contest for students from Virginia and other states. Teams compete virtually, but many schools actually get together with a teacher or coach to participate jointly. Teachers have told me that their students have been enjoying these contests very much.

What do you think is the most valuable thing programming team offers to students?

In the words of Chris Wu (one of our world finalists), participating in programming team often makes students better thinkers. It shows them new ways of approaching problems they hadn't previously been familiar, and just gives them an appreciation for the power of algorithms.

***Above**: Teamwork is very important in these contests because of the strict 5-hour time limit. Many teams use a "divide and conquer" strategy to help divide up problems, but may switch to a group solving method when things get tough.*

Do you have any other recommendations for students interested in programming team?

One perhaps is to make sure you evolve. Don't get stuck on one particular way of doing things, even if it seems sufficient at first. Learn from the best, and rethink your own knowledge along the way. Another one is community: share with others who also want to learn. Ask questions, share code. (Incidentally, programming team is one of the few places in our curriculum where you can do that without running afoul of the honor code.)

6 Important Questions

ELISABETH ROBB

To all the engineering students out there, thank you. You have gallantly chosen to pursue a major that has the main resolve of solving the problems of this world. You may be asking yourself “which problems are for me to fix?” From biomedical to aerospace, the possibilities of your future might be overwhelming. You may have avoiding narrowing down your major. However, the time is coming for you to decide your concentration.

General engineering is a great choice for many, but not for all. If you have some concerns with determining a concentration, ask yourself these questions.

What type of classes inspire and excite you? As you explore your classes in college, try to take courses that look challenging and interesting. A dream job can become “disenchanting” after learning more about the classes. This was the case for sophomore Kirsten Anderson ('21). Her dream of becoming a chemical engineer was readjusted after she researched classes at Virginia Tech. Try not to hold onto your preconceived notions about engineering and take some classes that show you what you might be missing.

What are your favorite hobbies? Maybe in high school you played around with video game design in your free time. Maybe you loved aerospace YouTube videos or reading about the environment. Someone like freshman Jacob Chang ('22) can relate to your situation. His small high school did not offer any computer science or coding classes, so he educated himself at home. Choosing to focus on computer science engineering in college allows him to get proper training for his passion and get jobs or internships that pay him to do what he already loves. For him, Virginia Tech offered the perfect concentration for his specific interest. What are yours?

What work environment suits you best? Psychology proves that performance is directly related to environmental stimulation. If the thought of an office setting bores you, as it did for sophomore Alan Hernandez ('21), then your performance in the career field will be greatly decreased, as well as your happiness. Take into consideration when you have been at your best performance in school or in a job. If you liked being outdoors or working in a flexible environment, consider jobs that would take you away from the office. This way, your major can be tailored to your liking.

Are you interested in getting a masters? Some engineering concentrations are easier to land a job after receiving an undergraduate diploma. However, other jobs may require further education. This education may mean graduate school, or it could mean a state license, which can get expensive. Companies might offer to pay for extended schooling or testing, but some may not. You may decide on the same path that Hernandez did, avoiding graduate school and state testing by choosing a different major. His realization came from talking to family members who had already been through the process. Talk to your fellow classmates and advisors to create a plan for education that excites you.

What personality traits do you possess that would suit a job well?

Every student is unique and equipped with his or her own set of intrigues and skills. These differences make each engineer valuable to companies. A prime example of this is sophomore Anderson: a detective trapped inside an engineer's body. She chose "failure analysis" because it reminded her of solving a mystery, much like a forensic scientist. This passion of hers is not only personal, it is valuable. Her interests, as well as your own, can be leveraged within the engineering department. Celebrate your personality and use it for your career.

If you need help finding your strengths, check out the Clifton StrengthsFinder provided by Virginia Tech. This resource offers qualitative data to help you understand yourself better. Another good resource can be your peers and mentors. They can see talents you might have taken for granted. Listen to their advice: they see what is special about you.

Do salary and job security affect your major?

It is okay not to lie, money is a big factor. Luckily, demand for engineers is projected to grow in 2019. However, certain concentrations are more lucrative than others. Chang and Hernandez, as well as many other students, had salary in the back of their minds when deciding their concentration. If this is the case for you, try to research different majors that can provide financial stability after college. No one can choose how important money is for you, but it would be helpful to talk to parents or advisors on what options may fit your budget.

After all these questions have been taken into consideration, you will be closer to finding a concentration that suits you perfectly. However, if the thought of deciding what to pursue still terrifies you, you don't need to worry. Be patient and give yourself room to grow and change your mind. Just pursue your passions and the rest will follow.

VT Hacks: Hack the Planet

LILY CHEN & MELANIE DO

***Left**: Jun Yu (Computer Science '18, left) and Chris Blair (Computer Science '19, right), President of VT Hacks Coordinating Committee, pictured left at the previous year's VT Hacks V.*

This year marks the sixth year of Virginia Tech's completely free premier hackathon, held in Surge Space Building this February 15th-17th. Students from local schools come together at Virginia Tech and spend 36 hours working on teams of up to four people to create and build projects they are passionate about and fit into the goals of the sponsors. Sponsors of this year's event include MicroStrategy, J.B. Hunt, Willowtree, Capital One, Eastman, Virginia Cyber Range, and Wolfram Language.

Co-writers Lily Chen ('20) and Melanie Do ('20) sat down with VT Hacks' lead organizer Chris Blair ('19) to discuss the upcoming hackathon.

Can you tell me about yourself? Your position in VT Hacks?

A: “I’m Chris Blair. I’m a senior at Virginia Tech and I’m the lead organizer for VT Hacks. I oversee all of our different committees, which include sponsorship, logistics, user experience, food, and anything you can think of that we need for a 36-hour event. I oversee all that and make sure that the event happens.”

When is VT Hacks?

A: “February 15-17th. It starts on Friday around 4 or 5 p.m. and ends on Sunday at 4 p.m., even lasting overnight. We get students from all different types of schools, so while we don’t encourage sleeping or anything like that, sometimes the hackers do sleep at the event site. People are very passionate about their project, so they can go and spend a weekend where they really push themselves to create something awesome.”

How do you prepare for VT Hackathons?

A: “It’s really evolved since I’ve been part of VT Hacks all throughout the years. I joined the sponsorship committee, so how I really prepared in the beginning was learning how to reach out to companies - to be professional in a sense whilst still being a student. That’s been the role I’ve been taking on recently, because it is really my job to make the event happen. So, how I prepare is by taking it in a professional sense. I am leading a wide group of teams, responsible for holding people accountable, being constructive, driving the things needed to happen for the event, and delegating the work to individuals on other committees. It really is a multi-faceted role."

You mentioned committees. How do people get on these committees? Does someone get voted as a committee lead?

A: “Each of our committee leads are usually chosen by experience, because that’s one of the most important things with the hackathon. Being a student organization, we have people graduating every year, so experience is really important. Having run the hackathon in previous years, they know exactly what they want, so we usually choose the team leads based on need. Each committee has a different personality type, so we can gauge where their [new members] preferences lie. Many applicants have never been on a hackathon committee, they’ve only seen descriptions of the responsibilities through an application. We can see where applicants see themselves and then where they’ll provide for our committee and try to make a compromise. Usually, people are pretty good at seeing themselves in a specific role, and we agree with it.

How long have you been planning the hackathon?

A: “It takes at least a year. We start planning 4 weeks after our prior hackathon. The four-week break allows for the transition of leadership and responsibilities, trying to figure out which people are graduating, who is taking on the new roles, which is a very important part because we need to be future thinking. We need to think about VT Hacks VII, VIII, IX, X; they need to happen and be better every year. We are not only focused on the present, but how we can cultivate the future, growing the committee, growing the hackathon, and starting from there, that’s when we start focusing on long-term planning.”

Is it like an election or do people get appointed?

A: “It’s mostly like a succession. There are mostly people who self identify as they want to lead VT Hacks. I find that to be much more organic because with an election, being a student organization, it is better to have a succession. How we have structured it in the past, the vice lead is the next person to succeed, so they can almost shadow the leader. It is like a right-hand man type of deal.”

What makes VT Hacks VI different than years previous?

A: “Not only are we bringing on more companies, more participants, upping all the prizes, making more fun events and puzzles for the hackers, and we’re also really pushing this year that everyone learns at least one new thing with our workshops. We want people to come to the hackathon even if they know nothing and come out with something learned. Hackathons to some people are a competition, but to other people, and how I perceive it, it is just a learning experience. Because very few times in your student life, do you get free reign to do whatever you want, code whatever you want, think of whatever project and the hackathon is the absolute best atmosphere and that’s where you truly learn something that you like, dislike, or something you are super passionate about. We provide networking opportunities. It’s better than a career fair because this is what you are actually going to be doing at a company, developing a project, so companies get to interview you over 36 hours.”

How did you get involved with this opportunity?

“Actually, I’ve been into event planning since high school. I planned a Model UN conference. That’s where I started my event planning experience and then this was just the next logical step. I think it was my sophomore year first semester and I was looking for opportunities and I just came across, the day before the deadline to sign up for an interview for VT Hacks. The interview is more informational, but we’re looking more for a fit. We are judging whether or not people are passionate about it. That’s what really drives our organization. I was interviewed by two people on the sponsorship committee that became my mentors and then it all just happened there. After the sponsorship committee, I really wanted to get involved further because I was really passionate about the experiences I had at hackathons. I wanted to give people those experiences and that’s how I got really involved with the event.

Do you ever feel like a mentor, especially to the new kids?

A: “Well, it’s hard because in the moment I feel like some of them think I’m just giving them orders, but I think that each of the lessons and everything we are doing has a purpose. I’ve never asked someone to do work that we don’t have them using for the hackathon. It’s all something that they can put their name on. It’s really a great experience for them because they have ownership of the hackathon just as I do. We all share the responsibility to put it on and that’s what makes the VT Hacks committee such a great group of people.”

What’s your favorite aspect of being a part of the executive committee?

A: “I love doing the opening and closing ceremonies. Those are always so much fun. I don’t have a speech ready and that’s the best part. I prepare at least one corny joke because that always breaks the ice. The majority of the

time, when participants get to a hackathon, they have this notion that everyone else is super smart, so breaking the ice is a really important thing. I love when I can get everyone to laugh and even cringe a little bit. I think what really drives the passion is to be able to plan this whole event and then see people having fun, getting passionate about their projects, and saying 'at VT Hacks _____, I was able to do something that I've never done before and I found that I'm super passionate about it.' If I can just make one person find their passion because of VT Hacks, it just validates the whole one year I spent doing what I did."

How much time and planning went into the organizing of this event?

A: "We meet once a week, but everyone works multiple hours during the week and it just ramps up. I am sure that people have easily worked 4-8 hours a week just getting everything done. We each have segmented roles, so each person has to prepare for their own responsibilities. I don't know exactly how many hours we put in, but we put in a lot of time. The reason why we have to spread it out over a year is because we can't make it happen in a semester. We need the full 12 months. It is not only getting committees organized, but it is getting new people trained and putting them through and making them comfortable being part of a committee. Once someone takes ownership in VT Hacks, that's when they are committed. That's what I love to see the most. From an executive point of view, in a committee, every single person takes ownership of VT Hacks."

What can participants expect to take away from the event? Why should we participate?

A: "I think what's amazing is that you can do anything at this event. You can go in there having learnt nothing about coding and attend our workshops, you could have never even attended a hackathon before. We have business and accounting majors where all they know is Excel, but with all these technologies, we make it so that they are reachable. We prepare a wide variety of beginner things, like how to survive your first hackathon, all the way from a first time hackathon to a veteran, we have everything that fits any level. We have networking opportunities, it's tons of fun, and free food the entire time. I can't think of a better way to spend time in something that I am passionate about other than a hackathon. Hackers at VT is our outward facing and small internal events groups. They plan for attending hackathons, getting buses and other protocol things. They also plan internal events with companies, such as events coming up in February, like Google. They do student outreach events and they also get us to other hackathons like HackDuke. This is essential because we want attendees from other schools to come to our hackathon and vice versa."

Will there be different tracks to participate in (i.e. health, technology, social good, etc.), similar to other Major League Hacking (MLH) hackathons?

A: "We usually focus on the companies to provide the tracks because we really want anyone to be able to do any idea. Now, if they want to do an idea and the company has a track or they come in with no idea and there's a company they want to pursue on their track, then we're all for it. I really like seeing any different ideas, with innovation. It is super open. Just take your mind, release any preconceived notions and just try it. There is literally nothing that can go wrong. If you don't finish it, you have a project stub to work for. The biggest thing that people struggle with is taking the first leap and this hackathon really is the first leap."

When is the deadline to sign up for VT Hacks VI?

A: “We do rolling. We are constantly accepting new sign-ups. We won’t really cut it off because we can accommodate a lot of hackers because since we’ve obtained permission to occupy the entire Surge building. If we start reaching like numbers like 1500 then we’ll start cutting it off, but we really do have the room to accept as many people as we need. I think there are different tiers of hackathons and the sweet spot is 300-400 people. After that, it feels like you get lost in the midst of things. We also ran an internal hackathon. It was just for VT people and I really liked that because small hackathons are really good in providing a chance to get close with everyone. The biggest problem with big hackathons is that not everyone can present their ideas, so with smaller hackathons everyone can present and this gets participants really enthusiastic."

How can students prepare to succeed if this is their first hackathon?

A: “Honestly, just going in with an open mind! Don’t simply pick something narrow and say you want to do it. There are hundreds of people at the hackathon and there are hundreds of ideas. If you have an idea, that’s great. If you don’t have an idea, that’s great. All you need to do is keep an open mind and talk to as many people as you want and can.”

How many participants are expected?

A: “We usually expect 400-500 attendees. People work at the hackathon in waves, so some people go home and sleep, some people work throughout the night. Participation throughout the night really varies. At 8pm is when we see the highest rate of participation, with spaces being more crowded, but at 4am we see a low number of people and decreased participation.”

What kind of incentives/prizes/awards are there for participants?

A: “We are really excited to say that for first prize, we are giving away a $500 check to the team. This is the first time we’ve offered a monetary prize, and we have upped our prize budget by 50% this year. Places 2nd-10th also have really fantastic prizes which we’ve never done before. We were fortunate enough to find more companies to support us this year.”

Is VT Hacks associated with SheHacksVT, the Virginia Tech all-women hackathon, at all?

A: “I am the link between SheHacks, but we have a partnership because SheHacks is a relatively new project started at VT. It is only on the second iteration, but it is an incredible hackathon because of the smaller nature and focus on women in computing. We usually target 75-100 females coming to the event. Part of what I love is highlighting the underrepresented demographic in STEM, which is women by and large. It is a really great event, where people get comfortable with the hackathon atmosphere and we’ve seen it drive up female attendance for not only VT Hacks but other MLH hackathons as well. I think it’s a place where people who don’t know a lot about CS can dive in and learn in a comfortable atmosphere.”

This year's VT Hacks will take place the weekend of February 15th-17th in Surge Space Building. Students interested can register for free online at https://register.vthacks.com/login and further questions can be sent to hackathon@vthacks.com!

ALUMNI CHATS

JIN TIAN ACTON

“Do something you **love**.” - Louis Michael

As cheesy as it sounds, this was a common theme of the advice a few recent graduates had. They emphasized the importance of searching for your interests because they might be different than what you thought they were. Another piece of advice shared was to recognize that it was okay to make mistakes, and that it’s perfectly fine to change your mind. Failure is inevitable, unfortunately, but taking risks is incredibly valuable, especially in college where there isn’t much to lose. As an undergraduate, and especially a freshman, it can be easy to stress about what you SHOULD be doing, instead of using college as a time to experiment and really discover your own interests. While this may be a very different path than you had originally intended going down, it will also be much more rewarding and honest.

Engineering is a time consuming and involved major. As a freshman, balancing fun and school may seem overwhelming. However, every alumni we interviewed seemed to have many interest outside of their work, and even outside of their major completely. Nyle Rodgers, a Computer Engineering VT graduate, for example, is interested in origami, cooking, and most recently, sewing. Louis Michael, a Computer Science graduate, shares this passion of cooking, and often hosts events where he cooks pasta, crême brûlée, and other dishes. As shown by these, and many other successful undergraduates, with good time management, having fun and enjoying your hobbies is possible, even in the college of engineering.

***Below**: Origami created by computer engineering graduate Nyle Rodgers.*

“After graduating, I realized that I still wanted to explore and learn more in different areas than just programming,” - Jordan White

After graduation comes the daunting and complicated question: What happens now? Most students will go onto one of two things: pursuing a higher degree, such as a master degree program, or moving right into the workforce. Both options are good for different individuals, and it is important to pick the option that best fits your needs and goals. While some students are interested in branching out into other subjects, others like to simply build upon their undergraduate’s degree. Other stay in the middle of this by picking a subject that is similar but a slightly different focus. Jordan White, for example, a recent Computer Science graduate, decided to branch out some and pursue a Masters Degree in Interactive Arts + Technology at Simon Fraser University. While many decide to continue their schooling, others start jobs after graduation, often times with companies that they have interned with previously. This opportunity offers first hand experience for those who are ready to be on their own and is great for those who are confident in their interests.

“While you don't necessarily need to be a leader to work with talented people or ask the hard questions... having a platform helps, and makes it easier to bring voice to issues you care about.” - Alyssa Herbst

Almost immediately you’ve answered the previous question and decided on what to do after graduation, you are again tasked to look forward. What is your five year plan? What do you want your career look like throughout your life? While this seems like an impossible decision to even start considering, it can help to think more broadly. Instead of focusing on exactly where you want to be, or what company you hope to work for, or even how much you hope to earn, it may be more helpful to start by looking at your own interests. Alyssa Herbst, a recent Computer Science graduate, who is currently pursuing a masters here at Virginia Tech, uses here interests to help guide her career goals. Not only does she have an apparent passion for Computer Science, but she also wants to use these skills to bring light to her other interests. Alyssa wants to focus on the things we can learn from data, and how we process this valuable information. While you might not have as specific a goal in mind as Alyssa, considering your current interests and how those can be relevant when trying to make decisions for the future.

***Above**: Louis Michael, computer science student and alum.*

New Biomedical Engineering Major

MEHAK KAMAL

A new biomedical engineering major at Virginia Tech was approved by the state of Virginia and begins in Fall 2019. This major focuses on transdisciplinary collaboration, entrepreneurship, and an inclusive environment for students so that they can adapt rapidly into the industry.

The undergraduate degree is offered as a B.S. in Biomedical Engineering, B.S. in Engineering Science and Mechanics, or a minor in either. There is an accelerated undergraduate to graduate option also available which allows undergraduate students to use courses taken during the senior year to count towards both the bachelor's and graduate degrees. Biomedical engineering focuses on bridging the gap between traditional medicine and technology, while engineering science and mechanics focuses more on building the engineering fundamentals to apply knowledge in various fields such as modern machinery, automotive and aerospace engineering, and biomedical equipment design.

A total of 123 credits is required to graduate with an undergraduate degree in biomedical engineering, while the minor requires 18 credit hours and a minimum overall GPA of 3.0. General Engineering students who have not declared their major and are interested in the biomedical engineering undergraduate degree can apply for the program this semester.

The courses required to graduate include various disciplines like Biology, Engineering Science and Mechanics, Statistics, Materials Engineering, Computer Science, Electrical and Computer Engineering, and a biomedical engineering senior design project.

Since this field of engineering is still emerging, it is important for students to get involved in undergraduate research. Virginia Tech has several research opportunities, including 11 interdisciplinary fields: Biomaterials, Biomechanics, Biomedical Imaging, Cardiovascular Engineering, Dynamics and Control, Fluid Mechanics, Nanobioengineering, Neuroengineering, Solid Mechanics, Tissue Engineering, and Translational Cancer Research.

Moreover, there are some study abroad opportunities where students can go for a semester or a year as sophomores or juniors to get more exposure in this field of engineering.

Due to various interdisciplinary courses and research opportunities, as well as its growing demand in the industry, biomedical engineering is something you should definitely consider.

Works Cited / Learn More

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Virginia Tech Science Festival 2018

ALEX PETSOPOULOS

***Left**: The McGlothlin Lab of Virginia Tech's Department of Biological Sciences brought live animals to engage young scientists with their exhibit, "Inside Reptiles (and You)".*

Late last October the Moss Arts Center hosted the Virginia Tech Science Festival, a free event curated with the goal of making science and research accessible to all ages. Most exhibits were designed to excite students from surrounding elementary and middle schools about Science and Engineering, but that didn't stop a few ambitious preschoolers from conducting some research of their own.

The Festival Expo sprawled across the Virginia Tech campus, occupying space in the Moss Arts Center, Newman Library, Torgersen Hall, and many outdoor spaces in between. Early Saturday morning the first few busloads of budding young scientists arrived, greeted by volunteers hosting exhibits from VT design teams, public organization, and corporate partners. the theme of the event was "Science is Bigger Than You Think!". Taken from the VT Science Fest website, "Science is a

way of knowing about everything -- people, trends, living things, rocks, economics, how things move, what people buy, probabilities, stars, animals, history, memory, physics, and so much more.". All the exhibits were unique and different, and one each contributed to this theme in their own way- here's how they did it.

SCIENCE IS MESSY

One of the events partners from the academic community, NanoEarth, taught the students about science on the microscopic scale in their exhibit, "What is Nano and What Does It Have to Do with the Earth and the Environment?" NanoEarth is a collaborative effort between the Center for Sustainable Nanotechnology at Virginia Tech and the Pacific Northwest National Laboratory that supports research on the environmental aspects of nanoscience and nanotechnology. For their exhibit, they engaged students in a hands-on demonstration, using toothpick/gumdrop models to understand molecular structure.

***Above**: "Write to Excite: Exploring Writing in Engineering and the Sciences" - Engineers' Forum, Virginia Tech.*

SCIENCE IS COMMUNICATION

Some of our own Engineer's Forum staff, including myself, also came out to volunteer with the children at the Science Fest, hosting our own table, "Write to Excite: Exploring Writing in Engineering and the Sciences.". Our particular exhibit was hands on, we set out numerous science related prompts for students to come by and write their own responses, such as "What would happen if gravity suddenly stopped?" or "Given you had the power to invent anything, what would it be?" A few such prompts were very well received, one young student responded that if she was an engineer she would create a wheelchair that allowed people with disabilities, like her sister, to ascend and descend stairs safely. Furthermore, one student wrote that if gravity were to cease to exist, her favorite business model, trampoline parks, would be suddenly rendered significantly less fun.

Also, important to note is that our table was labeled SAFE – Supporting Autism-Friendly Environments; some of our exhibitors attended a SAFE Mentor training to better accommodate young students with Autism. There were several children at the Science Fest with disabilities, and in addition to our exhibit, the Center for Autism Research at Virginia Tech also put together a Sensory-Friendly Space to promote inclusivity in the sciences.

SCIENCE IS ON THE ROAD

Accompanied by a few members of the Galactic Empire, students from the Motorsports Formula SAE design team at Virginia Tech volunteered as presenters to teach students how the sciences are important to vehicle design, especially so in the racing industry. Over a period of one year, SAE student members brainstorm, design, and

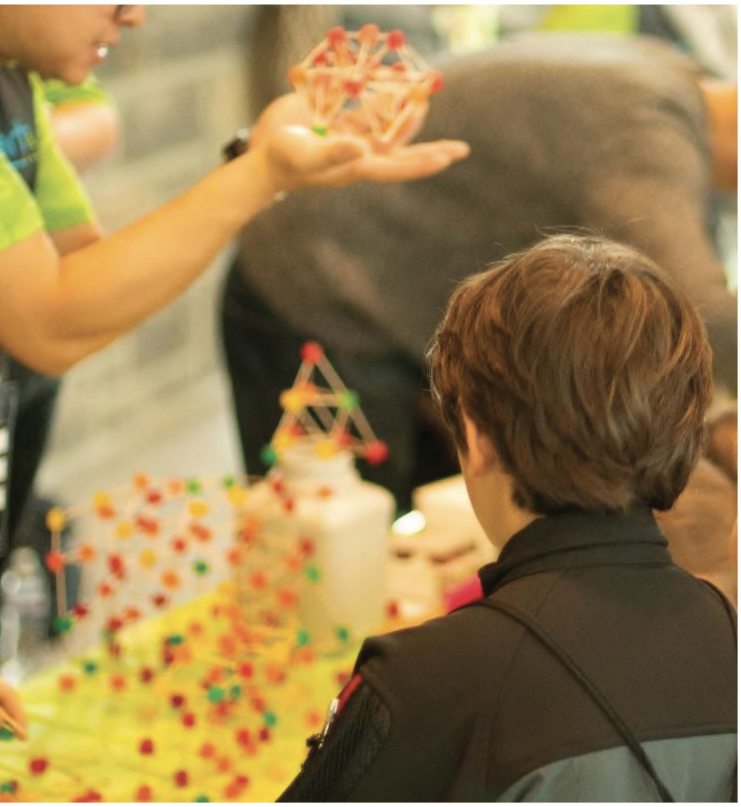
create their very own formula-style racing cars. They then take their creations to a competition in June for judging and competition with approximately 120 vehicles from other universities and colleges worldwide. For young engineers, the SAE experience is a meaningful engineering project, but also an opportunity to participate in a dedicated team effort. Their station set up at the Alumni Mall attracted students of all ages and emphasized the challenge the racing industry places on the knowledge, creativity, and imagination of engineers and scientists.The 2018 Virginia Tech Science Festival was a marvelous success in making the excitement found in science and research accessible to a young audience in a hands-on, far-reaching environment.

***Above**: Newly instated heart surgeon performs simulated surgery using robot-assisted instruments.*

Further information about how Virginia Tech is fueling the local STEM pipeline, and insights into previous Science Festivals can be found at the VT Science Fest Facebook page, www.facebook.com/VTSciFest/.

Keep reading *Engineers' Forum* in print and online at http://www.ef.org.vt.edu/ to stay up to date with all things Science and Engineering @ Virginia Tech, and watch out for information pertaining next October's Science Festival!

***Above**: Science Festival visitor learns about the role of writing in science and engineering and crafts a story from a given prompt.*



***Above**: Volunteer explains molecular geometry and its role in atomic properties to curious onlookers.*

Virginia Tech Marching Engineers

JULIA PIMENTEL

***Left**: Marching Virginians saxophone section (Credit: Alana Hassett).*

It's truly the best of both worlds: during the day they're conducting research, finding solutions to real-world problems, contributing to design teams, and creating long-lasting impacts in the field of STEM. While at night, they stand amongst hundreds of others on the practice field of the Marching Virginian Center with instruments, flags, and batons in hand. Pride in their eyes and stadium lights beaming down, they are preparing to perform a show that captivates thousands of avid VT football fans. The Marching Virginians exude confidence on game days as they enter Lane Stadium to hype the crowd with iconic stand tunes including Bom Bom, Scatman, Treasure, the classic Tech Triumph, and many more. Half time is *their* time. The Incredibles theme, Bohemian Rhapsody, and other songs flood the brain. They run onto their grass stage marked with white yard lines resembling a grid while mentally and physically priming themselves to march, play their hearts out, and form various shapes and words on the field specially catered to the song repertoire.

Students from all majors compose the esteemed marching band, with a large percentage of these performers also studying various disciplines of engineering. You may find a mechanical engineer playing the trumpet, an industrial systems engineer tossing and spinning flags, or a civil engineer carrying a saxophone. These active students lead lives characterized by both academic rigor in engineering and passionate performances on the football field.

I had the opportunity not only to perform alongside these inspirational musicians, but was also fortunate enough to reach out to a few members to ask questions and understand more about their perspective as a *Marching Engineer* of Virginia Tech.

Eric Chang is the senior drum major of the Marching Virginians who majors in aerospace engineering and triple minors in mathematics, computer science, and music. Conveying his enthusiasm for both the fine arts and STEM, Chang highlights, “Being able to have that creative outlet is something I’ve always appreciated.”

Ashlyn McDonald is the passionate junior drum major who studies both computer science and mathematics. Her favorite part about marching band is “spending every day with some of the best people on campus and being a part of such a unique group of people.”

Camy Colon offers a freshman perspective as a lead trumpet player who aspires to pursue mechanical engineering. Colon exemplifies her passion for performing as she proudly notes, “Marching band made me who I am today.”

Why do we do it?

The Marching Virginians is comprised of a diverse student body whose members come from all across the nation with unique backgrounds and interests ranging from animal and poultry sciences to history to multimedia journalism to human development to materials science engineering. Thus, each performer has various reasons for being in the marching band. Chang relays, “The main reason that I do marching band and any other music ensemble is really for the camaraderie of the people around it.” The Marching Virginians is a family: they actively strive to support and encourage each other both inside and outside of rehearsal.

On any given day, you may find clusters of MVs sitting on the couches at Squires or helping each other with schoolwork in Lee Hall, home of the Hypatia and Galileo engineering living-learning communities. McDonald acknowledges the challenge posed by the rigorous engineering curriculum and offers a way of incorporating her passions into her schedule when she states, “I always make sure to keep school a priority, but I’m

***Below**: Eric Chang, senior drum major, conducting the Marching Virginians (Credit: Alana Hassett).*

not afraid to enjoy my time with band because I think having that mental break is super important because so many people focus on studying all the time and wear themselves out super quickly." Marching band provides students with a creative outlet, a method of stress-relief, and most importantly, a spirited family that is incredibly musically talented.

Striking a balance

The life of a *Marching Engineer* is not easy, but is both rewarding and empowering. These high performers must juggle classes, research, and design teams on top of practicing music, memorizing drill, and attending rehearsals for an hour and a half every day Monday through Friday. Learning the significance of time management over the course of his time at VT, Chang makes the simple, yet profound statement, "You make time for what is important to you." Along the same lines, Colon emphasizes her appreciation for the time schedule created by the MVs. She comments, "Especially since marching band has a regimented schedule, it helps me keep a routine. So, I know how to budget my time; it's a good way to exercise your brain." Thankfully there are many *Marching Engineers* that relate to this lifestyle, and thus foster an environment of support and mentorship in the Marching Virginians.

As a freshman this past fall, Colon was immediately introduced to the fast-paced, productive schedule of a *Marching Engineer*. Fortunately, she was able to "always go to her section leaders or rank captains to ask for help and advice in engineering." Referring back to his freshman year, Chang recalls, "My saxophone section leader was a junior civil engineer. He was really helpful because he told me about the sort of classes that I would be taking. He also helped me write up my resume freshman year." *Marching engineers* are role models. Chang's positive experience shaped his character and influenced how he interacts with the marching band. He states, "I like to teach through action. Be the example for others. If people ask me for my recommendation, I provide feedback."

Engineering skills influence performance skills

The engineering perspective provides musicians and performers with a special skillset. McDonald describes the drum major role as one who "conducts half-time performances and serves as a role model for the younger members of the band." This form of leadership is strengthened by the VT engineering program's emphasis on teamwork as well as Ut Prosim, That I may serve. Chang notes, "There's an idea of problem-solving that comes up a lot with being a drum major. Some things I learned in my engineering classes include being flexible and able to work on the fly because things won't always go as planned. You have to have a plan of action as to what to do when things don't go your way." Engineering

encourages students to overcome challenges and difficulties. McDonald asserts that being an engineer teaches individuals “dedication, perseverance, and trying to think outside of the box to solve problems.” Reiterating the values of camaraderie and mentorship in the marching band, Chang reveals, “One of the things especially at VT that I think is great is that they always push this team-oriented aspect of learning—learning how to work with people.”

Interested in the relationship between engineering and music, McDonald describes how she “did a few research papers on the effects of music on the brain and how music can impact a student’s progress in school. I think it is important people understand that an engineer who is musically inclined gives them a step-up compared to engineers that just do engineering. It’s a very cool thing to have both aspects because it helps people become more well-rounded individuals.”

Not only do engineering skills influence performance skills, but the reverse also holds true. Colon demonstrates how, in the Marching Virginians, she was taught how to “fix mistakes and be proactive. It teaches you a lot of responsibility. Learning a lot from the people around you—from section leaders to band techs to band directors—has boosted my character.” Along the same lines, McDonald highlights “I have gained a stronger appreciation for what other people can bring to the table and valuing what each person has to offer.”

Do what you love and love what you do

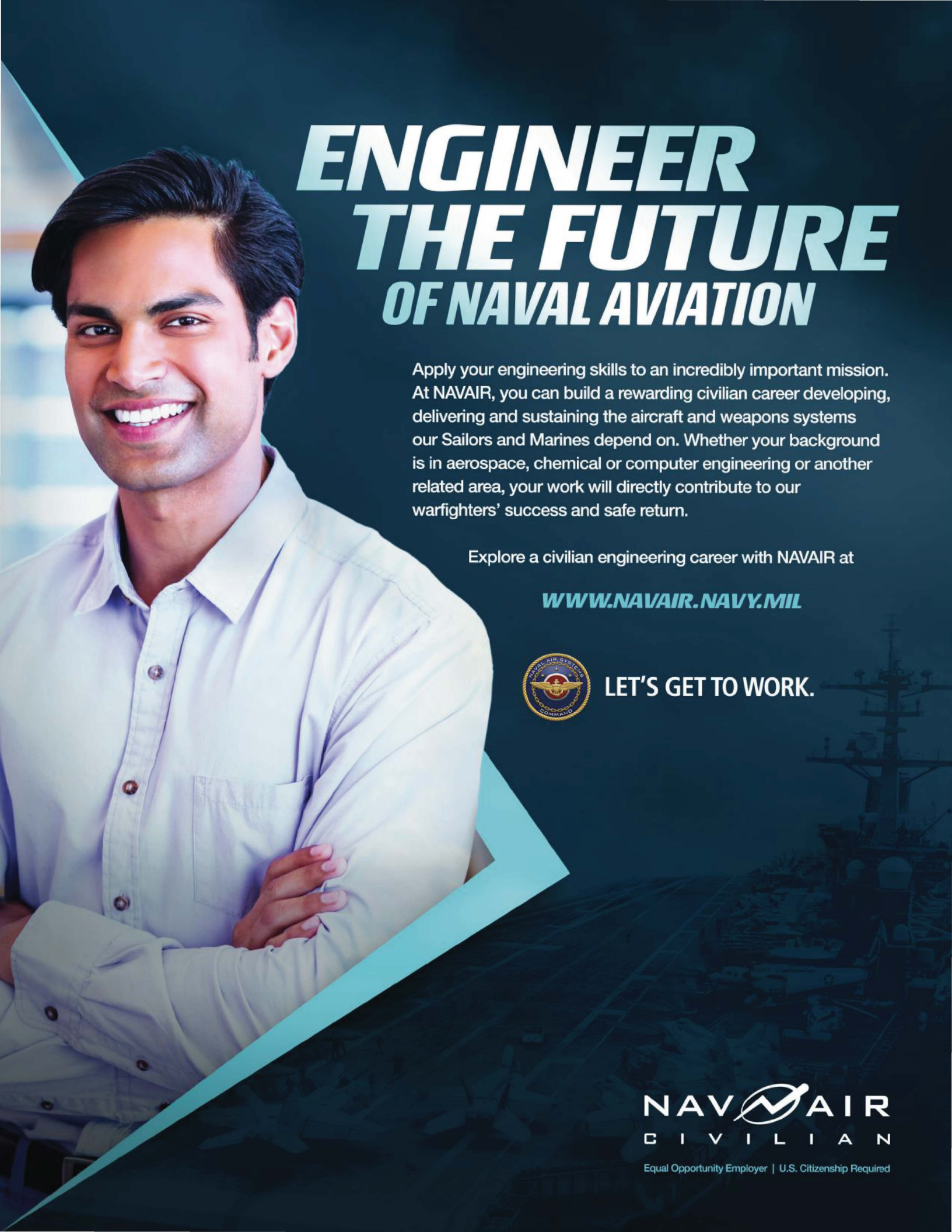
Marching engineers’ passions coexist in harmony: they all share a profound love for music—especially marching band—and engineering. Virginia Tech cultivates an atmosphere that is supportive of both engineering and the performance arts in which it is possible to pursue your dreams and desires. Engineering benefits from performing; performing benefits from engineering. *Marching engineers* proudly embrace the notion of doing what we love, and therefore loving what we do.

If you are interested in joining the Marching Virginians, learning more about our experiences in the MVs, reading articles from some of the writers who are *Marching Engineers*, or simply curious, please visit:

www.spiritoftech.com/mvexperience

***Below**: Marching Virginian brass players (Credit: Alana Hassett).*

***Above**: Julia Pimentel and Camy Colon, two freshman Marching Engineers, excited on game day!*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