



VJAS VOICE  
Fall 2025

# INVISIBLE FORCES

*Exploring the Wonders of Physics and Astronomy*



## WELCOME TO *THE VOICE*

Welcome to the 2025-2026 school year! The Voice is the student-led and student-written publication of the Virginia Junior Academy of Science. We, the Editors-in-Chief, are so excited to present the first issue of this year. The aim of the Voice is to educate our readers on the process of scientific experimentation, presenting research, and covering general news and topics related to various fields of science.

This is the first edition of the school year, with the theme of Invisible Forces (physics and astronomy). These two fields will be represented in the VJAS Symposium on May 30, 2026. We hope that the articles presented in this edition give you inspiration to continue your research in, or learn more about, these two fields of science, and hopefully present them at the symposium this year!

As we said before, the VJAS Voice is student-written. Make your passion for science heard and submit an article for our upcoming issues later in the year!

*Sajeela Ahmad and Taarun Ganesh*  
*Editors-in-Chief, VJAS Voice*  
*2025-2026*

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## THE PRESIDENTS' WELCOME

Dear VJAS community, greetings, and welcome back to the 2025/26 school year!

This year will definitely be a special one, marked by the start of my final and senior year of high school. As I reflect on the memories that marked the past few years of my life, the VJAS stands out as one of the core contributors to the development of my interests and passions. Whether it was going from speaking as a panelist to then hosting the STEMinar, or participating in the symposium itself, VJAS has provided countless opportunities for passionate individuals to pursue and get involved with their interests. Regardless of whether your interests lie in engineering, astronomy, biology, or any other STEM field, scientific success ultimately stems from one core principle: curiosity. For this year's symposium, if you feel stuck, confused, or just need direction regarding your project, consider looking through the various resources that VJAS provides. The Voice has various articles which assist in project-building, and we will be hosting a STEMinar this year in December to prepare you for the upcoming Symposium. This year, the Symposium is going back to being fully in-person and will be hosted at Hampden-Sydney College on May 30, 2026. As we step into another exciting year of exploration and innovation, I encourage each of you to embrace your curiosity, challenge your limits, and continue pushing the boundaries of discovery. I look forward to seeing all that you will accomplish this year.

Best wishes for a successful year ahead,

*Kriesh Tivare*

*Co-President, Virginia Junior Academy of Science*

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Want to submit an article to the Voice? Look no further!

Submit your writing to the VOICE [here!](#)

# VJAS STUDENT OFFICERS

## 2025-2026



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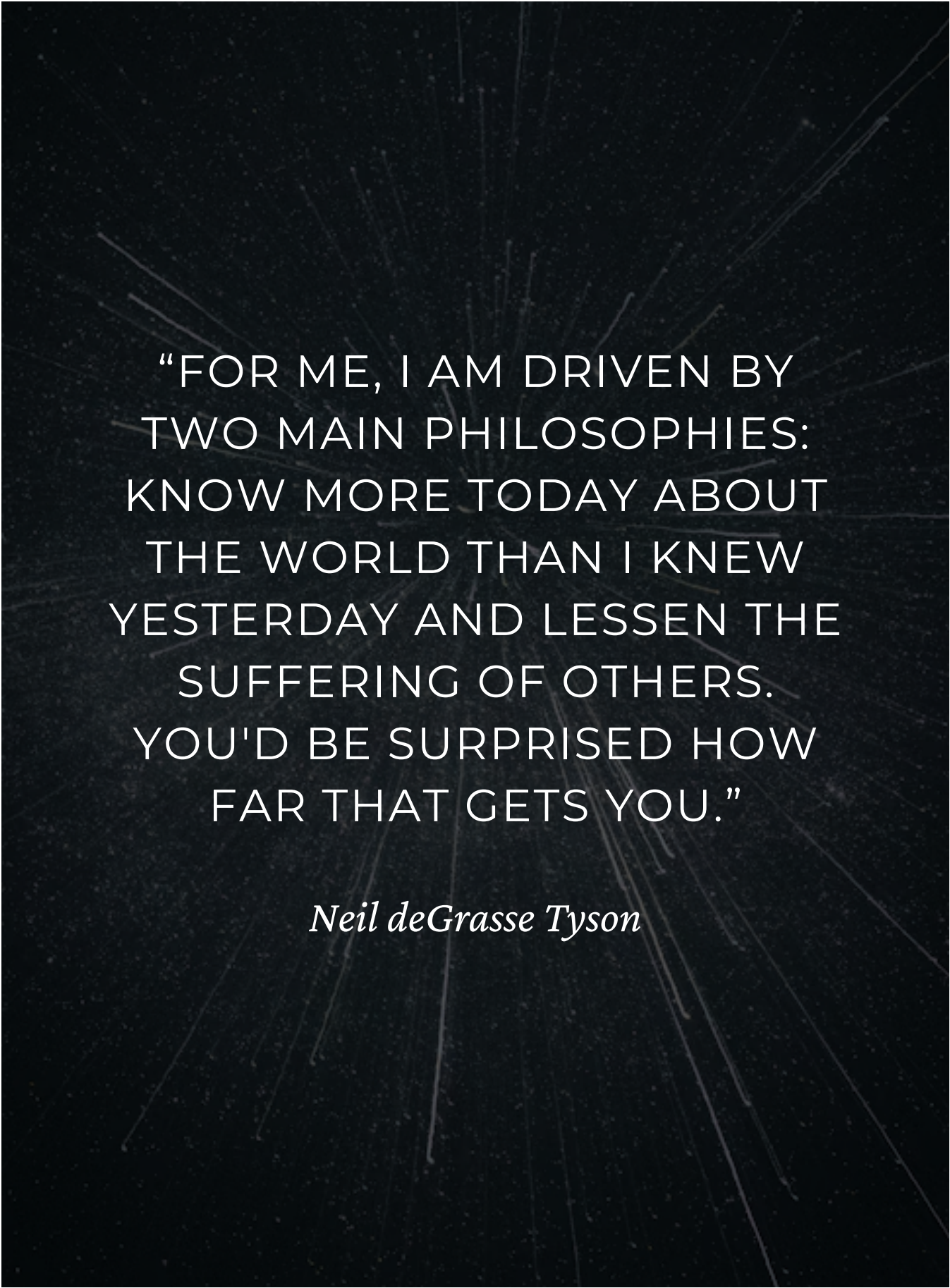
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**Priya Kumar**  
*Communications Liaison*



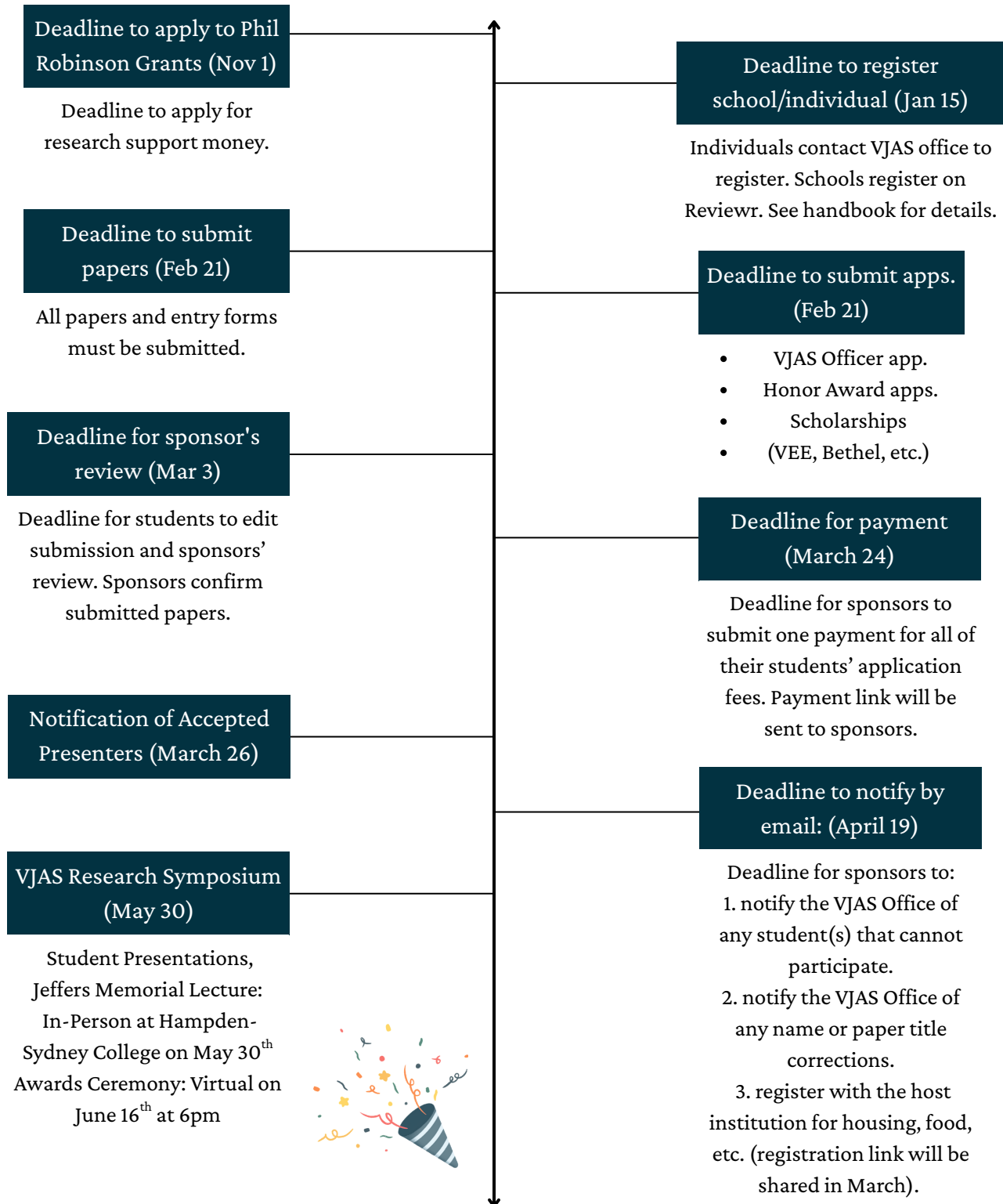
**Danyal Mian**  
*Communications Liaison*



“FOR ME, I AM DRIVEN BY  
TWO MAIN PHILOSOPHIES:  
KNOW MORE TODAY ABOUT  
THE WORLD THAN I KNEW  
YESTERDAY AND LESSEN THE  
SUFFERING OF OTHERS.  
YOU'D BE SURPRISED HOW  
FAR THAT GETS YOU.”

*Neil deGrasse Tyson*

# DATES TO REMEMBER



# CALLING ALL YOUNG SCIENTISTS!

On December 7, 2024, the Virginia Junior Academy of Science (VJAS) will host an engaging virtual STEMinar designed to help students take their research projects to the next level. Whether you are just starting your idea or fine-tuning a paper for submission, this session will give you the tools and strategies you need to succeed at the 2026 VJAS Research Symposium.

## Research Guidelines

The STEMinar will kick off with a deep dive into what makes a strong research project. Students will learn how to select a topic that is not only exciting but also realistic and researchable. We will walk through the process of narrowing broad ideas into focused questions and explain how to identify credible, high-quality sources such as books, peer-reviewed journals, and databases. Participants will also explore the VJAS Handbook, which outlines formatting, MLA citation, and other key requirements that ensure papers meet Symposium standards.

## Looking Ahead: The 2026 Symposium

The 2026 VJAS Research Symposium will be held fully in person at Hampden-Sydney College on May 30, 2026. This marks a return to the traditional in-person format, giving students the chance to present their work live, connect with peers, and experience the excitement of scientific exchange face to face. Students should keep a close eye on the VJAS website for important updates about submission deadlines, registration, and other key dates leading up to the Symposium.

## Interactive Q&A

The session will conclude with a live Q&A, giving students the opportunity to ask questions directly about their projects and the research process. From balancing schoolwork with research to finding reliable data sources, this interactive portion will provide tailored advice to help participants overcome challenges and stay motivated throughout their research journey.

## Don't Miss Out

This STEMinar is a chance to learn directly from experts, connect with other students passionate about research, and prepare yourself for success at the 2026 Symposium. Mark your calendars for December 7, 2024, and get ready to sharpen your skills, avoid common mistakes, and bring your research vision to life.

**Make sure to register [here](#)!**

*Shriya Bandla, VJAS Vice President 2025-26*

# STARTING YOUR VJAS PROJECT

*Madilyn Marsden, VJAS Secretary 2025-26*

## **1. Pick a Topic That Excites You**

Don't just go for the usual stuff, do something you love! Think about something you actually care about or find interesting. Do you love video games? Climate activism? Space travel? K-pop? Whatever it is, there's a way to turn your passion into a research topic. The more interested you are, the easier, (and more fun) the whole project will be.

## **2. Do Some Detective Work**

Start exploring what's already out there. Google it, check out YouTube documentaries, and read some cool articles. This isn't about writing yet, it's about getting inspired and finding out what people are saying about your topic. You might discover a surprising fact or a big question no one's answered yet!

## **3. Ask a Big Question**

Now it's time to focus. What exactly do you want to find out? A great research question is like a mystery you're trying to solve. For example:

"How does social media affect teen mental health?"

"Can music actually help you study better?"

"What would happen if humans lived on Mars?"

Make it specific, interesting, and something you really want to answer. Sometimes it's difficult to come up with a specific enough research question, it can be helpful to ask mentors or professors for help stimulating ideas. You could even research topics they had found through their research but hadn't gotten the time to dive into.

## **4. Make a Game Plan**

Good research = good planning. What sources you'll use (books, websites, interviews?) How you'll collect info (surveys, experiments, research?) When you'll do what (no last-minute chaos, please!)

Treat it like a mission, you've got goals, and research is all about passion.

## **5. Gather the Goods**

Now, get your info! Use trusted sources, take notes, and keep track of where everything comes from.

Things can get very chaotic very quickly if you don't. If you're doing interviews or surveys, be respectful and professional. When reaching out to mentors, make sure to show interest and find someone that's suitable for your project.

## **6. Write It Up (But Make It YOU)**

Time to put it all together. Start with a draft and don't stress about making it perfect right away. Write like you, clear, smart, and maybe even a little funny (if it fits). Organize your work into sections and explain things like you're teaching someone who's never heard about it before. Drafting the first one can be scary, work bit by bit, don't write it all at once. Make sure to follow VJAS guidelines!

## **7. Give Credit Where It's Due**

Don't forget to cite your sources! It shows you've done real research, and it keeps your work honest. Double check everything!



# VJAS Voices

## View the new episode on Ethics in Research on Spotify!

Sajeela Ahmad, Co-Editor-in-Chief interviews Dr. Elizabeth Romano, biology teacher and research mentor at The Governor's School at Innovation Park...

### What is VJAS Voices?

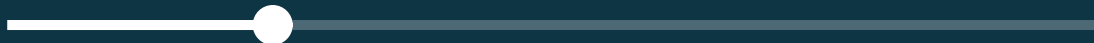
It is a podcast created by the Virginia Junior Academy of Science (VJAS), with a goal of helping students and mentors navigate the process of conducting, submitting, and presenting scientific research for the VJAS Symposium.

### Where to Listen:

You can listen to the podcast on the official VJAS website. The podcast is also available on Spotify.

### Examples of Episode Topics:

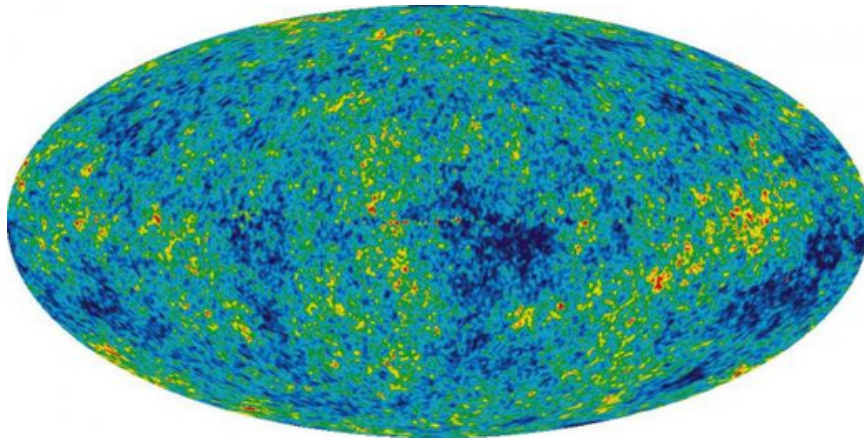
Navigating symposium day, Preparing for presentations, Writing a scientific paper, Conducting effective research, Choosing a research topic, An introduction to the VJAS program.



# COSMIC MICROWAVE BACKGROUND RADIATION: THE HIDDEN SHINE OF THE UNIVERSE

*Aarav Saxena*

When we look up at the night sky, we see glistening stars and gleaming planets; however, tucked behind the radiating sky, there's a faint light concealing the universe known as Cosmic Microwave Background Radiation, or CMBR for short. While invisible to the eye, this archaic light has shone ever since the Big Bang, the start of the universe. It provides scientists with crucial information on how our universe was formed, but what is CMBR, and why is it so important? CMBR is the remaining energy from around 380,000 years after the Big Bang. The Big Bang was an intense explosion that formed the universe as we



know it, and after it occurred, it took 380,000 years for the universe to cool down enough for protons and neutrons to form atoms. As the universe continuously cooled and expanded, the energy mirrored it, elongating from very small wavelength energy into microwave wavelength energy, creating the faint light we know today as CMBR. Specifically, CMBR is important in

astronomy since it provides direct clues as to how our universe was born and what happened shortly after its birth. By studying specific temperature and density variances present in the universe, scientists can understand the structure of our universe as we know it. These variances reveal the outlines of planets, stars, and galaxies, and their formation.

Concurrently, CMBR helps scientists study the composition of our universe. So far, CMBR has helped us discover that our universe is primarily composed of invisible materials, such as dark matter and dark energy, while only a small portion is made up of visible, ordinary matter. Moreover, using CMBR, astronomers have been able to discover that the universe's age is roughly 13.8 billion years.

Lastly, CMBR paves the way for future discoveries. Scientists are continuously working to better our understanding of the universe, and with new technology, CMBR will continue to tell us more about the universe. Currently, astronomers are coming up with new theories of how our universe was formed, and many use CMBR as the foundation of their theories. While indistinguishable to the naked eye, Cosmic Microwave Background Radiation, or CMBR, is one of the most pivotal parts of learning the history of the universe. Currently, scientists have limited knowledge of the universe, but with CMBR, there's no telling how much more we can discover.



# ELECTROMAGNETIC FIELDS: POTENTIAL FOR POWER TRANSMISSION?

*Kriesh Tivare, VJAS Co-President 2025-26*

When conventional forms of power transmission, like power lines and cables, fail, individuals are often left without power for minutes to weeks. Innovation in power lines over the past decade has focused less on radical changes to the basic technology and more on advanced materials, monitoring technologies, and digitalization to improve the existing infrastructure. The goal is to increase power capacity, improve efficiency, and enhance grid resilience, especially to handle the growth of renewable energy. However, if an entire sector of buildings can lose power from one singular disconnect of a power cable, the question arises: How necessary are wired lines for power transmission?

Electromagnetic fields, once primarily studied for their theoretical significance, are increasingly being explored as a means for wireless power transmission — a concept that could transform modern energy infrastructure. Using principles of electromagnetic induction and inductive coupling, researchers are developing systems capable of transmitting power without the need for physical cables or traditional power grids. These systems rely on circuits that combine coils and capacitors in parallel configurations. When tuned to their resonance frequencies, these circuits can efficiently transfer energy between one another through inductive coupling. Proper alignment of the coils enhances the magnetic flux linkage, thereby improving transmission efficiency and reducing power loss over distance. The implications of this technology are far-reaching. Conventional power lines are vulnerable to damage from storms, falling trees, and other natural disasters, leading to widespread outages. Even underground lines, often considered safer, can be compromised by flooding or seismic activity and can disrupt underground ecosystems. Wireless power transmission through tuned resonating circuits offers a fault-tolerant alternative that could ensure consistent energy delivery even under adverse conditions. Electromagnetic power transfer is already evident in everyday technologies such as wireless charging pads and electric vehicle charging systems. However, scaling this concept for large-scale power distribution presents both an engineering challenge and an opportunity. As research advances, electromagnetic coupling may soon pave the way for a more resilient, sustainable, and infrastructure-independent future of energy transmission.

# CLUB HIGHLIGHT: DR. KARLA MOSSI VISITS MLWGS WOMEN IN STEM CLUB

*Priya Kumar, VJAS Communications Liaison 2025-26*

On Monday, October 8th, Dr. Karla Mossi visited the MLWGS Women in STEM Club for a guest lecture about her journey, both personally and professionally, to becoming a leader in her community and a Forbes-recognized scientist. Dr. Mossi, who currently serves as both a Professor and Program Director of VCU's Mechanical and Nuclear Engineering Department, spoke about her presence as a woman of color in a male-dominated background, citing her childhood and education as vital components to her accomplishments today.

To begin, Dr. Mossi discussed her childhood and upbringing in Honduras. She grew up as the only woman in her family, with three brothers who all pursued STEM careers later in their lives as well. From the start, Dr. Mossi was interested in finding problems in her community and attempting to fix them, which ultimately led her to choose to pursue engineering as her career. Her transition to studying engineering at The National Autonomous University of Honduras (UNAH) was underscored by the fact that she grew up attending an all-girls school. However, Dr. Mossi stated that her undergraduate experience was not completely negative; the boys at the school treated her as a "younger sister," even as she continued studying engineering as the only girl in the program. In her college years, Dr. Mossi's work was greatly influenced by the rural area she grew up in; for example, a project that she worked on in undergrad involved "building a machine to cut grass for livestock using recycled materials." After finishing university, Dr. Mossi came to the United States, where she attended Old Dominion University and received her Master of Science and PhD in Mechanical Engineering. Through her academic journey and her work at VCU, Dr. Mossi shared the lesson that engineering is not always the highly technical, complicated image that it sometimes presents. Rather, engineering can involve attempting to find ways to make something more accessible to a community, to make it simpler instead of more complex. Dr. Mossi stated how her idea of engineering aligns with VCU's motto for its engineering program, "Engineering for humanity." Furthermore, Dr. Mossi discussed the obstacles she faced throughout her career due to her gender and presence in a largely male-dominated field. A difficult moment in her career that she mentioned is when she heard others complain about her, saying that she was "too sensitive," a common jibe against women who work in STEM and other fields with a lack of female representation. When she originally heard the statement, Dr. Mossi said that she took it as an insult and was hurt. However, Dr. Mossi stated that her outlook has changed now; she sees being "too sensitive" as a compliment, as it clearly shows that she cares about the impacts of her job on the individuals around her. On speaking about female representation in engineering as a whole, Dr. Mossi said, "There is change, but it is too small," elaborating that from 2005 to 2025, the percentage of women in the area of engineering at work has only increased by around 5%. She spoke about how if she had the opportunity to go back, she would be more sociable and "more insistent in the search for opportunities, not wait for them to arise on their own." She spoke about the importance of supporting other women, echoing the call of "see something, say something" and mentioning the significance of "giving others opportunities to speak up and participate." Her advice to young women in STEM? To "look for opportunities," not "wait for them to appear."

# VJAS ALUMNUS WRITES:

## *Kieran Wall*

When I arrived on the campus of Ferrum College in late May, it was as though I was stepping back in time. Seeing groups of middle and high school students wander the campus, dressed in business attire, anxious to give their talks, I was reminded of my own experience at the Virginia Junior Academy of Sciences Symposium eight years before. My symposium was at VCU, not Ferrum. And I had presented in the chemistry category, while it was the engineering category that brought me back. But beyond these superficial differences, the core of the VJAS symposium was still the same as it had been when I was in middle school – a stellar opportunity for young students to learn what it is like to be a scientist.

While a student at George H. Moody Middle School, my wonderful 6th and 7th grade science teacher Ms. Mitchell strongly encouraged me to conduct a research project. I enjoyed my science classes at least as much as my other ones, so I gave it a shot. As a middle school boy, I was naturally fascinated by anything to do with fire, so I conducted an experiment testing what types of wood sustain combustion for the longest. After months of work with Mrs. Mitchell (and of course my parents), I put the finishing touches on a report to submit to VJAS to participate in their 2017 symposium.

I had no clue what it meant to give a talk, and the thought of speaking in front of an audience that could ask questions I hadn't scripted the answers to was mortifying. However, when it was my turn to talk about my little wood burning experiment, I had an absolute blast. I realized during my VJAS presentation that the work of a scientist did not stop outside the lab. Effectively communicating one's results was just as important as reaching them in the first place.

My academic journey diverged from science quite dramatically following the wood project and my presentation at VJAS. I became more interested in my history courses, and gravitated towards the high school specialty center that offered electives directed towards those topics. For most of late middle school and all of high school, I wanted to be a lawyer. At least until I got the opportunity to see what lawyers actually do. While shadowing a local attorney, I got the sickening feeling that suddenly I had no idea what I wanted to do with my life.

During this time of stress about the future, I reflected on what I had done in the past that I had genuinely enjoyed. One of the first things to spring to mind was my wood burning project and my presentations on it at science fairs including VJAS. I had what amounted to a hobbyist interest in physics and astronomy at the time, reading Wikipedia articles on particle physics and looking at the planets through a backyard telescope. This burgeoning fascination, backed by my positive experience at VJAS, set me on a new path. I enrolled at the University of Virginia as a physics major, and was off to the races. I came back into contact with VJAS through Professor Craig Group, my research advisor at UVA. I was helping him to organize the Virginia Academy of Sciences meeting at UV A, when he mentioned that the junior academy was in need of judges. I was thrilled at the opportunity. VJAS had been in many ways the starting point of my journey into scientific research, a journey that had taken me all across the country, from Kentucky to California. But in May it took me back to VJAS, where I was to serve as head judge of the high school engineering category. In a comically full-circle moment, the very first person I bumped into was Mrs. Mitchell, who had driven me to try science for the first time back in middle school. After a while of catching up, I set up shop in my room and got the chance to hear over a dozen talks from students across the Commonwealth on their science projects. In a time in which the future of science in the United States feels more uncertain than ever, it was inspiring for me to hear about the work of the next generation, from the next generation. I did my best to provide the students in my category with the same opportunity that VJAS had given back in 2017, to learn a little about what it is like to be a scientist.

Opportunities like these are the reason why VJAS is so important to the young scientists of Virginia. They can shape future careers, just like they shaped mine.



Thanks for reading this issue of the  
VJAS Voice!

To submit an article for the next issue, please email:  
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**Resources:**

VJAS Website: <https://vjas.org/index.html>  
VJAS Handbook: <https://vjas.org/handbook.html>

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