

An Undergraduate Research Story: Part One

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The prestigious [Barry M. Goldwater Scholarship](#) is awarded to undergraduate sophomores and juniors planning on research careers in natural sciences, mathematics, or engineering. SfN is proud some of its members are Goldwater Scholarship Award Winners. This series features three SfN members who are 2016 winners to showcase their accomplishments and offer other undergraduate members interested in conducting research a chance to learn from their experiences. Here, [Kimberly Bress](#) of the [University of Tennessee, Knoxville](#) shares her insights.



When did you decide to pursue neuroscience for your undergraduate studies? What led you to making that decision?

From the very beginning of college, I knew that I wanted to study the brain, so I declared my neuroscience major at freshman orientation. I am pursuing a self-designed major, "Neuroscience and Mental Health," through the University of Tennessee College Scholars Program. I follow a curriculum developed with guidance from faculty mentors across multiple university departments, taking classes in neurobiology, psychology, cognitive neuroscience, social work, and counseling. Although my studies are primarily focused in the discipline of neuroscience, my unique curriculum allows me to explore the interdisciplinary applications of this complex and far-reaching field.

What does your research focus on, and what are your responsibilities?

For the past three and a half years, I have served as an undergraduate researcher in the [Cooper Behavioral Neuroscience Laboratory](#). Our lab studies the behavioral, neural, and endocrine factors that regulate social stress using a social defeat model in Syrian hamsters.

I work with graduate student Brooke Dulka to specifically study the effects of social defeat stress on activity in specific brain regions. Last semester, with guidance from Brooke and our PI Matthew Cooper, I studied the effects of social defeat stress on the ventral hippocampus, looking to see if the level of stress-induced activation in this region would be modulated by an animal's social status.

Besides the Goldwater Scholarship, do you have other scholarships or fellowships to conduct this research?

I am very grateful to be a member of the [Haslam Scholars Program](#) and [College Scholars Program](#) at the University of Tennessee. These two honors programs have provided me with a great deal of support, not only funding but also generous mentorship. My research experiences would not be what they are without all of the guidance which I receive from these groups.

How do you balance time in the lab with all of your classes and any extracurricular activities that you do?

Working in the lab is one of my main (and most time consuming) responsibilities, but I truly enjoy it. When I am in the lab, there is always something new to learn, a question to answer, or a problem to solve. My mentors, including Matthew Cooper, Brooke Dulka, and senior undergraduates who trained me during my first few semesters, have taught me that science is engaging and collaborative. Our lab has a great sense of community, and I am very grateful for that. Besides research, I also serve as a backpacking expedition leader with the university's Center for Leadership and Service and play oboe in the Symphonic Band. These activities are definitely a lot to juggle, but I wouldn't have my college experience any other way!

What is one challenge you've encountered trying to achieve this balance, and what is your approach to being as productive for and present in all of your school commitments?

One of the biggest challenges is trying to not be discouraged by the learning curve. When I first began studying neuroscience, and during my first semester in the lab, I was constantly overwhelmed by the amount of information that I did not understand. I really struggled with this, until I learned to be more comfortable asking questions. Once I took initiative to understand our lab's research and really dedicated myself to mastering my neuroscience course material, I became less overwhelmed and more curious. There will always be something new to learn, whether it be a concept, technique, or an entirely new area of research. Figuring out how to navigate the learning curve has been important for turning my academic stress into something that is motivating and productive.

What is one piece of advice that you would offer other undergraduates who are thinking about or who are already doing lab research to help them be successful?

My most important piece of advice would be to find a good mentor — someone who answers your questions and really engages you in the research process. Research is a collaborative activity, and mentorship is a key part of learning how to be a good scientist and peer. I am very lucky to have mentors who are constantly teaching, explaining, and advising. My relationships with senior undergraduates, graduate students, and PIs has made research a positive experience, and that is a lesson that I will carry with me for the rest of my career.



Kimberly Bress

[Kimberly Bress](#) is a senior at the University of Tennessee, Knoxville studying a self-designed curriculum called "Neuroscience and Mental Health" through the College Scholars Program. As a native of Melbourne, Florida, Bress chose to attend the University of Tennessee after being selected as one of the university's Haslam Scholars. Over the past three years, she has conducted research in the Cooper Behavioral Neuroscience Laboratory, using animal models to study the effects of stress on the brain. In addition to research, Kimberly enjoys playing the oboe in the university's Symphonic Band, leading backpacking trips for the Center for Leadership and Service, and volunteering with after school programs at local elementary schools.

Career Advice Following

An Undergraduate Research Story: Part Two

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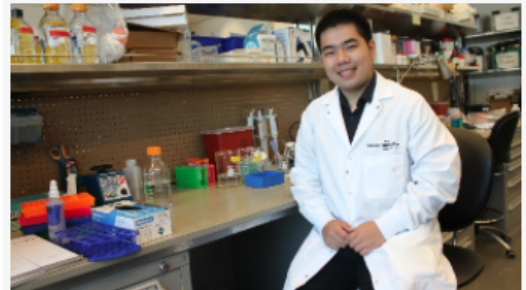


Photo of author, provided by author.

When did you decide to pursue neuroscience for your undergraduate studies? What led you to make that decision?

When I was 10 years old, I thought that I wanted to be a professional concert pianist. But I also always found the nervous system to be beautiful and enjoyed looking at pictures and drawings of nerves. In fact, my fifth-grade arts project was a children's picture book on motor nerves. In high school, I joined a research lab at Ohio State University (OSU), and from then on, I decided to become a neuroscientist. I am now majoring in neuroscience, with a focus on systems neuroscience, at Johns Hopkins University (JHU).

What does your research focus on, and what are your responsibilities? Why does this research excite you?

My overarching research goal is to understand how neurons interconnected with each other in neural circuits drive nervous system function.

I first began addressing this question in the [Beattie Lab](#) at OSU by looking at how neural circuits are formed and how neural circuit plasticity is affected by neurological disorders. I brought my interest in neural development to the [Hattar Lab](#) at Hopkins, where I worked on how disruptive light schedules such as shift work affect adult neural stem cells to impact mood and learning. I spent summers at the [Karpova Lab](#) at Janelia Research Campus and the [Yoshihara Lab](#) at the RIKEN Brain Science Institute to gain experience in molecular tools for anatomical and functional studies of neural circuits. I am now using some of these systems approaches to characterize the anatomy and function of neural circuits that regulate circadian rhythms at the National Institute of Mental Health, where the [Hattar Lab](#) recently moved.

I have been very fortunate to have generous mentors who let me work independently on all project aspects, from conceiving ideas and submitting grant proposals to conducting experiments and writing papers for publications.

Doing independent neuroscience research is especially exciting because the nervous system allows us to experience the world. What we see, feel, and think are the result of computations performed by neural circuits. Therefore, neuroscience is the gateway by which we can learn about the biological correlates that make us uniquely human. When neurons become sick, individuals lose the ability to experience the world in a complete manner, and are affected from learning and memory disturbances to loss of voluntary movement. Understanding how neural circuits work can lead to the development of new therapies that repair dysfunctional neural circuits in nervous system disorders, putting individuals back on course with their lives.

Besides the Goldwater Scholarship, do you have other scholarships or fellowships to conduct this research?

My research is funded by several internal JHU grants, notably the three-year [Woodrow Wilson Research Fellowship](#). In addition, my research has been supported by the [NIH Undergraduate Scholarship Program](#). My summer research experiences were funded by several internationally competitive fellowships, including those awarded by the Howard Hughes Medical Institute's [Janelia Undergraduate Scholars program](#), U.S. Department of State's [Benjamin A. Gilman International Scholarship](#), and the RIKEN Brain Science Institute [Summer Program](#) (which is typically for graduate students and postdocs but open to others). I learned about these external grants from Hopkins' National Fellowships Office.

How do you balance time in the lab with all of your classes and any extracurricular activities that you do?

For me, there is not much of a distinction between life inside and outside of the lab. Connecting the lab with the outside world allows me to accomplish more at once. I do homework and study while waiting for experiments to run, and when I am physically outside of the lab, I am reading papers and thinking of new and better experiments to try.

What is one piece of advice that you would offer other undergraduates who are thinking about or who are already doing lab research to help them be successful?

Enjoy the science and the opportunity to discover new and important knowledge that has the potential to make a difference in the world.

Also read [An Undergraduate Research Story: Part One](#).

Duy Phan



[Duy Phan](#) is a senior at Johns Hopkins University (JHU) majoring in neuroscience with a focus on systems neuroscience. He is a Bloomberg Scholar and recipient of the Barry Goldwater Scholarship. Phan has conducted basic and clinical neuroscience research across five institutions around the world supported by JHU internal grants and numerous national- and international-level fellowships from NIH, Howard Hughes Medical Institute, and the U.S. State Department. Phan's research has culminated in 10 publications, including two first-author papers. He is active in the community as a volunteer at the Hopkins Hospital Transplant Unit and a science and mathematics tutor at a maximum-security prison in Baltimore City. His interests in scientific writing have led him to write a weekly neuroscience column for JHU's newspaper and serve as the founding editor-in-chief of a student journal that publishes scientific review papers. While Phan considers himself first and foremost a physician-scientist in training, his passion for the performing arts as an orchestral violinist, solo concert pianist and ballroom dancer have taken him to competitions and performances throughout North America. He is currently applying for MD-PhD programs, and long-term, he hopes to become a clinical neurologist and basic science molecular and systems neuroscientist.

An Undergraduate Research Story: Part Three

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Photo of author, provided by author.

When did you decide to pursue neuroscience for your undergraduate studies? What led you to making that decision?

I've wanted to study the brain since taking an Intro to Neuroscience course at Dartmouth College as a freshman during the fall and joining the [Gulledge Lab](#) later that year.

I decided to do a major in physics modified with biology because the neuroscience questions that I'm interested in concern the mathematical and physical properties of neural networks. I want to understand how neurons connect to create circuitry that is the basis for higher-order processes in the brain, and I find the way physicists approach studying large systems a compelling way to look at neural networks.

However, it took a long time for me to decide whether I wanted to pursue a PhD or an MD. Before deciding on a PhD, I received advice from the people around me and read a lot of books by scientists and physicians.

What does your research focus on? What are your responsibilities, and in what lab do you do this research? Why does this research excite you?

My current research project in the Gulledge Lab is a computational study of glutamate receptors in single neurons. I code or modify neuron models, write and run simulations, analyze the data, and put together the results. I'm fortunate that the project is fairly independent and I'm able to see the project through from start to finish, which can be an exciting process. I also like the modeling itself, including thinking about what makes a highly simplified model faithful to reality in the aspects we're studying.

Besides the Goldwater Scholarship, do you have other scholarships or fellowships to conduct this research?

I have received funding through Dartmouth programs aimed at undergraduates, specifically, through the [Sophomore Research Scholars program](#) and the [Presidential Scholars program](#), as well as the [Neukom Institute](#) for travel costs and presenting and conducting my research. Information on these programs came from the school's websites, emails, or posters around campus.

How do you balance time in the lab with all of your classes and any extracurricular activities that you do?

Balancing research, courses, and extracurriculars is a challenge. It's sometimes not realistic to want to get the most out of my classes, spend a lot of time with friends, and make steady progress on research projects simultaneously. Sometimes I feel as though I have it all balanced well by prioritizing activities and being careful with my time, but often I don't.

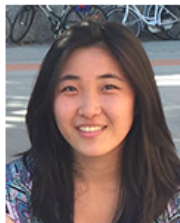
What is one challenge you've encountered trying to achieve this balance, and what is your approach to being as productive for and present in all of your school commitments?

As a student, classes tend to be my primary concern, so I sometimes feel as though I'm not working on research as much as I would like. My attempt to solve this is to set aside time as early in the day as I can for research so it doesn't get pushed aside by my other commitments. I try to figure out what is most important to me and schedule around that.

What is one piece of advice that you would offer other undergraduates who are thinking about or who are already doing lab research to help them be successful?

Reading books written by or about people in science has been extremely valuable. E.O. Wilson and Ramón y Cajal each have a book of advice ([Letters to a Young Scientist](#) and [Advice for a Young Investigator](#), respectively) for potential researchers, and many people have written about their experiences in their fields, such as Oliver Sacks in his autobiography, [On the Move: A Life](#), or reflections on their discoveries, like Francis Crick in [What Mad Pursuit: A Personal View of Scientific Discovery](#). Personal recollections like these have given me some perspective on both the life of a scientist and the science itself.

Also read [An Undergraduate Research Story: Part One](#) and [An Undergraduate Research Story: Part Two](#).



Chenguang Li

[Chenguang Li](#) is a senior at Dartmouth College, majoring in physics modified with biology, minoring in chemistry. She currently does computational neuroscience research in the Gulledge Lab. Li intends to pursue a PhD in neuroscience in order to teach and conduct research in the future. On campus, apart from research, she is an active member of the Agape Christian Fellowship and enjoys music improvisation and graphic design. Li is from Bellevue, Washington.