

Synapse

BYU Neuroscience Magazine



Spring 2021

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Reflections: Ramona Hopkins

I love to travel with my husband and family. We have traveled widely in the United States, Europe, Iceland, Morocco, South Africa, and parts of Asia. One of the many things I love about travel is being able to push outside of my comfort zone. Being exposed to new sights, languages, cultures, and food, along with the ability to meet new people—these experiences can be transforming.

On a trip to Alaska, we crash-landed in a small mail plane north of the Arctic Circle next to the frozen Yukon River (we were not hurt). We were marooned for a number of hours in a very small Inuit village waiting for a new plane to be sent to pick us up, which was eye opening. Local villagers fed us dried salmon and kept us warm in the local schoolhouse, the only building that had central heat and indoor plumbing.

The kindness of the strangers who were not expecting anyone to get off the plane, let alone visit their village for hours, taught me to be kind, accepting, and flexible. While in Vietnam, I learned perspective visiting the sights of the “American War” or as I knew it, the “Vietnam War”. I also learned that while I thought the famous Vietnamese Water Puppets (puppeteers performing in a pool of water), were pretty cool, my husband and sons were less impressed.

For the past six years I have had the privilege of serving as the director of the Neuroscience Center. During this time there have been many changes and challenges. In 2015 the Neuroscience Center had less than 500 undergraduate majors.

During the last six years this has grown to almost 700 students. The master’s and doctoral programs were united with the undergraduate major as part of Neuroscience. The Neuroscience office was remodeled, adjunct faculty were hired, and the number of course offerings doubled, to name a few of the changes.



Dr. Ramona Hopkins has served as the Neuroscience Director since 2016. We are very grateful for all she did!

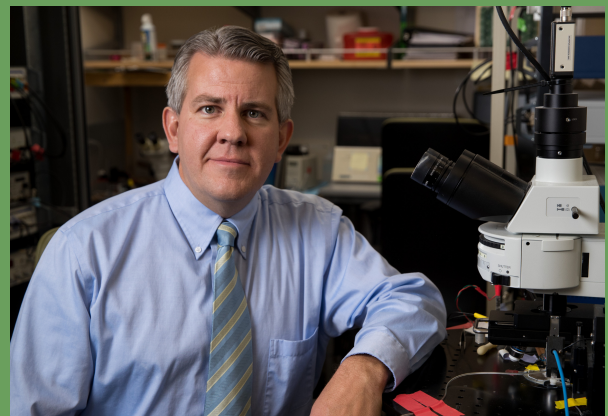
More importantly I have learned much, and I am grateful to the people I have worked with. The faculty are amazing, and they care about students and improving the programs. They are outstanding mentors and during the pandemic have worked unceasingly to make online, in-person and hybrid teaching the best experiences possible.

The staff and student employees have worked tirelessly behind the scenes making sure everything runs smoothly. They have been instrumental in developing Synapse, the Neuroscience news magazine, sending out the weekly email, planning and running the opening social, the annual art contest, class scheduling, and many things too numerous to name.

I want to express my gratitude to the faculty, staff, and student employees for their unflagging service. They are the life-breath of the Neuroscience Center. As our travel through life continues, may the journey be educational, memorable, and enlightening.

New Director: Jeff Edwards

Dr. Jeffery Edwards has been appointed as the new Neuroscience Center director starting July 1, 2021. Dr. Edwards has been serving for the past six years as associate director of the center under the direction of Dr. Ramona Hopkins. After receiving his PhD, Dr. Edwards had the opportunity to conduct research at Brown University. He then taught one year at BYU Idaho before returning to BYU. With experience in research and teaching, Dr. Edwards is excited to start his new position as director and help the Neuroscience Center move forward.





Faculty spotlight

Dr. Derin Cobia

I was raised in Quincy, Washington, a small farm town located in the middle of the state. While country life was fun at times, I realized farming was not in my future.

For some reason I thought I was going to grow up to be a chiropractor, but that changed once I started my first semester at BYU and identified as Pre-Med. For sure I was going to be the best physician out there, but after taking the Pre-Med seminar I soon discovered I wasn't really interested in that either.

At the end of the semester, I left to serve a mission in St. Louis, Missouri believing inspiration would strike me with the right career choice. (It did not). When I returned, I was pretty stumped on what to do (from farmer to chiropractor to physician to... now what?) and spent the next several years spinning my wheels.

It was not until I took the Introduction to Psychology course that I was exposed to, and really felt captivated by, the nuances of human behavior, mostly due to the fascinating experiments on its supposed causes and influences. At that point it was settled, I am now a Psychology major. But exactly what in psychology to do? That was not settled.

The next few years were filled with distractions, including involvement in various BYU performing groups and finishing a minor in Hebrew while studying abroad in Israel. Of all places it was at the Jerusalem Center where I met a BYU psychology graduate student who told me of her fascination with the connection between brain and behavior – and it was all because of a class she took from Dr. Erin Bigler at BYU, the resident neuropsychologist. Neuropsychology? What was that?

My new graduate friend described Dr. Bigler's ability to evaluate various cognitive functions in people suffering from a range of brain disorders, and then help them understand how to navigate the world based on that knowledge. It was the perfect blend of what psychology and neuroscience had to offer when understanding the human experience.

Upon returning from Israel, I was determined to take a course from Dr. Bigler and explore this world further. Soon I found myself enrolled in his graduate neuropsychology class. It was going to be tough, but I was determined to do my best and hopefully develop a mentoring relationship to support my graduate school applications (by then I had determined to get my PhD in... something?).

All I can say is that course was a game changer for me, learning about the neural substrates of thought and action, how they are altered in disease, and the advanced tools used for studying them completely amazed and inspired me. It was in this course I was first introduced to neuroimaging technology and how it was used to study the brain.

Dr. Bigler built a prolific career using neuroimaging to study brain disorders and I wanted to do the same, but alas, his lab was full. I was not deterred, I performed well in his



course and kept probing for opportunities; eventually he let me assist with collecting normative data on a memory test he was developing, and that's where it started. I was on my way to becoming a neuropsychologist and it was exciting.

Finishing up my bachelor's degree was slow going, but with my wife's encouragement ("7 years is long enough") I finally graduated and found myself returning to Missouri to attend graduate school. Likely due to generous letters from Dr. Bigler and others, I was accepted into the Clinical Psychology PhD program at St. Louis University and specialized in the neuropsychology track.

"...learning about the neural substrates of thought and action... completely amazed and inspired me."

There I worked with Dr. Jeffrey Gfeller and had a thoroughly wonderful time immersing myself in all things psychology, both clinical and "neuro" in nature. I developed clinical skills in neuropsychological assessment with many different neurologic and psychiatric populations, as well as conducted research in traumatic brain injury and mild cognitive impairment—it was a great time.

Even though I enjoyed all of this, I still had an itch for neuroimaging and began to seek out opportunities at neighboring Washington University Medical School.

With some persistence and good fortune, I met Dr. John Csernansky who directed the Conte Center at Washington University, a lab focused on understanding the neurobiology of schizophrenia using imaging and computer algorithms.

Here I had another transformative experience where I was flooded with new ideas, concepts and approaches to studying complex aspects of the brain in disordered states. I developed my dissertation using the tools I learned to examine cortical thickness and working memory in schizophrenia, which ignited a passion to study psychosis long-term.

My last year of graduate school was spent completing a clinical internship in neuropsychology at West Virginia University School of Medicine; I worked with some amazing people who taught me valuable lessons about brain-behavior relationships and the importance of clinical care.

After internship we moved to Chicago, Illinois for postdoctoral training at Northwestern University Feinberg School of Medicine (and to eat some good food). I was quite fortunate to not only continue with neuroimaging research in schizophrenia, but also collaborate on

projects studying aging and neurodegenerative disease with the Mesulam Cognitive Neurology and Alzheimer's Disease Center at Northwestern. We studied a fascinating dementia syndrome known as primary progressive aphasia, where language abilities are slowly lost over time, similar to what happens with memory in Alzheimer's dementia.

By the time my postdoctoral fellowship ended I guess I was doing something right as they offered me full-time faculty position to stay and continue doing clinical work, research, and graduate training.

After 8 years in Chicago, it was once again my undergrad mentor, Dr. Bigler, who changed the course of my career. He reached out and encouraged me to return to BYU as a faculty member. The stars appeared to align and beginning in 2016 I joined the department and started the Brain Imaging & Behavior Lab (well... borrowed, Dr. Bigler retired and gave me both his lab space and the name, I will always be in his debt).

In the lab we conduct research on the implementation of computational anatomy tools to study brain structure in neuropsychiatric diseases, mostly schizophrenia, but we also dabble in other areas. Primarily we are interested in understanding the heterogeneity that exists in the disease, such as brain integrity in different cognitive subtypes or those with early illness onset. We are also studying how the neural signatures of infectious processes are differentially expressed in schizophrenia.



Currently we are developing a collaborative clinical trial with the Utah State Hospital to examine the brain correlates of cognitive training in patients hospitalized with severe schizophrenia. We hope to be able to make an impact not only in the broader science of this disease, but also positively affect the lives of those in our local community.

My wife and I have three girls, one dog (also a girl), and one rabbit (not a girl). We miss the Chicago food, but do our best to make it when we can, particularly the pizza. While I don't farm anymore, I still do some things for fun. I love a variety of music (not sure my students do, the 80s New Wave broadcast on my Zoom line prior to class has gotten mixed reviews), and I also build electric guitars and guitar pedals when I get the chance.



My BYU Story

Mika Honda Lundberg

When I started as a freshman, all I knew was that I wanted to go to medical school. While that dream has not changed, the experiences I've had while attending BYU have taught me things that will make me a better doctor and have certainly made me a better person.

After realizing my interest in the brain, I jumped for joy when I found the neuroscience major. It seemed like the perfect combination between studying molecular and cellular mechanisms and people's behavior which was exactly what I was interested in.

My adoration for neuroscience has exponentially grown. I started to fall in love with neuroscience during my neurobiology class with Dr. Rebekka Matheson. Through her excellent teaching and kind mentorship, I began to be confident in my abilities as a young neuroscientist. I became enamored with neuroanatomy during my class with Dr. Michael Brown. I was like a little girl on Christmas morning every day of that class.

One of the things that fascinated me was learning about how someone's functionality could drastically change depending on where their brain lesion was located.

Even though the classes were challenging, learning about brain function just made me more excited to become a physician and help others improve the quality of their lives.



"I was like a little girl on Christmas morning every day of that class."

For the past three years, I have had the opportunity to work in Dr. Michael Larson's neuropsychology lab. We work with electroencephalography (EEG) to study event-related potentials extracted from brain waves we record from participants. We have explored the effects that exercise, stress, and different personality traits have on people's cognitive abilities and motivation.

I have learned so many things from Dr. Larson and the other students working in the lab. One of the most influential things I have learned while in the lab is the importance of good data, lab practices, and replication. There is no substitute for clean and good



data! It is so important for us to continuously monitor the EEG data as it is recording. If something goes wrong when the participant is wearing the net, our data could become very “fuzzy” and unusable. I truly believe that through good study practices we can learn many important things through research.

From my lab experience, one piece of advice I have is to not hesitate when reaching out to professors. I stumbled upon Dr. Larson’s lab while looking at research labs online, but when I first reached out to him, he was not accepting any new research assistants.

However, about a month later, he contacted me asking if I would be interested in a lab manager position. Being a lab manager was a lot more administrative than what I was originally looking for, but it opened a lot of doors for me.

After starting that job, I have been able to help run participants for data acquisition, participate in a “bootcamp” where I learned more about the details of EEG and analysis, design and submit a study to the Institutional Review Board (IRB), as well as analyze my own data sets and write manuscripts for publication.

I know that I had these opportunities because I was proactive in reaching out to a research lab I was interested in. I encourage all students to do the same.

Throughout my time at BYU, I have had the chance to participate in different associations and clubs. For about a year, I was a program director for BYUSA’s Honor Service Squad. We planned weekly service activities to serve different groups of students on campus.

I loved being involved in BYUSA because their motto is “students serving students.” I think it is so important for us to find ways to be aware of our fellow students on campus and try to find ways to serve them. Sometimes the service we did felt small, but it was rewarding to see how happy it made students.

It is also important to find things you are interested in. I had the fun and unique experience of being a part of BYU’s A Cappella Club. I have always loved singing, and joining this club gave me a chance to learn to use my voice in new ways to contribute to a group. We met weekly to rehearse numbers, work on group blend, and were able to perform and even record songs in a sound booth.

BYU has so many ways to get involved in things you are interested in and try new things! I highly recommend using the resources provided through the campus. There are so many, and you will definitely benefit from surrounding yourself with things and people you love. Such activities also provide breaks in between course-heavy schedules that help maintain balance.

The most rewarding thing I have taken from my time at BYU is the interpersonal relationships I have made. Through different activities and classes, I have met and connected with so many people and have made lasting friendships.

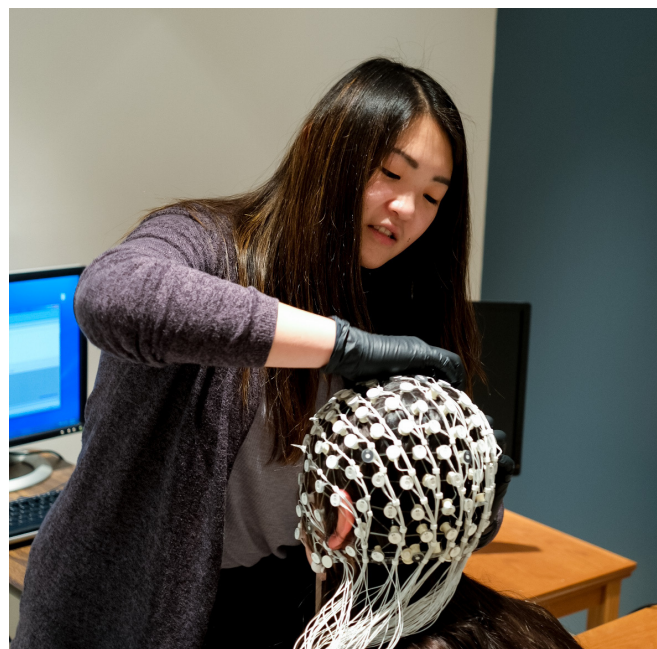
I am sure many students can relate and have a special place in your heart for anyone you studied organic chemistry with. All jokes aside, some of my closest friends have been my study group friends.

I believe that you can learn material so much better when you review concepts with friends. Plus, it does not seem like you are studying for as long because you are having fun together. My experience at BYU has truly been better because of my friends that have lifted me up and encouraged me when I was down.

I am currently following my dreams and applying to medical school after graduating in April. I know that the knowledge I gained during my undergraduate degree will take me far, but the relationships I have made, the skills I’ve gained, and the lessons I have learned will take me so much farther.

Do not be afraid to go out of your comfort zone to find new opportunities. It is no secret that college is hard—especially as a neuroscience major! In the end though, it is all worth it to know that you have accomplished something difficult that will carry you on to new challenges and an exciting future.

I am incredibly grateful for all of the professors, mentors, and opportunities I have had at BYU.



Mika is a recent graduate and is in the process of applying to graduate school.

How a Textbook Changed My Life

By Matthew Viveiros

My name is Matthew Viveiros and I finished my bachelor's degree in Neuroscience this past April 2021. I was born and raised in Provo, Utah, and graduated from Timpview High School.

I love everything outdoors, and when I'm not in the mountains or skiing, I'm probably stressing about school/ work/ volunteering or eating Cafe Rio. I have ambitions of becoming a plastic surgeon or dermatologist and will be attending medical school at Ohio State University in the Fall.

Being the firstborn to a pair of college students gave me a nontraditional upbringing. The majority of my youth was spent with my mother as she was finishing her college degree. Yes, I was that screaming baby in the back of the lecture halls while she slaved away at her education and raising me.

Her graduation, however, didn't boot me from these hallways as she went on to pursue a master's degree and was subsequently hired as a professor in the College of Family Life to teach marriage prep.

While she would spend hours on end working in her office in the JFSB, I would entertain myself through a variety of shenanigans, ultimately forcing her to calm me by treating me to a couple dollars to use to buy a bag of chocolate covered cinnamon bears from the former candy kiosk in the bookstore.

BYU became my second home. I remember walking directly from Provo High School (which I attended during the 7th and 8th grades) after class to my mother's office in the JFSB because I knew she and my dad would always be there.

I definitely took BYU for granted prior to my matriculation, likely because it was so deeply connected to my life. In fact, I never wanted to go to BYU. I had dreams of attending Stanford University, and always thought that it was meant to be since my first word was "tree."

I worked very hard throughout high school to optimize my chances of landing an acceptance to Stanford, my dream school.

My hard work throughout high school gave me many accolades, but the turning point for BYU came when my neighbor, Dr. Mike Brown, reached out to me and asked if I would like to receive a tour of the neuroscience program here.



When I met with Dr. Brown and witnessed the program's opportunities firsthand – interdisciplinary collaboration, emphasis on research, and a general atmosphere of inclusion—my initial lack of desire to apply to BYU diminished.

Before I returned home, Dr. Brown gifted me with the Neuro 205 textbook, telling me that this would come in handy when I decided to come here the next year. After much time spent stressing about college applications, my decision came down to two schools: Duke and BYU. But I left this decision to be made after my LDS mission service.

"...the more I engaged with my wiser peers, the more I realized how lucky I was to be at a university surrounded by this group of role models."

Unfortunately my mission service in Washington DC ended after five months due to medical complications. Upon my return, the Neuro 205 textbook that collected dust during that time sat waiting for me at my nightstand. Remembering the abundance of opportunity that I knew at BYU; I knew that I needed to spend my undergraduate career here and not at Duke or anywhere else.

The transition to college was a rather bumpy one. I entered BYU with 48 college credits that helped propel me into more advanced classes starting my first semester. In fact, I even mistakenly took two advanced biology classes that were prerequisites for each other without knowing during my first semester.

Though I was confident in my abilities coming in, I did not expect BYU to be filled with such stellar students academically and socially. This intimidated me because I was not used to being around so many amazing and accomplished people. Because of the relative age gap that I experience from returning home early from my mission, the majority of my peers were older than me and were further along in life than me.

I was scared of being the odd man out at first, but the more I engaged with my wiser peers, the more I realized how lucky I was to be at a university surrounded by this group of role models. Despite my age, I knew I had to carry on their legacy as they began to graduate.

I am the oldest sibling in my family, which means the majority of my life is figured out with trial and error. But here at BYU I felt like I had an older sibling to watch over my shoulder in every hobby, in every class, and in everything that I attempted.

Without the guidance of my stellar classmates and peers, I never would have realized the value of the many resources that helped me succeed throughout college. My neuroscience peers helped me succeed not only with studying and class preparation but also with life and in obtaining resources to help me succeed in all of these aspects.

From grinding through Anki and Quizlet decks to late night McDonald's runs for a large Diet Coke, I learned that college is more than just academic busy work: it's about bettering ourselves and the people around us.

This became extremely evident to me the moment I stepped into Dr. Brown's Neuroanatomy/Advanced Neuroscience and Dr. Matheson's Cognition and Behavioral neuroscience classes respectively. The material taught in all of these courses is perhaps the most fascinating of any college class.

Who doesn't love learning about the thing that makes us think!? The sheer rigor and interdisciplinary nature of neuroscience is something that I really love about studying this degree.

It is very obvious that both professors are very knowledgeable and are experts in the field. But what stands out most is how much Dr. Brown and Dr. Matheson truly care about every single student that fills their lecture halls and zoom meetings.



Dr. Matheson's medical degree doesn't just prove that she is clinically skilled, but her compassion and deep interest in the academic and life success of her students proves that being a great doctor is always second to being a great teacher.

Additionally, Dr. Brown's punctuality and precision with his teaching of such advanced topics makes it easy to learn essentially anything, and it is a testament to his love for each of his students and his mastery of the art of teaching.

If the material of this major is not enough to convince you to stay, these two leaders are the final piece to the puzzle. I know that their example and my attempt

to emulate their legacy will help me become the best physician that I can be to my future patients, and I'm excited about that.

Being surrounded by such great professors and advisers made me want to do the same for my community, and that led me to begin a nonprofit tutoring service for underserved individuals in this area.

I knew that I was blessed enough to come to this university for a purpose, and I needed to give back what I had learned from these examples.

"Coming from an ethnically diverse background, BYU may appear intimidating... but I have only been met with positive experiences..."

BYU's motto of "Enter to learn, go forth to serve" is the purpose that I had lacked prior to coming to this university. It's not enough to simply learn/master a certain topic or skill; we need to take action and make people around us better.

My favorite memories here at BYU are with those loved ones and whenever I am doing something in the service of others.

Coming from an ethnically diverse background, BYU may appear intimidating because of its limited diversity. But I have only been met with positive experiences by my professors, advisors, and peers regarding inclusion of all sorts of diversity. Not only have I had the opportunity to receive a phenomenal education, I have been able to involve myself in BYU's community of service and obtain leadership roles as an Advanced Neuroscience and physics lab TA.

One of the most meaningful accomplishments in my life is becoming an inaugural recipient of the FHSS Student Research Academy scholarship, which is meant to encourage the pursuit of research across BYU students of all backgrounds.

Executing BYU's motto, I have been honored to learn under the excellent guidance of Dr. Jared Nielsen investigating neurodevelopmental disorders with computational tools, and I am going forth to hopefully inspire similarly diverse BYU students to achieve their maximum potential while studying here.

Whether its spending countless hours studying in the basement of the HBLL, or late nights furiously rehearsing neural pathways on the JKB whiteboards, I simply enjoy being at my second home.

My mother's former office was located on the first floor of the JFSB and has since become the neuroscience advisement center. However, I always spend at least five minutes of my day walking past it to reminisce on my journey with this sacred school.

BYU isn't Stanford, but it's made me a better person than any other university ever could. Now it's my turn to represent BYU and propagate its tradition by helping others better their lives, and I have the neuroscience program to thank for preparing me to embark on my future.



Matthew is a recent graduate and plans to continue on his path of learning at Ohio State University.



Graduate Student Spotlight- Jacob Hunter

My name is Jacob Hunter, and I grew up in Beaverton, Oregon. I am married and have two kids whom I love to spend time with. I came to BYU for my undergraduate degree and had a really positive experience.

While doing my undergraduate studies, I was working in a lab that I enjoyed, so I decided to stay for my Master's to study neuroscience. I just recently completed my Master's degree, and I am excited to take what I've learned and help others.

I have always loved neuroscience! The brain is so fascinating, and I have always loved the interface between biology and behavior. When I discovered that I could study brain and behavior, that's when I knew I wanted to go into neuroscience.

Since coming to BYU, I have participated in research with a number of professors. I had the opportunity to work with the BYU health and behavioral lab with Dr. Birmingham during my undergraduate work. As part of my Master's degree, I had the chance to work in primate research with Dr. Dee Higley. Both of these labs and professors have taught me valuable lessons and I have really enjoyed doing research.

One of my favorite things about being a student at BYU is the great faculty. Many faculty members have made an impact on me and have really supported me through my education. I was very lucky to have the opportunity to work with Dr. Rebekka Matheson in graduate coursework, and was fortunate to be a teaching assistant for her. This was an amazing experience and I learned so much.

"The best time to plant a tree was 20 years ago. The next best time is now."

Dr. Matheson is an incredible instructor and really helped me get some experience teaching. My professors also taught me how to love the writing process. This is something I will always remember. As I continue my education, I hope to learn more about bioinformatics.

Attending BYU provided many great opportunities for me personally, my family, and my learning experience. I loved all the professors I have been able to get to know throughout my time here.



I really enjoyed all of the classes I took at BYU, especially the evolutionary biology course and genetics class. Not only were they interesting, but both helped me in my research and other projects I worked on. I have learned many valuable, interesting facts from my classes and research. One of my favorite facts is that Rhesus macaques (a primate) have an enlarged prefrontal cortex like humans!

Throughout my life and schooling, the scripture Jacob 6:12 has always helped me. It says, "O be wise, what can I say more." I also love the Chinese proverb that says "The best time to plant a tree was 20 years ago. The next best time is now." These two insights have blessed my life and have helped me learn to be wise and act now. My advice to current and future students is to study smart not hard and to plant those trees in your lives that will bless you in the future.

In my spare time, I love to play with my kids. I don't play any sports, but I like to think that chasing my toddler around counts! I also love to share fun facts about monkeys with everyone I meet. I love to go to Tibble fork reservoir up the American Fork canyon with my family to relax and unwind.

Although I have a lot to learn, I feel that my education at BYU both in my undergraduate and graduate experiences, have helped prepare me for the future. The experiences and knowledge I have gained at BYU has prepared me to be in a position to learn even more and excel in my employment. I am grateful for the chance I have had to attend BYU and am excited to use what I've gained to bless the lives of others.

What I Learned Doing Research

Kennedy Madrid

I got involved in research after I transferred to BYU in Fall 2019. I have always wanted to be a part of a research project. Being new to BYU, it was difficult for me to find lab openings since I did not know any of my professors.

I decided to reach out to professors that had ongoing research that was interesting to me and express to them my interest in their lab. Dr. Cobia was one faculty member that contacted me, and I was able to discuss his research with him and what the lab does. I was excited to work in the lab, and I was able to join his lab in Winter 2020.

Dr. Cobia's research is focused on the utilization and implementation of computational anatomy tools to study psychiatric (schizophrenia) and neurodegenerative (dementia) illness. We construct high-dimensional brain models using MRI scans that can quantify subtle differences in brain structure. These require computationally intensive resources to generate.

With the projects I am involved in I assist with processing data obtained by another lab member. This is done through a program called FreeSurfer, a brain imaging software to help process and analyze human MRI scans.

After processing the data, I view the brain scans through a program called Freeview and apply edits if needed. These edits consist of making corrections to white matter or gray matter on the scans.



I have learned a lot during my time in the lab. Dr. Cobia's lab utilizes computer coding, which I had no knowledge or experience in when I entered the lab. In the year that I've been associated with the lab, I have learned a lot about coding and am continuing to learn more as I continue to work on new projects.



Coding is difficult, but I am happy with how far I've come with respect to my coding abilities with the lab. Besides learning about coding and computational tools, I've also learned the importance of teamwork. Going into the lab with no coding experience, I knew I needed help, but I was hesitant to reach out for help.

I started learning that it's important to ask questions and get help when it's needed. We are all a team in the research lab, and we try to help each other out the best we can, and I am grateful for that.

I would highly recommend doing research during your college career at BYU. I feel that research has helped me understand and appreciate the human brain more. Being a part of a research lab has helped me gain more experience in my major and has helped me make connections with my fellow lab members.

The most fulfilling part of this research is seeing your code work and execute the desired outcome based on what you tell the computer to do. Sometimes codes do not work and it is a cycle of editing and trying different codes.

Research is fulfilling seeing a code you have been trying to figure out for hours being successful and seeing the end product. I always do a little happy dance when my codes are executed without error and everything gets processed correctly.

I love that my research gives me the opportunity to learn more about the brain and brain anatomy. I also love that my research allows me to learn coding and gain new skills in research. My experience in the lab has been great, and I am excited to continue working in the lab.

The Gut Microbiome and Autism

Stephen Gilliat

My name is Stephen Gilliat, and I grew up in Northwestern Oregon. I have one brother and three sisters. We spent a lot of our time playing games, running around outside, gardening, and eating food. I also love to build and fix things.

Growing up, I had always planned on going into engineering like my dad and grandpa. However, while serving a mission in the Philippines, I had experiences with mental health that made me want to understand the brain and how it works. I came to BYU as a Civil Engineering major but was unsure that I really wanted to pursue that.

On my first day of BYU, I walked around new student orientation and saw a flier that talked about Neuroscience. I did not know what it was, but I had a good feeling about it. That day I changed my major and I enrolled in Chem 105.

Research always seemed a little intimidating and boring, as I really did not understand what it was. But I knew I would need some research experience if I was going to be a competitive applicant for medical or dental school. I was encouraged by a friend to join Dr. Lundwall's lab, so I applied but was not accepted at first. The next semester she let us know that she had some openings, and I was able to join her lab.

"Doing research has helped me make new connections and discover a love of research I never knew was there."

In Dr. Lundwall's lab there are a number of different studies going on: including studies about traumatic brain injury using MRI to assess brain function to attention in infants and children assessed using eye-tracking. The lab is trying to find biomarkers in the feces of infants who are high-risk for autism-spectrum disorder (ASD). Other studies had shown that adults with ASD had different microbial contents in their guts. Specifically, there is a bacterium involved in the permeability of the gut membrane that seemed to be lacking in individuals with autism. This permeability of the gut membrane may be possibly allowing harmful toxins to leave the gut and reach the brain.

We are studying to see if this difference in gut membrane exists in young infants who have older siblings with ASD. If so, this may be an early biomarker that could help at risk



infants be diagnosed earlier allowing for earlier treatment. Preliminary results have been promising, and we are excited to see the results of this study.

Dr. Lundwall is a great mentor and has helped me learn how research can be an incredibly fun and exciting experience. It is a collaborative process, where things may go wrong (especially when working with infants) and we get to brainstorm how to continue to be able to get consistent and reliable results. Dr. Lundwall takes time each week to meet with the students working in her lab to help us understand how to best move forward and overcome the research obstacles.

Dr. Lundwall also helped me realize that research does not have to be daunting. All it takes is a consistent curiosity in how the brain works, research skills, and a desire to discover something new. Since starting to do research, I have decided to pursue a graduate degree in Neuroscience to continue learning about how the brain works.

I also had the opportunity to attend the Snowbird Symposium and the Utah Conference for Undergraduate Research (UCUR) with my research team to present our findings. These conferences have been some of the most enjoyable parts of my BYU experience because I got to learn from amazing scientists and hear about their discoveries.

For anyone just starting out in the neuroscience major, or who hasn't had the chance to join a research lab, I would highly recommend it. It has been one of the most exciting and fulfilling parts of my undergraduate academic experience. Doing research has helped me make new connections and discover a love of research I never knew was there.

Don't Wait for Life to Get Easy

Valedictorian Alyssa Stockard



My name is Alyssa Stockard and I just graduated from BYU this past April. I came to BYU from my hometown in Fallon, Nevada and took my time exploring possible majors before deciding to study neuroscience. I knew I was interested in math and science and wanted to work in a meaningful profession one day but didn't know exactly what that would look like for me.

I initially chose to study neuroscience because it combined a lot of areas of interest to me, such as math, physics, chemistry, and biology. I still vividly remember sitting in my first neuroscience class, Neuro 205, and googling what a "neuron" was because I was not exactly sure. I discovered a lot of things I did not know, and initially it concerned me that I wasn't cut out to study neuroscience. I am glad I didn't let the things I didn't know stop me.

Instead, they taught me that I am capable of learning new things, over and over again. I did a lot of googling throughout my time at BYU. I recently graduated in April 2021 with my BS in neuroscience. I'll be starting medical school this summer, where I am excited to further my education and learn to care for and treat patients.

When I am not studying, I love to paint, sew, and read. During the pandemic, some of the other hobbies I have picked up are watching old seasons of Survivor and playing Tetris.

Put in the (Lab) Work

One of my favorite experiences at BYU was participating in neuroscience research. I spent several years in Dr. Steffensen's and Dr. Yorgason's labs, where we examined various mechanisms of substance abuse and addiction.

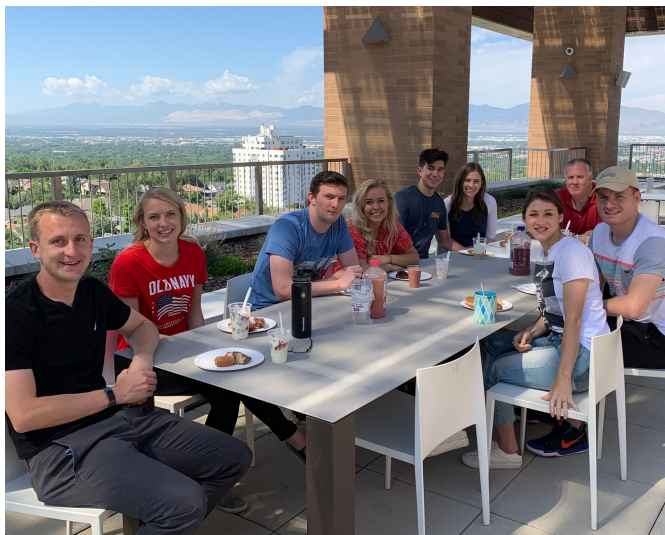
While I learned more than I imagined I would about lab techniques and designing experiments, the most important thing I learned was how to be an independent learner. Although I was underqualified when I began in the lab, beginning research early in my education helped me develop skills that made me a better student.

"I have found if you wait until you feel ready, or qualified enough, you will be waiting for a very long time."

I have found if you wait until you feel ready, or qualified enough, you will be waiting for a very long time.

The moments when I have experienced the most growth are the ones when I took a chance, admitted what I did not know, and kept myself open to learn. Working as a research assistant, I learned how to interpret current research articles, design and





troubleshoot experiments, and find answers to my questions. To any current neuroscience undergraduates, I would highly recommend getting involved in a research lab.

Make Connections

In neuroscience, connections between neurons are one of the keys to learning. As a student, I also found the connections I made with others to be just as key to my development. One of the best things about BYU is the network of students, professors, staff, and alumni.

As a BYU student, you are surrounded by people who want to help you succeed. Some of the best connections I have made came by making friends with the people I sat next to in class or talking to my professors during their office hours.

I have also found amazing mentors by reaching out to graduate students or alumni who are working in fields of interest to me. People are usually really excited to help current students.

I am so grateful for the times when I reached out to someone and ended up with a great friend or mentor.

"As a BYU student, you are surrounded by people who want to help you succeed."

The connections I have made at BYU have helped shape my future goals and given me perspective. The friends I made in my lab and classes helped me get through challenging projects or tests.

Make the Process Fun

Although I absolutely loved studying neuroscience, every moment of my undergraduate education was not magical.

For current and future students, I would imagine it will not always be perfectly smooth sailing either. I did not love every single class or ace every test. There were a lot of really hard weeks and challenging times.

The best thing I have found is to make sure I have fun, even when life feels too busy. I spent enough time telling myself "I will be happy when..." or "I will make time for x after..." until I realized that my life is happening right now, and I want to enjoy it as it is.

"I do not know if life ever gets easier or less busy, and I realized I don't want to wait to find out."



I do not know if life ever gets easier or less busy, and I realized I don't want to wait to find out. Sometimes that meant spending fewer hours in the library so I could go on a date with my husband or catch up with a friend. I have learned that I'm a better student and happier person when I make time for things that bring me joy.

As I head into medical school, I know this will be something I will have to keep working on. The years I spent at BYU were wonderful and challenging and, yes, fun!

I am so grateful that I decided to study neuroscience. Neuroscience has broadened my perspectives and helped me gain an appreciation for the incredible complexity and organization of the brain.

Finding the Balance

Taylor Woodward



I grew up in Colorado Springs, Colorado and currently reside in Bloomington, Indiana with my wife and our 2 toddlers. I graduated from BYU in 2016 with a BS in Neuroscience (minor in Spanish) and am currently in my third year of a dual-PhD program in Psychology and Neuroscience at Indiana University-Bloomington. I love my family, writing and recording music, and experimenting with my 3D printer.

Why Neuroscience?

I decided to major in neuroscience because I had burning questions that needed to be answered. I had experienced depression and anxiety as a teenager. A combination of antidepressants, counseling, exercise, and support from friends and family helped me through it.

How exactly did pharmaceutical treatment help me feel happier? How did my life experiences affect my brain? How much of me was 'me' and how much of me was 'chemicals'?

As a missionary in Carlsbad, California, I met literally hundreds of people who were battling addictions to alcohol and other substances. How can addictive molecules so profoundly disrupt a life of individuals and their families? These questions, along with my interest in biology that was kindled by a wonderful high school teacher, led me to study neuroscience.

Grades vs. Learning

I spent 3 and a half years in Dr. Steffensen's lab, learning patch clamp electrophysiology and studying the neurobiology of alcohol abuse. Looking back, I can see how fortunate I was to receive training in patch clamp electrophysiology, as that training has played a big role in my career trajectory.

While I loved performing experiments and learning about other scientific techniques, I really struggled in the classroom. Because research let me directly apply what I learned in the classroom, it gave me continual motivation to press onward in classes, though I rarely escaped with a shiny 'A' as a grade.

Because electrophysiology incorporates concepts from chemistry, biochemistry, physics, molecular biology, cell biology and can be used to ask how these influence big-picture topics like behavior, I constantly learned things in classes that made me say "Oh, so that's what (insert confusing thing I'd heard about in the lab) means." The phrase 'don't let school get in the way of your learning' resonates deeply with me.

Applying it to the Real World

I applied for grad school, hoping that my research experience would make up for my less-than-stellar grades. However, I was not accepted to any of the PhD programs I applied to.

After a bit of frantic searching and applying, I found a position as a technician in a lab at Anschutz Medical Campus, the medical school and hospital associated with the University of Colorado-Denver.

The lab studied mechanisms of anesthesia and was led by an MD/PhD who spent 1 day a week performing anesthesia for patients in the hospital and the remainder of his time supervising research in the lab. Although I initially thought that I only wanted to study addiction neurobiology instead of anesthesia, I soon realized that this environment was a treasure trove of important principles that I needed to learn.

Because we were on a medical campus, I sat in departmental seminars where clinical scientists presented their results from human patients. Many of the other 'basic' scientists (working with cells/mice/rats instead of patients) on the campus studied topics with direct clinical impact. It was refreshing and inspiring to see how the basic and clinical scientists influenced each other's journeys.

I developed an urgency for whatever I studied to be clinically relevant, as I wanted to use science to help people like my friends, family, and those I met on my mission.

Knowing that I wanted to pursue a PhD, my supervisor gave me individual projects to cultivate along with my administrative duties. These projects helped me

learn, think, and write in new ways, and I published two peer-reviewed articles from experiments I did in this lab. I am extremely grateful for the time I spent at Anschutz and the 'real world' perspectives that I received there.

Balance in all things

I decided that I wanted to continue doing science with the intent to find better ways to treat addiction, depression, and anxiety. I was accepted into IU Bloomington's Neuroscience and Psychology programs after my time.

I have learned new skills and techniques, I've learned more about funding, I've learned better ways to ask and answer questions, and I have filled in lots of gaps in my knowledge that I didn't know existed. I have a wonderful mentoring team who are supportive of me and my desires to do translationally oriented basic science.

While graduate school has been a wonderful time of growth, learning, and exploration, I frequently feel like a juggler with about 5 more balls in the air than I can handle. I often wonder if other members of my lab and program think I am insane as I rush around during the day in order to get things done and make it home in time to put my kids in bed.

I am trying to be as present as possible in the lives of my children. I am trying to support my wife in her chosen career path. I am trying to learn new skills in the lab and ask questions that no one has asked before. And, to top it off, like every other human on the planet I am trying to adjust to a world that has been drastically altered in a very short time span by COVID-19.

"BYU's Neuroscience program [has] steered me to where I am now."

Beyond the Bench

As I have learned more about the opioid crisis and the role that the medical and scientific community played in its unfolding, I have realized that public education and scientific transparency can solve a lot of problems.

I have spent the last couple years developing my science communication skills in order to better engage with regular folks about neuroscience topics. While taking Dr. Brown's neuroanatomy course (for the second time), I wrote a quirky song about the cerebellum to tie in my own personal interests

(music/songwriting) with what I was learning in class. While in Denver a few years later, I teamed up with an artist friend to make this video ([link](#)) for the Society for Neuroscience Brain Awareness Video Contest. Because of how well received this was, I followed up last year with another song ([link](#)) that teaches some basic neuroanatomy and the roles that different brain regions play in love.



As part of my science communication efforts, I also joined a local graduate student science blog called SciU ([link](#)), where I've written various posts explaining scientific concepts in ways that are more accessible to a non-scientist audience, as well as commentary on the human side of science.

Brain songs and blogging have been enjoyable projects and are helping me to develop skills that I believe are important for scientists. I feel that these endeavors, along with my research, have been a way that I have tried to fulfill BYU's challenge to 'go forth to serve.'

Neuroscience is an integral part of my identity. I am extremely grateful for the experiences I had as an undergraduate in BYU's Neuroscience program that have steered me to where I am now.

Without Your Cerebellum
<https://youtu.be/pwoJXe6dA2w>

I Love You with All of My Brain
<https://youtu.be/J1mIKwSZW3s>

SciU Blog Articles
<https://blogs.iu.edu/sciu/author/tjwoodwa/>

Links are listed in order of appearance in the text

Neuroscience Center is Relocating to Life Science!

Since the creation of the Neuroscience Center in 1999 it has been a multidisciplinary Center administered jointly by the college of Family, Home, and Social Sciences and the college of Life Sciences.

Established in 1999, the Neuroscience Center provides an excellent multidisciplinary environment for students and faculty to study the workings of the nervous system. It includes 28 BYU faculty members from various departments across campus, including Physiology and Developmental Biology, Psychology, School of Family Life, and mechanical engineering. The Neuroscience Center includes an undergraduate major with approximately 700 majors.

In the Fall of 2017, the Master's and Doctoral degrees were moved from Physiology and Developmental Biology to the Neuroscience Center, consolidating all neuroscience degree programs in place. This has increased cohesion in the program's administration and collaboration.

Neuroscience faculty members and students have benefitted from their association with the two colleges. This shared responsibility for the Center has conferred benefits including integrating faculty from multiple departments.

In addition, neuroscience students have the opportunity to work with and receive mentoring from faculty from diverse disciplines, allowing for a wide ranging and immersive neuroscience research experiences that could not have been accomplished otherwise.



Shared stewardship of the Center has produced collaborative research among faculty and a wider experience for students in labs and in classrooms.

However, the rapid growth of the undergraduate major in the last 10 years has created challenges and moving the Neuroscience Center to a permanent home in Life Science will allow for consistent oversight, continued growth and improvement, and prevent the disruption of moving the Center every five years.

The Neuroscience office will remain in the same location S-192 ESC and will continue to serve students. The advisement center will change from the Liberal Arts Advisement Center to the Life Sciences Advisement Center effective July 1, 2021.

<https://lifesciences.byu.edu/advisement>

Career Services will change as well from Family Home and Social Science to Life Sciences. The Career Directors are Candilyn Newell and Sterling May. You can contact them at <https://careers.byu.edu/students/life-sciences>

Please check the weekly Neuroscience Center email messages and website for additional information.

<https://neuroscience.byu.edu/>

We look forward to this new step in the Neuroscience Center story and opportunities it will bring to these dynamic, multidisciplinary programs.

Samuel Injae Shin Scholarship

Samuel Injae Shin was a bright young man studying neuroscience at BYU. He was gifted with a good work ethic, intelligence, and a good sense of humor. He loved his research in neuroscience. Samuel had many interests including photography, piano, rock climbing, basketball, snowboarding, and various other outdoor activities.

On August 13, 2016, Samuel tragically passed away from a rock-climbing accident, while trying to help an injured friend. To honor Samuel and the light he was, his family established the Samuel Injae Shin Scholarship in 2017. It is awarded annually for the winter semester to Neuroscience undergraduate students and has blessed the lives of many students over the years.

Samuel left a legacy of faith, obedience, integrity, and love. This scholarship allows his legacy to continue on as a life-long learner, as well as his example of righteous living.



*"Legacy of faith, obedience,
integrity and love"*

Recipients of the Shin Scholarship 2021

- Stephen Gilliat
- Jarom Hutson
- Bradley Embley
- Ben Graul
- Leonardo Monteiro
- James Blood
- Kennedy Madrid
- Logan Garr
- James Bates
- Jonathan Hodson

Words of Gratitude

"Thank you again for your kind and generous nature in providing this opportunity. I look forward with confidence to being able to give back to the community once I embark upon my future career."

"Thank you again so much for your Christlike examples. I will give my best effort to honor the memory of Samuel."

"Thank you for your generous endowment... I'm extremely grateful for the faith that you've put in the aspiring neuroscientists at Brigham Young University."

"I had talked with my wife about how we were going to pay for our education next year and receiving such news has brought peace to our home."

"Thank you for your generosity in sharing your funds and your love for Samuel. I am immensely grateful that I now have a connection, however small, to the man I've seen pictured in the Neuroscience office"

"This scholarship has literally been an answer to our prayers and a confirmation that the Lord is continually watching over us."

2021 Neuroscience Art Competition

Every year, the BYU Neuroscience Center invites neuroscience majors to submit creative works expressing the beauty of neuroscience. In years past, many inspiring and magnificent pieces have been submitted and this year is no different. The theme for this year's art competition is:

CONNECTIONS

More than ever, we're learning the importance of connections with one another. With COVID-19, we have found fun and even unimaginable ways to stay connected. These neuroscience majors are learning about neural connections and synapses all the time. We wanted to let this theme inspire the artists and their pieces for this year's art contest.

We hope these art pieces can inspire you to find ways to connect.



FIRST PLACE WINNERS



The winners for this year's competition includes two first place winners, as well as three third place winners. The time and talent put into these pieces are shown through their striking vibrance and their deep meaning. We felt that these pieces truly displayed the theme, Connections, in creative and inspiring ways.

Interconnected

By: Shawna Ibarra

I think one of the most fascinating things about the human brain is how it allows us to communicate, understand, and build relationships with others. I designed the piece to show two people connected not only by hugging, but also emotionally, through their minds.

Synapses of Light

By: Taylor Murdock

"Synapse of Light" features a portrayal of a neuronal synapse—a primary connection of the nervous system. Connections bring learning, understanding, and ultimately light into our lives, which is the one powerful reason that light is an integral feature of this piece. I hope that viewers recognize through the use of lighting, color, and synapse positioning that the pre-and post-synaptic terminals are different from one another yet still reach out towards each other until they finally achieve meaningful connection.



THIRD PLACE WINNERS



Adrift

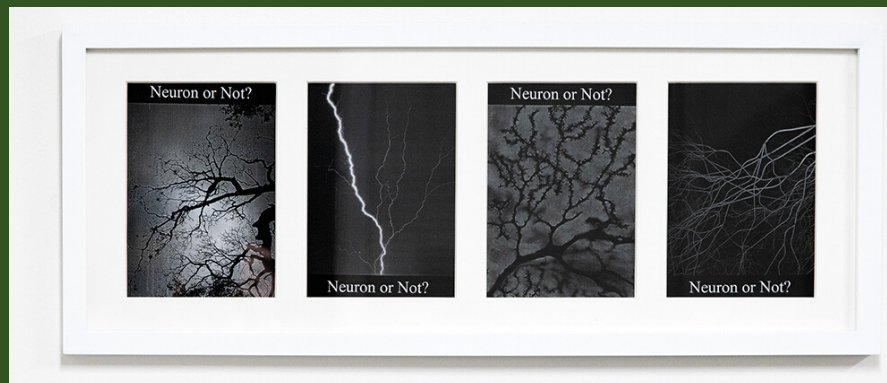
By: Emma Steimle

Since it's been kind of a wild year with a lot of disconnect, I wanted to juxtapose that disconnect with the theme of connections. Thus, I chose to draw neurons, which make up thousands of connections, as seeds in a dandelion, drifting apart.

Neuron or Not?

By: Devin Downing

"Neuron or Not" is an interactive photo collage that highlights the beautiful branching patterns that not only connect our neurons but connect us with nature.



When Hands Touch

By: Celine Timpson

One of the most prominent ways we “connect” and form connections with others is through touch. But have we ever stopped to really think about the miracle that is touch? From the touch receptors on the skin and the release of oxytocin to the feeling of bonding and well-being, touch is so important to us as a species—and we are hardwired with so many tiny connections that make it possible. It’s so fascinating that human connection can begin from a single touch. This piece features two hands and composed of neurons, passing neuro-transmitters between them, much like the connection at axon terminals.

[illegible]

We want to thank you for all your generous donations that have changed the lives of so many students and families. We could not do it without you.

BYU Neuroscience

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S-192 Eyring Science Center
Brigham Young University
Provo, Utah 84602



Photography by
BYU Photo and
Sarah Brown

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Created by the BYU
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- Sarah Brown

If you would like to send
feedback or be featured
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please email us at:

neuroscience@byu.edu

For more information and updates
about BYU Neuroscience, visit our
website: neuroscience.byu.edu.

EXPLORE
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byu.edu/major-exploration](https://universityadvisement.byu.edu/major-exploration)



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