# SYNAPSE

## The Art of Science

Seth Hoffman's Creative Path in Neuroscience

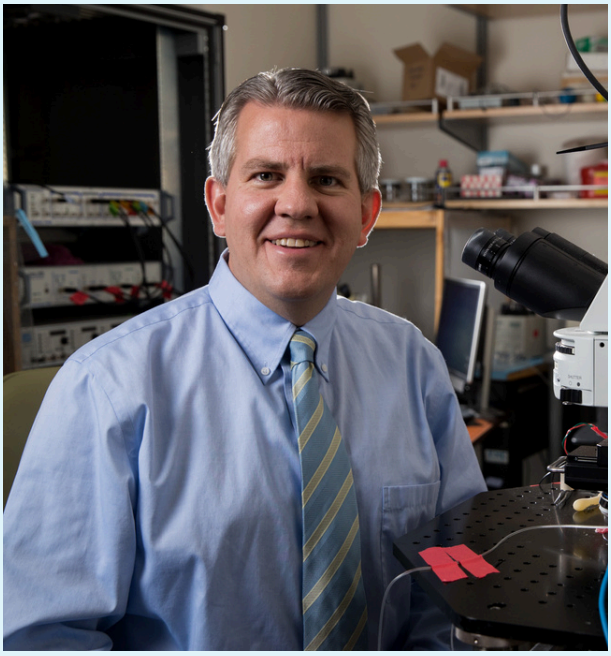
New Course: Neuropathology

Neuroscience Art Contest

Neuroscience Seminar Highlights Alzheimer's Advances

2025 | BYU NEUROSCIENCE

# Celebrating: BYU 150



Dear BYU Neuroscience Community,

We are so grateful and blessed to have so many fantastic undergraduate and graduate students, as well as a multitude of passionate alumni who care deeply for BYU and the Neuroscience Center. To all of you we say, 'Thank You' and are so happy to call you our own. BYU Neuroscience Center alumni are indeed a powerful force for good in the world! During my time as the BYU Neuroscience Center Director, it has been my special opportunity to see contributions that have allowed us to bless the lives of many students through funds for scholarships, research assistantships, internships, etc. The ability for us to bless the lives of Neuroscience students is directly related to the generosity of those who give. We appreciate you more than we can say!

Being able to lead the Neuroscience Center and seeing the passion of the students and their sincere interest to bless the lives of others through their education and career plans has been inspirational. These students truly are fulfilling the aims of a BYU education to 'go forth and serve' and are easily among the best students on campus. This opportunity to oversee the Neuroscience Center has been a great blessing to me to get to know our excellent students and become acquainted with alumni. The power that this group has for good is immense. I am excited to see the future of neuroscience at BYU.

As we look forward to the new 2025-2026 academic year, we are excited for the opportunity to celebrate 'BYU 150', our sesquicentennial anniversary. The focus of BYU 150 is celebrating 'Gifts of Light'. We hope through this focus to initiate opportunities to share our light and the light of Christ with others. As part of this anniversary, the Neuroscience Center hopes to create service opportunities for BYU students and faculty to serve others. We will also have various experiences such as a creative writing competition where students can write about how they will share their gifts of light. Keep an eye out for upcoming activities and opportunities as we celebrate this special anniversary with other departments and colleges across campus.

We invite all students, faculty and alumni to share the 'Gift of Light' for our BYU 150 celebration in whatever way you can share your light with others. Thank you, we love you all!

With warm regards,
Jeff Edwards
BYU Neuroscience Center Director

## BYU College of Life Sciences

### VISION

Inspire learning and discovery in the life sciences for the benefit of the world.

### MISSION

We cultivate an environment that inspires learning and discovery bathed in the light of the restored gospel of Jesus Christ. We study and celebrate the diversity and unity of life. We engage students in excellent academic instruction and student-centered scholarship to prepare the next generation of life science leaders and innovators who will serve throughout the world.

### VALUES

#### Discovering Truth

We value scientific and spiritual truths and affirm that all truths are compatible.

#### Christlike Community

We value Christlike compassion, respect, and kindness in all our interactions.

#### Academic Excellence

We value an excellent academic environment where students are inspired to reach their highest potential.

#### Student-Centered Scholarship

We value substantive student engagement to produce scholarship that benefits the world.

# SYNAPSE



*Welcome to our newest member of the Neuroscience Faculty*

ERIC MELAONKOS

The Melonakos Lab is interested in how neural activity gives rise to consciousness. General anesthesia and sleep are two states defined by a reversible loss of consciousness, making them useful tools for studying which neural features are necessary to generate the conscious state. Synchronous neural activity is a hallmark of general anesthesia and sleep. However, the mechanisms and functions of synchronous neural activity under these and other states remain incompletely understood. The lab uses modern neuroscience techniques, such as in vivo calcium imaging, optogenetics, electrophysiology, and computational tools, to investigate the origins and functions of synchronous neural activity in rodent models.

# *The Art of Science: Seth Hoffman's Creative Path in Neuroscience*

By Gillian Garmon | Photography by Tanner Frost

For Seth Hoffman (PhD '27, NEURO), it took faith to hit submit fifteen minutes before the deadline.

He was the last person left in the building, the quiet hum of the fluorescent lights in the lab at Western Kentucky University accompanying the staccato tap of his fingers across his keyboard. This was the place where it all started—where he had spent countless hours as an undergraduate laying the foundation not only for the research that now propelled him forward into a new stratum of academic success, but also for the faith that inspired him to apply to BYU's prestigious graduate program.

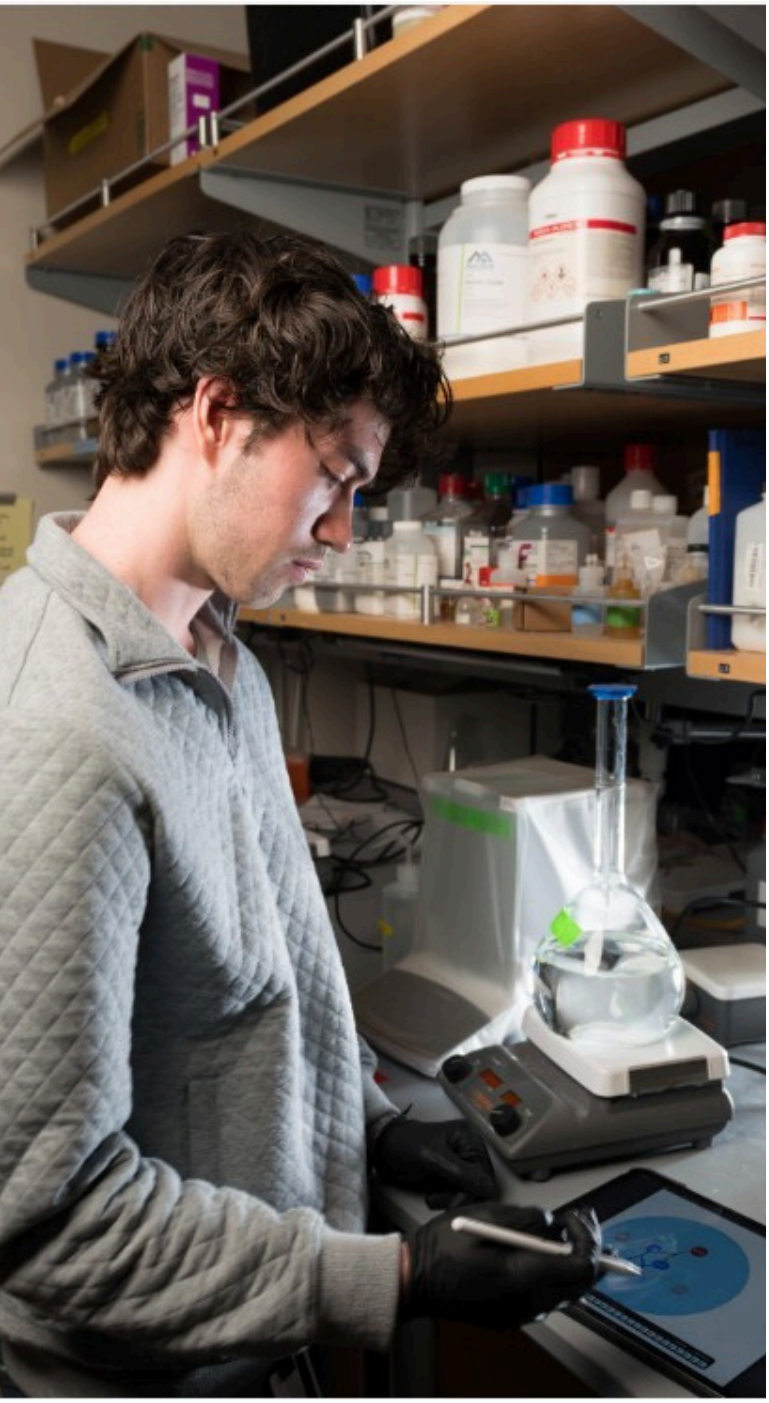
"I did my undergraduate research with Dr. Michael Smith," Hoffman recalls. "His son and I had been best friends in high school, and while I was working with his dad, he sent me a letter asking me to read the Book of Mormon." Encouraged by the Smith family to read and pray for guidance, Hoffman began meeting with missionaries. Over time, he felt a growing sense of conviction that led him to embrace the gospel. After his baptism he decided to apply to BYU.

Though it was 10:00 p.m. and the deadline to apply closed at midnight, Hoffman did not falter. Swiftly attaching the required letters of recommendation,

**"I THOUGHT I WAS ABANDONING SOMETHING GOD HAD GIVEN ME TO PURSUE SCIENCE, BUT THEN IT ALL CAME FULL CIRCLE. IT MADE ME FEEL TRULY SEEN, AND IT MADE ME REALIZE THAT GOD HAS A PLAN FOR ME."**

transcripts, and essays, he felt a sense of immense relief sweep through him as he paid the $45 fee at 11:45 p.m. and submitted his application. A few weeks later, he received an acceptance email. What had begun as a faith-driven foray into the unknown yielded powerful results: an opportunity to grow, learn, and make a lasting impact in ways he couldn't have possibly imagined.

Now working in the Edwards Lab at BYU, Hoffman's love for neuroscience makes every day exciting. "Neuroscience is a discipline of science that applies to everything," Hoffman explains. "You can find examples of neuroscience in any human interaction. We're all products of what occurs in between our ears and understanding that allows me to navigate life with a little bit more clarity."



Using a mouse model to study mouse behavior and compare the effects of drugs like morphine, marijuana, and cocaine, Hoffman is studying the effects of drug abuse on neuroplasticity. "It's really rewarding because it's so clearly relevant," he shares. "Opioid use affects millions of people in the United States. As we learn more about it, we're able to take the necessary steps to help these people." With each new discovery, Hoffman and his team inch closer to understanding the complexities of addiction.

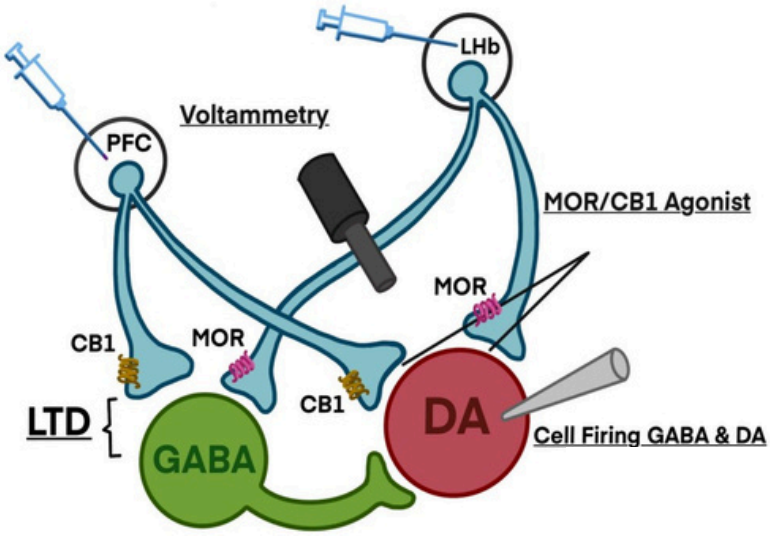
While Hoffman's work in neuroscience is grounded in data and discovery, his artistic skills play a crucial role in shaping how he approaches and visualizes scientific challenges. "I've always been very visually creative; I love drawing and illustration," he explains. "I've done it since elementary school, and because I loved it so much, I naturally became pretty good at it." After joining the Church, Hoffman strongly resonated with the idea that God gives talents for the edification not just of the individual but also for the benefit of others. He started sharing his conversion story through a series of illustrated videos and was amazed by the overwhelming response. One video garnered nearly 50,000 views on Facebook, with viewers commenting on how Hoffman's artwork had deepened their testimonies, strengthened their faith, and even inspired some to contemplate baptism.

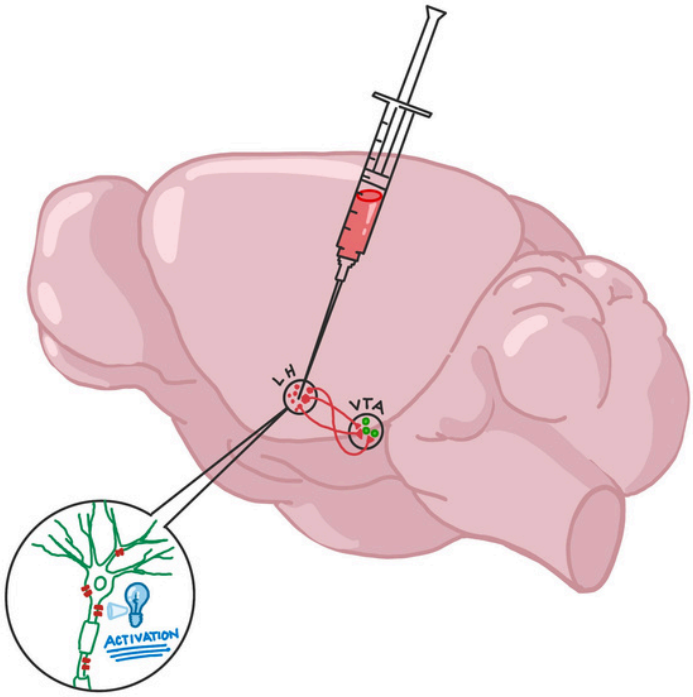
Eager to develop this talent further, Hoffman originally began exploring potential careers in medical illustration but couldn't shake the feeling that he was meant to pursue something different. While working in the Edwards Lab felt like a step in the right direction, a part of Hoffman couldn't help but wonder if he was abandoning the artistic talent God had given him. And then, inspiration struck.

"Once we started receiving data in the Edwards Lab as a result of our research, I started having to communicate that data and share it with people," Hoffman explains. "I had to write about it and present it to other people so they could understand it, and I realized that the best way to do that is visually because a lot of scientific techniques that we do in the lab are really hard to understand with words and so much easier to understand with visual representations."

Once Hoffman began drawing figures and diagrams, the response was overwhelmingly positive. His willingness to go above and beyond by crafting his own artistic visuals for his presentations helped other researchers increase their understanding of complex scientific techniques and data. "It was incredibly fulfilling," Hoffman says happily, "because I thought I was abandoning something God had given me to pursue science, but then it all came full circle. It made me feel truly seen, and it made me realize that God has a plan for me." What had once felt like a crossroads now revealed itself to be the perfect intersection of faith and science.

## Illustrations by Seth Hoffman



# *Neuro 420*
# NEUROPATHOLOGY

The neuroscience curriculum at BYU is designed to provide students with a strong foundation in the fundamental science of the brain. Building on this core knowledge, a newly approved course—Neuropathology 420—offers students an exciting and rigorous introduction to the diseases that affect the nervous system.

Originally offered as a Special Topics course (Neuroscience 360R), Neuropathology 420 was officially approved by the BYU Curriculum Committee in Spring 2024 as a 3-credit course. It has since been taught in both the Fall and Winter semesters—by Dr. Rebekka Matheson and Dr. Paul Larsen, respectively—and will continue to be offered in both semesters in the coming academic year.

The course immerses students in the clinical, radiological, and pathological aspects of major neurological disorders. Topics covered include trauma, tumors, vascular diseases, infections, degenerative conditions, metabolic disorders, congenital abnormalities, and diseases affecting muscle and nerve. Neuroimaging findings—critical for diagnosis—are studied alongside the gross and microscopic pathology of these disorders.

What sets Neuropathology 420 apart is its interactive learning model. In addition to traditional lectures, students engage deeply with written and video-based patient case studies. These hands-on exercises challenge students to apply clinical knowledge, interpret neuroimaging, and analyze pathology to arrive at diagnoses. This integrated approach mirrors methods used in medical education and helps students solidify their understanding through real-world application.

Student response to the course has been overwhelmingly positive. One student shared, “I learned a lot in this class. I think it has been one of my favorite classes I’ve ever taken at BYU. It was fascinating and pulled from all the classes I’ve taken, which felt like it was a great course to help truly apply what I’ve learned throughout my degree.” Another wrote, “Fantastic course. One of my favorites ever.”

For students seeking to deepen their understanding of neurological disease through a challenging yet rewarding experience, Neuropathology 420 is an ideal next step in the neuroscience major.

# BYU STUDENTS *'go forth to serve'* IN THEIR OWN COMMUNITIES


By Melissa Jenson | Photography by Rebecca Fuentes

The adage “Enter to learn, go forth to serve” is a slogan many BYU students are familiar with. The calling inspires students and graduates to use their education to make a meaningful impact in the world.

Two BYU students are learning that this call to service doesn’t always require grand gestures or distant travels.

“Going forth to serve can feel like I need to go somewhere far away,” said Jared Weight, a BYU senior studying neuroscience. “But it’s about lifting where you stand. Rather than saving the whole world, I can help in my local community.”

In a collaboration with the United Way of Utah County, BYU students including Weight and Mazzy Marcucci (also studying neuroscience) are embodying the spirit of service. Both Weight and Marcucci volunteer a few hours each week at the reading club run by the United Way's South Franklin Community Center in Provo.

Each week, BYU students and other volunteers lead reading sessions for kids and teens, focusing on building reading comprehension, vocabulary and pronunciation. The reading club plays a crucial role for immigrant children who are navigating the challenges of adapting to a new country and learning English. Many of these children have faced significant difficulties before joining the club, such as: political and social unrest; separation from loved ones; and economic uncertainty.

“These kids are only 7 or 8 years old, and they’ve been through probably more than I ever will have to go through in life,” Weight said.

Marcucci, who directs eight BYU-supported programs at the center, has been a constant source of support for the children. Her dedication is evident in her work with a young girl who initially doubted her ability to attend college. Through Marcucci's unwavering encouragement, the girl is now excited about her aspiration of attending BYU, just like Marcucci.

Both Marcucci and Weight say the opportunity to serve with the United Way has played a pivotal role in their education and career goals.

Marcucci decided to pursue a career in medicine after her sister was diagnosed with multiple sclerosis, while Weight’s path was influenced by a humanitarian trip as a teenager. Serving at the South Franklin Center has given the students a direction and purpose in their journey to medical school.

“While these kids have a need for reading English, they also definitely have a need for healthcare and proper access to it,” Marcucci said. “Serving has only perpetuated my goals to become a physician because I’ve seen that there are a lot of healthcare inequities in the United States.”

Weight shares the same conviction: “I still would love to do a humanitarian trip as a doctor someday,” he said. “But I’ve realized there’s so much need in marginalized communities right here.”

Serving these underrepresented populations has enriched the students’ education in a way classroom learning alone cannot offer. The few hours spent each week at the reading club is a small sacrifice when compared with the blessings the BYU volunteers have experienced.

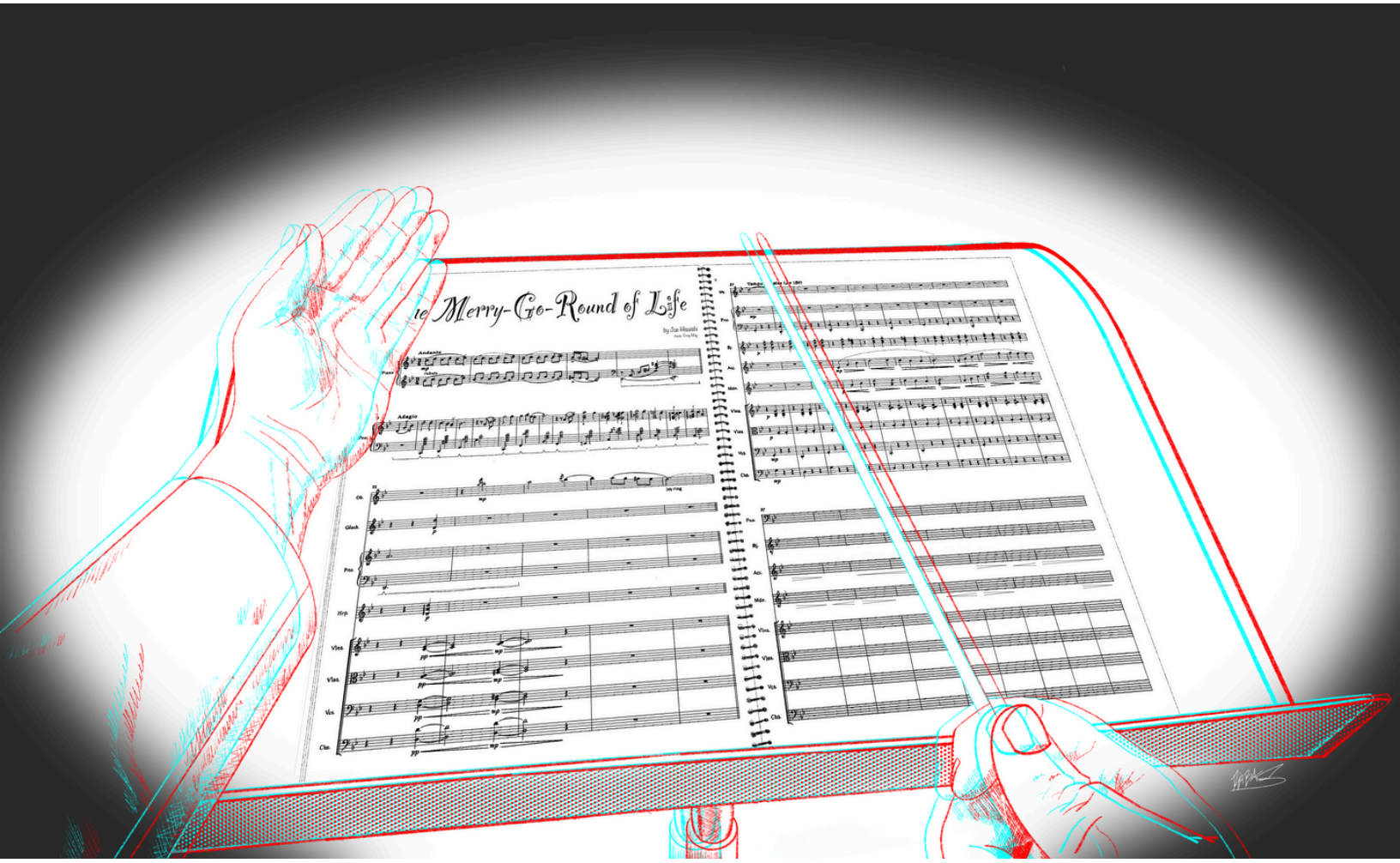
“When I leave reading club I think, ‘This is what life is about.’” Marcucci said. “It’s not about the B I got on a test or about all my worries. It’s about loving and supporting God’s children.”

# NEUROSCIENCE ART CONTEST

## *Neuro Symphony*

## 1ST PLACE

Melody of the Mind: Life in Double Speed
by Amulek Brenes



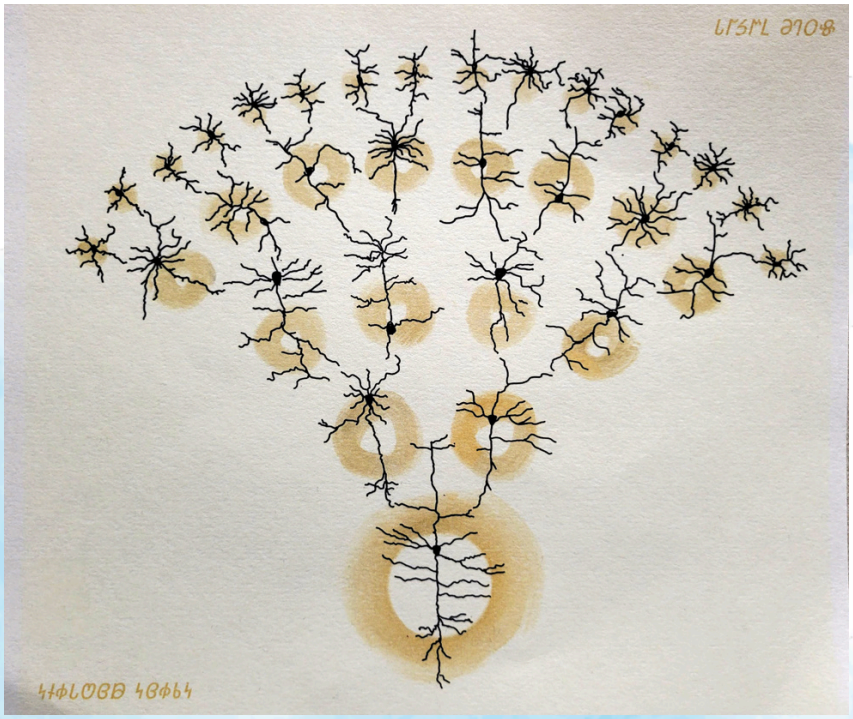

This piece explores the interplay between control and uncertainty as I near graduation, standing on a new stage of life. I chose Joe Hisaish's "Merry-Go-Round of Life" for its cyclical, whimsical tone, which underscores the evolving stages of life.

The conductor's podium represents orchestrating one's future, although some notes are invisible, mirroring an unknown future. The 3D effect doubles and distorts, allowing the brain to process two different perspectives – each eye and each cortical region adding a unique layer to our experience. Like a symphony, it's only when these varied elements come together that we perceive the full depth of life.

At the same time, each viewer's experience, your experience, is an integral part of the artwork. Our brains are not passive observers; they actively reconstruct what we see and feel. The illusions and depth only come to life through your unique perception, connecting the external image and internal understanding. In this way, you, the viewer, complete the artwork, bringing your own neutral "performance" to the piece and reminding us that every mind orchestrates its reality.

# 2nd Place

## Neuron Doctrine by Solei Paget



"Neuron Doctrine" reflects the divine harmony of Heavenly Father's plan. Like the notes in a symphony, each neural connection represents the inherited knowledge and purpose that has been handed down for generations and creates the beautiful synchronicity and symphonic nature of life.

# 3rd Place

## Bill's Brain by Issac Stubbs

A jazz trio of neurons making beautiful music. I think this happens in Bill Evans' brain.

# Honorable Mention

## Cognitive Sonata by Kierra Oyler

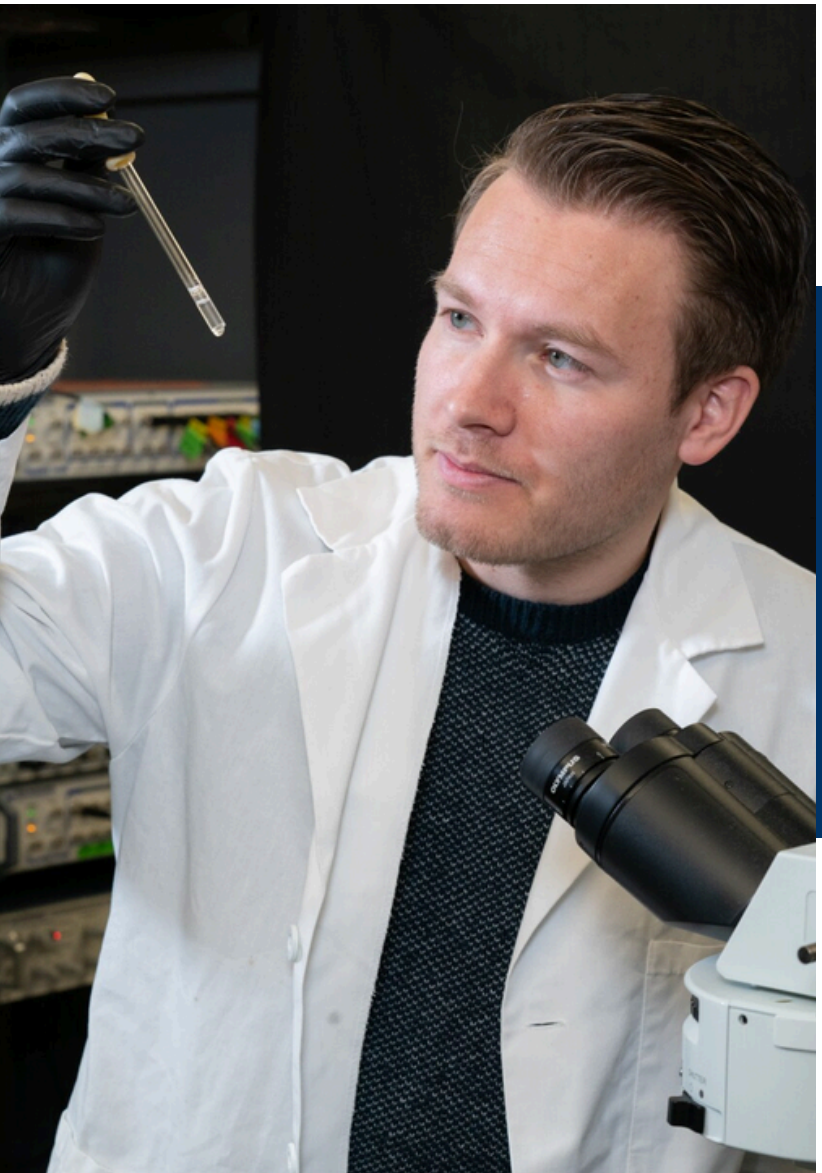
When I was in 6th grade, I joined an orchestra as a beginner violinist. I didn't feel like I was contributing much, but as I practiced my part every day I became an integral part of the orchestra. One neuron alone may not seem impactful, but when combined with other neurons, a neural symphony is created that transforms individual potential into a powerful, harmonious force.

# *Discovering the Impact of Polydrug Use on Addiction*

**BY TRAVIS DAVIES & ERIN SAITO | PHOTOGRAPHY BY SPENCER HALL**

Using multiple types of drugs at once, called polydrug or polysubstance use, is common among opioid users. However, polydrug use is heavily understudied, despite the fact that as many as 80 percent of opioid-related overdose deaths involve alcohol or other drugs.

Research from the Edwards Lab at BYU reveals that co-using morphine, an opioid, and tetrahydrocannabinol (THC), the psychoactive ingredient of marijuana, may expedite the development of addiction. This research may potentially lead to more effective tools for managing and preventing drug dependence and addiction.



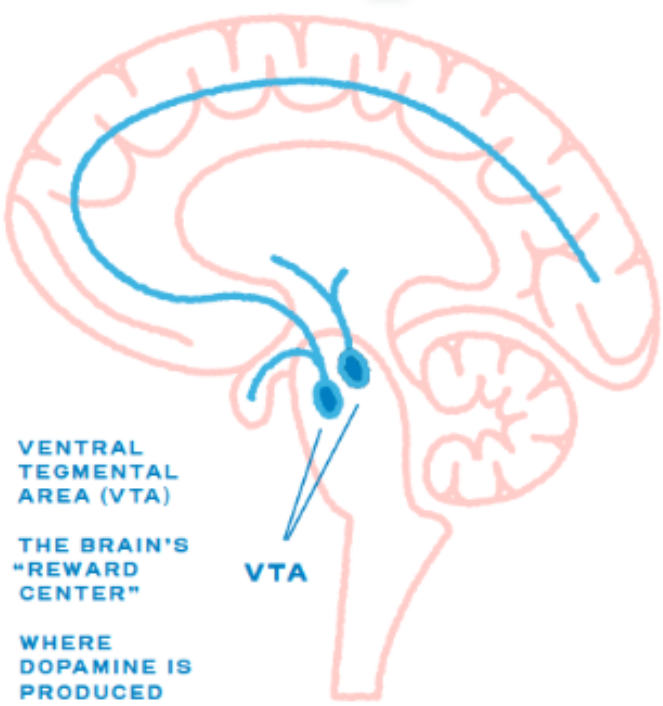
Opioids are a class of highly addictive pain-relieving drugs that, from 1999 to 2021, have been responsible for nearly 645,000 overdose-related deaths in the US—approximately 280,000 of which have involved prescription opioids.1 Opioids encompass legal, commonly prescribed pain medications such as oxycodone, hydrocodone, and morphine, as well as illicit drugs such as heroin and fentanyl. Both opioids and cannabis (marijuana) are commonly prescribed to treat chronic pain and are increasingly co-prescribed.

> "Being prescribed more than one type of drug is extremely common," says Dr. Jeffrey Edwards, professor of cell biology and physiology and director of the BYU Neuroscience Center. "And the reality is that most individuals abusing drugs aren't just abusing one drug—they're co-abusing."

Despite the increased mortality rates linked to polysubstance use, the mechanisms of drug interactions and how they affect addiction are less understood.

Addictive drugs act on a region of the brain

called the ventral tegmental area (VTA), the brain's "reward center." Neurons in the VTA produce dopamine, a chemical responsible for feelings of reward and pleasure. Normally, the amount of dopamine released in the VTA is closely controlled by GABA neurons, which put "brakes" on the dopamine cells to prevent excessive release. But the Edwards Lab has shown that when the GABA neurons are exposed to commonly abused drugs such as opioids and THC, the GABA brakes are released in a process called long-term depression (LTD),
a form of synaptic plasticity. Synaptic plasticity is the ability of connections between neurons in the brain to change over time in response to experiences. Releasing the GABA brakes in response to opioids or THC increases dopamine, which modifies plasticity in the VTA. The increase in dopamine levels through drug use changes the brain's threshold for dopamine, making it more difficult for users to feel pleasure from natural dopamine levels. This is the hallmark of addiction.



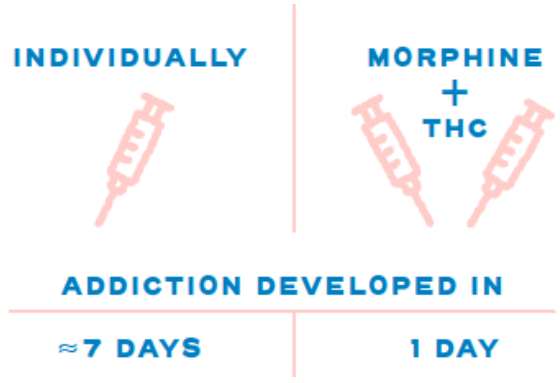

So, what happens when both opioids and THC are used at the same time? To explore this question, researchers in the Edwards Lab exposed mice to either morphine, THC, or both drugs combined. When mice were exposed to either drug individually, changes in plasticity that were indicative of addiction took approximately seven days to develop. But when exposed to the combination of morphine and THC, addiction developed within a single day.

"The effect of combining both drugs is much more potent than you'd expect from looking at the effects of each drug individually," says Michael Von Gunten (NEURO '25) , the PhD candidate spearheading the project. "We saw a rapid acceleration of the onset of addiction, which has serious implications for both prescription and recreational users."

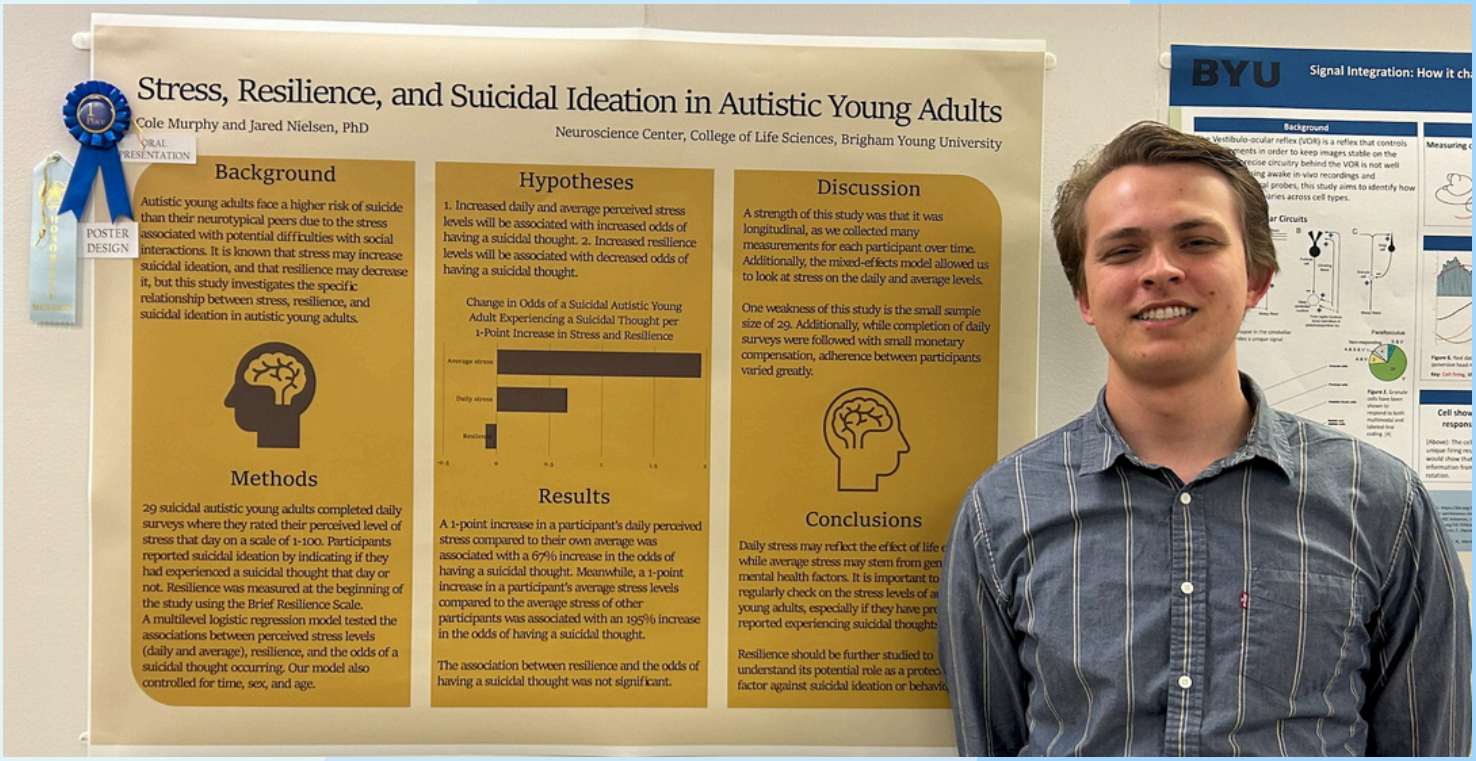
Based on these results, polysubstance use of morphine and THC appear to have a synergistic effect on the development of drug dependence, which is consistent with population data. This study calls for greater caution when co-prescribing opioids and cannabis for pain management and highlights the need for further research on polysubstance use for other combinations of drugs of abuse.

Currently, the Edwards Lab is exploring unique pharmacological interventions that may mitigate the effects of polydrug use on the VTA and the development of addiction.

"As we take our first steps in exploring the polysubstance effects of drugs like marijuana and opioids," Edwards explains, "our research underscores the increasing need for the scientific and medical community to understand drugs' combined effects so that we can make evidence-based decisions on public practices."



# Stress, Resilience, and Suicidal Ideation in Autistic Young Adults

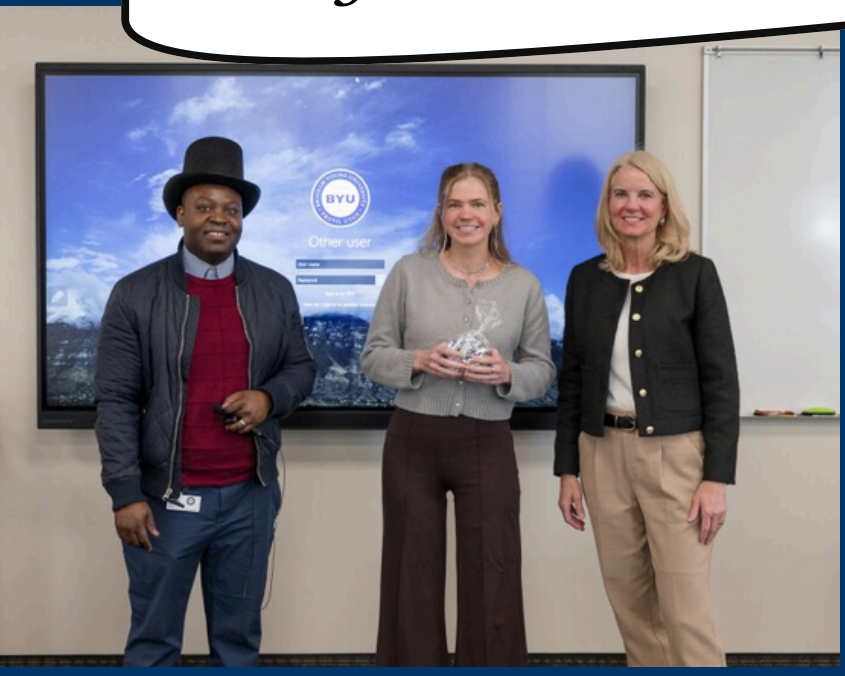



A recent study conducted at Brigham Young University's Neuroscience Center sheds light on the complex relationship between stress, resilience, and suicidal ideation in a particularly vulnerable population: autistic young adults who have previously reported experiencing suicidal thoughts. Led by Cole Murphy and Dr. Jared Nielsen, the research focused on 29 participants who reported experiencing suicidal thoughts. Over a period of time, these individuals completed daily surveys rating their stress levels and indicating whether they had experienced suicidal thoughts that day. Resilience was assessed using the Brief Resilience Scale at the beginning of the study.

The results revealed that both daily and average stress levels significantly increased the likelihood of suicidal ideation. A one-point increase in daily stress was linked to a 67% rise in the odds of suicidal thoughts, while a similar increase in average stress across participants corresponded with a striking 195% rise. Interestingly, resilience did not appear to significantly buffer against these effects in this particular group, though the authors note the small sample size as a limitation.

This study highlights the importance of closely monitoring stress—especially chronic or average stress levels—in autistic individuals who are at higher risk for suicidal ideation. It also calls for further investigation into how resilience might serve as a protective factor, potentially guiding more effective and individualized mental health interventions for autistic young adults.

# Neuro 1st Place & College of Life Science 2nd Place 3 Minute Thesis Competition Winner




Melissa Blotter aims to contribute to the scope of knowledge on status epilepticus, which leads to prolonged seizures that can cause death. She is paving the way to finding more effective medicines to treat the condition.

Epilepsy affects over 50 million people worldwide, including my cousin Josh, whose diagnosis at 28 derailed his dream of becoming a surgeon. In the face of adversity, Josh turned to puzzles —a fitting metaphor for my research into one of epilepsy's most dangerous complications: status epilepticus (SE). SE is characterized as a seizure that lasts longer than five minutes, or back-to-back seizures with no recovery in between. It can be fatal and often become resistant to anti-seizure medication, a phenomenon known as pharmacoresistance.

To study SE, we use rodent brain slice models, thin sections of brain tissue that allow us to observe seizure-like activity in a controlled environment. Traditionally, researchers have recorded this activity using one or two electrodes, offering only a limited view, like trying to solve a puzzle with one piece. To overcome this problem, I use a multielectrode array (MEA), a platform of 4,096 electrodes that captures activity across the entire brain slice, letting us see the full picture of activity. This technology enables us to track where SE begins, how it spreads, and ultimately to test and identify effective medications that can eliminate SE. By expanding our view, we hope to develop more effective therapies that can improve, and even save, the lives of people like Josh, who face the dangers of epilepsy and the possibility of SE every day.

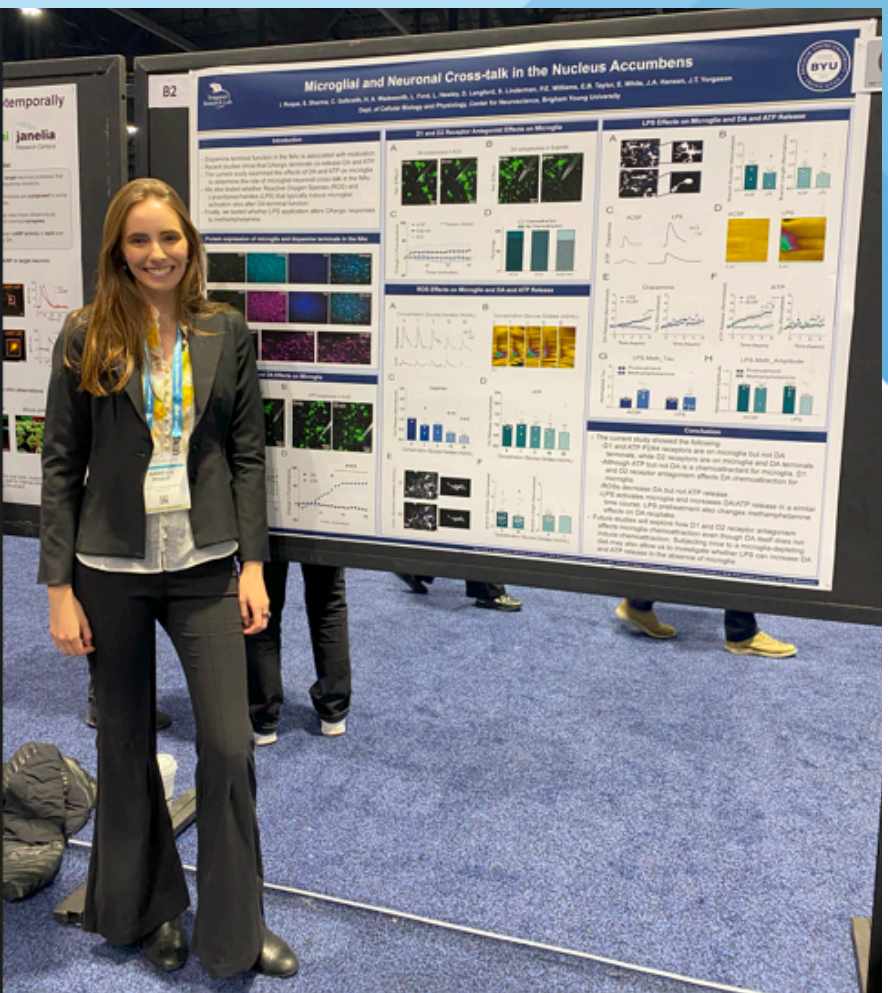
# *Isabella Roque*
# HONORED STUDENT

Why did you choose to study neuroscience?

I chose to study neuroscience because my grandfather died of brain cancer. All my family is from Brazil, and so when my grandfather was diagnosed with brain cancer I was able to see the deficiency in resources in the Brazilian healthcare system. I was eight years old at the time. This experience inspired me from a young age to develop an interest in the human brain and to devote my life to healthcare.

Can you share a memorable accomplishment from your time at BYU?

I really enjoyed publishing my honors thesis during my time at BYU (Bile Acid Effects on Accumbal Cholinergic Interneurons). It took a long time to gather all the data, create figures and write the entire thesis. By the time I was done, though, I felt really proud of what I had accomplished!




Did you participate in any research, internships, or extracurricular activities? What did you gain from those experiences?

I participated in research with Dr. Yorgason for 2 years. I am still working with him but will soon transition over to Dr. Parrish's lab for my master's degree in neuroscience. During my time at BYU, I went to Oaxaca, Mexico for a medical internship. I also completed my honors leadership experience in Brazil, where I organized a series of online trainings connecting Brazilian parents, teachers and healthcare professionals working with children with Autism Spectrum Disorder (ASD) to professors in Utah specializing in ASD research.

What has been your favorite class and why?

My favorite class was NEURO 360 with Dr. Matheson. I liked it so much that I was a TA for that class for Dr. Matheson for 2 years! I liked the class because I have always enjoyed learning about the brain, and taking the class felt like becoming more familiar with an old friend.

Who has been a mentor during your time here and how have they helped you?

Dr. Yorgason and Dr. Matheson have both been amazing mentors to me throughout my time at BYU. Dr. Yorgason helped me throughout the process of learning how to gather data through the patch clamp technique and publishing my honors thesis. Dr. Matheson taught me so much about the brain and increased my passion for healthcare.

What advice would you give to students just starting out in the program?

My main advice would be to be passionate about the brain! There is so much complexity and beauty to the brain, and I deeply believe that studying neuroscience has helped me be more compassionate and understanding of other people. If students coming into the program are passionate about the brain, all the classes in the program will become more enjoyable and meaningful to them.

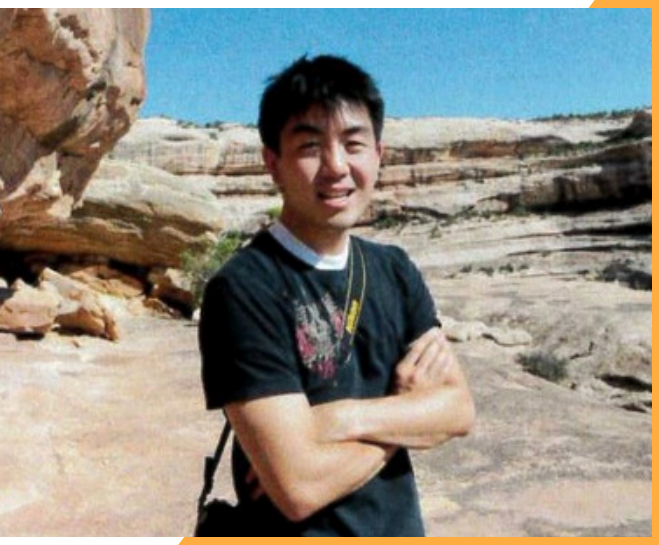
What are your plans after graduation?

I plan on completing a master's in neuroscience at BYU with Dr. Parrish as my mentor. After my master's, I hope to go to medical school and specialize in neurosurgery. I am also considering completing an MD/PhD program.

How has your time at BYU prepared you for what's next?

My time at BYU has deepened my understanding of the connection between knowledge and service. BYU has prepared me to apply the knowledge I have gained to serve others through healthcare throughout my life.

# Recipients of the Samuel Injae Shin Scholarship



Michael Forvil
Jared Wieland
Lucas Petersen
Ronald Ahrens
Eden Ordyna
Dallas Esplin
Sarah Alvarado
Ryan Cluff
Afton Beard
Joe Davis
Emily Linford
June Bryant
Kaylan Christensen
Abigail Ainsworth
Matthew Hong
Kyle Oehler
Sydney Stuart
Olivia Johnson
Josephine Bateman
Brendan Plank

The Samuel Injae Shin fellowship was established to honor the memory of Samuel Shin, who graduated with bachelor and master degrees in neuroscience from BYU, but died tragically in a climbing accident in 2016. The Samuel Injae Shin Scholarship is a way to continue his legacy of life-long learning in neuroscience.

# Rawlinson Scholarship Recipients

Suehelen Garcia
Justin Webb
Ryan Poland

# Student Awards

**2024 LIFE SCIENCE RESEARCH CONFERENCE:**
**WHERE CURIOSITY INSPIRES DISCOVERY**

**1st Place: Addie Hamilton—**Fishing for Neurocircuitry: Identifying Multi-Sensory Integrating Neurons in the Optic Tectum of Zebrafish

**2nd Place: Colby Odom and Griffin Sauer—**Determining if Optic Tecti of Larval Zebrafish Receive Input from Deep Brain Photoreceptors

**3rd Place: Talmage Barney, Alex Rolfson, and Sammuel Bennett—**
Left/right neuronal asymmetry is regulated by the Hox gene mab-5 in Caenorhabditis elegans

**2025 LIFE SCIENCE UNDERGRAD POSTER COMPETITION**

**OPEN HOUSE ORAL PRESENTATION**
**1st place: Cole Murphy -** Stress, Resilience, and Suicidal Ideation in Autistic Young Adults

# Faculty Awards

**EARLY CAREER RESEARCH EXCELLENCE AWARD**

**JORDAN YORGASON**

**SAM & ALINE SKAGGS DISTINGUISHED MENTORING FELLOWSHIP**

**PERRY RIDGE**

**ARMINDA SULI**


# NEUROSCIENCE SEMINAR *Highlights Alzheimer's Advances*

By Gillian Garmon
Photography by Danny Lopez Cedeno

**DR. MARC W. HAUT, PROFESSOR AT THE UNIVERSITY OF WEST VIRGINIA AND DIRECTOR OF THE MEMORY HEALTH CLINIC, WAS THE KEYNOTE SPEAKER FOR THE NEUROSCIENCE SEMINAR IN OCTOBER 2024.**

"Give me a show of hands," Haut encouraged as he began his lecture. "[Is there] anybody here who has had a family member affected by Alzheimer's or another form of dementia?" The majority of the hands in the room went up. "Yeah, that's a lot of people. It's terrible, isn't it? We've got to do something about it."

Haut's rich and diverse 35-year long career as a scientist and researcher allowed him to discuss in depth his experiences in combating dementia by utilizing biomarkers like amyloid and tau in Alzheimer's diagnosis. He also commented on his efforts to improve patient outcomes through the use of monoclonal antibodies to clear amyloid plaque (deposits of protein that form in the spaces between nerve cells) from the brain.

In order to gain access to the region of the brain suffering from amyloid plaque build-up, Haut used a neuroimaging technique referred to as a focused ultrasound. Many of the drugs that treat Alzheimer's disease are too big to easily pass through the blood-brain barrier, but with the use of MRI scans to pinpoint the desired brain location, researchers are able to utilize focused ultrasound like a key in a lock. This technique temporarily opens the blood brain barrier, allowing for the administration of life-saving medication.

For the neuroscience students in the audience, Haut's remarks provided insight into the scientific world they one day hope to inhabit. A world where questions such as, "do structural differences underline differences in activation?" lead to groundbreaking research with solvent-damaged railroad workers.

As students strive to combine classroom learning with experiential education, interactions with professionals such as Haut act as invaluable stepping stones, allowing them to more fully understand how they might apply what they're learning in a professional environment. "Learning about the brain and just how God's creations work is always a faith builder," commented Anna Black MA '26 (NUERO).

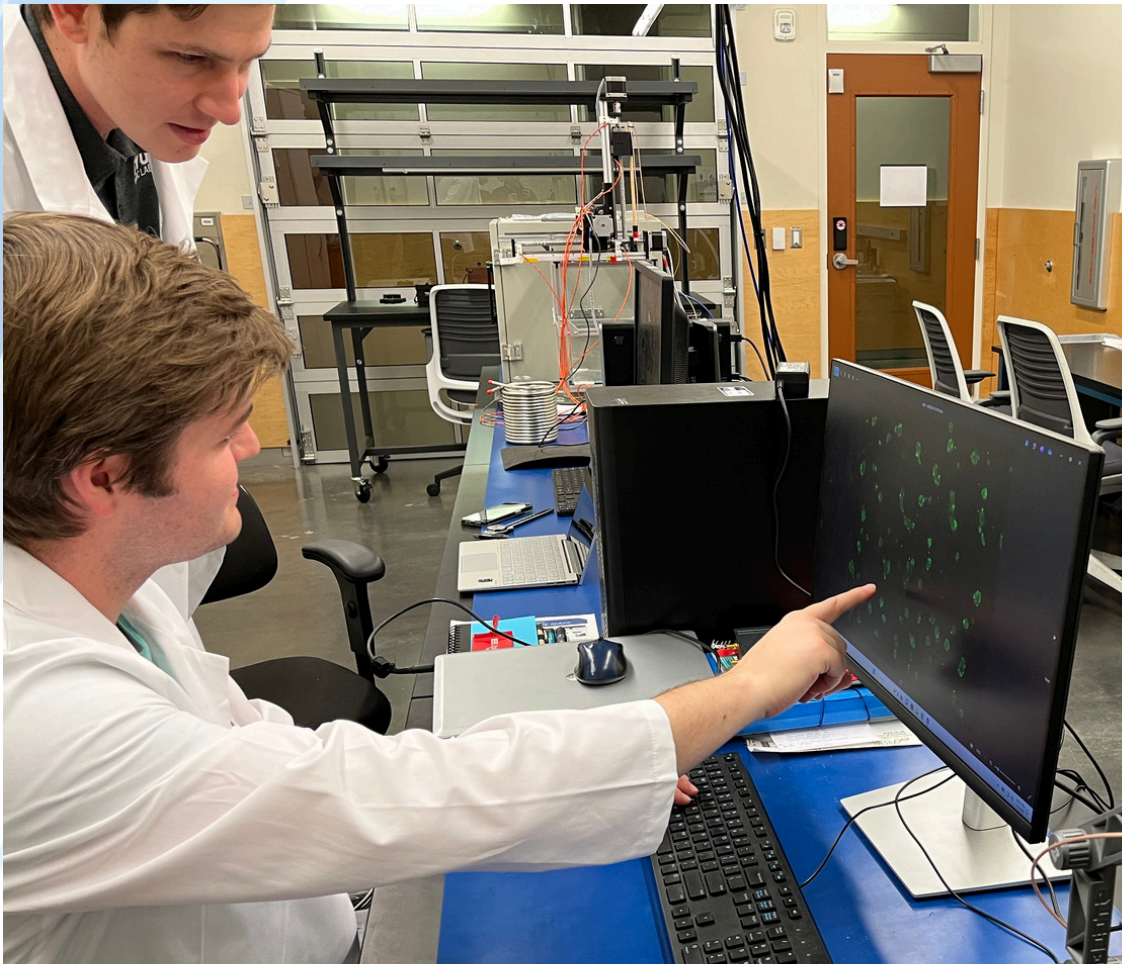
"This seminar has inspired me to learn more about neuroimaging." Her experience highlights how exposure to expert insights not only deepens students' understanding but also fuels their passion for further exploration in the field.

Haut ended his remarks by reminding his audience that "good work knows no limits." He encouraged them to integrate neuroimaging skills both in practice and in the lab. He also expressed immense thanks to all those who believed in him and gave him the opportunity to do good. This sentiment touched many in the audience, especially Black, who felt reaffirmed in her belief that "science is so collaborative."

# RESEARCH HAPPENING IN PRESTON MANWARING'S LAB

Our research aims to explore the mechanisms by which pulsed radio frequency electromagnetic fields can induce neuromodulation. By investigating the electromechanical effects these fields have on the cell membrane, we hope to understand how they influence the function of gated ion channels and induce action potentials. This therapy has implications for treating neurological conditions such as neuropathic pain, epilepsy, Parkinson's disease, dementia, depression, anxiety, ADHD, and addiction, among others.

While previous studies have demonstrated that pulsed radio frequencies can induce neuromodulatory effects, the mechanisms by which they occur are not well understood. Additionally, most existing research has focused on direct-contact electrodes that inject current into tissue, a method that can be challenging to apply to deep neural tissue without invasive implants. Our approach aims to investigate the potential of using electromagnetic fields to achieve similar neuromodulatory effects on deep neural tissue, in a non-invasive manner. This will involve understanding parameters such as the optimal frequency for penetration and resonance with physiological structures, as well as the design of antenna arrays for greater precision and efficacy.



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**~TONYA FISCHIO, BYU DEVOTIONAL, JULY 16, 2024**