we are
engineers

SPRING 2019 ▶ GEORGIA TECH COLLEGE OF ENGINEERING

OCULOGX

✕ XWING

the upstart issue

Tech faculty startups lead the way

Learning to pitch perfect

Xwing: Autonomous air travel

A culture of biomedical invention

CARBICE

Zyrobotics
freedom through technology

Shef

ETHOS

UPPING THE ANTE
STARTUPS SOAR AT TECH

Friends of the College,

I am delighted that you are reading the Upstart Issue. Some may wonder why we didn't call it the Startup Issue, but there are some subtle differences in the words.

Startup implies that these are fledgling business enterprises or new businesses. To me that narrowly defines what these students, faculty and alumni are all about, as they begin to create companies and products.

The truest description of upstarts is a person who is driven by an idea or passion and wants to dedicate themselves to making it a reality, to achieve success or just make a name for themselves. I believe this more adequately describes the entrepreneurial culture on campus. The College is full of engineers with innovative ideas, some that become overnight successes, others that percolate for a time, and some that fail or fade away.

Particularly in the case of students, many of them go through multiple iterations of products and services before landing on a good business model. They start something, fail, start again, pivot their idea, taking part in the cycle of innovation. Our students are driven by the passion to create something of their own, to make a name, to be their own person, and design their own job. These upstarts cannot be defined by a single business enterprise but rather by their willingness to boldly run with an idea, build a company, or be a disruptor or change agent.

Our students, faculty and alumni are all upstarts in their own right. Innovation is part of their DNA. And here at Tech, we are committed to unlocking this fundamental characteristic. It's why I was part of the founding of CREATE-X five years ago, our campus-wide initiative to instill entrepreneurial confidence in students and empower them to launch real startups.

Students today have a passion to change the world, and entrepreneurship gives them a way to do that. With it, they can control their own destinies. I share this passion with our students, having tried a startup myself, and now as someone who can help be a cheerleader and spokesman for what we are doing — nurturing the entrepreneurial spirit of students and faculty alike. Upstarts to me implies how these individuals view themselves and their goals in life. I hope you will take the time to read and understand the why behind these entrepreneurs.

Steve McLaughlin
DEAN & SOUTHERN COMPANY CHAIR
COLLEGE OF ENGINEERING
@gtengineerdean on Twitter

inside

WE ARE ENGINEERS > SPRING 2019

we are engineers
GEORGIA TECH COLLEGE OF ENGINEERING
SPRING 2019

the **upstart** issue

Tech faculty startups lead the way
Learning to pitch perfect
Xwing: Autonomous air travel
A culture of biomedical invention

Dear Readers,

This Spring's *Upstart Issue* is all about startups, innovation and the maker culture of Georgia Tech's College of Engineering. I'm very excited about this issue because I have had the pleasure of watching many of these startups develop — from idea to prototype to full-fledged company.

Across campus and the nation, our students, faculty and alumni are taking the work ethic and knowledge they gained from the College and applying it to create companies that are revolutionizing countless industries. These upstarts are also solving problems we didn't even know we had. They're not just engineers, but entrepreneurs. They disrupt the status quo and push the boundaries of technology.

In the following pages, you'll see that the startup ecosystem at Tech and across Atlanta is alive and well. From ATDC in Tech Square to CREATE-X and The Garage, you'll learn how startups are being fostered across campus. I hope you enjoy discovering our engineers and their journeys to bring innovation to the world.

Happy reading!

Sincerely,
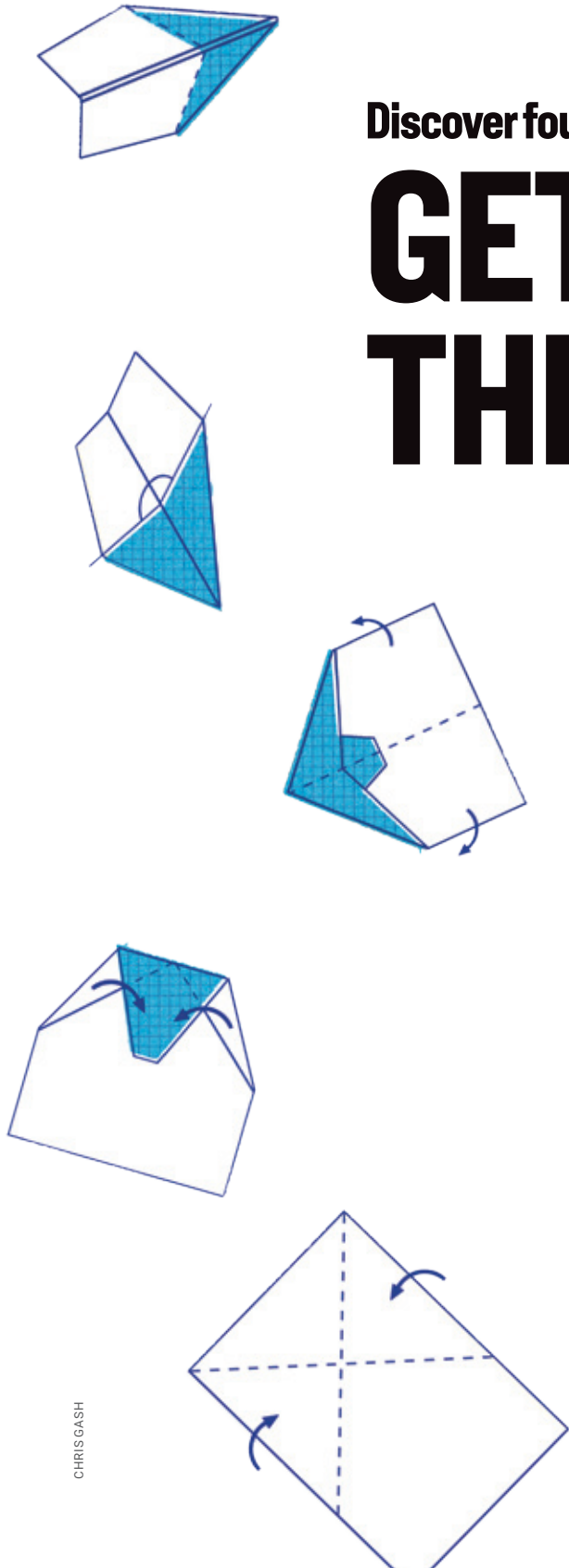
Georgia Parmelee

Georgia Parmelee
EDITOR
editor@coe.gatech.edu

> These upstarts are solving problems we didn't even know we had. They're not just engineers, but entrepreneurs. They disrupt the status quo and push the boundaries of technology.

2018 CREATE-X STARTUPS

Discover four promising companies that are just

GETTING OFF THE GROUND
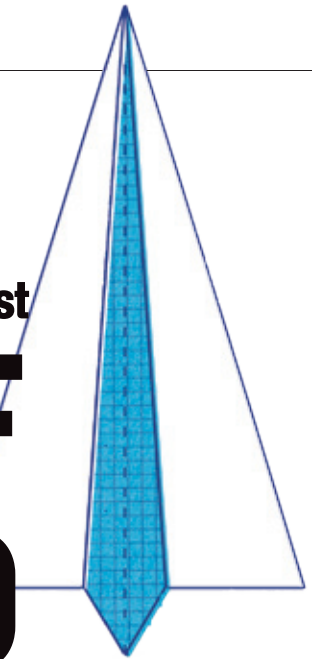
Students from around the world come to Georgia Tech with startup ideas already in mind, hoping to launch the next invention that revolutionizes an industry. The startup ecosystem at Tech is extremely healthy, providing programs that foster young engineers who want to be entrepreneurs either during school or after they graduate.

And CREATE-X is leading the way, producing hundreds of student-run startups each year. It's a Georgia Tech initiative to instill entrepreneurial confidence in students and empower them to launch real startups. The broader goal of CREATE-X is to provide the knowledge, skills, abilities and experiences that will give Tech graduates the confidence to create their own future and confidently pursue entrepreneurial opportunities.

This past year, the CREATE-X Startup Launch program introduced more than 100 new companies to the market, with more than 300 students participating. VAILS, ConvexMind and pHam are just a few of the 2018 startups that have promising concepts and hope to see early success.

As told in their own words, a few of the co-founders (who are also recent engineering graduates) provide insight into their promising companies and vision for the future.

CHRIS GASH

4

Vails

> **Co-founder Brianna Cochran (ISyE, 2018)**

The Problem

My co-founder Kendall (ISyE, 2018) went to the nail salon for her birthday last year and came back with quite a few complaints: The color hadn't turned out as expected, the shape wasn't what she had asked for, and it took almost two hours to have the nails applied! For the price she had paid, the quality of her experience was severely lacking. In fact, her nails were physically hurting from the chemicals the salon had used to adhere her new manicure.

The Solution

VAILS (Virtual Nails) delivers a product and service in one: custom, 3D-printed artificial nails designed through a mobile application. VAILS are water soluble, sealed with a waterproof coating and personalized (shape, color, length, design) 100 percent to user description. Our nails are robust but have a quick and easy removal process that protects the nail bed keratin barrier and prevents common concerns of splitting, peeling or drying the customer's natural nail from careless removal techniques using acetone and nail buffers. We are developing an app that uses augmented reality to capture the exact measurements of your nail and allows you to preview and design your manicure in real time before you commit to making a purchase. Once you're satisfied, your nails are 3D-printed and shipped to you.

The CREATE-X Experience

CREATE-X gave us an opportunity to pursue our passion for self-care and self-expression by combining our industrial engineering skills with our interest in the fashion tech industry. We wanted to take advantage of the program to bring our vision to life and introduce a product that is beautifully unique but exceptionally complementary to today's market. We've also seen enormous potential in having nail health at the forefront of our initiative, as we tackle an industry with such notorious use of harsh chemicals. As industrial engineers, we see VAILS as a unique opportunity to use additive manufacturing to allow for mass customization, while maintaining freedom of design, control of our supply chain, support of 'green' manufacturing initiatives, and streamlining of economies of speed.

The Future

Today, we have partnered with various students across engineering disciplines to assist us in iterating on our prototype and will seek additional investments early this year to begin production in mid-2019. We are also interested in looking into the medical benefits of VAILS once we're more established. Ultimately, we want to change the way the world thinks about the nail industry by demonstrating that it's possible to own your individual aesthetic without compromising your health or wasting your time.

pHam

> Co-founder Aaron Stansell (MSE, 2018)

The Problem

The four of us were brainstorming ideas for senior design one morning. Like most mornings on campus, we had coffee in front of us. Tyler made a comment that his dentist had noticed coffee stains on his teeth. Aaron said that his GI doctor had mentioned avoiding coffee to keep symptoms of acid reflux, like heartburn, in check. This caught our attention; why were two different medical experts concerned about coffee? We did some research and found that the acidity of coffee is the issue. And we got to work!

The Solution

pHAM Products was founded by four material science students: Luke, Tyler, Michele and myself. We've created the first ever acid-reducing coffee filter. Coffee is acidic, which erodes the enamel on your teeth, leading to staining and sensitivity. The acidity of coffee is also cited as a leading cause of heartburn for those who suffer from acid reflux. Our filter reduces this acidity, keeping your teeth healthy and allowing coffee lovers to enjoy coffee without stomach discomfort.

The CREATE-X Experience

Mentorship and legal assistance were the most important aspects of CREATE-X for us. Through the free legal resources, we were able to better secure our intellectual property and officially structure our LLC.

From our coaches to our ATDC mentors, we were constantly challenged on the "why" of our decisions, allowing us to refine the vision and direction we're currently pursuing with pHAM.

The Future

Over the past few months, we've completed several provisional patent filings, performed taste testing with hundreds of people around the Atlanta area, and worked with the Georgia Tech Renewable Bioproducts Institute on manufacturing development. We've also been able to sell to and test our filters with 22 pilot customers, providing wonderful feedback and suggestions that are helping us refine our current filter, as well as ideas for future products. We are planning to launch a kick-starter campaign in 2019, so we hope you all have a chance to get some pHAM filters for yourself.

DEEP DIVE

When we were initially engineering our filter, there were many factors to consider. The brewing process of coffee itself is fairly complex, since you want to engineer the flow rate through the filter in such a way that the water contacts the grounds for just enough time to get the optimum flavor and caffeine extraction without getting any off-flavors in the coffee. Add to this an entirely new dimension of changing the acidity of the coffee while brewing, and things get very complicated. We performed lots of pH and flow rate analysis and, through the models we developed, were able to come up with an engineering solution that works well.

Filio

> **Co-founder Fikret Atalay (PhD, CEE, 2019)**

The Problem

The idea for Filio was initially conceived during a computer vision class at Georgia Tech. The team's past experience with civil construction projects, where photo management remains an ongoing challenge, led to the idea. Historically, capturing and organizing construction photos is an inefficient task, which involves multiple steps: capture photos using a digital camera or mobile phone, write down a description and location of each photo on a piece of paper, then manually transfer photos to a computer (sometimes many days later). Often, important information is lost during this transfer process. For example, if good field notes were not taken, one may not recall where exactly the picture was taken, or what the picture is trying to convey. Further, creating a summary report (for presentation to client/stakeholders/etc.) involves additional steps, such as copying and pasting photos into a template (typically Microsoft Word), and retyping the information (location, description, etc.) from the field all over again.

The Solution

Filio is a web and mobile-based platform for capturing site construction photos (including 360-degree images) and managing them. The Filio platform streamlines a previously inefficient process by automatically capturing the location (latitude and longitude) and direction (bearing) of each photo using a mobile platform, allowing direct voice-to-text captioning for ease of describing the content of each photo, and providing real-time cross platform sharing from the mobile app to the web server. Once on the web server, the user can easily filter and search through the photos (using either a tabular or map-based approach) and generate a summary report with one click using an interactive template.

The CREATE-X Experience

The best part of being in CREATE-X was the mentoring aspect. The suggestions and constructive feedback we received from the different mentors with various backgrounds were extremely valuable and forced us to take a harder look at our platform, our potential client base, and our company's direction. It is safe to say that we would not be where we are today without CREATE-X.

The Future

The Filio platform is currently being beta tested by six companies, with the goal of being released to the market in the first quarter of 2019. The companies testing the product include contractors, government agencies, engineering consultants and building construction companies. Currently, we are focusing on building relationships with more companies and expanding our customer base through targeted marketing, while improving the features and quality of our product. We are also in talks with potential investors to secure funding for 2019 and beyond.

" IT IS SAFE TO SAY THAT WE WOULD NOT BE WHERE WE ARE TODAY WITHOUT CREATE-X."

Fikret Atalay

ConvexMind

> Co-founder Charles Lehman (Master's, ECE, 2018/PhD, Machine Learning, 2021)

The Problem
I am a parent of two young boys, ages two and five, who are easily distracted. My co-founders and I spent a while batting around ideas that would solve the problems I face as a parent. We landed on the issue of trying to keep your kids occupied in an educated and wholesome way. Parents go to all sorts of lengths to choose the best educational content for their children, but there isn't a convenient way to keep track of the benefits of that content. So, we want to close that loop.

The Solution
ConvexMind is an app for parents to help them find books and activities for a pre-reading child that will help accelerate their journey to literacy. The child plays our mobile game called Percy's Travels that provides a dynamic experience — adjusting itself to the child's capabilities, all while gathering the data relevant to our recommendations. Those recommendations are then provided to the parent.

The CREATE-X Experience
CREATE-X is the best opportunity at Tech, which is a place of many great opportunities. The most beneficial part of CREATE-X is access to mentorship from players in the game (founders, investors and executives). Building a business is challenging, and I think that a big reason we keep seeing the statistic that more than 90 percent of start-ups fail is that they don't have access to the necessary mentorship to avoid pitfalls.

The Future
We have a closed demo of the game available on Android to test some critical aspects of the feedback system and dynamic experience. Since the central part of this tool is the game itself, we need to be certain that children as young as two will be engaged long enough to meet the needs of the parent, hence the closed testing for now.

The Brainiac and the Rainmaker

"Tech Twins" company Brain Rain Solutions specializes in software development for businesses

For Atlanta natives and twins Travis (Master's ME 2009) and Troy Nunnally (ECE Master's 2009 and Ph.D. 2014), it all started with a soap-box derby.

When a friend introduced them to the pastime in their youth, Travis and Troy scrounged around the neighborhood to create their derby car: rusted weights for wheels, a couple of two-by-fours for an axle, and a rope for a steering wheel. To them, the hobby was just plain fun, but it started them down the path of problem solving using engineering at a young age.

After receiving their bachelor's degrees from Tuskegee University in mechanical and electrical engineering, respectively, Travis and Troy enrolled at Georgia Institute of Technology to continue their studies.

"Georgia Tech has always been top tier for engineering," says Travis. "As locals, we visited the campus in high school and really enjoyed the experience, especially seeing the number of resources that students could take advantage of."

"We also knew that the opportunities for networking were unparalleled," Troy follows up. "Being here would allow us to excel in business."

And excel they did. Their company, Brain Rain Solutions — which specializes in combining augmented reality and Internet of Things technology to help companies design, develop and deploy mobile and web applications — sprouted from a project they began at Tech in 2008.

"I was a member of the Black Graduate Student Association at Tech, and we needed a better way to upload students' abstracts and papers to present them to employers," says Troy. "As we worked to create a solution, Travis and I decided to launch Brain Rain to help companies create better web applications."

The "Tech Twins," as they're known, formed the company around their individual talents: Troy, the 'brainiac' side of Brain Rain, is chief technology officer in charge of the technical implementations. Travis, the 'rainmaker' side, functions as CEO, closing deals and managing the business.

"The company represents the yin and yang of our relationship," says Travis. "We complement each other as brothers and as business partners."

Over the last 10 years, Brain Rain has grown a great deal, with clients ranging from small startups — such as Atlanta-based Partpic, an image recognition app that was acquired by Amazon — to the Department of Defense, for which Brain Rain created a contract management system.

Other projects include FaceMD, a mobile app in which the user takes a photo of their face and is recommended dermatological products based on the individual's visible skin concerns, such as acne or redness. Brain Rain also helped medical IT firm McKesson generate extra revenue, thanks to software that charges a nominal $0.50 fee to process frequent and time-consuming medical records requests.

The Nunnally twins credit Tech for creating a culture that allowed them to envision Brain Rain's potential and begin building its foundation in the early stages.

"At Tech, innovation is encouraged," says Troy. "From the Advanced Technology Development Center (ATDC) to the business incubators surrounding the campus, Tech continues to value entrepreneurs and give them the resources to succeed."

With more than $50 million in startup business valuations attributed to their work, Brain Rain's goal is to continue launching software products with game-changing technology that will not only disrupt the market, but also make an impact on the communities of the people they serve.

▶ **KATHRIN HAVRILLA**

> " **AT TECH, INNOVATION IS ENCOURAGED. TECH CONTINUES TO VALUE ENTREPRENEURS AND GIVE THEM THE RESOURCES TO SUCCEED.**"
>
> Troy Nunnally

Troy and Travis Nunnally

10

Tech Startup Cleans Up

Former students pilot Hux, an online marketplace streamlining the housekeeping industry

I n 2012, Stanley Vergilis (ME) was quite busy: He had his studies at Tech, a co-op placement at Bosch North America, and a thriving side business as a tutor. While his tutoring was a big help in earning money to pay for his tuition, he was finding it hard to make the time to both tutor and keep the actual business running with new customers.

"Finding new customers, scheduling appointments, and accepting payment all took up a big chunk of my time," says Vergilis. "I wanted to find a better way."

At his co-op, Vergilis met James Loper, a fellow mechanical engineering student at Kettering University. James was also running a side business fixing phones and computers for extra cash, and he too was finding it time-consuming to manage his customers and schedule appointments. Vergilis saw an opportunity to combine forces to solve both of their problems — why not create a system that would seamlessly handle the management side of their businesses, freeing up more time for them to do the actual work of tutoring and tech repairs?

The result of combining forces was Hux. Over 99 cent burritos, Vergilis pitched his idea to Loper: With his business savvy and Loper's programming skills, they could create an online marketplace where customers could easily find Atlanta-based independent service providers — such as tutors or computer repair technicians — and see their rates, read reviews from satisfied customers, view their calendars to instantly book appointments, and pay for services.

"My time at Tech was instrumental in launching Hux," says Vergilis. "The Advanced Technology Development Center (ATDC) was the first place I went when I initially had the idea. I pitched it to my mentors there and got some great support and advice, especially in the ideation phase."

Vergilis' friend AJ Alix (BS, EE 2013/MS, CS 2020) became involved in Hux shortly thereafter. Alix was working on the side at a startup funded by Mark Cuban, and Vergilis mentioned to him his need for help with

QUENTIN LUENINGHOENER

"selling" the idea to customers. Alix came on board briefly to help out with pressing marketing needs, such as identifying growth opportunities, building out the customer service system, and scaling Hux's recurring customer base.

The beta version of Hux was a huge hit, attracting a $20,000 angel investment early on and reaching a one million-dollar gross merchandise volume (GMV) run rate in just one year — a figure that uses the total sales dollar value for merchandise sold through an online marketplace over a period of time, as well as indicates future financial performance.

Soon, Vergilis began to focus on Hux full time, and the team decided to take a closer look at their business model before launching the site in earnest to clarify a target audience and maximize growth potential.

"We decided to concentrate Hux exclusively on housekeeping services so we could really figure out one service and build a solid business around it," says Vergilis. "It's an industry that has scalable supply and demand, and nearly everyone who can afford to have their house cleaned wants to hire someone to do it. This move toward housekeeping helped us focus on our core customer and create the right technology to facilitate bookings in a way that was most useful for both the client and service provider."

Over the next few years, Hux continued its ascent, gaining $1.25 million in seed funding from venture capitalist Tim Draper in 2016 and launching in Charlotte, NC, that same year.

Alix has since moved into an advisory role at Hux while he pursues his master's degree at Tech and functions as an entrepreneur-in-residence at Cox Communications. Vergilis maintains his position as Hux's CEO and is eyeing expansion to a third city in 2019, as well as the possibility of adding additional service industries in the future.
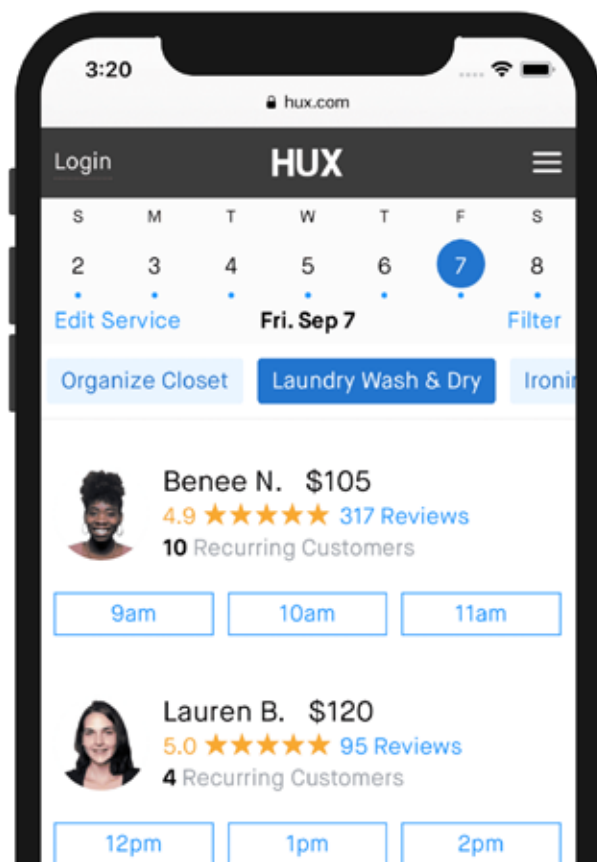
▶ KATHRIN HAVRILLA

James Loper and Stanley Vergilis

❝

MY TIME AT TECH WAS INSTRUMENTAL IN LAUNCHING HUX. ATDC WAS THE FIRST PLACE I WENT WHEN I INITIALLY HAD THE IDEA."

Stanley Vergilis

The Night I Met Mark Cuban

Rob Kischuk looks back on a defining moment in his entrepreneurial journey

As a Georgia Tech engineering student, Rob Kischuk (ECE, '00) was the quintessential man about campus. After graduation, he rose steadily in the ranks of software development and tech team leadership. He then launched a startup, Badgy, which he later pivoted into Converge, a digital reporting platform for marketers.

The winding road behind him is replete with stories — one of which was the night he met business mogul and notorious "Shark Tank" panelist Mark Cuban. For Kischuk's first full foray into entrepreneurship, the meeting proved to be a turning point. Here, the story unfolds in his own words.

I had started this company called Badgy, which created digital contest games for brands. Our customers would use Badgy to get more people to enter company contests, which gave their brands more exposure.

It was August 2011. Three weeks before our second child was born, I had a birthday. My birthday gift — and Christmas gift, from my wife, sister, my mom, my in-laws, everybody — was a trip to the Super Bowl in Indianapolis. I'm originally from Indiana.

After I got to Indianapolis, I saw there was this startup pitch competition taking place at a co-working space there. So, I showed up and met Scott Case, who runs Startup America and was the founding CTO of Priceline. Someone else at this event said, "Hey we're having a 'Shark Tank' watch party tonight, and we've invited Mark Cuban. Would you like to come?"

So that night, I went to this watch party at Don Shula's Steakhouse inside the Westin. And sure enough, Scott Case came strolling through the lobby with Mark Cuban, and we all watched "Shark Tank" together. When the program was over, Scott brought over two of the people who had won the pitch competition to present to Mark what they were doing. I got to be a fly on the wall and listen to what they said and how he processed that conversation.

You could tell he was a smart guy who had done a lot of deals. If you're talking to an investor, typically they'll have 10 questions that are always asked. You could just see him connecting the dots and skipping those questions. That night, he told them both no, though he later invested in one of the companies.

Kischuk with Cuban

But after those two made their pitch, nobody was talking to him. I had just come off from Flashpoint's "Demo Day" for Badgy, which gave us a $25,000 early investment. I said, "Hey Mark, can I get your feedback on my business?" He said, "Sure." So, we talked for five or 10 minutes, and he said, "I want to keep talking, here's my email." And then I got the heck out of there, because there was nothing more that was going to come out of that. All I could do was make a mistake and embarrass myself.

I ran into him again the next night. Mark throws a big party for Direct TV every year on the night before the Super Bowl. I got there after Katy Perry was performing. He was hanging out with Michael Irving in the

VIP area. And again, I'm thinking, don't embarrass yourself. Just smile and say hi. He finds me an hour later. He said, "Where'd you go? I was going to get you into my VIP area." He said he was still interested in talking to me and to be in touch. That affirmation mattered to me.

The lesson here is you need to create the opportunity to put yourself in position, but also know that success depends on things that are out of your control. Mark ended up investing $250,000 in Badgy. Merrick Furst, who runs Flashpoint, was a great help to me in making sure I covered all of the details of the deal.

It took five months from the first meeting to get the check. I was sitting in Rev Coffee in Smyrna, Georgia, doing some work. Up until that point, everything still seemed a little uncertain. You think you've got something going on, you've got a term sheet, you've got a signature. But none of it is real until the money hits the bank.

I knew the paperwork was signed, so in this coffee shop, I just checked the bank account, and there the money was. Then, it was real. It gave me permission — not that I needed it — to feel like I could be the one to run the company. I had worked for so many other people who had raised the money, and now I was doing it.

In some ways, I've always struggled a little bit for that acceptance. Some of us folks who come into Georgia Tech have this chip on our shoulder. We were very good at math and science in high school, but there wasn't a lot of admiration for people like us. Now, I was a CEO. Doing that deal sort of made me feel like I belonged.

▶ **AS TOLD BY ROB KISCHUK, CEO AND FOUNDER OF CONVERGE**

Taking Flight

Autonomous aircraft startup relies on Tech engineers to reimagine an industry

Imagine a Delta flight from ATL to LAX traveling across country — but without a pilot. The answer to "Who's flying this plane?" will be "No one." And that's by intent. Xwing, a small aviation startup, plans to make this a reality by 2023.

Now just a couple years old, Xwing is dedicated to lifting barriers to on-demand air transportation, combining software and traditional aviation techniques to reimagination the airline industry through autonomy. It's no surprise that four Georgia Tech grads got in on the action at the ground floor.

Maxime Gariel (AE Ph.D., 2010), Vlad Popescu (AE Ph.D. 2013), Phillip Jones (ECE Ph.D. 2008) and Allen Wu (AE Ph.D. 2010) all spent time at Tech working closely with the Guggenheim School of Aerospace Engineering. And they credit Tech with giving them the high-level engineering and critical thinking skills necessary to be part of a company that's disrupting the industry.

At its core, Xwing develops a suite of technologies for pilotless flight of small passenger aircraft. Founded in 2016 by Marc Piette and based in San Francisco, the startup brings together experts in optionally-piloted vehicles, unmanned systems and certified avionics.

"We are trying to bring autonomy to passenger-carrying aircrafts," said Wu, avionics and GNC lead at Xwing. "Hopefully, we can apply some of the latest state-of-the-art, perception-based algorithms to our industry, which is heavily focused on safety critical aspects."

The aviation industry tends to move at a slower pace, and Xwing is looking to shake things up. As startups continue to innovate, the FAA has been more flexible to help move things along more quickly.

"It's an exciting time to be in this industry because we are literally creating it," said Jones, electrical lead for Xwing. "The autonomous airline doesn't really exist yet, so there's nothing to disrupt."

Xwing is adding value to a sector of the industry where there is a skill and capability gap. It's partnering with companies that have extensive experience building aircrafts. These safe and reliable companies see Xwing as a value add, providing the software and autonomous technologies that help the industry innovate.

"Autonomous flight is not going to happen with just traditional methods," said Gariel, CTO at Xwing. "Eventually, our startup will be a major provider of autonomous aircraft technology. We are enabling the companies that make the vehicles to remove the pilot from the cabin."

Just last year, Xwing partnered with Bell, a Textron Inc. company — and a good example of a more traditional avionics company — to develop and test unmanned aircraft technology. With the end goal of enabling certification, the focus of the partnership is on tackling the key remaining challenges that prevent routine commercial unmanned aircraft operations. Flight demonstrations are planned for as soon as 2020. Early applications include cargo transport missions for medical facilities, disaster relief and offshore platform supply.

"We are trying to piggy back on existing industry knowledge and bring in new kinds of expertise that our partners don't have," said Popescu, COO at Xwing. "It creates a synergy and brings something new to the table for the more established players."

When Popescu was offered the role as COO at Xwing, he was working in consulting and looking for a change. With a Ph.D. from Tech in

"GEORGIA TECH TAUGHT ME GRIT AND HOW TO APPLY MYSELF TO A TARGET — BOTH OF WHICH HAVE BEEN TREMENDOUS AT XWING."

Vlad Popescu

Georgia Tech engineering alumni at Xwing include (clockwise from top left) Maxime Gariel, Allen Wu and Phillip Jones

aerospace engineering, he felt that Xwing would be a good fit for him — plus, he would get to work with old classmates from Tech.

"I love the idea of autonomous transportation," said Popescu. "It feels like the next big thing that will change our lives and the economy at large."

Popescu also notes the far-reaching effects autonomous flight will have on people. Just like driverless cars, pilotless flight will unlock the economic and social benefits of transporting people who don't have access to cars and planes. The elderly and those living in rural areas will have an option that helps them feel less isolated. The idea is that autonomous aviation will dramatically increase human mobility and bring people and places closer than ever before.

As COO, Popescu oversees daily operations and business development. After consulting at McKenzie for four years, he wanted to join a team where he could apply a more ambitious, longer-term vision. Having previously worked with clients in the airline industry, he can now take what was once a consultant's recommendation and actually implement it.

"I wanted to use my hands and grow a business," said Popescu. "At Xwing, I have the ability to affect change. And with a startup, you can take a cool idea and be there at the ground level, turning research and technology into a marketable product."

Popescu credits much of his entrepreneurial attitude to the College of Engineering. While working on his aerospace Ph.D., he learned how to think about problems in a sophisticated way that brings multiple kinds of disciplines together to create new technologies. He also compares writing a thesis to working at a startup.

"Writing a thesis dissertation is a long process, and you have to have the end vision in mind when you start," said Popescu. "A startup is like that too. You must create a path to get to the end goal. Georgia Tech taught me grit and how to apply myself to a target — both of which have been tremendous at Xwing."

Jones also found that Tech was excellent preparation for working in a startup, specifically all the hours he spent in the lab with deadlines for flight tests.

"We'd be preparing software and a helicopter for a flight test with a 24-hour deadline," said Jones. "Most of the time there was a big scramble the day before, and we'd be working until 2 a.m., packing up and then driving to the field for the test flight. Having deadlines and working with a small capable team is almost perfectly replicated in a startup."

Autonomy is coming — we've heard about it for cars, Uber and mass transit. But it's also coming to the sky thanks to companies like Xwing, soon to provide yet another way to get from point A to point B.

▶ **GEORGIA PARMELEE**
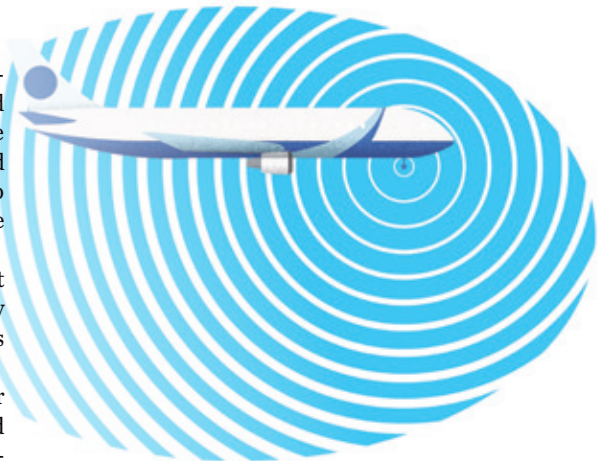
HEADWINDS

Pilotless flight may be on the horizon, but that doesn't mean that everyone is ready for it. Consumer perception could be a headwind for companies like Xwing. A recent survey showed that 54% of respondents would be unlikely to take a pilotless flight. Younger respondents aged 18 to 34 are more willing to fly on pilotless flights, as are high-income respondents. Countries showing the greatest likelihood to take a pilotless flight are the U.S. and U.K.

"This is what happens when you let engineers run amok in finance."

Lara Hodgson (AE, '93) on how she launched a pioneering enterprise — several, in fact

She never did build a rocket or redesign a helicopter rotor. Yet Lara Hodgson credits her aerospace engineering education at Georgia Tech with much of her success as a serial entrepreneur. Those college years instilled a mindset for tackling impossible problems and challenging the status quo.

Today, Hodgson heads Now Corp., a novel financial services enterprise she co-founded with fellow Georgia Tech alumnus John Hayes (ISyE, '71). Recently, she took time out of a hectic day to share insights from her odyssey through startup companies.

You've started three companies. Growing up, what entrepreneurial experiences did you have? I started my first business by accident in third grade. My friends had these hair barrettes with ribbons and beads on them. They were pretty, but expensive. So, Mom took me to the local craft store, bought some ribbon and beads, and we decided to braid them ourselves. I wore them to school and all my friends wanted some. I sold them for $4 apiece.

How was business? It was good. The lady at the craft store asked why I kept coming back, buying so much ribbon. When I showed her what I was making, she said, "I could sell those for you." So, she placed an order, too. Before long, I was making hundreds of pairs a week.

Engineering education at Georgia Tech today brings lots of entrepreneurship opportunities. If you had those when you were in school in the 90s, would you have participated? I really don't know. Some people know when they're growing up that the reason they want to be an entrepreneur is to run something. They want to be in charge. And that was never me. What drove me to be an entrepreneur was a desire to fix things. When I see a problem that hasn't been solved, I have to solve it. I think studying engineering is better than studying entrepreneurship.

What kinds of problems did you solve with your first company, a consultancy? It was called Insomnia, and I started it with Stacey Abrams (recent candidate for Georgia governor). We helped bring the Atlanta Dream to the city. We had a client that was trying to figure out how to generate income for native Alaskans. We developed a plan for infill stations for MARTA. We only took a project if it challenged both our head and our heart.

Why the name Insomnia? Stacey and I would email each other at two in the morning and get an immediate response. We stayed awake and solved the problems that kept other people awake at night.

How did that morph into your second company, Nourish? I was going to a meeting one day, and I got out of the car to find my son has spilled his bottle everywhere. He's soaking wet, stuff is all over the place. So, I walk into the meeting, and I'm asking, "Why can't someone just make a bottled water that doesn't spill? Or a baby bottle that doesn't spill?" Stacey and I said, "Let's do it," and we developed patented, spill-proof bottled water for kids.

What was the problem you had to solve with Now, your third company? It's a problem that businesses don't realize they have. You deliver a good or service, you send an invoice — and you wait. You wonder why the U.S. Postal Service can't seem to find small business mailboxes with payments, yet the checks are always "in the mail."

That happened to you at Nourish? Yes. We got our first big order of bottles from a major grocer,

and we were going to be shipping truckloads of product. We went to our suppliers and said, we've got this big order, and they want net 30 terms. So, will you give us net 60? They made the product, we shipped it, the 30th day came, but a check didn't arrive. The 45th day came, another order came in — the grocer said it's flying off the shelves. But we weren't getting paid in a timely way, and we didn't have the cash to manufacture more product.

What about just getting a line of credit? That's actually what people told me to do. But anytime someone gives me a suggestion that seems so automated, I question it. That's what Tech taught me. I'm an engineer, and I remember thinking, "I understand why I would borrow money if that money stays in my company. But why should I borrow money and loan it to my customer for free, which is really what an unpaid invoice is?"

How did you solve this? I was sitting at lunch one day with a friend, lamenting that we're going to grow to death. The orders were bigger and bigger, but I couldn't pay my suppliers. Then I realized, this restaurant never waits to be paid. They accept a credit card. The problem is, in business, your clients don't want to pay with a credit card — because when their credit card bill comes, they face interest and penalties if they don't pay up right away, but they can take as long as they want to pay an invoice. So we created NOWaccount, the first payment system that enables a business to get paid immediately when they deliver a good or service. In a way, it feels like accepting a credit card for payment, not a loan or factoring, even though the customer will not pay with a card and demands an invoice.

Looking back, how did your engineering education influence your entrepreneurship? I don't get flustered easily, and I think that's from Georgia Tech. When things go horribly bad in a day — and there will always be days like that — I take a deep breath and just try to figure out what went wrong and how to fix it. Georgia Tech gave me that grit, that resilience.

▶ **MICHAEL BAXTER**

Oculogx Helps Companies See Things Differently

Alumni's startup streamlines supply chain with augmented reality

For most people, the process that occurs between clicking the "Buy Now" button and an eagerly anticipated package arriving at their doorstep is comprised of little more than patient waiting. But order processing involves many steps, from picking to sorting to consolidation, taking place in warehouses all over the world and akin to a well-coordinated logistical symphony of sorts.

Charu Thomas (ISyE 2018) knows these dozens of unseen steps in great detail — and she's working to streamline the process for companies all over the world.

An industrial and systems engineering major with a concentration in operations research, Thomas is the founder of Oculogx, an augmented reality (AR) platform that uses wearable technology to modernize the supply chain. From a hardware perspective, the Oculogx wearable is an augmented reality headset with heads-up display — meaning it overlays data in the regular field of vision.

The Oculogx platform focuses on order picking — the process by which employees collect individual articles from a warehouse of goods to fill each customer's order and ready it for shipment — which is one of the most crucial elements in the supply chain to affect productivity. With Oculogx, data is overlaid in the warehouse worker's field of vision as they work, streamlining the order picking process. Order picking accounts for up to 60 percent of the operational costs of warehouses, which amounts to millions of dollars every year.

"Our solutions are up to 83 percent faster than traditional order picking methods," says Thomas. "By using Oculogx's wearable computing technology — basically replacing the warehouse employee's list of orders on a piece of paper with a pair of AR glasses programmed with the same information — companies can save $500,000 a year in just one facility."

Thomas' interest in the supply chain began during her first internship at McDonald's, working in a warehouse environment and seeing the order picking and bin packing processes every day.

"You realize how hard these people's jobs are," says Thomas. "It's so easy for us to forget everything that happens behind the scenes to get the right orders shipped to the right homes and businesses."

After her internship, Thomas attended a Georgia Tech hackathon focused on mixed reality — in which the real world is merged with a virtual one through the use of technology such as AR. She became fascinated by the capabilities of introducing digital objects into the real world and decided to approach Thad Starner, wearable technology pioneer, Georgia Tech professor and the inventor of Google Glass, for some advice.

"I began doing research in my freshman year with Professor Starner on order picking and the brain-computer interface," says Thomas. "Our work eventually led to an article that was named Best Paper at the ACM International Symposium on Wearable Computers/Ubicomp 2018."

Oculogx's wearable tech is a natural match for e-commerce sites like Walmart or Jet.com but also advantageous for any industries where order picking is prominent, such as automotives or pharmaceuticals.

"From the opportunity for research with one of the industry's foremost experts in the field, to its location in the
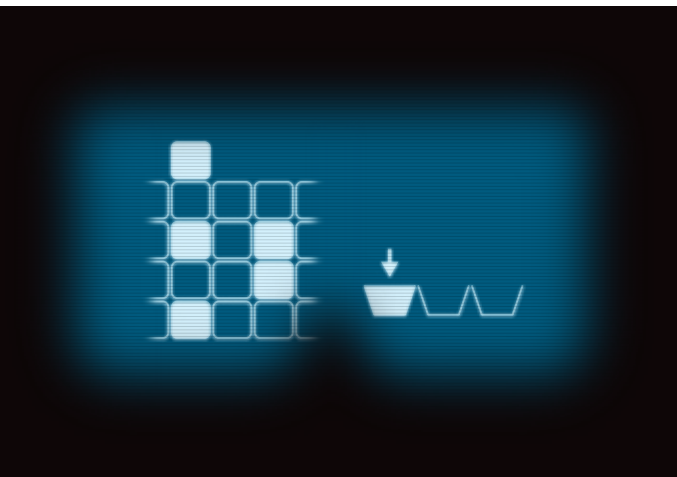
An artist's rendering approximates what the viewer sees through the Oculogx AR platform.

> **"FROM THE OPPORTUNITY FOR RESEARCH, TO ITS LOCATION IN THE BUDDING ENTREPRENEURSHIP ECOSYSTEM THAT IS ATLANTA, TECH IS HELPING ALUMNI LIKE ME DO SOME INCREDIBLE ENGINEERING."**
>
> Charu Thomas

budding entrepreneurship ecosystem that is Atlanta, Tech is helping alumni like me do some incredible engineering," says Thomas.

A recent customer, Newell Brands, will benefit from Oculogx through an auditing platform. It also works with a heads-up display and is used to keep track of the inventory being shipped out. Workers put on the headset to begin the audit process.

"It's a different process altogether than order picking, but it's also extremely cost efficient, and we've predicted some significant savings," said Thomas.

Having just graduated in December 2018, Thomas will now be focused on heading up Oculogx full time. She plans to take a wider approach to wearable computing in general, adapting the technology to appeal to other industries, especially in enterprise environments like Newell Brands.

▶ **KATHRIN HAVRILLA**

Cooking with Gas

Will Sweet looks to disrupt the food industry with innovative apps

Will Sweet is something of a grill master. Raised by a single dad after his mom passed away, almost every meal in their house was cooked on the grill. That tradition continued at Georgia Tech, where Sweet continued to grill out with roommates on a regular basis.

As a business major in undergrad and later an engineering master's student, Sweet also enjoyed solving problems. So, when one of his friends almost entirely burned his eyebrows off during a grill flareup, he set to work creating a safer grilling environment. That's how FlameTech Grill Defender got started.

First, Sweet identified other pain points for avid grillers: gas leaks, accidentally leaving the gas on after cooking, or just running out of gas entirely. He knew he needed to come up with something that would better monitor the grill — and his idea was born. FlameTech is a hardware device run by a software application that alerts grillers about propane levels in the tank, taking the guesswork out of grilling and improving safety.

Sweet worked with friends in mechanical engineering and the College of Computing to build the prototype. Someone suggested they apply to InVenture Prize, Tech's innovation competition for students.

"When I started college, I didn't really know how to come up with my own idea and execute on it," said Sweet. "But InVenture Prize gave me the structure to refine and execute my idea. I learned how to pitch my product and show off the viability of the company."

FlameTech ended up winning first place at InVenture Prize in 2015.

"The competition really made me catch the entrepreneurship bug," said Sweet. "It exposed the mystery of startups to me."

After Sweet graduated from Tech, he took a job in finance but worked on his side projects and ideas every night. He also was very careful to save money, knowing he would need it later when he started his own company.

Today, that company is Shef. Sweet's passion for cooking didn't stop at grilling — he's become quite an accomplished chef in his own kitchen.

"I started cooking a lot on my own when I graduated, but I realized I was wasting so much food," said Sweet. "I'd buy all these different ingredients to make the meal but end up using only half of them."

Again, Sweet saw a pain point. Not only was good food getting thrown out and wasted, but money was being wasted as well. In the U.S. alone, about 40 percent of wasted food is thrown out by consumers. And globally, about 1.3 billion tons of food is thrown out each year. Sweet had a few ideas for how to solve this problem, and the most viable one was a meal planning app. Shef is a mobile app that helps home cooks save money by reducing food wastes.

"Grocery expenses are a big part of anyone's budget," said Sweet. "It's also time consuming to think through recipes and shopping lists that are going to maximize your budget. Shef does it all for you."

Shef allows you to search out recipes but also offers different recipes that will use those same ingredients. Cooks then get two unique meals out of the same ingredients. The app also scales ingredients up or down, depending on how many portions you need. Plus, Shef gives you a personalized grocery list to use at the store.

> ❝ **THERE'S A RISK WITH EVERYTHING — EVEN WITH STAYING WHERE YOU ARE.** ❞
>
> Will Sweet

"Really, it's about making cooking easier for people that want to do it," said Sweet. "It takes the guess work out of recipe planning, shopping and cooking. Plus, you save money."

Shef's business model is simple. It's a free app with an ad-based model. As the user looks through recipes, grocery product ads will pop up. And with the grocery industry being an $800 billion market, the dollars are there to support the app.

For the past six months, Shef has been Sweet's full-time job. The company is currently pre-revenue, but Sweet is committed, and he's saved money for the past two years while working in finance. He's the only full-time employee right now, but he has some part-timers and freelancers that work on building the app interface.

Sweet has been applying his engineering problem solving skills to Shef, leaning on his master's in data analytics from the H. Milton Stewart School of Industrial and Systems Engineering at Tech. Engineering taught him to run tests and gather feedback and data. Recently, the app has been in testing mode to gauge how consumers interact with it. Sweet wants it to be perfect since consumers have high expectations in the grocery space.

"As engineers, we focus on the problems that we discover through meaningful data and feedback," said Sweet. "It helps us know if we are moving in the right direction, particularly when building the Shef app. My expertise is in the algorithms that drive the app. And with the future moving toward more vertically integrated search engine apps, the more we can learn from the data, the better."

Sweet knows that launching a startup comes with risk, but he is more than willing to take it.

He feels confident since moving from his predictable nine to five in finance to the unpredictable world of technology startups.

"There's a risk with everything — even with staying where you are," said Sweet. "I learned a lot from my finance job, but I really wanted to be in the tech sector, and I knew that I wouldn't get there by staying in finance. So, the biggest risk for me was to stay where I was. I needed to branch out and do something on my own."

For Sweet, his love of cooking continues to grow. He has almost every type of cooking appliance in his kitchen, and he and his girlfriend are making their way through two cookbooks. Hopefully, the Shef app will take off — reducing food waste, while introducing more people to the joys of cooking.

▶ GEORGIA PARMELEE
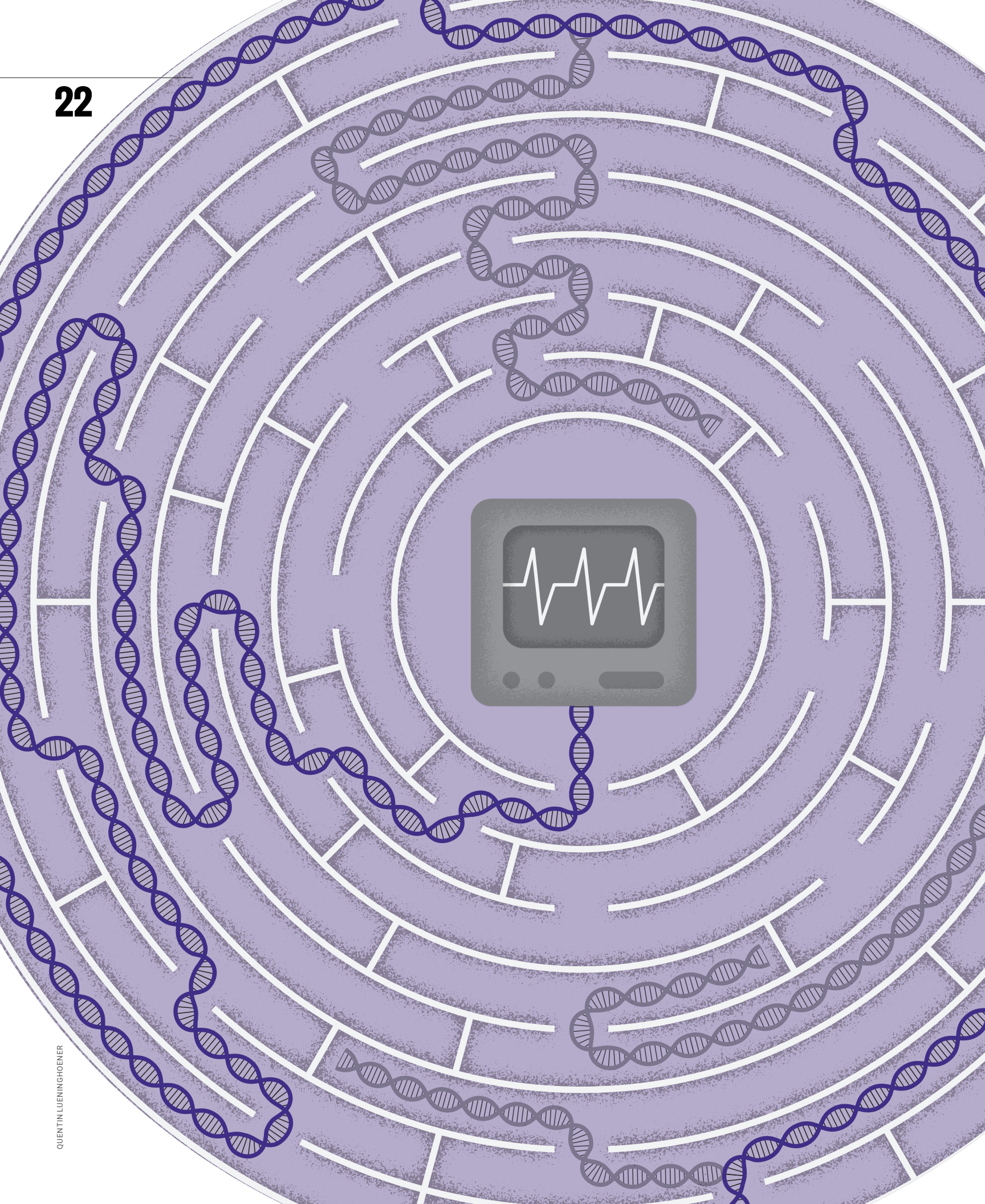
THE ENTERPRISING CULTURE OF
COULTER

The Coulter Department of Biomedical Engineering is driving students and faculty to turn inventions into ventures

24

Ever since the article was published last summer, James Dahlman's life hasn't been the same.

It appeared in MIT Technology Review under the intriguing headline, "His Method Makes It Possible to Test 300 Drugs at Once." Dahlman, a 32-year-old associate professor in Georgia Tech and Emory's Wallace H. Coulter Department of Biomedical Engineering, was one of the magazine's celebrated "35 Innovators Under 35." And the "method" is something to behold.

In 2017, Dahlman figured out a way to test the potential of gene therapies on a scale never before seen. By loading thousands of nanoparticles with different, customized DNA, then injecting all of them into a mouse model, he could track which particles reached their cell targets.

Because gene therapies only work when they reach the right cells, his breakthrough opened the door to a faster, more precise evaluation of an entire class of drugs. Dahlman became an overnight sensation.

"We started getting emails from venture capital firms — they were reading our papers," he said. By the end of the year, he and post-doc student Cory Sago had started a company, Guide Therapeutics, and signed their first term sheet, a "significant investment" from a major venture capital firm. The funds will allow them to exponentially expand their testing of nanoparticles from thousands to millions.

Dahlman is just the latest example of Coulter Department faculty and students propelling scientific discoveries out of the lab and into the world. Whether licensing inventions to industry or launching startup companies, the department has developed a culture for venturing beyond research to that next step: commercialization.

"Part of the fabric of this department is that we're composed of people who don't stop with simply asking 'why,'" says Chair Susan Margulies. "They really want to make a difference in healthcare outcomes. We celebrate the translation of research into helping people, no matter how it occurs."

By definition, biomedical engineering is the creation of something — knowledge or a physical thing — that solves a problem in the medical field. It's the realm of devices and processes engineered to help healthcare providers better serve their patients. But there's evidence that the Coulter Department approaches its mission with a capacity to think big and ask: Why not be the people who bring this innovation to the world?

James Dahlman
Associate Professor, BME
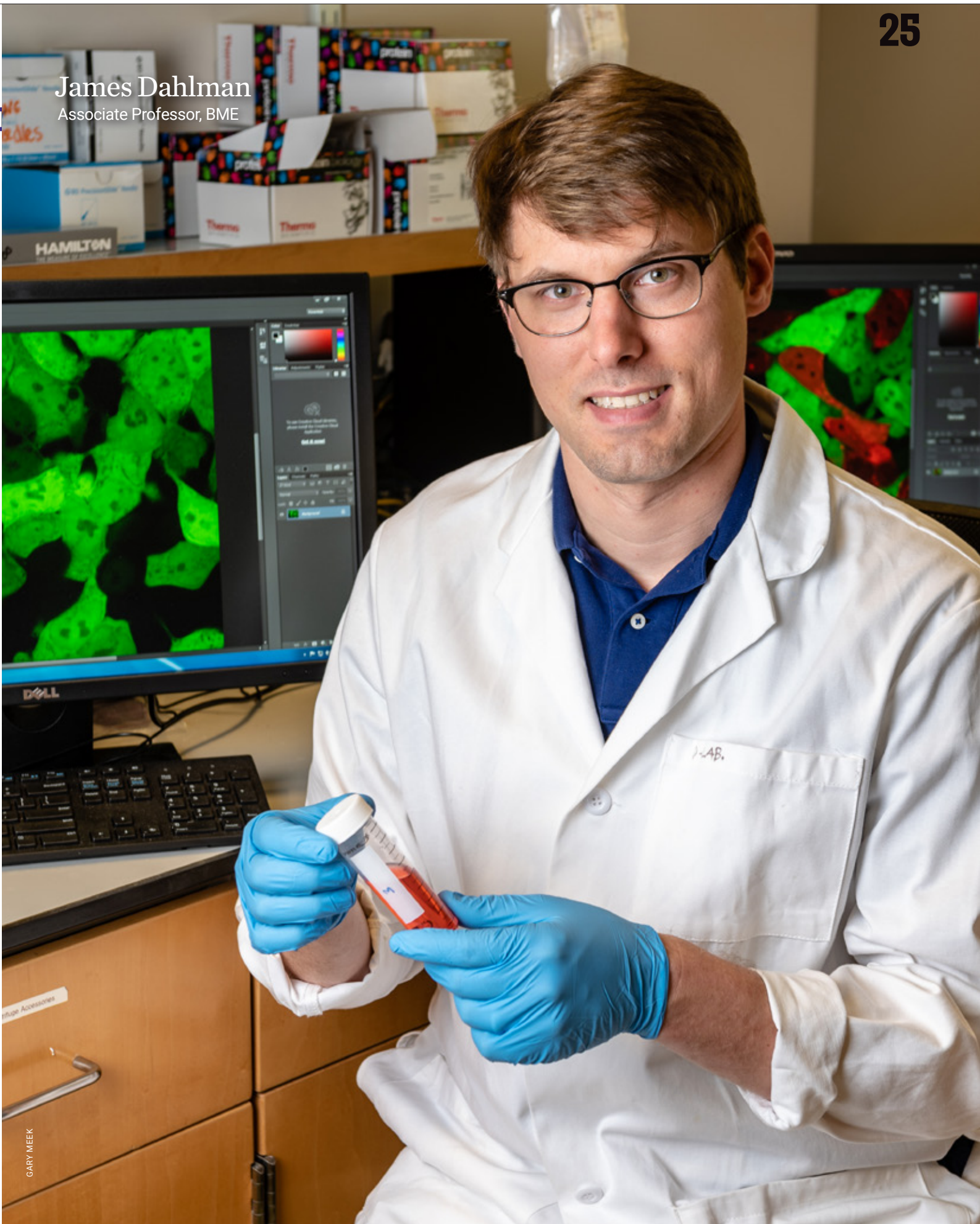
The Capstone team of Libi Medical in Ethiopia includes (left to right) BME students Hannah Geil, Elizabeth Kappler, Yahia Ali, and Elianna Paljug. The team has innovated devices and processes for the hospital, including a better way to monitor fetal heartbeats.

James Stubbs (far right), Professor of the Practice for Coulter Capstone, and Coulter BME colleague Rudy Gleason (second from left) visit colleagues Sisay Teklu and Mahlet Yigeremu at Black Lion Hospital in Ethiopia.

"Our department is particularly well positioned to participate in projects like these because our students come from all over the world."

James Stubbs

One of the most prominent examples is the Coulter Department's Capstone Senior Design program. In recent years, the department has fine-tuned the Capstone model to simulate the startup experience so that more students have the chance to commercialize their designs.

That begins with identifying real-world needs.

"Because our department is a joint venture between Georgia Tech and Emory, we're fortunate to be able to work with Emory's healthcare providers," says James Rains, who directs BME Capstone. "We also have great industry partners that sponsor projects. They come to us and say, 'Hey, we need to solve a problem in this particular area.'"

Most of the problems are put forward by local organizations, but there are exceptions. A couple of years ago, the Mayo Clinic in Jacksonville, Florida, invited in Coulter Department students on the recommendation of a patient and Georgia Tech alumnus, Larry Huang. The students observed surgeries from early in the morning until late at night. They interviewed scores of healthcare professionals. The immersion revealed that Mayo would benefit from a more precise way to insert needles into the spine for epidurals and other purposes.

Another group of Coulter students traveled all the way to Ethiopia to visit Black Lion Hospital. The challenge there was to come up with a better way to monitor fetal heartbeats. The hospital couldn't afford the sophisticated Doppler technology used in the West, so it relied on a Pinard horn, a kind of ear trumpet to count heartbeats.

"I visited five different departments at the hospital to ask them, 'What are the problems you most want to solve?'" says James Stubbs, professor of the practice and a faculty leader in Coulter's Capstone program. "I walked out with a full notebook. Our department is particularly well positioned to participate in projects like these because our students come from all over the world."

Having real-world problems already identified by hospitals and industry gives Coulter students a head start in developing solutions. Traditional senior design projects begin with students finding a problem to solve. Still, after choosing their pre-defined problem, Coulter students "still spend a third of the semester understanding what the real problem is," Rains emphasizes. "That means going out into the field, watching procedures, and interviewing lots of patients and clinicians."

With deep knowledge of the problem in hand, the students then must figure out how to solve it — not by generating one idea, but 100. "The first few ideas are typically the obvious solutions," Rains says, "so we push the thinking out of the box. Plus, the best ideas don't come from one person, they come from the collective. We want to get them into that mindset of working as a real team."

The teams haven't failed to impress. That Capstone team that visited the Mayo Clinic invented a device that takes the guesswork out of inserting needles into the spine. Last summer, team members launched the startup Ethos Medical to continue their journey to market. Another student group engineered a tampon insertion aid, solving a significant challenge for women who have limited use of their hands. They went on to start a company called Tina Healthcare.

"...the fabric of this department is that we're composed of people who don't stop with simply asking 'why.'"

Susan Margulies

Both Ethos Medical and Tina could become the next Sanguina, a shining-star startup launched in 2014 out of the Coulter lab of professor Wilbur Lam, largely on the ingenuity of then-student Erika Tyburski. She devised AnemoCheck, a single-prick blood test for anemia that reports results in two minutes. The FDA green-lighted AnemoCheck in 2017, signaling the potential of students to take a product all the way to the finish line.

"As many as half of our student teams file a provisional patent application by the end of the semester," Rains says. "At the same time, getting all the way to market is hard because of government regulation. It takes years and a lot of money and hard work."

It helps that the faculty leading Coulter's Capstone are themselves entrepreneurs. Stubbs had five startups spanning a venerable career, two of which he sold. Rains developed products for two medical device giants before joining his alma mater in 2012 to direct Capstone.

But he hasn't parked his entrepreneurial ambition. In 2016, Rains founded Jackson Medical around a product he had engineered, a safety cap for surgical light cables. The cap, now marketed as GloShield, prevents carelessly placed lights in an operating room from setting materials on fire. GloShield was introduced to the market last summer.

Margulies says startups like Jackson Medical reflect the enterprising drive of more than a few Coulter faculty.

"There's a difference between translation and entrepreneurship," she says. "Many of our faculty actually take the baton from the laboratory into the prototype stage and then on to the launch of a company. They see this as the best way to make a difference in the lives of others."

Exactly why the Department is able to spawn such innovation is a question with many answers. Dahlman cites physical infrastructure and talented students and colleagues as the foundation. But he adds, "the administration is supportive, and you can do any experiment you want. Plus, there's this general feeling that if it hasn't been done before, we'll be the ones to do it."

James Stubbs, who has lived the life of an entrepreneur, echoes that sentiment. "A lot of places are very afraid to try something because they're afraid of making a mistake," he says. "But the Coulter Department really hasn't shown any hesitancy for trying new things. And that's the mark of a true entrepreneur." ◄

GloShield is a safety cap for surgical light cables. Engineered by James Rains in 2016, it prevents carelessly placed lights in an operating room from setting materials on fire.

Capstone team Ethos Medical invented a handheld medical device to guide the placement of needles for lumbar punctures, improving the accuracy and safety of the procedure.

The team, comprised of Cassidy Wang (BME), Lucas Muller (ME), and Dev Mandavia (BME), won the 2019 InVenture Prize competition at Georgia Tech, taking home a cash prize and free U.S. patent filing.
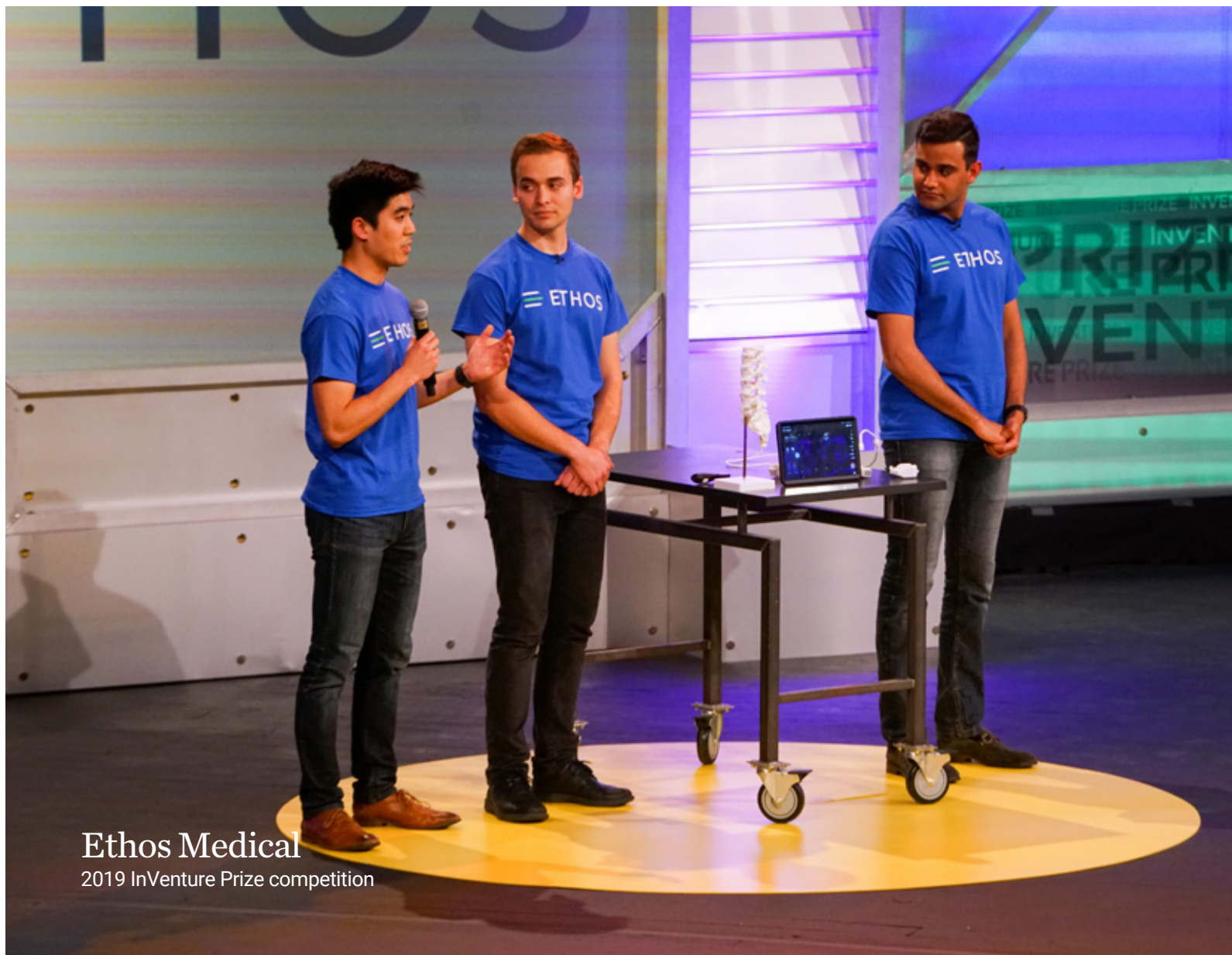
Ethos Medical
2019 InVenture Prize competition

IN THE COMPANY OF
THE DARING

FOR ENGINEERING FACULTY, MOVING A DISCOVERY FROM THE LAB TO THE WORLD IS A JOURNEY INTO THE UNEXPECTED

They could have chosen to publish a paper about their research and forge ahead with their explorations, satisfied with adding knowledge to their field. Or they could have filed the patent and licensed the technology, allowing an established industry player to bring their work to the world. Either approach would have benefited humankind. But these six Georgia Tech faculty did something else: They started their own companies.

This is not a casual thing. While the realm of research is complex, it's also familiar; the entrepreneurial journey, however, is an endeavor generally made with little or no expertise. You have to take new kinds of risks, confront alternative ways of thinking, and open yourself up to an assortment of challenges, obstacles and setbacks.

But it can bring reward beyond money. When a Northrup Grumman rocket was launched into space last fall, it carried thermal tape invented by Baratunde Cola and marketed by his startup, Carbice. "NASA live-streamed a video of the launch, and our whole company was watching it," says Cola, an associate professor of mechanical engineering and materials science. "We're now in space, circling the world!"

The buzzword for bringing a university technology to market is commercialization, but the purest defini-

Back row: Santiago Grijalva, Gleb Yushin, Baratunde Cola. Front row: Steven Danyluk, Ayanna Howard, Jeffrey Skolnick

tion of the word — "managing or running something principally for financial gain" — somehow seems ill-suited to people in academia. So many are motivated simply by seeing their work make a real and lasting impact on others. Besides, they don't always quit their day jobs. There are classes to teach, research to do, committees to serve. Company work often takes place in the off hours.

This doesn't feel like a lab...

Lessons in the differences between academia and private enterprise are learned quickly. "In the academic world, it's OK if there's a high chance something won't work," says Gleb Yushin, a professor of materials science engineering and CTO of Sila Nanotechnologies, a startup he co-founded. "But when you work for a company, you

can't move the needle on one thing at the expense of something else. Everything must perform well and be reproducible."

"The Ph.D.s we have in our company are all brilliant, but we needed to shift from research to actually building a product," says Santiago Grijalva, a professor of electrical and computer engineering and founder of the startup ProsumerGrid. "That was not trivial because you've got to build something that's bulletproof. Looking back, I think I took for granted that this shift in thinking would just happen."

At the start of 2019, Grijalva found himself straddling the worlds of academia and business more than most. ProsumerGrid offers a software platform that helps electric utilities better simulate and plan power distribution — which has become much more complex in the era of onsite electricity generation through solar and other sources. Most of Grijalva's time is now spent on the research side, rather than on the company: He and his team are winding down the U.S. Department of Energy-funded research project that shaped the platform.

"It takes some years to develop a highly specialized system like ours," Grijalva says, while clarifying that the company is very much up and running. "We have a working product, as well as customers. Beginning this year, we'll be working to broaden the marketing effort."

Are we there yet?

Indeed, the time it takes for a product to reach the market comes as another surprise to some faculty. Prior to starting Sila, Yushin and colleagues discovered a potential way to accommodate the swelling of silicon anodes inside batteries. This discovery pointed to a new way of getting rechargeable batteries to last longer.

And after eight years, $100 million in investment and 30,000-plus iterations to develop a nanocomposite anode material, those batteries are now becoming a reality. Early this year, a manufacturer of wearable

electronics will begin rolling out new products containing batteries made with Sila's materials.

"It takes much longer than you expect," Yushin says, "and yet, we still feel like we're at the beginning of our story. We'll continue to expand in consumer electronics, and ultimately we'll be in electric and autonomous vehicles."

While Sila had enormous success with investment, communicating to investors was a tall hurdle. Improved battery technology is a Holy Grail, and its search is a global race, so the startup fared phenomenally well in early investment rounds. "But for Round B, we had to visit lots of investors, and we kept hearing no, no, no, no," Yushin says. "Some investors would struggle to understand our business category. Others would just point to battery companies that have failed."

Baratunde Cola of Carbice can relate. "The biggest thing is to get investors to understand the business model, because they mostly trust you on the science," he says. "Materials-based companies like ours have a completely different business model and growth trajectory."

The thermal material engineered at Carbice dissipates heat inside electronics, but with higher reliability in all environments — like outer space — and at a much lower assembly cost. Thus, a company choosing Carbice is committing to making its

products a little differently for several years to come. That stickiness, Cola says, is the essence of the business model.

"One of the biggest mistakes I made in articulating Carbice early on was to show investors all these customers we had in our database," Cola says. "And we were doing some sort of business with about 100 companies. But that wore us out. People who really understand this know that it works best when it's optimized in the system the customer has. And that takes a partnership, not a transaction."

Right this way — er, that way

Even to some impressive inventions, the market sometimes says "no thank you." But one closed door often opens another. That's when a startup makes the infamous "pivot."

Steven Danyluk, professor emeritus of mechanical engineering, remembers the day he began to pivot his startup, Polaritek. The company had refined a way to optically measure stress in materials used to make semiconductors and solar cells. While Danyluk and colleagues were at a product showcase, staffing their booth, a group of three men walked by, stopped, looked. They found Polaritek's technology intriguing.

"They asked us, 'Could this technique measure stress in plastic?' And I told them yes, and actually, measuring plastics is a lot easier than measuring silicon," Danyluk recalls. "It turns

> # "It takes much longer than you expect and yet, we still feel like we're at the beginning of our story."
>
> Gleb Yushin

out, they were from a soft drink company, and they were interested because of their bottling operations."

Now, 90 percent of Polaritek's business is in the beverage industry. Companies are pursuing lighter weight bottles of all shapes and sizes, but they need to be sure the plastic can perfectly withstand pressure changes and high stacking in storage. By the end of 2018, Polaritek was poised to partially pivot again by developing machinery that allows manufacturers to do their own lightning-fast assessment of individual bottles.

At Tech, it's not just engineers that are taking the startup path. With cross-discipline collaboration, faculty members like Jeffrey Skolnick in the College of Sciences has capitalized on artificial intelligence (AI) and drug development for his startup, PanXome. Skolnick's AI platform can look across 97 percent of human proteins and predict how they will interact with each other. The resulting knowledge speeds the evaluation of drug compounds in their earliest stages of development.

Originally, PanXome was going to help drugmakers do just that, on a fee-for-service model. But Skolnick quickly realized he'd need to make a pivot, similar to Polaritek. "The sales cycle for that is really long, and the number of sales we would need to succeed was just too high," says Skolnick, a Georgia Research Alliance Eminent Scholar. "It became clear to us that we had to pivot." The priority now, he says, is to use the technology in concert with the company's own wet labs to develop new drugs.

That's not to say that PanXome won't support molecule screening and evaluation for research organizations and pharma companies. But Skolnick is clear that the plan is to plant the flag in drug development, beginning with identifying new kinds of antibiotics.

The same can be said for Zyrobotics; its pivot was more of a brand extension. Now a well-entrenched young company started by Ayanna Howard, a professor of electrical and computer engineering, Zyrobotics makes a

THE COMPANIES OF THE DARING

device called TabAccess. Using Bluetooth technology, the device allows children with disabilities to use a tablet computer without having to swipe or stretch the screen.

If you go to the Zyrobotics website, you'll find TabAccess for sale — but you'll see it listed alongside a robot, some immersive books and a series of STEM e-learning modules. One new technology led to others and, ultimately, a wider focus: helping children with special needs learn. "These children are often struggling in school because the world is not accessible to them," Howard says. "We're trying to level the field."

The ultimate test

While Zyrobotics products now work in harmony with each other, Howard acknowledges the big trial ahead: selling them. "Our apps have been downloaded a half-million times, so that's a success," she says, "but if I were to start again, we would focus more on developing a concrete sales strategy before implementing marketing initiatives."

"Developing a sales channel is the hardest part for a startup," says Kurt Jacobus ('93), who has seen the entrepreneurial landscape as both a company founder (MedShape) and as managing director of a VC enterprise (GRA Venture Fund). "When you get into sales, you're talking about the vagaries of human behavior. Most startup founders are technically oriented people. They believe people recognize superior products and buy them. But in most cases, people don't recognize superior products. And to try them, there's always some mental hurdle they need to get over."

It's impossible to say which of the startups launched by College of Engineering faculty will make those sales and go on to become wildly successful companies. What is clear is that the founders are not just building better mousetraps. They're venturing into territories of paradigm shifts and new problems, ready to solve.

For a national economy built on innovation — and a planet growing in complexity — that's good news. ◄

WORDS: POLLY OUELLETTE

PITCH PERFECT

4 STRATEGIES TO NAIL YOUR ELEVATOR PITCH
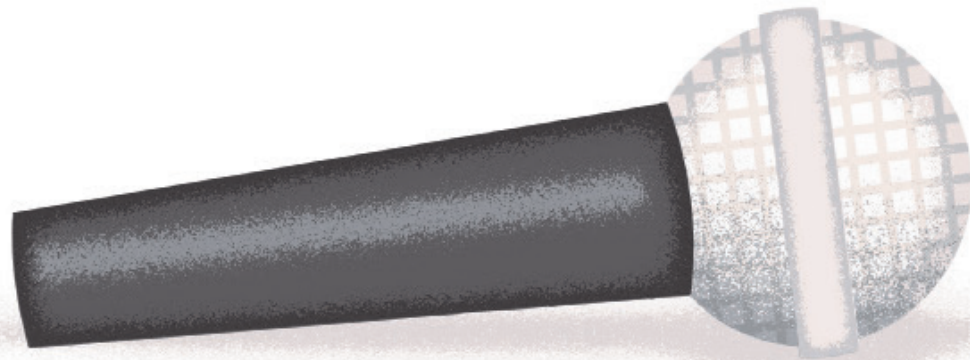
Five hundred pairs of eyes stare up at the young woman on stage, eagerly waiting to hear what she has to say. She scans the audience for a familiar face and sees her team give her a thumbs up from the crowd. She takes a deep breath, smiles, and launches into her pitch.

The young entrepreneur on stage has two minutes to convince a crowd of strangers that investing in her startup is a good idea. And those two minutes will make or break her startup's future — which is a lot of pressure. For Georgia Tech's student entrepreneurs, pitching their startups to a crowd of strangers can be especially daunting and stressful. In fact, public speaking was found to be the biggest fear of Americans, according to a study done by Chapman University, beating out both snakes and spiders.

That's where CREATE-X comes in. As an on-campus program to help students create and launch startups, CREATE-X also gives them the coaching and resources they need to become experts in convincing people that their company has what it takes to be successful. CREATE-X offers students the opportunity to be critiqued by seasoned professionals — a unique benefit from a well-connected alumni network. This feedback sets Tech's student entrepreneurs apart, giving them a skillset that includes confident articulation of the benefits of their products and services.

So, what makes for a convincing pitch? We talked to a few students who are pitching pros, and they gave us a few tips on how to effectively and confidently sell a startup.

1 CONNECT WITH YOUR AUDIENCE

Everyone begins their pitch a little bit differently, but they all start with a few sentences that attempt to connect to the audience and help listeners understand the problem the startup is trying to solve. The hook is intended to grab the audience's attention and keep it there throughout the duration of the pitch.

Vaibhav Kumar, a graduate student in aerospace engineering and founder of AirLogs, says that he always starts his pitch with a story. Beginning with an anecdote is tricky for his company because people have a hard time understanding AirLogs — it's a software solution for aircraft maintenance logbook research.

He uses a relatable example, asking the audience to imagine the frustration that would accompany spending four hours a day searching through documents to find one sentence. This, he says, is the problem that aircraft maintenance experts face and what his company is trying to fix. A simple example like this one goes a long way towards helping the audience understand the technical challenge and innovative solution that AirLogs proposes.

Charlie Lehman has a slightly different approach. He's a Ph.D. candidate in the interdisciplinary machine learning program and co-founder of a startup called ConvexMind, a video game product to aid childhood development.

Lehman starts with his personal connection to helping kids develop their skills and learn to read faster. He has two small children, and he opens his pitch with a photo of them sitting in their pajamas in front of the television, entertained but not learning anything. He then transitions into the solution that ConvexMind is presenting: a video game that helps kids develop their reading skills faster without them even knowing it.

2 CONVEY A CONFIDENT DEMEANOR, EVEN IF YOU'RE NERVOUS

Kumar says that some of the best advice on pitching he ever received was from Raghupathy 'Siva' Sivakumar, director of the CREATE-X program.

"He said, 'You're the one who knows the most about your company, so there's no reason to be nervous or afraid,'" said Kumar. "And that's true, because usually people are nervous about pitching not because the content's hard, but because they're nervous that they are going to say something wrong. The reality is that you're the one who knows the most about what you're pitching. Let that expertise flow through and don't be nervous."

Lehman has a very specific tip to make sure people pitching are as confident as possible on stage: Wear really nice shoes. He said that when he was in front of hundreds of people, he was happy he looked professional and put together from head to toe.

Confidence can go a long way because it conveys the sense that the presenter knows what he or she is talking about and is trustworthy. Business interactions happen between people, so the most important part of a pitch is for the company head to present him or herself as a person that the audience would like to do business with.

3 CONVINCE THEM TO GIVE YOU MORE OF THEIR TIME

Even the most seasoned "pitcher" can't easily convince someone to invest in their company or buy their product in just a minute or two. The best they can hope for is to get their audience interested enough to learn more.

"In your pitch, you cut straight to the most striking points because your audience is going to remember only two or three items," said Kumar. "And the whole point of a pitch is not to communicate what you've done; it's to say, 'Hey, come talk to me afterwards.' Sell it so that they'll come talk to you for the 15 minutes, and then you can say 'Look at how much money we made,' or 'Look at how awesome our research is.'"

The time on stage isn't the time to talk about complicated figures or impress the audience with fancy words. Many times, the audience is full of people from a variety of backgrounds, and the speaker should try to get as many of those people as possible to come and learn more after the pitch is over. Startups never know who might come talk to them about the next big break for their companies.

> "The whole point of a pitch is not to communicate what you've done; it's to say, 'Hey, come talk to me afterwards.'"
>
> Vaibhav Kumar

4 END WITH A CALL TO ACTION

Startup companies need a lot of support and resources, including those from investors, mentors, customers and potential partners. An audience listening to a pitch should leave with not only a good idea of what the startup does, but what that startup needs from them.

For Lehman, that call to action was based on a strong, emotional message that came from a point of view of a parent struggling to help their kid learn to read instead of being glued to the TV. He asked the audience, "As a parent, wouldn't you rather see this?" and pointed to a photo of his own child reading a book, which garnered a cheer from the crowd. He continued on to ask the investors, mentors and parents in the room to partner with ConvexMind to help mature their product and to contact him for an early version of the game.

Founders don't want to leave it up to the audience to decide what to do after they hear the pitch. A clear, actionable instruction will encourage the audience to take action if they like what they hear.

Pitching, just like anything else, is a skill that can be mastered only with practice. And for Kumar, Lehman and their co-workers, it is the key way that people end up investing time and money into their fledgling companies.

Pitching doesn't always come naturally, but it's an extremely valuable skill. A good pitch shows confidence; that you believe in your product; and that you know what you're talking about. Likewise, it gives others confidence in you and your company. A good pitch also translates easily into successful sales and marketing. With these tips, you can hone your pitch with the confidence and poise necessary to get your startup off the ground. ◄

Looking for more tips? Check out pitch stories at **create-x.gatech.edu**

MAKE YOUR FUTURE BUZZ.

As an alum, you know that solving problems means tackling issues from every angle. At Georgia Tech Scheller College of Business, we equip you with the knowledge and skills you need to tackle a whole new set of challenges, from operations and finance to commercialization and strategy. Our three globally ranked MBA programs feature specialized curriculum designed to prepare you to thrive in today's innovative, entrepreneurial world of business — all right here at the university you know and love. **Learn more at GTSchellerCollege.com.**

Application fee waivers available for Georgia Tech alumni who apply by June 3, 2019. Email mba@scheller.gatech.edu for more information.

Georgia Tech | Scheller College of Business

in the field

In December 2018, Georgia Tech's School of Aerospace Engineering and SpaceX launched the RANGE cubesats. These tiny satellites, about the size of a loaf of bread, are currently in orbit gathering data that will help Tech make advances in space technology.
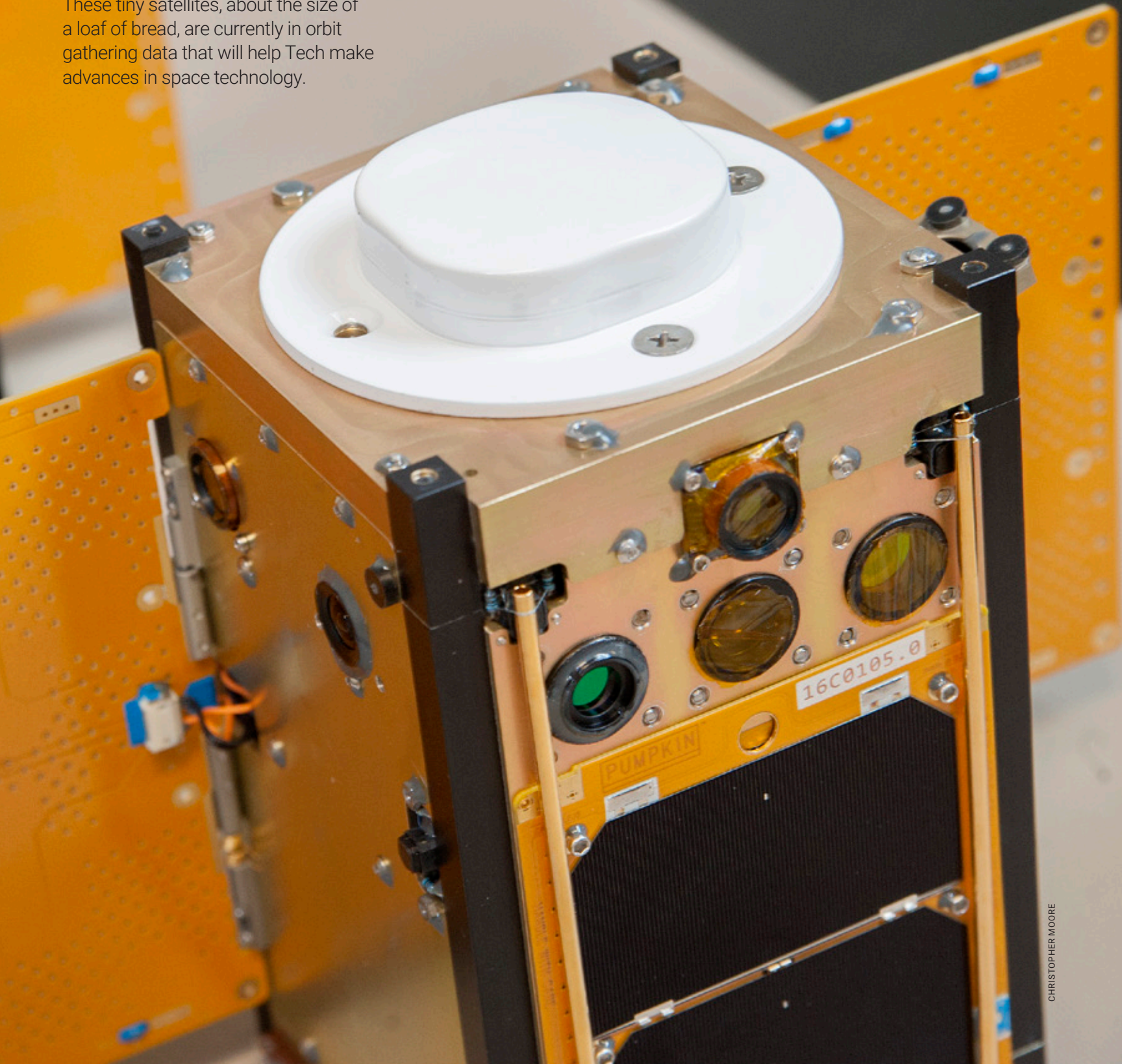
Patented Calling: Andrea Hence Evans helps entrepreneurs protect their ideas

The world of intellectual property involves strange intersections sometimes.

Back in 2015, Draion Burch filed paperwork to trademark his name. The Pennsylvania OB-GYN styles himself as a media personality with a video series and books about women's health issues, and he wanted to legally protect the name his friends, professors and colleagues have long used.

Almost immediately, "Dr. Drai" ran into trouble. Rap icon and producer Dr. Dre contested the trademark application, arguing — true story — that similar names would create confusion among consumers.

Just last year, the U.S. Patent and Trademark Office sided with Burch and awarded his trademarks in a decision that ultimately went viral.

The lawyer who won that case was a Georgia Tech civil engineer.

Andrea Hence Evans finished her bachelor's degree in 1999 and now runs her own intellectual property law firm outside Washington, D.C. In that sense, she's an entrepreneur. But she also spends all of her time helping entrepreneurs and other businesses protect their ideas.

"Ultimately, I am an extension of my clients' teams. I'm helping them to build and fulfill their dreams," said Evans, who has turned her love of patents, copyrights and trademarks into an Amazon-bestselling book and an appearance on the PBS reality competition Make48.

On the show, she helped teams of inventors quickly assess whether their ideas could be patented.

"The show was literally taped in 48 hours. It was an incredible experience," she said. "There were 12 teams, and on the spot, they give them a very broad topic, the clock starts, and they have to invent something [or] solve a problem, make a website and market it, pitch it, and even build a prototype."

Her role was helping teams make sure their idea would be patentable, meaning she had to work through her entire research process many times over the course of two days.

"I do that every day," she said with a chuckle, "but just not under those time constraints with cameras next to me."

All of this started when Evans was a college student volunteering around Atlanta. She knew she wanted to become a lawyer, and her work in the community convinced her to concentrate on environmental law.

She chose to study civil engineering because she knew she needed a scientific background, but then her law school professors suggested those skills could be put to good use in intellectual property law instead.

That's when Evans found her calling.

After a few years as a patent examiner and trademark examining attorney at the Patent and Trademark Office, Evans struck out on her own. Eleven years later, she said she still uses her engineering skills every day.

"My target audience is, essentially, independent inventors … who are in their garages, tinkering with things. Some of them have great ideas, [but] you can't ultimately patent an idea, so we have to talk to them about going from an idea to a real invention," Evans said. "We never can really call the invention what it is, so I need to understand how things work. I need to understand good synonyms to be able to do proper [patent] searches."

Evans said that's what prompted her to write a book, to help the inventor who has a great idea or a great product but is afraid to talk about it and doesn't know where to turn.

"What I found is that books go from one extreme to the other," Evans said. "[Some argue,] 'You don't need an attorney; let me teach you how to write this patent application.' And then I've seen other books that will say, 'Hey, you don't need a patent. Here's why you don't need a patent.' This book is not that. It's just making you a more informed consumer."

Evans said lots of books and companies promise shortcuts for people with interesting new ideas. That's why she takes every opportunity to explain how they can use intellectual property law to protect themselves — through books, social media (she said she's known to tweet along with Shark Tank), speaking at trade shows and the PBS reality series.

Evans said everyone has some kind of intellectual property; she's made it her mission to make sure they're protected.

Whether they spell their name Dr. Dre or Dr. Drai.

▶ **JOSHUA STEWART**

The Making of a Mentor

A mentor can take many different forms, from an expert in a technical field, to a successful business person, to a peer with wise words to share. It's not just an older and more experienced individual giving direction to a younger protégé. At its core, mentorship is simply a collaborative effort to draw on past experiences to help inform future ones.

For young entrepreneurs who are often experiencing their first foray into the world of startups, having a mentor is essential. Mentors provide guidance to help students navigate the often rocky terrain of launching a new company, and for those who have already experienced these ups and downs, mentoring can be an excellent way to give back. We chatted with a few Tech alums who mentor current students and promising entrepreneurs about how to make the relationship as productive as possible for the mentor and mentee.

Deborah Kilpatrick

DEBORAH KILPATRICK
Deborah Kilpatrick graduated from Georgia Tech with a bachelor's in engineering science and mechanics, and both masters and Ph.D. degrees in mechanical engineering. She is currently the chief executive officer of Evidation Health, a digital company that uses real-world patient behavior data to better measure health outcomes. Kilpatrick is also the former chair of the College of Engineering's Advisory Board.

Why is mentorship important to you? Diversity and inclusion are critical to the future of our competitiveness as a society. I believe that the best products, the best answers and the best solutions are created by diverse-thinking people with very different experiences. That means that those of us who have some aspects of difference, whether we are female or have a different ethnicity or a different skill set … it's really important to bring that to the table with mentorship. I do a lot of work with women and underrepresented ethnicities and minorities in engineering specifically. That is part of the lens that I look through as well for how mentoring can have an impact.

What are some of the challenges in the mentor-mentee relationship? I think the number one challenge is when the people who are asking to be mentored don't have an objective in mind. The reality is, a lot of the best mentors don't have a lot of time, and when people approach them and don't have

"
I THINK THE NUMBER ONE CHALLENGE IS WHEN THE PEOPLE WHO ARE ASKING TO BE MENTORED DON'T HAVE AN OBJECTIVE IN MIND."

Deborah Kilpatrick

an objective, it's just an inefficient process. However, if students take my phone calls or show up to meetings and they tell me, "Here's what I want to accomplish in the next hour," I can guarantee that we're going to accomplish their goals. They're coming into it with an intention of being very specific about the use of time both on their side and on mine.

What experiences do you draw on to give founders advice? I've been in Silicon Valley now for 22 years, and some of that time was spent in a Fortune 500 company, and part of that time has been spent in startups, both in genomic medicine and now in digital health. The point being that, in a mentoring relationship, I've seen a lot of different business models, I've seen a lot of different funding cycles, and I've seen what makes for successful financing. What does good go-to market strategy look like in the current environment? How can digital completely transform business models? And certainly as it pertains to healthcare, what are the

regulatory aspects of product strategy that need to be considered?

What are your goals in a mentoring relationship? My number one goal is to contribute in a way that is useful to the mentee. My second goal is to learn, honestly. I learn in this process as well, and I think any good mentoring relationship is one where education flows in both directions. That to me is part of the fun and why there's such a payback beyond helping a company succeed. I get exposed to new ideas and new kinds of people, people that I might not have met otherwise. It's mutually beneficial.

JEFF LANE

Jeff Lane graduated from Georgia Tech with a bachelor's degree in biology. Since then, he's worked at a wide variety of companies, from global corporations like McKinsey & Company to small businesses and startups. He's currently a managing partner at Messner Lane Capital, LLC. He is involved at Georgia Tech — serving on the CREATE-X and College of Engineering advisory boards and chairs the advisory board for the Coulter Department of Biomedical Engineering.

What do you like about mentoring? I've enjoyed having an impact in the world to help make it a better place, whether it was through philanthropy, informal relationships, my business, or my for-profit initiatives that I have done. I want to continue to have some positive effect in the world, and mentoring is a good way to do it.

How is mentoring someone leading a startup different than mentoring someone who's part of a big company? I always use sort of a physics metaphor. Momentum is mass times velocity. Big companies have a lot of mass but not much velocity. Little companies have a lot of velocity but not very much mass, right? It's a really big difference in leadership challenges. In a big company, the hard thing is to get the big mass moved in a different direction and accelerate it. For little companies, it's clearly very different.

What's an example of advice you give? The main thing I've learned and what I tell people who work at startups and small companies is that you have to moderate your emotions.

One day you'll have a big breakthrough in the lab or you'll have a new customer, and you're on top of the world. The next day, something will fall through, or there's a disaster in the lab. A mentor shared this expression with me once: "You're not as good as you think when things are going well, and you're not as bad as you think when things are going badly."

As a mentor, what are your goals? I just have a very simple goal, which is to be helpful. That's my only goal. I just try to keep it extremely pure, which is, "How can I help you the most?"

MICHAEL TINSKEY

Michael Tinskey earned his Master of Electrical Engineering at Georgia Tech and since then has been immersed in a long career at the Ford Motor Company. He currently serves as the global director of Connectivity and Emerging Services and is a member of the advisory board in the School of Electrical and Computer Engineering.

What experience do you have with entrepreneurship? I do what you might call intrapreneurship. I work at a really large company, Ford Motor Company, and we've been doing small startups within the company for many years. For example, right now I'm leading what we call digital insurance. Think of it as Ford Motor Company getting into the insurance space. It's a whole new area that we haven't ever participated in, which makes it a startup in a way.

Why is participating in mentorship important to you? It's obviously something that I really enjoy. Just the amount of knowledge that's coming out of Georgia Tech and the talent that's being produced is top notch and globally recognized. So, I'm really excited about being able to be part of something where we take the best of Tech and then utilize the advisory board and some other folks like myself and help the whole Atlanta and Georgia Tech community create these new entities. It's really something that I think I

Jeff Lane

Michael Tinskey

A Startup Exchange meeting at The Garage at Tech Square

get more out of it than the students. It's been a great experience for me.

What's one of the biggest challenges of being a mentor? Figuring out how to be a good mentor and not a tormentor. It's a fine line because you want them to learn the lessons themselves, but you also want to make sure that they understand the lessons and the experience that you have and learn from it. The one thing that's a real challenge is deciding when to say, "That won't work," and give them absolute directive that that's a road they shouldn't go down, versus saying, "Why don't you give it a try," but you know that there's going to be a lot of lessons. That's a tough one to call because you want everybody to succeed, but you also want them to have their own ideas and their own experience in pivoting and figuring out where to go next with the company.

What are some of your mentoring success stories? I was fortunate enough to work with a company called FIXD. I've been working with them even since they've graduated from Tech and continue to work with them today. Their business model is to demystify the check engine light, and what comes out of that generally is auto part sales. Their original model was to basically go off and sell themselves to one of the auto parts suppliers. But they realized the customer base for a check engine light is much, much bigger than do-it-yourselfers. I really pushed hard to say tread lightly on selling the company so early and really focus on growing the customer base and not necessarily going after the big auto parts providers. Frankly, that was a really good move for them. They've got a good chunk of the market. They just reached 1.5 million units sold. They'll be on the store shelves soon at Best Buy and Target.

▶ **POLLY OUELLETTE**

Ideas Flow Freely at Student-Led Startup Exchange

Several dozen students relax in chairs surrounding the stage, focusing their attention on three speakers, who answer questions about how to handle product management in a startup. The industrial space is nestled in the center of Tech Square, marked by two-story tall ceilings and huge, roll-up doors that give the space its name: The Garage. The students are members of Startup Exchange, a student-run organization of entrepreneurs and startup founders. They've come to network, learn, and figure out how to get their startups off the ground.

Startup Exchange aims to empower the student entrepreneur community at Georgia Tech in a variety of ways, engaging with undergraduate and graduate students, as well as with leaders in the Atlanta area and other entrepreneurship-focused groups. Instead of using a classroom setting to teach theoretical skills, students rely on a more relaxed context to facilitate an exchange of ideas. Additionally, by being student run, the group has more flexibility without faculty time or schedule constraints. Startup Exchange also helps guide students into a more structured program on campus (like CREATE-X or InVenture Prize) as they crystalize their ideas.

"Because this club is run by students, we're closer and more in touch with our audience," said Jonathan Wang, third-year undergraduate in the School of Electrical and Computer Engineering and a co-director of Startup Exchange. "We can get feedback a lot faster and change quickly if needed. People participate in Startup Exchange because it's a community of like-minded people that provides value."

The most popular events include Friday gatherings — a productive meeting of the entrepreneurship community, where speakers are often invited to share insights about their own journey. Anyone is invited, and it's

"Love is the only force capable of transforming an enemy into friend."
- Martin Luther King, Jr.

not uncommon to see Tech Square employees and students from Georgia State or Emory University.

Other weeks, several seasoned Atlanta-area entrepreneurs and company founders hold a panel discussion, answering questions on a specific topic, like how to conduct customer discovery. Startup Exchange also hosts workshops facilitated by experts on topics like public speaking. Recently, the group held a mini "hackathon," where participants used artificial intelligence and computer science to solve societal challenges.

"I feel like everyone has been affected in some way by the talks," said Wang. "There's always one line that makes you think, 'Wow, I'm glad I came out this Friday to hear that because that got me thinking.'"

Since its start in 2012, Startup Exchange gatherings have developed into more than a structured session — students end up hanging out afterwards and talking to each other about their own projects. Some students need technical expertise to solve an issue, and their peers can offer that in exchange for valuable experience or some extra spending money. They get excited about what they're doing and have the opportunity to talk with other people passionate about the same topics. Wang says this mingling teaches students how to network without even realizing it.

Startup Exchange has become a place for everyone from first-year students, who are new to the startup scene, to founders who already have their company up and running. It has grown to include a group called CORE as well, made up of students who are actively working to grow their startups and need more advanced community support. Startup Exchange helps this group gain one-on-one time with potential investors and offers a platform that facilitates discussion and problem solving.

"CORE members have more specific questions and complicated issues," said Wang. "So, they might not get as much value out of our events, which are more open to general audiences. If you have a community of entrepreneurs, they can help each other and get more value out of the community. It's been really beneficial for them to have a group chat, and we organize dinners so that they can meet up occasionally."

And for those who are somewhere in between the casual observer and the established founder, Startup Exchange established membership this year, a category of the organization that runs workshops and connects students to the existing resources on campus. Wang says that one of the most powerful things about Startup Exchange is that it gives students enough insight into the startup space so that they can decide if it is for them.

"Everyone in Startup Exchange, even if they're not doing a startup, has some kind of hustle," he said.

Wang's own hustle recently has been learning to produce music and DJ at events around Atlanta. He loves the Startup Exchange community because it brings like-minded students and entrepreneurs together, helping each member figure out how to hustle.
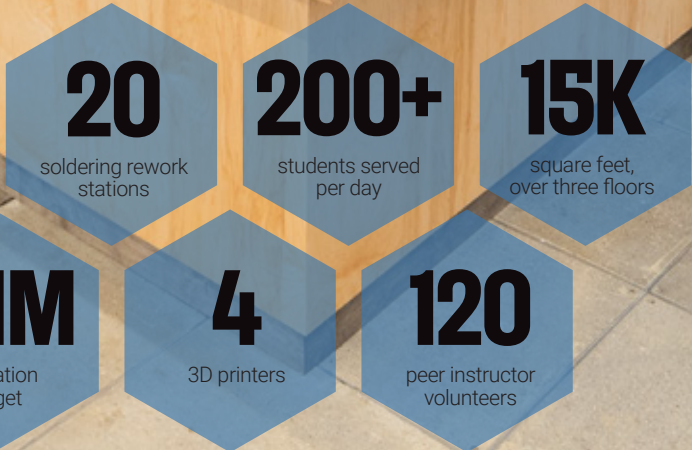
▶ POLLY OUELLETTE

Pollinating Start-ups

Step into "The Hive:" engineering's newest maker space

What used to be an auditorium in the Van Leer building, the Interdisciplinary Design Commons (IDC) is now the largest electronics-oriented student makerspace in the country. Opened in September 2018, it offers students a hands-on learning environment where they can work together to solve technology design challenges.

Any student who comes to the center with an idea will be able to leave with a prototype they built. The facility provides access to equipment that is industry standard, giving students access to hands-on design projects that are woven throughout the curriculum. Students are affectionately calling the space "The Hive," which is also the name of the student volunteer group which helps train students to use the facility.

20
soldering rework stations

200+
students served per day

15K
square feet, over three floors

$11M
renovation budget

4
3D printers

120
peer instructor volunteers

The goal is to instill entrepreneurial confidence in our students by offering a comfortable, low-pressure learning environment in which any student has room to grow and explore. The facility helps give every student the ability to create anything they want to create.

"The IDC is a space where our students can dream big and realize those dreams in hardware and software. Given the level of ingenuity and creativity I see unleashed in the IDC on a daily basis, I wouldn't be surprised if the next multinational tech giant is conceived within the walls of this beautiful new space."

Magnus Egerstedt, Steve W. Chaddick School Chair
School of Electrical and Computer Engineering

The IDC is another key in the College's "maker culture," helping facilitate growth and inventive ideas, and providing the tools that our students need to achieve their dreams of creating the next big thing. ◄

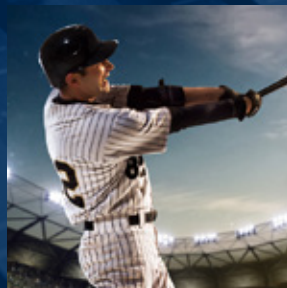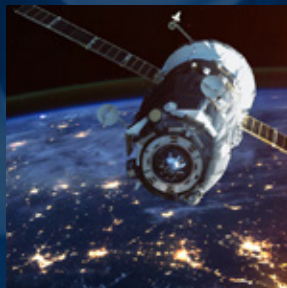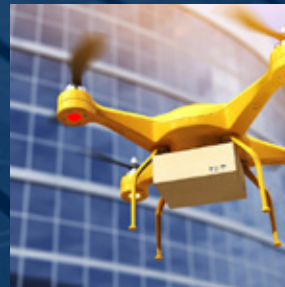**48**

10
TO END
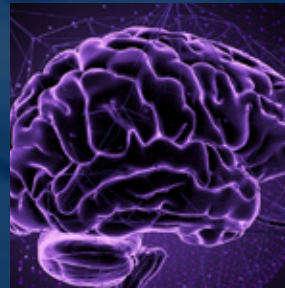

10 Questions with K.P. Reddy

K.P. Reddy is a self-proclaimed serial entrepreneur with more than 25 years of experience in disruptive innovation. He has been a technologist, subject matter expert, founder, CEO, advisor, investor, professor, author and coach. He graduated from Tech in 1994 with a degree in civil and environmental engineering. Reddy is a globally recognized authority in AEC environments, artificial intelligence, robotics and automation, collaborative communication, mobile applications and cloud computing.

1 ▶ Hometown? Stone Mountain, GA. **2 ▶ Graduation year and degree from Tech?** 1994, Civil & Environmental Engineering **3 ▶ Current job?** Founder at Shadow Ventures, a venture capital firm focused exclusively on technology that drives innovation in the built environment (real estate, architecture, engineering and construction). **4 ▶ What made you get into startups and become an entrepreneur?** Being young and impatient. My first job was with a large engineering consulting company. The idea that it would take 15 years to become a partner felt like an eternity. I started a company on the side and began to see more potential in it vs. my day job. **5 ▶ How did Tech instill entrepreneurial confidence in you?** Tech is hard. Professors provided a construct for learning, but there was no spoon feeding. I had to 'figure things out' with the resources available. That's pretty much the day in the life of an entrepreneur. **6 ▶ How did being an engineer inform and/or inspire your startup work?** I believe that engineering is the core knowledge for any career. An analytical approach and understanding of engineering principles are the basics — especially in this day and age. I have two teenagers, and they know a bachelor's in engineering is the minimum requirement in our house. They are more than welcome to get a master's in art history, if that's what they enjoy. But engineering is the base. **7 ▶ What is your opinion on startup culture in Atlanta?** I spend most of my time outside of Atlanta in more mature ecosystems. So, my point of view is a little different. Building a culture of any kind takes time. In a lot of markets, there is a transference of culture from the universities or anchor startups like Google, Yahoo, Apple, etc. The startup environment in places like Silicon Valley is much more competitive, where Atlanta is more cooperative. This 'play nice' culture is somewhat counter-intuitive to startups in other ecosystems. We have a very fragmented culture in Atlanta, which actually stifles growth of the ecosystem. **8 ▶ What does the future hold for your companies?** My companies are all over the U.S. They are all seed stage companies that are solving 'real' problems. Not a lot of apps. They are all in different stages — some are just getting started, and others are going through exits. Our startups are making a difference and have a bright future. We are trying to hire as many Georgia Tech folks as possible! **9 ▶ Of all your startups and roles, what has been your favorite and why?** This role [at Shadow Ventures] has been ideal for my high level of energy and experience. Startups lack experience and connections. Having been at this for 25 years, I'm able to help our startups solve problems that they are seeing for the first time. I love solving problems, and startups have lots of problems that they need help solving. **10 ▶ What advice do you have for young engineers at Tech who want to be entrepreneurs?** Get some foundational experience by working at a larger company. Spend some time understanding how they operate at scale. Then go work for a startup as employee number 50. Then work at one as employee number 5. Then go start something. The stories of first-time entrepreneurs being successful are more urban legend than fact. Like any career, it is progressive.

Do you have a Georgia Tech engineer working at your company? We'd love to hear from them. Email us at editor@coe.gatech.edu.

Georgia Tech | College of Engineering

Georgia Institute of Technology
225 North Avenue NW
Atlanta, Georgia 30332-0360

coe.gatech.edu

parting shot

You can feel the excitement as Tech students
celebrate commencement #IGotOut

ALLISON CARTER