

August 2019

# GEORGIA PATHWAYS

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**Preparing  
for Internships**

**Brain STEM:  
Dr. Hoff**

**Summer at GSU**



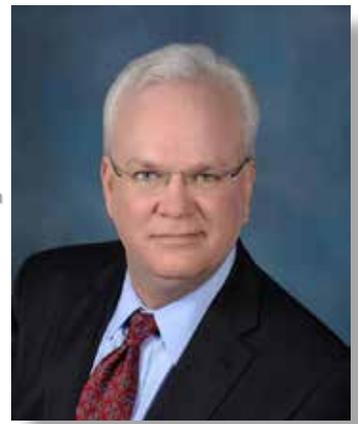


It not luck or a roll of the dice.....it's career pathway preparation.

Georgia Pathways™ STEM Magazine is your state resource to help pave your way.

STEM skills? We use them more than you know.

Welcome to the latest edition of Georgia Pathways™ STEM Magazine.



As K-12 curriculum's continue to expand their emphasis on STEM, students are increasingly gaining an educational foothold in core learnings that put them on a pathway for next-step opportunities that stretch beyond graduation.

Colleges and universities are expanding STEM offerings and seeking students who will pursue STEM degrees and STEM graduate designations.

The Georgia Institute of Technology now offers STEM degrees within its school of economics. A change this past May in the school's Classification of Instructional Programs (CIP) Code makes the school of economics program in econometrics and quantitative economics the only one in the University System of Georgia to have the STEM designation.

The implications of this shift are far reaching. The new designation means foreign students who come to Georgia Tech to study economics and obtain a STEM degree may remain in the United States to work for up to three years after graduation. Students who earn non-STEM degrees can only stay for one year. Meanwhile, domestic students are offered the chance to be designated as a STEM graduate.

Those students become highly desirable to potential employers in the technology field and beyond. As programs like the one at Georgia Tech expand, it becomes easier to see how the future workforce pipeline is building for students who are immersed in STEM education.

The building blocks of that educational foundation begin in grade school and fostering STEM education and nurturing STEM learning opportunities becomes that much more vital when you consider the enormous potential for students.

Each month, this publication supports STEM education efforts by sharing enriching stories and information about STEM programs, bright ideas, new approaches to STEM learning and great examples of STEM in action.

Editions of this magazine are intended to offer ways to extend STEM opportunities and inspire educators, parents and administrators to start or grow programs that encourage students to start down the ever-expanding pathway towards promising technology careers.

Thanks for your support!

Larry K. Williams  
President  
TAG-Ed

Larry K. Williams serves as the President and CEO of the Technology Association of Georgia (TAG) and President of the TAG Education Collaborative (TAG-Ed). TAG-Ed's mission is to strengthen Georgia's future workforce by providing students with relevant, hands-on STEM learning opportunities by connecting Technology Association of Georgia (TAG) resources with leading STEM education initiatives.

The Technology Association of Georgia Education Collaborative (TAG-Ed) strengthens the future workforce by providing students with relevant, hands-on STEM learning opportunities and connecting them to Technology Association of Georgia (TAG) resources. Formerly the TAG Foundation, TAG-Ed is a 501(C)(3) non-profit organization formed by TAG in 2002. Later, the organization's name was re-branded to TAG Education Collaborative to facilitate our role as the leaders for K-12 STEM education in Georgia.

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**TAG-Ed**<sup>1</sup>  
Education Collaborative

## From the Executive Director

Similar to educators, throughout the state, Georgia Pathways<sup>TM</sup> strives to engage the mind, stimulate new thoughts and ideas and broaden access and exposure regarding “what’s possible” for students. That’s why we’re excited to partner with you to ensure that students receive the content and resources they need to think beyond their current boundaries.

For example, in this issue there are engaging articles from a student who just graduated and had an amazing cybersecurity internship opportunity beyond belief at Georgia State University as well as an empowering article from Warner Media about how they’re partnering with educational partners to make a difference and change trajectories!

After 18 issues, we can only hope that we’re making a difference and making an impact. But to ensure that we are, please continue reading and sharing Georgia Pathways<sup>TM</sup> with your circle of influence.

As George Couros states, “If we want to create the leaders of tomorrow, there is no better time to develop our students as leaders than today.” Please continue to leverage the magazine to inspire, encourage and empower the STEAM Education Ecosystem. Because to quote George Lorimar, “You’ve got to get up every morning with determination if you’re going to go to bed with satisfaction.” And like you, we’re determined to see great things happen in our STEAM Ecosystem.

Sincerely,

A handwritten signature in black ink that reads "Errika Moore". The signature is fluid and cursive.

Errika Moore  
Executive Director  
TAG Education Collaborative

# How To Prepare Your Student for an Internship

by Stacey Young Rivers



If you are an educator or parent with a desire to help your high school student or child gain an internship, then this article is for you. While most students' first exposure to an internship is after they start college, kids who work internships at the high school level can accelerate their learning as well as identify their career focus early.

In addition to developing career skills, parents can use this time to introduce life skills that will also aid in students' educational success during college. For example, since most internships are paid, parents can demonstrate the importance of saving by allowing their child to open a bank account. This simple gesture is a foundation of financial literacy and creates an expectation to save a portion of their earnings.

Finding ways to teach students the necessary skills to succeed professionally and personally is a partnership between teachers and parents, and one way to get started is by preparing for a high school internship.

So how can you start down the path to preparing your student for an internship? First, check out the TAG Education Collaborative website where there is helpful information for student programs. Next, have a conversation with your student to ensure you understand their career aspirations and the types of roles that may be a fit.

Finally, review the checklist below to determine how much time will be needed to prepare. The goal is to start early enough so the task cadence is manageable, avoiding the risk of overwhelming the student and turning a great opportunity into a negative experience.

## Checklist for High School Internship Readiness:

- Get an early start. Internship positions usually post early in the year, so applicants should be ready to apply at least 3-4 months before summer. Creating a habit of preparing early will pay off in other areas, too.

- Create the resume. Resume prep is key to understanding your student's skills and where they may have gaps. The gaps can then facilitate a training plan to help the student become a viable candidate for future roles.
- Use real-world job skills on the resume. When building the resume, use an entry-level job description based on the area of interest to translate their activities to relevant experiences. It's essential to showcase leadership and community involvement to illustrate the student's talents and abilities.
- Invite a professional to speak. One of the easiest ways to make an impact on students is to invite professionals to talk about their roles. Make it a "show and tell" so kids don't zone out from lectures.
- Make learning practical. Determine how you can coordinate job shadowing opportunities to help make concepts usable, providing a level of understanding the student can speak to during the job interview. This includes facility tours to give students insights into professional environments and behavioral standards.
- Practice good communication skills. Managers rate communication skills high with students as this is a minimum requirement for any role. Orchestrating mock interviews, writing assignments, and idea pitch sessions can aid the student in developing good communication practices.

As a member company of TAG Education Collaborative's High School Internship Program, managers in the WarnerMedia Technology & Operations Division have a passion for working with junior talent. Because they embrace the opportunity to partner with students during the summer, our managers have developed a proven strategy that's as easy as saying our ABCs.

We introduce students to the world of work and our tech culture by:

- **A**cclimating them to our culture through career events and networking with technologists
- **B**uilding confidence through mentorship and delivering business presentations
- **C**hallenging them to grow through tasks and individual/team assignments that aid in learning about the business

Collaborating with TAG Ed, students who come to work at WarnerMedia gain real-world experience, from the job application to the job assignments, and beyond.

And the return on investment for us is inspiring students to pursue STEM careers by exposing them to professionals who share their career journeys of trials and triumphs, illustrating that they too can reach their goals.



*Managers from WarnerMedia's Technology Division, (L-R) Sharon Johnson, Stacey Rivers, and Artie Converse celebrate with high school intern Snigdha Nellutla after winning at TAG Ed's 2019 Horizon Awards for demonstrating excellence throughout the program.*

Stacey Young Rivers is the Director of Human Capital Management for WarnerMedia's Technology and Operations Division.

WarnerMedia is a global entertainment, sports and news company that creates premium content and delivers exceptional experiences to fans whenever and wherever they consume content.

These efforts are fueled by data-driven insights and industry-leading technology. WarnerMedia owns and operates some of the most valuable brands in the world, including Adult Swim, Bleacher Report, Boomerang, Cartoon Network, CNN, ELEAGUE, Great Big Story, HLN, iStreamPlanet, TBS, Turner Classic Movies (TCM), TNT, truTV and Turner Sports.

# Brain STEM: Hoff Receives \$1M Grant to Recruit & Prepare STEM Teachers

by Julie Lineback

*University of West Georgia*

In one of the largest grants ever received at the University of West Georgia, the College of Education (COE) was recently awarded more than \$1.3 million from the National Science Foundation in an effort to recruit and prepare STEM certified teachers.

Spearheaded by COE Dean Dr. Dianne Hoff, along with a team of seven committed faculty members, including co-principal investigators Drs. Jennifer Edelman and Anne Gaquere-Parker of COE as well

as the College of Science and Mathematics (COSM), respectively – the grant supports students enrolled in the Master of Art in Teaching program, which is a one-year program for those holding a non-education bachelor's degree seeking teacher certification.

“I was driven to write this grant because, sadly, the shortage of qualified teachers in STEM disciplines continues,” Hoff explained. “This leads to fewer children becoming excited about math and science,



Dr. Dianne Hoff

which over time will have a negative effect on the quality of Georgia's workforce."

With the support of the Robert Noyce Teacher Scholarship Program, also referred to as the NOYCE MAT Impact Fellow Scholarship, student recipients will have the majority of their tuition and fees covered and receive access to state-of-the-art technology via the COE Innovations Lab and UWGLive Simulations. But the benefits don't stop there.

"The Noyce program has many aspects beyond the scholarship money for the students, as it also includes a mentoring program and professional development opportunities for the students during their matriculation at UWG and beyond," said Gaquere-Parker, who works with Hoff through UTeach, a teacher preparation program for students majoring in science and math. "It ensures continuing quality support even after they have entered the teaching profession."

Carrollton City Schools and Carroll County Schools are partner districts for the grant, and many of the recipients will be placed in these schools. The West Georgia Youth Science Technology Center, a nonprofit organization, will provide professional development during post-certification years, as will the Carrollton-Carroll County Education Collaborative.

Recipients are asked to commit to teaching in a high needs school district in

Georgia, where in addition to leadership and professional development opportunities, they will also receive a \$10,000 salary stipend for up to four years following graduation.

"The demand for qualified science and mathematics teachers in Georgia is extremely high and growing," explained Edelman, chair of COE's Department of Early Childhood through Secondary Education. "We know our K-12 students need to be prepared for success in a modern workforce that values scientific thinking, technological innovation and problem-solving. Having qualified STEM-certified teachers in every secondary math and science classroom in Georgia will help students achieve that success."



According to a report by the Georgia Professional Standards Commission, the past two years saw an average math teacher vacancies of 246 in grades 6-12 and 164 in grades 4-8, and science teacher vacancies of 157 in grades 6-12 and 152 in grades 4-8.

“The shortage of qualified and enthusiastic STEM teachers creates a downward spiral in which fewer students interested in the STEM fields are entering college,” said Gaquere-Parker. The projected growth rates of STEM-related jobs reinforce the importance of teacher preparation.

According to the Bureau of Labor Statistics, employment in STEM occupations grew by 10.5 percent, or 817,260 jobs, between May 2009 and May 2015. By 2024, the mathematical sciences occupation alone will increase by 28.2 percent, or 42,900 new jobs. Computer occupations are expected to increase by half a million new jobs, and engineering by 65,000 new jobs.

“Sustaining global competitiveness depends on a highly trained workforce, and this starts with excellent math and science teachers,” concluded Hoff. “This incentive will help us build a strong pipeline of STEM teachers for Georgia’s schools.”

About the author -

*Julie Lineback* has had something to say from the beginning. Yesterday’s blank books and pencils have evolved into today’s laptops and Google Docs, and the stories have changed from a schoolgirl’s daydreams to those of cutting-edge research and academics in the University of West Georgia’s College of Arts and Humanities and the College of Education.

Originally from East Tennessee, Julie’s career started in 2000, after graduating with a Bachelor of Science in Communications from the University of Tennessee, Knoxville. While serving as a communications specialist at Oak Ridge Associated Universities, she received an Award of Quality from the Public Relations Society of America, the world’s largest public relations organization, for her work on a catalog.

She also worked as a website editor, copywriter and search engine specialist for BellSouth, where she was a certified Google AdWords Professional. She joined UWG in August 2006.



## HOW STILL CAN YOU BE?

By *Kay* Howard

The word, **still**, can be used as an adverb, adjective, noun or verb. In this discussion, I'm going to address its uses as an adjective.

Still: adj; not moving or making a sound.  
Synonyms: motionless, unmoving, immobile, stationary.

Have you tried to be perfectly still? How long can you do it? Are you really still?

We have the autonomic nervous system; the part of the nervous system responsible for control of the bodily functions not consciously directed, such as breathing, the heartbeat, and digestive processes. So, things in our body are moving whether we want it to or not.

But let's expand on your stillness, or lack thereof.

Questions about how fast anything is moving are incomplete unless you also ask, "Compared to what?" Without a frame of reference, questions about motion cannot be completely answered.

The earth rotates on an axis. Consider the movement of the earth's surface with respect to its center. The earth rotates once every 23 hours, 56 minutes and 4.09053 seconds, called the sidereal period. The earth's circumference is roughly 40,075 kilometers or 24,901.45 miles. Thus, the surface of the earth at the equator moves at a speed of 460 meters per second, or roughly, 1000 miles per hour (mph)\*.

The earth is also moving about, or revolving around, our sun in a very nearly circular orbit. It covers this route at a speed of nearly 30 kilometers per second, or 67,000 mph.

In addition, our solar system, Earth and all, whirls around the center of our galaxy, The Milky Way, at some 220 kilometers per second, or 490,000 mph. But even at that high rate, it still takes us about 230 million years to make one complete orbit around the Milky Way!

The galaxies in our neighborhood are also rushing at a speed of nearly 1000 kilometers per second, or about 2.24 million mph, towards a structure called the Great

Attractor, a region of space roughly 150 million light-years (1 light year is about 6 trillion miles) away from us. This Great Attractor, having a mass 100 quadrillion times greater than our sun and span of 500 million light-years, is made of both the visible matter that we can see along with the so-called dark matter that we cannot see.

Each of the above described motions were given relative to some structure. Our motion about our sun was described relative to our sun, while the motion of our local group of galaxies was described as toward the Great Attractor. The question arises: Is there some universal frame of reference relative to which we can define the motions of all things? The answer may have been provided by the Cosmic Background Explorer (COBE) satellite.

In 1989, the COBE satellite was placed in orbit about the earth (again, the earth is the frame of reference) to measure the long-diluted radiation echo of the birth of our universe. This radiation, which remains from the immensely hot and dense primordial fireball that was our early universe, is known as the cosmic microwave background radiation (CBR). The CBR presently pervades all of space. It is the equivalent of the entire universe "glowing with heat."

One of COBE's discoveries was that the earth was moving with respect to this CBR with a well-defined speed and direction (speed + direction = velocity).

Because the CBR permeates all space, we can answer the title of this article's question fully, using the CBR as the frame of reference.

It is more fun, though, to look up into the night sky and find the constellation known as Leo, the Lion. The earth is moving toward Leo at the dizzying speed of 872,405 mph. It is fortunate that we won't hit anything out there during any of our lifetimes.

So, can you really be still?

Most, if not all, animals on earth are accelerometers. We are not velocimeters. We cannot feel velocity,  $v$ , defined as  $x/t$ , distance over time, miles per hour, mph. But we can feel acceleration, 'a', defined as  $\Delta v/t$ , change in velocity over time, miles per hour<sup>2</sup>,  $m/h^2$ .

So, you can feel like you're being still.

*\* For anyone wondering, your speed of rotation at the exact north or south pole on earth is 0 mph. But you have to be on the exact point. A point has 0 dimension. We cannot be a point. We have 3 dimensions. So, we can never be standing on that spot. Bummer, huh?*

# Summer in the GSU Containment Unit: *Not What you Expected*

By Will Scarborough

In 1997, readers were first introduced to the world of Harry Potter through the Dursleys, a family who provided Harry with only a broom closet in which to sleep. At my internship, my peers and I worked in a space similar to the broom closet beneath the stairs at 4 Privet Drive, but that is where the similarities between the Dursleys and the Georgia State Evidence-Based Cybersecurity team end. Because unlike Harry and the Dursleys, I encountered nothing but kindness, support, and patience in my seven weeks at 55 Park Place.

The broom closet, affectionately referred to as the “Containment Unit” (from Ghostbusters), was where the majority of my work lay. Its four old computers housed our connection to the Dark Web, a section of the Internet that most people will never use or hear about—despite its many dangers. The Dark Web contains a bevy of illicit goods, from stolen bank accounts to firearms, from pornography to drugs. My job (along with my fellow intern, Colin) was to assist graduate students in “scraping” these dark markets by using Python programs to record and register the products and identities of sellers for further research, and eventually prevention of their illegal practices. It’s just as cool as it sounds.

Of course, my daily crime-fighting wasn’t the only perk of working at GSU—the people occupying the office made my every day a bit brighter. Mary Mason at the front desk always greeted me with a “good morning” and a smile, and Mai Ensmann, my mentor, always had a story about her kids and words of advice.



Srilekha, a graduate student who works on the scrapers, always possessed patient wisdom when I struggled to understand how to upload to Github or how to access a file using SQL. Om, another graduate student, sometimes brought treats from his job—brownies, red velvet cookies, the works. I’m looking at the freshman fifteen, and I haven’t even started college yet.

I would be remiss without mentioning David Maimon, our fearless leader. When Mai pitched the internship to me on the phone, I envisioned a professor too busy with his graduate and PhD students to give a pair of interns even a fleeting glance... but that is not the environment David has cultivated here.

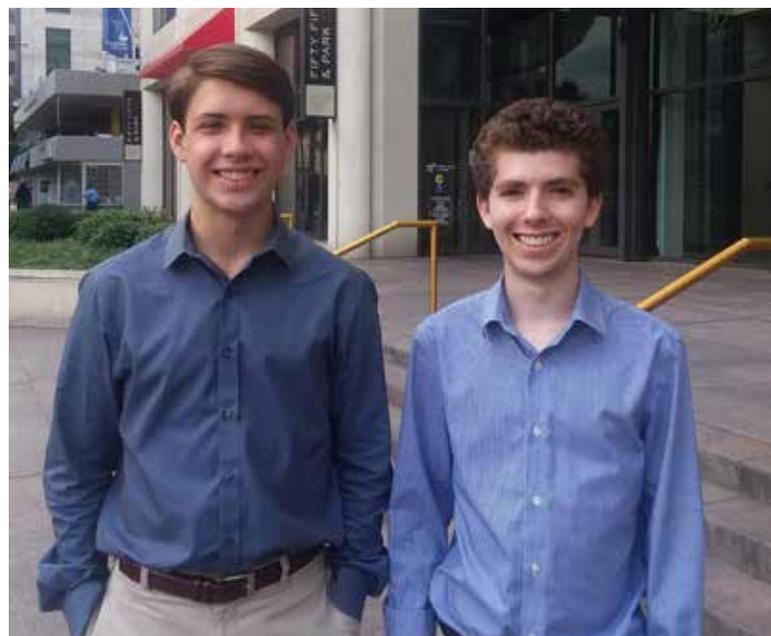
In fact, David's expectations of us were not as recent high school graduates, but as peers of his own students, ensuring that we always had some work to do, and challenging work at that. But that trust was given with the expectation of hard work and progress, an expectation we fought hard to meet. So, little by little, as tables in the database fill up and code runs successfully, progress became tangible.

Thankfully, we were not confined only to working in the Containment Unit, but we were assigned other projects as well.

One project consisted of installing and configuring Raspberry Pis on the GSU network from a number of different buildings. Then, using a custom piece of Python code as a "worm," we tested how fast the program could crawl through the network. Another project taught me how to create a Firefox extension that could log keystrokes and send that data to a server. Each project was not only engaging and difficult, but meaningful and educational.



Of course, that didn't mean that there were never slow moments, times when the work flow slowed down, and it felt as though there was nothing to do. These moments were alleviated by the scope and variety of projects going on at any given time. Hit a roadblock on the scraper code? That's ok, we could switch to browsing the Darknet for new dark markets to research.





Javascript won't compile when writing an extension? Ok, just start researching exploit kits. Some companies have expressed difficulty in finding enough work for their TAG-Ed interns to perform, but GSU never had any shortage of problems to solve, and I loved it. Every day was a new challenge, a new experience that educated me in my abilities and how they might improve.

I enjoyed the experience so much that I contacted the TAG-Ed offices, and they negotiated an extra two weeks for me and Colin.

Much has changed over the course of this summer: EBCS operates now from a computer lab instead of just the Containment Unit, and by the end of our time at 55 Park Place, we felt greatly changed in our fundamental technical skills. We are better coders, better communicators, and better collaborators.

GSU taught us a great deal about who we are, and I am grateful for it. To Mai, David, Ohm, Srilekha, Praneeth, and Urmi, thank you for your time and effort in helping us learn and grow through EBCS. And to TAG-Ed, thank you for pairing us with such a wonderful place full of incredible people. They made my last summer before college both memorable and fun, and I wouldn't have it any other way.

---

*Will Scarborough is a rising freshman at the University of Chicago studying Computer Science and Economics. He has just completed his second year with the TAG-Ed internship program in addition to participating in 48in48. He loves coding and creative writing.*



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content: "";
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table {
border-collapse: collapse;
border-spacing: 0;
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button, input, select, textarea { margin: 0 }
:focus { outline: 0 }
a:link { -webkit-tap-highlight-color: #FF5E99 }
img, video, object, embed {
max-width: 100%;
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## University of North Georgia (UNG) senior earns National Science Foundation graduate research award worth \$134K

By Clark Leonard, UNG

Caroline Brown keeps making history, and her faculty mentors at the University of North Georgia (UNG) aren't one bit surprised.

The latest honor for the senior from Carrollton, Georgia, is acceptance into the National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP), worth a total of \$134,000 for her graduate research endeavors. Brown, who will begin a doctoral biochemistry program at Yale University later this year, is the first student to win the award while enrolled at UNG.

"It opens the door into any lab that I want to work in because I bring my own funding with me," Brown said. "That primary investigator doesn't have to pay me because the National Science Foundation is."

A year earlier, she was the first UNG student to be named a Goldwater Honorable Mention, an award given to exceptional college students in natural sciences, engineering and mathematics in the United States.

Brown has worked on research with Dr. Yu Wang, assistant professor of chemistry at UNG, for three years.



Caroline Brown

Caroline helped Wang write an NSF grant application and served as second author on an invited review in AIMS Microbiology journal. She was part of a Faculty Undergraduate Summer Engagement (FUSE) grant with Wang in 2017. Brown expressed gratitude for her time learning from Wang.

“She has provided such great leadership and guidance throughout this whole process of developing my scientific toolkit and understanding what it means to write a grant proposal,” Brown said.

Wang considers Brown, who is pursuing a chemistry degree with a biochemistry concentration, her most capable student of the past 10 years. “Caroline is a truly outstanding undergraduate student who shows the potential to be a leader in academic research,” Wang said.

Dr. Royce Dansby-Sparks, associate professor of chemistry at UNG and assistant Honors Program director on the Dahlonega Campus, has served as Brown’s adviser since she was a freshman. He noticed her potential in his Honors Program chemistry course and a science, technology, engineering and math (STEM) interdisciplinary lab.

The talent Brown displayed early on at UNG has flourished, and it culminated in the proposal she wrote to apply for the GRFP. Brown’s proposal outlined a desire to build on work she did as part of an NSF Research Experience for Undergraduates (REU) grant at the University of Minnesota in summer 2018.

Specifically, she wants to look at how an increase in the chemical process known as protein prenylation could lead to increased incidences of Alzheimer’s disease. She is intrigued by the idea that most medical treatments tackle a small portion of a disease and would like to help change that with Alzheimer’s.

“She’s already going to Yale,” Dansby-Sparks said. “She didn’t even need this to get to Yale.” Dr. Anastasia Lin, assistant vice president of research and engagement and director of the Nationally Competitive Scholarships (NCS) office at UNG, could see Brown’s talent even in an Honors American literature class.

“Caroline is one of the most capable students I’ve ever worked with. She’s not only intelligent, but she’s hard-working and driven,” Lin said. “She’s a community-builder. She encourages and supports others in their academic pursuits.”

Brown is president of the Honors Program on UNG’s Dahlonega Campus and is an NSF Scholarship in Science, Technology, Engineering and Mathematics (S-STEM) Scholar. In Brown’s personal statement for the GRFP application, she expressed her intent to continue to seek out ways to help others chase their dreams in science.

“The need for better STEM education systems in rural communities has driven me to seek change,” Brown wrote. “I desire to inspire other rural, female students by showing them science is a valid option, and there is no limit to their potential despite what their surrounding influences may indicate.”



*This message was created automatically by mail delivery software.* **1**

*You have more than 6 incoming messages that could not be delivered to your inbox since September 02 2019 for wayne@stem-magazine.com* **2**

*The following address(es) failed and reconfigure Port 486, Retrieve Pending Messages Diagnostic-Code: smtp; 552-5.7.0[TSS04] max defers and failures per hour (Exim 4.88) allowed. Message deferred Reporting-MTA: dns; gateway31.website-welcome.com* **3**

*X-Postfix-Queue-ID: 5867033100 Original-Recipient: rfc822; wayne@stem-magazine.com SIZE=22481: Arrival-Date: Mon, 02 September 2019 04:14:44 -0500 (CDT)* **4**

*Click on the attachment to retrieve your messages and correct future errors.* **5**

**1** Any mail delivery software you use will identify itself by name, such as Google mail, your website E-mail or your web host. This is non-specific and unidentifiable causing an immediate red flag about its truthfulness.

**2** Once again we see a vague and non-specific number of E-mails. This does not happen and is another “flag” to cause concern. Reality would specify “exactly” how many E-mails were not delivered, (if there was such a notification, which I have never seen on “incoming” messages). Normally you would just never receive them.

Also, note the grammar error - “...that could not be delivered ....since September 02 2019 for wayne@stemmagazine.com”.

Ask your teacher why this grammar and punctuation should read differently if this were real. A genuine problem message may look like this:

**“Error code- #fail684611”.** This is a real error code on one mobile device. Note that the text is very limited to the facts... short and to the point and yes, it is computer generated.

**3** The message is only referring to one E-mail address, so why the mention of multiple addresses? (es).

More grammar issues in this one. Can you spot it?

The mention of an **SMTP** issue is a flag since the SMTP setting is for “out-going” messages, not incoming. The mention of “websitewelcome.com” is incomplete and if you look it up, it’s a hosting company that we have nothing to do with. I don’t know them....that’s always a flag.



**4** This part is just nonsense that the untrained reader wouldn’t know about. The size of the E-mail would NOT be mentioned, punctuation is all wrong, and the “Arrival-Date” is a flag.

Also note that twice in the message it mentions the “date”, but says it “differently” each time, rather than the normal consistency of format you would expect.

Notice the arrival time is also not formatted correctly and is a vague window of time. It’s also in the Central Time Zone, which I am not, and neither is my web host provider or E-mail server.

**5** Here is the biggest “**no-no**” flag you need to watch for daily. This message has an attachment you are asked to open. **NEVER** click on something you didn’t ask for from someone you don’t know.

**Attachments can:**

- Load active automatic files onto your computer without you knowing it.
- Install remote access software.
- Deliver a computer virus to lock-up your computer. (the dreaded **BLUE** screen of death, used to extort money from you)
- Send you to a website that will hack your mail or computer.
- The possibilities are vast and never good.

## Prevention

What should you do with this?

- Immediately mark the E-mail as SPAM
- DELETE the message without clicking anything.
- Empty your SPAM folder and check your “trash” to permanently delete the message.

If someone you communicate with sends you an E-mail that didn't arrive, they will try again and the message will be different. Perhaps they may even give you a call and ask, “Did you get that E-mail is sent you?”

These types of scams and attacks are big business and will always continue. It's up to you to protect yourself, your computer and devices, your money and your privacy.

*Wayne Carley*  
Publisher

## We investigated the suspicious E-mail and found the following:

*If you click on the link that says “Retrieve Messages”, you will be taken to a website asking for your email address and password.*

*This FAKE web page is designed to harvest your login information. This information could be used to retrieve your emails and/or send emails through your email account. Additionally, if you use the same password for your email as other accounts, those accounts could be compromised. This is a very convincing and new form of phishing attack, so please be aware of it.*

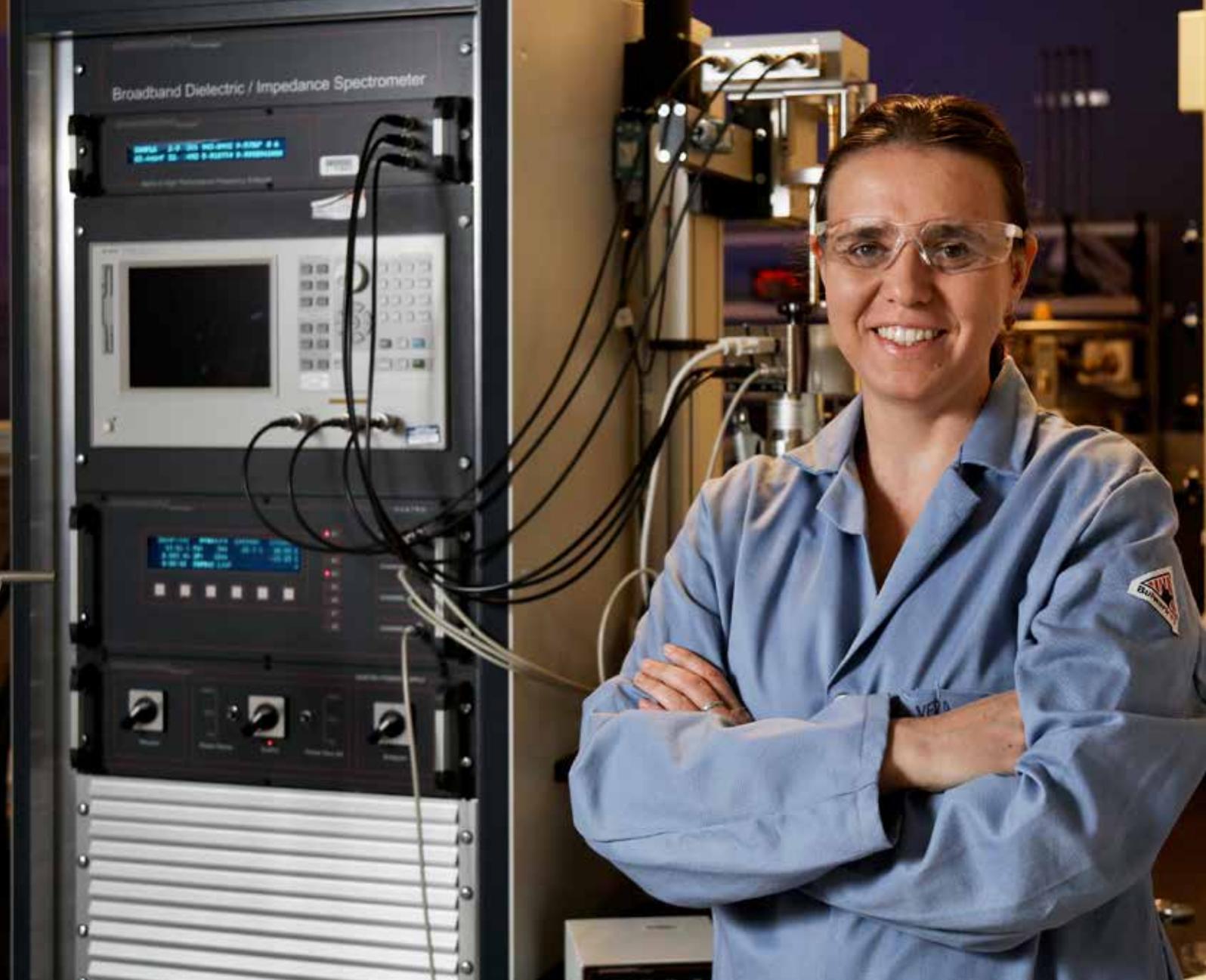
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### **phish·ing**

/ˈfɪʃɪŋ/

noun: phishing

- the fraudulent practice of sending emails purporting to be from reputable companies in order to induce individuals to reveal personal information, such as passwords, personal information, credit card numbers and more that endanger your privacy. Phones and mobile devices are not exempt from these dangers.



*To develop complex materials with superior properties, Vera Bocharova uses diverse methods including broadband dielectric spectroscopy. Credit: Oak Ridge National Laboratory, U.S. Dept. of Energy; photographer Jason Richards*

## *Vera* **Bocharova-**

Advancing the frontiers of knowledge about ***soft materials***

by Dawn Levy / ORNL

Vera Bocharova at the Department of Energy's Oak Ridge National Laboratory investigates the structure and dynamics of soft materials—polymer nanocomposites, polymer electrolytes and biological macromolecules—to advance materials and technologies for energy, medicine and other applications.

She explores the chemistry and physics of soft materials on the scale of nanometers, or billionths of a meter. (One nanometer is approximately 100,000 times thinner than a human hair.) This scale is small but powerful, determining the optical, conductive and mechanical properties of bulk materials.

Bocharova works with world-class experts in ORNL's Chemical Sciences Division in its Soft Materials group, led by ORNL/University of Tennessee Governor's Chair Alexei Sokolov. Their fundamental studies of polymer dynamics, ion transport and interfacial structures create new knowledge to guide the rational design of materials that are highly conductive and materials with unique viscoelastic properties.

In polymer nanocomposites that are important on a practical level, interfaces that form between polymers and fillers are on the size scale of several nanometers. "I'm especially interested in how interfaces are formed between nanoparticles and the polymer, and what structural and environmental parameters control the formation of interfaces," Bocharova said.

With colleagues using quasi-elastic neutron scattering, broadband dielectric spectroscopy and Brillouin light scattering, she found that the packing (density) and stretching of the polymer chain in the interfacial region affect the mechanical performance of composites and their dynamics differently—suggesting a way to design "on demand" composite materials with specific properties.

In the case of polymer electrolytes, interfaces play an important role in affecting conductivity. For instance, an electrified interface inevitably forms when polymer electrolytes are sandwiched between two electrodes and placed in an electric field. The electrified interface hurts the performance of batteries because it blocks ion access to electrodes. Scientists can use only a few experimental techniques to study this interface; Bocharova favors neutrons.

"Neutrons do not damage polymers," Bocharova notes. "We use neutron reflectometry to study the formation of this interfacial layer [formed on electrodes in an electric field] as a function of applied electric field and correlate that with the bulk conductivity. It's the perfect technique to study interfaces." The work relied on LIQREF, a liquids reflectometer at the Spallation Neutron Source (SNS). Effectively correlating the structure of the electrified interface and the bulk conductivity will create a path for optimization leading to materials with better conductivity.

## Soft materials

Soft materials are materials that can be easily deformed by thermal stresses or thermal fluctuations at about room temperature. Soft materials include liquids, polymers, foams, gels, colloids, granular materials, as well as most soft biological materials.



Bocharova performs experiments and works with theory and simulation experts to improve understanding of these and other soft materials.

She relies on specialized equipment at ORNL to synthesize materials and characterize their structures and functions. In the Chemical and Materials Sciences Building, she uses various light scattering techniques to characterize the diffusion of nanoparticles and ions. To study chemical contrast at the nanoscale, she employs tip-enhanced Raman spectroscopy (TERS). She uses broadband dielectric spectroscopy to analyze dynamics in the range from billionths to hundreds of seconds ( $10^{-9}$  to  $10^2$  seconds). To characterize dynamic processes in polymers and ionic conductors on time scales of trillionth to billionths of seconds ( $10^{-12}$  to  $10^{-9}$  seconds), she uses BASIS, a time-of-flight back-scattering spectrometer at SNS.

She conducts structural studies at the High Flux Isotope Reactor (HFIR) using SANS, a small-angle neutron scattering instrument, to characterize various structural aspects of interfacial layers in composite materials. HFIR and SNS are DOE Office of Science User Facilities at ORNL.

## Born to learn

Bocharova's mother, a chemist, first inspired her love of learning. Growing up in Russia, 5-year-old Vera wanted more than anything to attend school, but she was still too young. Nevertheless, she pestered

her grandmother for a backpack and then used it to run away—to school. (Her grandmother intercepted her halfway to the schoolyard.)

Bocharova's enthusiasm for learning was later fueled by inspirational teachers, especially a great high-school biology teacher. She went on to earn a bachelor's degree in mathematics in 1999 and a master's degree in physics in 2001, both from Orenburg State University in Russia. In 2008 she earned a PhD in chemistry from Dresden University of Technology in Germany. For her award-winning dissertation, she formed one-dimensional wires from conducting polymers—an innovation that launched her nanoscale investigations.

Bocharova did a postdoctoral fellowship at Clarkson University in New York in 2009, implanting electrodes and biofuel cells into snails and performing electrochemistry experiments toward developing a drug-delivery system. The fuel cells used enzymes to convert sugars from the snail's blood into ions that created current capable of powering a device.

Away from the lab, Bocharova enjoys hiking, watching old movies, reading books and gardening. Her garden is devoid of snails. Said Bocharova, "They know who I am, so they stay away."

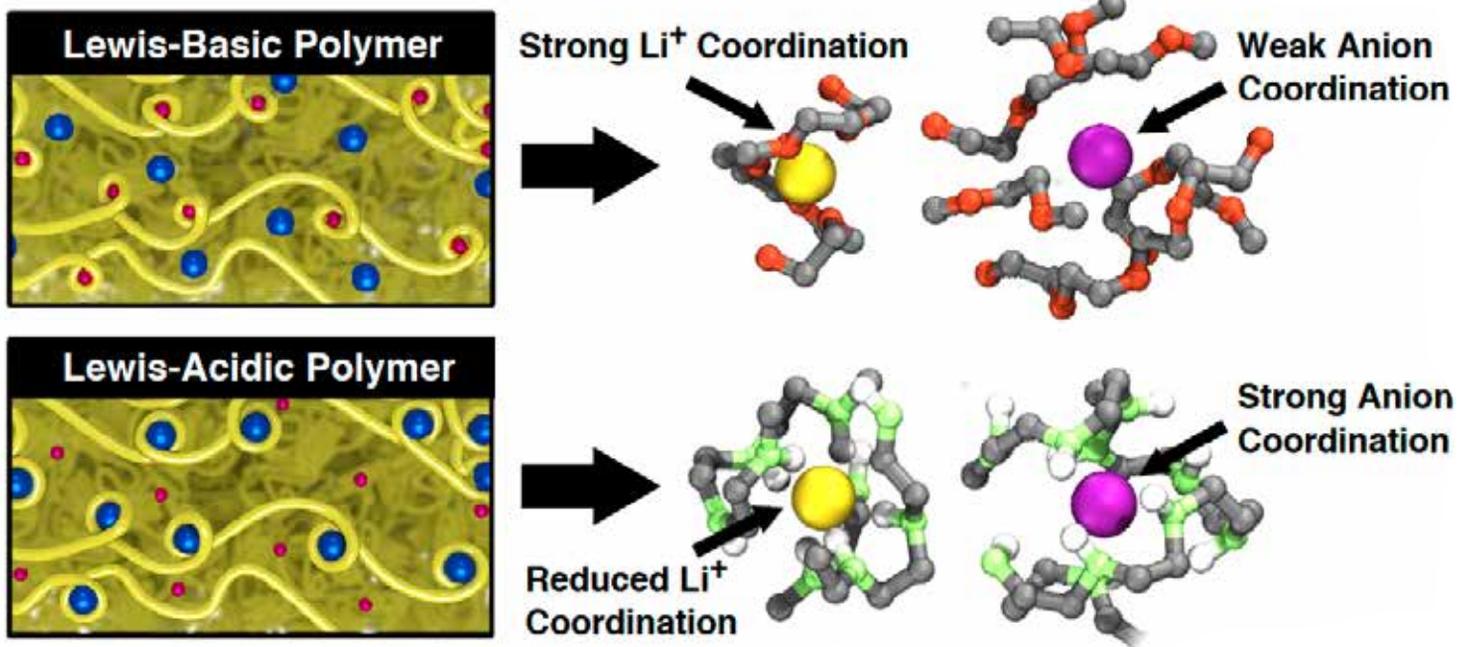
## Innovation at the interface

In 2012, Bocharova accepted a two-year Wigner Fellowship at ORNL over several other job offers. "When I saw the equipment and people, I decided on ORNL," she said. "I can accomplish a lot of science here."

Her Wigner project explored how polymers change shape in response to external changes in temperature, pH and other stimuli. "We found that if you apply an electric field to polymer electrolytes, they start to locally melt," she said. "This can create a nice pattern. You can write on a surface."

Her subsequent research has been diverse. It includes projects to design a probe for TERS (with Alex Belianinov and Nick Lavrik at the Center for Nanophase Materials Sciences, a DOE Office of Science User Facility at ORNL), transport ions in liquids and polymers for energy storage (with Sokolov and ORNL's Tomonori Saito, Benjamin Doughty, Rajeev Kumar and Gregory Smith), and design membranes with controlled free volume (with Sokolov, Saito, Kumar and ORNL's Lilin He).

"Now I'm especially interested in polymer electrolytes," Bocharova said of a promising class of materials for lithium batteries, fuel cells and water desalination. "I want to understand what chemical structure polymer electrolytes should have to get the highest conductivity possible."



A polymer electrolyte is safer than the traditional liquid electrolytes used in batteries and fuel cells, which have weak resistance against short circuits and are flammable.

“We hear about overheating batteries in cell phones and laptops,” Bocharova said. “We could replace liquid electrolytes with polymer material that has much better mechanical performance and is robust, nonflammable and nontoxic.”

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DOE’s Office of Science (Basic Energy Sciences) supports Bocharova’s research. UT-Battelle manages ORNL for DOE’s Office of Science. The single largest supporter of basic research in the physical sciences in the United States, the Office of Science is working to address some of the most pressing challenges of our time. For more information, please visit <https://science.energy.gov/>.

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