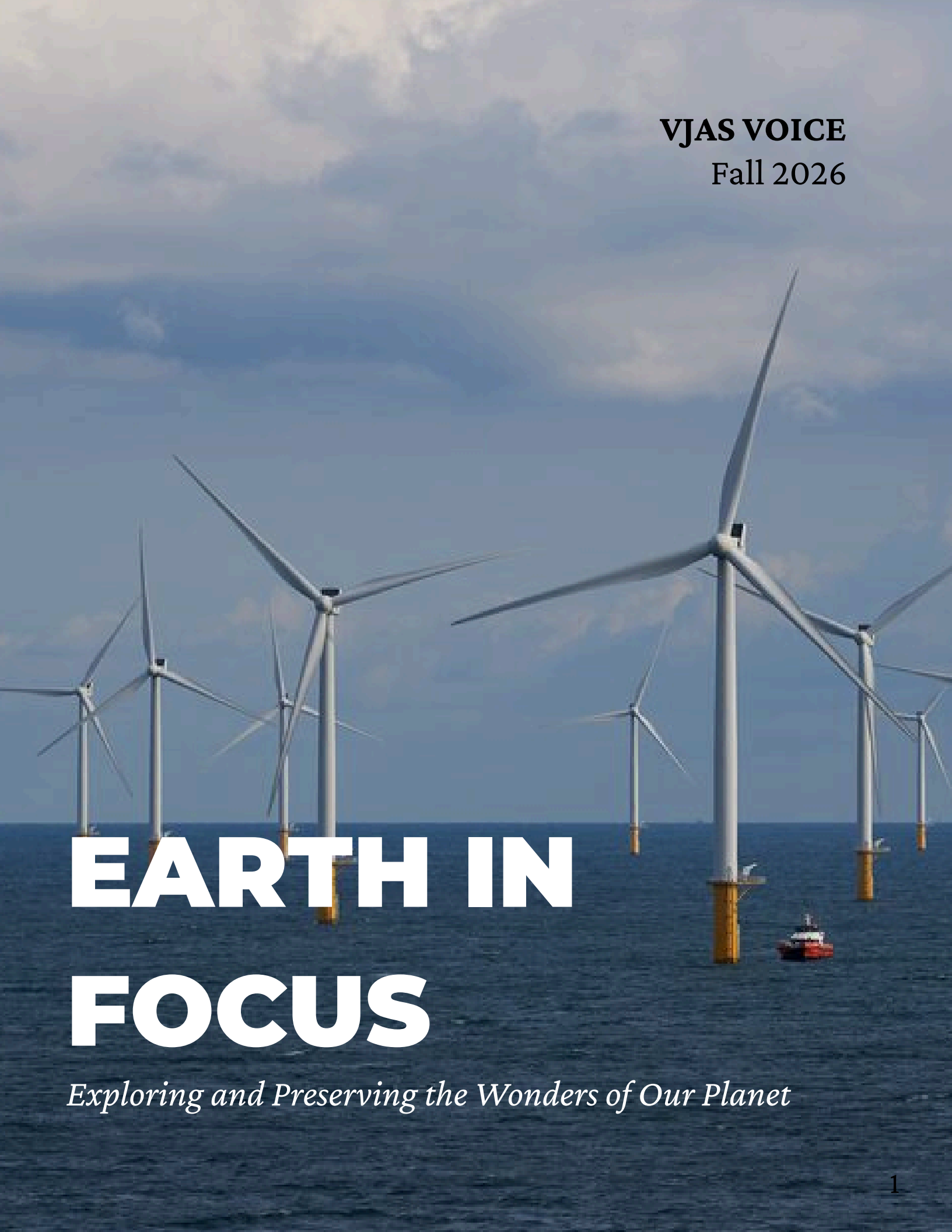


A photograph of an offshore wind farm with several large white wind turbines on yellow foundations in the ocean under a blue sky with light clouds. A small red and white boat is visible in the water near the turbines.

VJAS VOICE
Fall 2026

EARTH IN FOCUS

Exploring and Preserving the Wonders of Our Planet



Credit: NPS

THE PRESIDENTS' WELCOME

Dear VJAS Community,

Greetings, and welcome back to the 2026/27 school year!

My name is Taarun Ganesh, the president of Student Leadership for VJAS. This year will mark an exciting year as we will be returning to Northern Virginia for the in-person symposium after a long time! As I look back on the journey that brought me to my senior year, VJAS has been such an integral part of my life. From being a nervous freshman presenting my computational biology project to being able to work with so many strong individuals on the leadership side, VJAS has consistently given hardworking minds such a strong place to grow, experiment ideas, and meet new students.

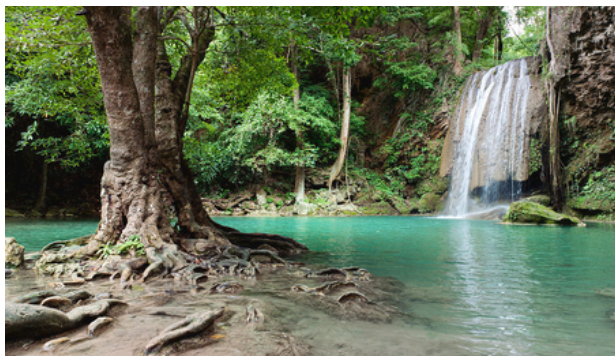
On that note, if you are currently having trouble brainstorming ideas for a new project this year, remember that VJAS posts a ton of resources on its website (vjas.org) to help students, whether this is your first season or your fourth. Additionally, the Voice has posted tons of articles on creating a project, from creating a novel idea to interpreting your results. We will also be hosting our annual STEMinar in December to walk you through the whole process well ahead of the registration deadline, so please be sure to join in for that session!

As we begin another year of experiments, late-night data collection, and last-minute presentation edits, I want to encourage everyone to ask for a second opinion on your project. Remember that you are not alone: I am always happy to provide an extra pair of eyes on your project, and you should not feel shy about reaching out to your mentor for help! I can't wait to see all of the new ideas this year at the VJAS Symposium on May 22, 2027, at Potomac Shores Middle School in Prince William County, Virginia.

Best of luck for the upcoming school year and symposium,
Taarun Ganesh

CONTACT US

Contact us at voice@vjas.org.



Credit: Fine Art America

WELCOME TO THE VOICE

Welcome to the 2026-27 school year! We as the Editors-in-Chief present to you the first quarterly VJAS Voice publication which strives to inject science into this exciting school year.

The VJAS Voice is a student-initiated publication compiled by the Editors-in-Chief, officers, and community members of Virginia's premier junior scientific organization. The mission of the Voice is to educate student readers about scientific investigation, paper writing, and presentation. It aims to provide students with the skills and knowledge they need to participate in the annual VJAS symposium and beyond. The Voice team also aims to spread current scientific advances, news, and hot topics across various scientific disciplines.

As mentioned earlier, this is the first Voice edition of the academic year. This edition's theme, *Earth in Focus*, dives into current environmental science and technology topics along with botany and zoological sciences. Not only are these key topics covered in the VJAS symposium, but are also pressing issues in the modern world we wanted to share. We hope that shedding light on current research in these topics along with information about VJAS and the symposium will compel you to investigate these topics further and maybe even conduct a year-long research project to present at the symposium in the spring!

The VJAS Voice is student led and written. Make sure to make your scientific **voice** heard by submitting your thoughts and articles for the next edition. See past editions at <https://vjas.org/publications/vjas-voice/>. Additionally, make sure to participate in our symposium and upcoming events such as our STEMinar.

Eshaan Patel and Maedot Ayalew
Editors in Chief
2026-2027

HIGHLIGHTS

WELCOME

From Presidents & Editors

MEET THE OFFICERS

2026-2027

TIMELINE

Due Dates & Important Info

INTERESTED IN BEING A MENTOR?

*Learn more about this
exciting opportunity.*

STARTING YOUR PROJECT

Advice on Getting Started

VJAS VOICES

LExplore the VJAS Voices podcast!

NEWSLETTER ARTICLES

*Dive into the complex and
fascinating world of
Environmental Science!*

VJAS STUDENT OFFICERS

2026-2027

President – Taarun Ganesh

Taarun is a senior at Thomas Jefferson High School for Science and Technology, with a passion for research in bioinformatics and cell biology. Outside of academics, Taarun enjoys helping his local community through initiatives such as The Future Brighter, a local non-profit providing STEM education to elementary students, as well as being president of TJ Neuroscience Society.

Fun Fact: Taarun enjoys singing Indian classical and pop music, along with spending time with his friends



Vice President – Sajeela Ahmad

Sajeela is a senior at Governor's School at Innovation Park and Charles J. Colgan High School. Her academic interests include cancer biology, environmental health, and the societal impact of scientific innovation. She hopes to pursue a career as a physician-scientist. She enjoys drawing, biking, and writing.

Fun Fact: Sajeela loves to sing



Secretary – Mirabella Garza

Mirabella is a senior at Blacksburg High School with a passion for STEM research and collaboration. She is interested in studying biomedical engineering or biochemistry after high school. In her free time, she loves to play sports, read, and hike with her dog. As VJAS Secretary, she is excited to help contribute to the supportive and innovative environment that the symposium fosters.

Fun Fact: Mirabella's favorite movie is Good Will Hunting



Secretary – Zach Martin

Zach is a senior at Central Virginia Governor's School, as well as Liberty High School. He has a strong passion for student leadership, representation, and inclusion. He has additionally been involved in SCA at the state level and the Special Olympics. Relating to academics, Zach has enjoyed learning about and conducting research in the field of botany, where he hopes one day to combine that interest into the field of aviation.

Fun fact: Zach is on the varsity volleyball team

VJAS STUDENT OFFICERS

2026-2027

Communication Liaison – Chloe Sistrunk

Chloe is a sophomore at Charles J. Colgan High School. She has a passion for chemistry and hopes to pursue a degree in the sciences. She is also passionate about supporting and encouraging other students by sharing her experiences and having a love of scientific research.

Fun fact: Chloe enjoys competitive golf and spending time outdoors with family and friends.



Communication Liaison – Aarav Saxena

Aarav is a sophomore at Maggie L. Walker Governor's School. He is passionate about neuroscience, artificial intelligence, and exploring how technology can improve quality of life. He hopes to pursue a career using research and technology to address real-world challenges, advance scientific innovation, and create a better future for humanity.

Fun fact: Aarav enjoys playing soccer, spending time outdoors, hiking, and exploring new trails with friends and family.



Editor in Chief – Maedot Ayalew

Maedot is a sophomore at H-B Woodlawn Secondary Program. She is passionate about computational physics, machine learning, and space weather research, and she loves using science and technology to solve real-world problems. Outside of research, Maedot enjoys teaching STEM, leading her school's Astronomy Club, and encouraging other students to get involved.

Fun fact: Maddy plays flag football and enjoys reading.



Editor in Chief – Eshaan Patel

Eshaan is a sophomore in the Center for Medical Sciences at Godwin High School. He has always been fascinated by science and scientific research. In addition to VJAS, Eshaan has expanded his scientific background by participating in science summer camps, biology olympiads/clubs, and by leading his school's medical club. Outside of academics, he enjoys hiking, taekwondo, competitive cricket, and pickleball with his friends.

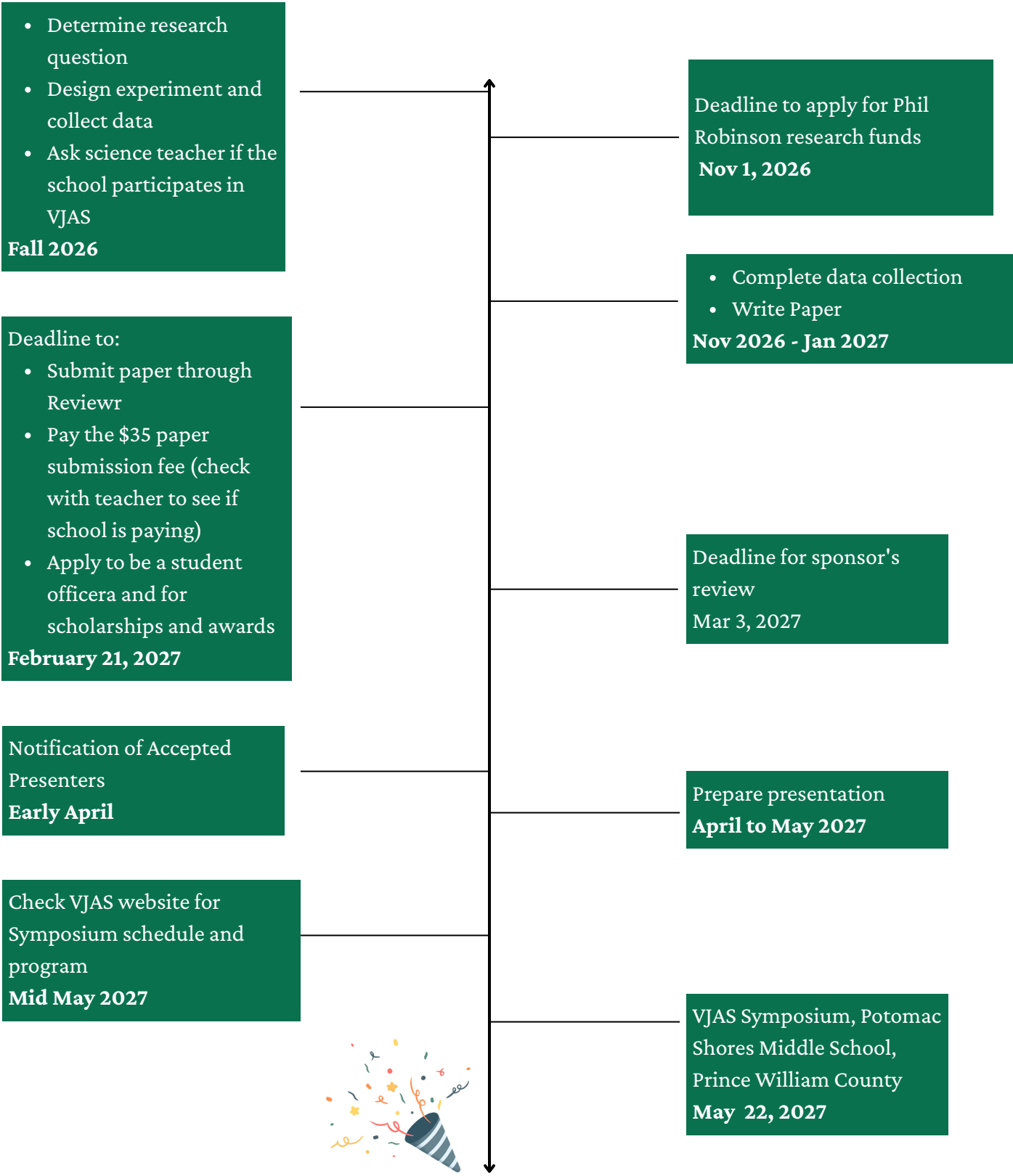
Fun fact: Eshaan has been participating in VJAS for 4 years and outside participates in scientific associations and groups outside of VJAS



**“SUSTAINABILITY, ENSURING THE
FUTURE OF LIFE ON EARTH, IS AN
INFINITE GAME, THE ENDLESS
EXPRESSION OF GENEROSITY ON BEHALF
OF ALL.”**

Paul Hawken

DATES TO REMEMBER



Phil Robinson Research Grant

The deadline to apply for the Phil Robinson Research Grant is November 1, 2026.

Need funding for your research project? You can apply for the Phil Robinson Research Grant, dedicated to providing financial support for student projects.

Research grant funds are available to students in grades 7 through 12 who attend public or private schools or are home-schooled.

This is a valuable opportunity for students to be able to conduct experiments they are passionate about. See the VJAS handbook for more information about the guidelines and application process.

VJAS Handbook:

<https://vjas.org/students-virginia-junior-academy-of-science/>

INTERESTED IN BEING A MENTOR?

Share your experience. Inspire the next generation of scientists.

VJAS is always looking for scientists, educators, and experienced researchers who are interested in supporting Virginia's young scientists. As a mentor, you can help students develop their research ideas, navigate the scientific process, and prepare their work for the VJAS Symposium.

What does a VJAS mentor do?

Mentors can provide guidance throughout the research process, from developing a research question and designing an investigation to analyzing results and communicating scientific findings. Mentorship can be tailored to each student's project and experience.

Who Can Mentor?

Scientists, researchers, educators, university faculty, graduate students, and other STEM professionals with relevant experience are encouraged to get involved.

Interested in becoming a VJAS mentor, or are a student wishing to participate in the program? Visit the VJAS website at [VJAS Mentor Opportunities](#) to learn more about getting involved.

VJAS STEMINAR: BY STUDENTS, FOR STUDENTS

What is the STEMinar?

The VJAS STEMinar is an interactive virtual session organized by the VJAS student leadership team, along with directors of VJAS and mentors/sponsors. The STEMinar is designed to provide an overview of the symposium, outside VJAS opportunities, and advice from the VJAS student body.

What is the STEMinar about?

The STEMinar involves student and sponsor-led discussion about the VJAS symposium and events. It also outlines expectations and requirements along with advice and procedures for scientific writing and presentation. In addition to symposium prep, it also gives information on student-initiated activities and resources like the VOICE and VJAS Podcasts.

Who is the STEMinar for?

The seminar is designed to be for student researchers (Grades 7-12) who are interested in conducting a research project and participating in VJAS. Adult research sponsors who are involved are also welcome to join.

When is the STEMinar?

While the finalized dates haven't been allocated, the STEMinar is likely going to be held in December. See the [linked website](#) for more info.

Starting Your VJAS Research Project

Eshaan Patel, Co-Editor-In-Chief 2026-2027

Research can seem like a difficult and demanding task, but VJAS is here to support you! From first-time researchers to seasoned junior scientists, VJAS welcomes all to present at its symposium. This article dives into how you can get started on your research project and grow it from a small endeavor into a competitive project. See [Conducting Research Resources](#) and the [VJAS Style Manual](#) on the VJAS website for more info.

1. Research an Observation or Topic that interests you

Think about what you see around every day and what you have heard of. Think of an interesting observation or a problem that you have heard of and make sure you delve deep into it online. You may be surprised by what you find online, or your continued research could lead to more questions and lead you to come up with a completely novel idea! Lastly, make sure you are doing something that interests you! While a project is certainly a commitment, don't fret as VJAS provides dozens to categories to choose from Botany to Physics and Medicine!

2. Ask a Question

After coming up with your field of study and doing some initial research, think about a question that you can investigate over the next year. Think about something that you couldn't answer through your initial research or just something that interests you. A good research question can be molded into an effective title, a relevant project, and will naturally flow into paper writing and data collection. If you are struggling to come up with a research question, professors, mentors, teachers, and even fellow researchers are great resources.

3. Review Literature and Conduct Background Research

After you have decided on a project, make sure to conduct further background research on your topic, previous studies, and your variables (the things you are changing/measuring). Some of the best sources for scientific writing are peer-reviewed journals, so make sure to check out previously completed work through them. After you have conducted sufficient background research, use what you have learned to write the introduction segment of your paper. This is different from introductions you may have learned in English class and is designed to provide background on the project, describe its importance, and discuss similar research previously conducted.

(Photo Credit: Unsplash)

4. Document Your Procedure

One key element in scientific research is repeatability, which in science means that a project should be able to be conducted by a different researcher in the future with the same steps and come to the same conclusion. To ensure repeatability, it is important to effectively document the procedures you will be performing for the research project. From your previous background research, think about what materials you will need and how you will use them. Make sure to use standard scientific procedures related to your work that have been used in research previously, due to their increased effectiveness and reliability. Make sure you document your procedure in detail.

5. Prepare for your Project

Scientific research requires weeks of thoughtful preparation, and it is important to start early and assess standard requirements and prerequisites. Before you begin experimentation, make sure you can do the project in your setting and make sure that you have an adult supervisor as appropriate depending on the project. If you require a laboratory for your project, make sure to reach out to mentors early and find a facility that has the appropriate biosafety level (BSL) for your project. Keep in mind that you absolutely don't need a lab for a competitive project, and it is your effort, not your setting, that makes a project stand out. Also, make sure to plan out your time. Research projects are demanding schedule-wise, so ensure that you are working slowly throughout the year instead of cramming everything into one week in February.

6. Be Mindful of your Next Steps

The year goes by quickly, especially as you will be doing your project while school is in session. As such, as previously mentioned, it is extremely important to plan out your time effectively. Keep in mind that it is never too early to get a head start! It is recommended that you begin working on your experiment and paper writing early so you can work when you have time to spare. Also, don't hesitate to start practicing your presentation for VJAS weeks or months beforehand, as the symposium is the culmination of your work, which you definitely don't want to ignore.

(Photo Credit: Instagram)



VJAS Voices

Explore VJAS Voices!

VJAS Voices is a podcast created by the Virginia Junior Academy of Science (VJAS) to help students and mentors navigate the process of conducting, submitting, and presenting scientific research for the VJAS Symposium. Through conversations with students, mentors, educators, and VJAS leaders, the podcast shares experiences and advice from members of the VJAS community.

What is VJAS Voices?

VJAS Voices gives students the opportunity to hear directly from members of the scientific community about research, the VJAS Symposium, leadership, and their experiences as young scientists.

Where to Listen:

You can listen to VJAS Voices on the official VJAS website and [Spotify](#).

Previous Podcasts to watch:

- [Interview with a Past VJAS Awardee](#)
- [When Computer Science Meets Research: Can AI Make Scientific Work More Efficient](#)
- [Interview With VJAS Alum](#)
- And more!



FROM A SEED TO A LEGACY: ASNE'S INVESTMENT IN VIRGINIA'S FUTURE ENGINEERS

Susan Booth and Jessica Galassie - VJAS Coordinators

It all started with a seed.

Decades ago, members of the American Society of Naval Engineers (ASNE) made an investment in Virginia students that continues to grow today. They may not have known how far their contribution would reach, but they helped create a lasting legacy of recognition, encouragement, and opportunity for young scientists and engineers.

In the 1990s, ASNE members supported the efforts of Jim O'Brien, Virginia Academy of Science fundraising chair, and Don Cottingham, director of the Virginia Junior Academy of Science (VJAS), to establish an endowment for the VJAS Engineering section. Their shared vision was simple: Students who commit their time and energy to scientific research deserve to have their work recognized and celebrated.

For an organization dedicated to advancing naval engineering, supporting young researchers was a natural extension of its mission. The future of shipbuilding, ship repair, maritime technology, and naval readiness depends on people who are curious, creative, and willing to solve difficult problems. Those qualities often begin developing long before a student enters a college engineering program or a professional workplace.

Through VJAS, students conduct original research, write scientific papers, and present their findings for review by experienced judges. They compete in scientific disciplines, receive recognition for outstanding work, and see their research preserved in the VJAS Proceedings.

ASNE's original investment has grown into an Engineering endowment valued at approximately \$18,000, providing about \$900 in student awards each year. These awards do more than recognize strong research. They show students that professionals in engineering and related fields believe their ideas matter and that their work has a place in the future of science and technology.

The seed has become a tree.

Today, there is an opportunity to strengthen those roots and grow new branches.

The Virginia Junior Academy of Science is reconnecting with ASNE's Tidewater Section to explore how naval engineers and maritime professionals can support today's students and teachers. Opportunities may include mentoring student researchers, reviewing scientific papers, serving as virtual guest speakers, and helping students understand careers in naval engineering, shipbuilding, ship repair, and maritime technology.

ASNE Tidewater may also share its newsletter and STEM grant information with science teachers in the Hampton Roads region, creating additional connections between classrooms and the maritime community through connections with the Virginia Association of Science Teachers.

An endowment can provide awards, but an active partnership can offer something equally important: access to people who can help students imagine where their curiosity might lead.

What began as a seed has become a legacy. With renewed involvement from ASNE, that legacy can continue to grow for generations to come.

Its branches represent the students whose work has been encouraged and recognized over the years. Its fruit can be seen in their research, growing confidence, and interest in STEM careers. Its roots reach back to 1941, when the Virginia Junior Academy of Science was established through the Virginia Academy of Science to support young people in scientific discovery.

FROM A SEED TO LEGACY: ASNE'S INVESTMENT IN VIRGINIA'S FUTURE ENGINEERS



Graphic Produced by Generative AI

CAN ARTIFICIAL INTELLIGENCE HELP SAVE ENDANGERED SPECIES?

Maedot Ayalew - Co-Editor-in-Chief 2026-2027

Imagine trying to monitor an endangered species across thousands of acres of forest, desert, or ocean. Scientists may need to collect and analyze thousands, or even millions, of photographs and hours of recordings to determine where animals are, how many there are, and how their behavior is changing. Traditionally, much of this work has required researchers to examine data manually, which can be slow and labor-intensive. Today, artificial intelligence (AI) and machine learning are providing conservation scientists with new ways to process this information. From identifying animals in camera-trap photographs to detecting endangered whales through underwater sounds, these technologies are becoming increasingly useful in wildlife research.



Credit: All-About-London

One of the most established applications of machine learning in conservation is the analysis of camera-trap images. Camera traps are motion-activated cameras that can photograph animals without requiring researchers to observe them directly. They allow scientists to study wildlife remotely and can provide information about species presence, population trends, and animal activity. However, camera traps can produce enormous amounts of data

In one study, researchers trained a deep-learning model on more than 111,000 camera-trap images and successfully classified 20 African wildlife species with 87.5% overall accuracy (Miao et al., 2019). Machine learning can help transform large collections of photographs into usable ecological information. More recently, AI systems have become capable of processing wildlife images on an even larger scale. The World Wildlife Fund's SpeciesNet model was trained using more than 65 million images collected by conservationists. The system can automatically determine whether an image contains an animal and classify it at the species level (Hehmeyer, 2025). This matters because manually sorting millions of photographs can consume enormous amounts of researchers' time. By automating the initial stages of image analysis, scientists can spend more time interpreting the results and determining what they mean for wildlife populations.

AI can also work alongside humans rather than completely replacing them. Wildlife datasets are often unpredictable, since some species may appear thousands of times in photographs, while rare species may appear only a few times. This makes it difficult for a machine learning model to recognize every possible animal equally well. Miao et al. (2021) developed a system that combined automated identification with human review. Their approach reached approximately 90% accuracy while requiring only about 20% of the human annotations used by existing approaches. This human-in-the-loop strategy matters because researchers can review uncertain classifications while letting AI handle large quantities of easier cases.

The potential applications extend beyond photographs. Scientists can also use machine learning to analyze animal sounds. For example, NOAA Fisheries has used AI to help analyze acoustic recordings of endangered Cook Inlet beluga whales. Underwater microphones can collect enormous amounts of sound data, but identifying beluga calls among sounds from ships, ice, and other animals can be difficult and time-consuming. Machine learning can help distinguish potential beluga calls from other sounds, allowing researchers to process acoustic data more efficiently (NOAA Fisheries, 2020). NOAA Fisheries is now also incorporating AI and machine learning into broader efforts to monitor protected species using acoustic recordings, imagery, and other technologies (NOAA Fisheries, 2025).



Credit: NOAA

However, AI is not a perfect solution to the biodiversity crisis. A model can only perform as well as the data and methods used to train it. Wildlife images can vary because of lighting, vegetation, camera position, and animal behavior. Researchers have found that even advanced deep-learning systems can face difficulties when species look similar or when models are applied to environments different from those represented in their training data (Mulero-Pázmány et al., 2025). Errors can also have consequences. Inaccurate identification can affect estimates of where species occur or how large their populations are. For this reason, human expertise remains an important part of conservation research.

AI also cannot address the underlying causes of species decline by itself. A computer model cannot restore destroyed habitat or eliminate pollution, climate change, or other pressures on wildlife. Instead, its greatest contribution may be helping scientists understand these problems more efficiently. A 2024 study found that AI-assisted camera-trap monitoring could improve the speed and cost-effectiveness of wildlife monitoring, demonstrating that the technology can provide practical benefits when incorporated into conservation programs (Smith et al., 2024).

Ultimately, artificial intelligence can not save endangered species entirely by itself. Conservation ultimately depends on ecological research, habitat protection, effective policies, and human decisions. However, AI can give scientists a powerful new way to collect and interpret information. As wildlife monitoring produces increasingly large datasets, machine learning may allow researchers to detect changes faster, identify animals more efficiently, and make better-informed conservation decisions. In a world where many species are facing increasing environmental pressures, the ability to understand wildlife quickly and accurately could become an important part of protecting biodiversity.

Literature Cited

Hehmeyer, A. (2025, March 3). Using the power of AI to identify and track species. World Wildlife Fund. <https://www.worldwildlife.org/news/stories/using-the-power-of-ai-to-identify-and-track-species/>

Miao, Z., Gaynor, K. M., Wang, J., Liu, Z., Muellerklein, O., Norouzzadeh, M. S., McInturff, A., Bowie, R. C. K., Nathan, R., Yu, S. X., & Getz, W. M. (2019). Insights and approaches using deep learning to classify wildlife. *Scientific Reports*, 9, Article 8137. <https://doi.org/10.1038/s41598-019-44565-w>

Miao, Z., Liu, Z., Gaynor, K. M., Palmer, M. S., Yu, S. X., & Getz, W. M. (2021). Iterative human and automated identification of wildlife images. *Nature Machine Intelligence*, 3, 885–895. <https://doi.org/10.1038/s42256-021-00393-0>

Mulero-Pázmány, M., Hurtado, S., Barba-González, C., Antequera-Gómez, M. L., Díaz-Ruiz, F., Real, R., Navas-Delgado, I., Aldana-Montes, J. F., et al. (2025). Addressing significant challenges for animal detection in camera trap images: A novel deep learning-based approach. *Scientific Reports*, 15, Article 16191. <https://doi.org/10.1038/s41598-025-90249-z>

NOAA Fisheries. (2020, March 24). Using artificial intelligence to identify endangered beluga whales. <https://www.fisheries.noaa.gov/feature-story/using-artificial-intelligence-identify-endangered-beluga-whales>

NOAA Fisheries. (2025, November 20). Advanced technologies improve protected species conservation. <https://www.fisheries.noaa.gov/feature-story/advanced-technologies-improve-protected-species-conservation>

Smith, J., Wycherley, A., Mulvaney, J., Lennane, N., Reynolds, E., Monks, C. A., Evans, T., Mooney, T., & Fancourt, B. (2024). Man versus machine: Cost and carbon emission savings of 4G-connected artificial intelligence technology for classifying species in camera trap images. *Scientific Reports*, 14, Article 14530. <https://doi.org/10.1038/s41598-024-65179-x>

MYCOREMEDIATION: USING FUNGI TO FIGHT POLLUTION

Eshaan Patel - Co-Editor in Chief 2026-2027

While humanity continues to choke the planet with synthetic chemical waste, nature's most powerful recycling network is quietly growing beneath our feet. Mycoremediation, the use of fungi to decontaminate toxic substances and pollutants in soil and the environment, is gaining traction as a method for decontaminating toxic substances in the environment. From the nuclear disaster in Chernobyl to the countless oil spills in our oceans and constant plastic disposal, humanity has been poisoning its own planet for centuries. As industrialization pushes the planet to the brink, these unassuming fungi could be a tool to save it.

Why Mycoremediation?

As aforementioned, increasing development and industrialization resulted in the byproduct that was large scale industrial waste, litter, and environmental contamination. For a long time, humanity solely relied on traditional cleanup practices like digging up large concentrations of waste or chemical burning off-site. While relatively efficient, these processes come with high costs, destruction of ecosystems, massive CO₂ emissions, and other compounding issues.



Credit: Eversio Wellness

Additionally, despite requiring immense resources, traditional cleanup never truly removes the toxins, but simply relocates them to a landfill site, unlike mycoremediation. Aside from solving the logistical and environmental concerns with traditional cleanup, mycoremediation has been growing in popularity because it also actively rebalances the ecosystem by fertilizing the soil with rich organic matter through the degradation process (Sevindik et al, 2026). According to one article, mycoremediation requires a staggering 90% less energy and 25% less economic cost per square meter, showing its potential (Herrero, 2025).

How Does Mycoremediation Work?

While the benefits of mycoremediation are hard to ignore, to truly understand the effectiveness of this process, it is important to dive into how it functions. Fungi are natural decomposers that, without internal digestive organs, acquire energy through external digestion. To accomplish this, fungi release strong digestive enzymes through their complex mycelium root systems (Ningomban et al, 2025). Mycoremediation exploits this biological process by using enzymes to break down agricultural chemicals, petroleum, and other serious environmental pollutants, including wood preservatives and even certain plastics (Akhtar et al, 2020). While fungal enzymes are unable to destroy heavy metals, they are still highly effective at decontaminating metal poisons and metal-related pollution issues (Akhtar et al, 2020). Through a process called bioaccumulation, in which these fungi absorb and store heavy metals in their bodies, these fungi are able to naturally decontaminate the environment, after which they can be incinerated to destroy the metal contaminants.

Recent Advances in Mycoremediation

Mycoremediation is a highly active area of research and development, and new research shows more than ever that these unassuming fungi could be the solution humanity needs for its own crisis. For starters, relatively recent advancements have allowed mycoremediation to expand to aquatic environments and sewage treatment. By installing floating mycelium “mats” in contaminated water sources or by growing filamentous fungi into condensed, porous “pellets”, scientists have used fungi to decontaminate sewage water (Eberhardt 2023). Moreover, earlier this year, a British water utility company called Anglian Water installed fungi in storm outflow and surface runoff sites and proved mycoremediation’s effectiveness and ability to remove 90% of water pollutants. Furthermore, mycoremediation specialists have been able to genetically modify fungi to make them even more effective at decontamination both in land and water, and have made these fungi more resilient to strong toxins. AI and machine learning models have also helped improve the efficiency of the process by determining fungi survival rate and effectiveness in a specific site without lengthy fieldwork (Ningomban 2026)



Credit: Om Mushroom Superfood

Literature Cited

- Akhtar, N., & Mannan, M. A.-U. (2020). Mycoremediation: Expunging environmental pollutants. *Biotechnology Reports*, 26, e00452. <https://doi.org/10.1016/j.btre.2020.e00452>
- Eberhardt, E. (2023, November 30). RISD researchers create floating mycelium pods to cleanse waterways. *De Zeen*. Retrieved August 18, 2026, from <https://www.dezeen.com/2023/11/30/risd-students-floating-mycelium-pods-cleanse-waterways/>
- Herrero, J. (2025, May 7). Mycoremediation as a step further to soil remediation: The LIFE MySOIL project. *European Dissemination*. Retrieved August 18, 2026, from <https://www.europeandissemination.eu/article/mycoremediation-as-a-step-further-to-soil-remediation-the-life-mysoil-project/23193>
- Ningomban, L., Mana, T., Pradhan, S., Apum, G., & Singh, Y. D. (2025). Fungal bioremediation in environmental pollution and recent strategies. *Discover Environment*, 3(1). <https://doi.org/10.1007/s44274-025-00267-x>
- Sevindik, M., Krupodorova, T., Gürgen, A., & Eraslan, E. C. (2026). Mycoremediation as a sustainable biotechnological approach for environmental pollution control. *Environmental Sciences Europe*, 38(1). <https://doi.org/10.1186/s12302-026-01365-0>

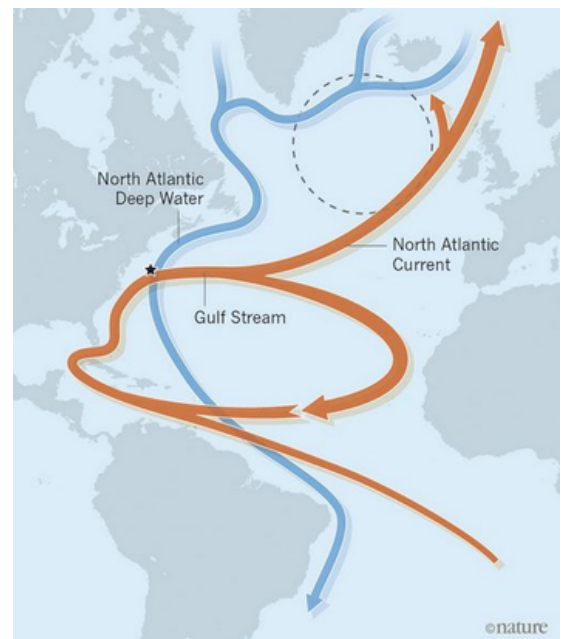
THE STALLING ENGINE: HOW A WEAKENING GULF STREAM THREATENS GLOBAL CLIMATE

Eshaan Patel - Co-Editor in Chief 2026-2027

As humans continue to ravage the very planet that nurtures them through pollution, habitat destruction, and global warming, an unassuming mass of water in the North Atlantic could be the factor that destroys the entire world's climate. The Gulf Stream is often dismissed as a stream of warm water that moderates the European climate. However, the truth is that the Gulf Stream is part of a larger global conveyor belt that has lasting impacts across the globe far beyond just winter temperatures. And unfortunately, this delicate balance of ocean water is being turned on its head by human activity, which could have disastrous events far beyond a couple more winter dustings.

What is the Gulf Stream?

The simple textbook explanation is that the Gulf Stream is a warm ocean current that brings tropical water from the Caribbean to Western Europe. However, the reality is much more complex, and the functioning of the Gulf Stream is dictated by global oceanic patterns. Specifically, the Gulf Stream is the most famous segment of the Atlantic Meridional Overturning Circulation (AMOC), which is a massive system that transports cold polar and warm tropical water across the Atlantic Ocean. The AMOC is the result of thermohaline circulation, or the interaction and movement between oceanic water of different temperatures and salinity. In this case, warm and less salty tropical water is taken from the low latitudes, specifically the Caribbean is taken to northwestern Europe. Then, as the water approaches Greenland, it gets colder and mixes with salty Arctic water, which prompts it to sink, after which it is taken back to the tropics to heat up ("Atlantic Meridional Overturning Circulation (AMOC)", 2021). This whole process is extremely slow and delicate, taking 1,000 years for one AMOC cycle.



Credit: Severe Weather Europe

Why is the AMOC Threatened?

As climate change accelerates and human activity continues destroying ecosystems, the fragile system that is the AMOC is at risk of weakening or collapsing. The main issue revolves around the increase in temperatures in the High Arctic. As previously mentioned, an essential component of the Atlantic current system involves the sinking of Gulf Stream water in the cold, salty high Arctic waters, which allows it to return to the tropics to continue the loop. However, an increase in melting of freshwater ice in the Arctic will reduce water salinity, which could make it difficult for this sinking process to occur, slowing down the entire conveyor belt (Carrington 2023). While this may seem like an exaggerated problem, which is what scientists believed for a long time, recent research has demonstrated the urgency of the issue. Recent research shows that the Gulf Stream could experience a staggering 50% weakening by the end of the century, 60% more than what was previously believed. Moreover, after a certain level of weakening, the AMOC system will cross a “tipping point”, after which it is destined to strongly weaken or even entirely collapse (McBride, 2026). The AMOC is at its weakest in over a millennium and a half, and one study from a few years back even claimed that the AMOC is likely to collapse between 2025 and 2095 (Carrington, 2023).

Results of a Potential AMOC Collapse

In the worst-case scenario - a complete collapse of the AMOC - several disastrous implications could occur for the entire planet. For starters, the destruction of the Gulf Stream could destroy the mild climates of Western Europe with it. Predictions for temperature changes vary, but a decrease of 10-15 degrees is often claimed, which would make the region more closely mimic the harsh continental climates of Eastern Europe and Russia further inland. Not only would this change livelihoods, but it would have massive consequences for the agricultural industry of the region and result in different and unpredictable storm patterns. Furthermore, it could cause severe issues in infrastructure, make urban design unsuitable, and largely undermine centuries of European urban design. Keep in mind that the last time an AMOC collapse occurred was during the last glacial maximum.



Credit: CNN

Outside of Europe, the collapse of the AMOC would result in severe sea level rise on the North American coast, which could threaten quintessential cities like Boston or New York. Typically, the Gulf Stream takes water away from the North American Coast on its way to Europe, but its destruction could result in increased flooding and sea level rise on the continent as well. In addition to the European climate, the AMOC influences climate all across the Atlantic and the world by influencing precipitation patterns, which are essential for agriculture, including by shifting high precipitation regions further south. Once again, the collapse of this system could result in unpredictable, sparse, or different rain patterns, destroying agriculture even outside the European continent. Finally, upwelling of cold, nutrient-rich ocean water is a key driver of marine life, but without the AMOC, this will be disrupted. Combined with loss of coral reef habitat and pressure on the Amazon rainforest, the loss of the Gulf Stream would end up causing a global ecological disaster (“The Looming Threat: What Happens if the Gulf Stream Shuts Down”, n.d.)

Literature Cited

Atlantic meridional overturning circulation (AMOC). (2021, August 10). Civilsdaily.

<https://www.civildaily.com/news/atlantic-meridional-overturning-circulation-amoc-2/>

Carrington, D. (2023, July 25). This article is more than 3 years old Gulf Stream could collapse as early as 2025, study suggests. The Guardian. Retrieved August 23, 2026, from <https://www.theguardian.com/environment/2023/jul/25/gulf-stream-could-collapse-as-early-as-2025-study-suggests>

The looming threat: What happens if the Gulf Stream shuts down. (n.d.). Arctic Ice Project. Retrieved August 23, 2026, from <https://www.arcticiceproject.org/the-looming-threat-what-happens-if-the-gulf-stream-shuts-down/>

McBride, O. (2026, April 20). Scientists warn Gulf Stream weakening faster than expected. The Fishing Daily. Retrieved August 23, 2026, from <https://thefishingdaily.com/latest-news/scientists-warn-gulf-stream-weakening-faster-than-expected/>

FOREVER CHEMICALS, LASTING RISKS: PFAS IN WASTEWATER AND BIOSOLIDS

Sajeela Ahmad, Vice President 2026 - 2027

You may have heard of PFAS, or “forever chemicals”, in the news lately. Although we have recently been hearing about the risks of this chemical that has been found in our environment, PFAS have been used in different industries since the 1940s. There are thousands of different types of PFAS, and these synthetic chemicals have many applications due to their ability to resist water and heat. However, of all PFAS, the two main ones that have been found in our ecosystems, studied for health effects, and regulated by the government are PFOS and PFOA (Wee & Aris, 2023).

PFAS are commonly detected in our aquatic ecosystems, and they have entered the food chain and water system, leading to humans being exposed to them through diet. Manufacturing facilities that use or produce PFAS release them into the environment, leading to global contamination. Although little is known about the mechanisms of the toxic effects of PFAS, studies have shown an association between exposure to PFOA and PFOS and negative metabolic effects such as altered metabolism, changes in hormone activity and receptor expression, infertility, oxidative stress, impacted homeostasis, and much more. PFOA and PFOS are studied more and considered more dangerous because they are a longer chemical chain, which makes them resist degradation and last longer in our environment and in our bodies. This is why the EPA proposed that the maximum amount of PFOA and PFOS in our drinking water should be four nanograms per liter. But drinking water is only one pathway of PFAS exposure that needs to be monitored (Wee & Aris, 2023).



Credit: Canva

PFAS are commonly found in wastewater and sludge. Yes, the water that comes from our bathrooms, sinks, showers, and washing machines, along with the water from commercial and industrial sources, that is sent to wastewater treatment facilities—PFAS is found there (Wee & Aris, 2023). But what is “sludge”? Sewage sludge are the “solid byproducts of the wastewater treatment process” (Bickel, 2025). This solid waste can be disposed of, or it can be used to land applications as a useful, nutrient-rich fertilizer called a biosolid (Bickel, 2025; US EPA, 2025). The

majority of biosolids generated are land applied (US EPA, 2025). Because the sludge was originally mixed with water which could have had PFAS contamination, it can also contain PFAS. If the sludge is applied as a biosolid, that PFAS can reach the farm fields and even the table (Bickel, 2025). Recently, there has been legislation passed in the Virginia General Assembly 2026 that helps regulate PFAS levels in sewage sludge. First, House Bill 938 targets the problem from upstream, requiring industrial users of Publicly Owned Treatment Works (POTW; wastewater treatment facilities) to test for PFAS quarterly and report the results to both the POTW and the Virginia Department of Environmental Quality (PFAS Monitoring; DEQ to Require for Industrial Wastewater Source, Publicly Owned Treatment Works., 2026). Next, House Bill 1443 focuses on biosolids right before application.

Any sewage treatment works that are distributing biosolids must test samples of such biosolids for PFAS (specifically PFOA and PFOS), and based on the concentration of those PFAS in the biosolids, the application of their biosolids changes. An annual average concentration of PFOA or PFOS greater than 50 microgram per kilogram in biosolids prohibits such biosolids from being distributed, marketed, or land applied. If the average concentration is between 25 and 50 micrograms per kilogram, then the application of such biosolids is limited to 3 dry tons per acre of land. There are no limitations for treatment works whose biosolid samples have an annual average of less than 25 micrograms per kilogram (Owners of Sewage Treatment Works; Land Application, Marketing, or Distributing of Sewage Sludge., 2026). Lastly, House Bill 1072 gives local authorities, like a county, to test for PFAS in biosolids within their borders (Sewage Sludge; Local Authority to Test and Monitor Land Application within Its Political Boundaries., 2026).

These bills are a step towards monitoring and regulation of PFAS near our sources of food. But, they still could be improved. The EPA, in a draft risk assessment, found that under central-tendency models, even sewage sludge that contains only one part per billion of PFOA or PFOS could lead to farm scenarios that exceed acceptable human risk thresholds (US EPA Officer of Water, 2025). The assessment did not lead to any one part per billion safety limit, and this is only a model or a specific site and exposure pathway, but this still raises an important question: is the 25 micrograms per kilogram limit on PFAS concentration in biosolids enough to protect farmers and nearby communities?

Literature Cited

Bickel, J. (2025, March 26). Sewage sludge can find a second life on farm fields. Here's how it's made. AP News. <https://apnews.com/article/human-waste-sewage-sludge-farm-fertilizer-how-it-works-05d3656b76223b54b3e14fe0831dd875>

Owners of Sewage Treatment Works; Land Application, Marketing, or Distributing of Sewage Sludge., No. SB386 (2026). <https://lis.blob.core.windows.net/files/1222999.PDF>

PFAS Monitoring; DEQ to Require for Industrial Wastewater Source, Publicly Owned Treatment Works., No. HB938 (2026). <https://lis.blob.core.windows.net/files/1222322.PDF>

Sewage Sludge; Local Authority to Test and Monitor Land Application within Its Political Boundaries. , No. HB1072 (2026). <https://lis.blob.core.windows.net/files/1224704.PDF>

US EPA. (2025). Basic Information About Sewage Sludge and Biosolids. In EPA. <https://www.epa.gov/biosolids/basic-information-about-sewage-sludge-and-biosolids>

US EPA Officer of Water. (2025). DRAFT SEWAGE SLUDGE RISK ASSESSMENT FOR PERFLUOROOCTANOIC ACID (PFOA) CASRN 335-67-1 AND PERFLUOROOCTANE SULFONIC ACID (PFOS) CASRN 1763-23-1. <https://nepis.epa.gov/Exe/ZyPDF.cgi/P101D7KQ.PDF?Dockey=P101D7KQ.PDF>

Wee, S. Y., & Aris, A. Z. (2023). Environmental impacts, exposure pathways, and health effects of PFOA and PFOS. *Ecotoxicology and Environmental Safety*, 267(115663), 115663. <https://doi.org/10.1016/j.ecoenv.2023.115663>

INTERESTED IN ENVIRONMENTAL SCIENCE?

Here are some topics to explore!

- Plant power vs. soil erosion: What types of root systems prevent soil wash away during heavy rain?
- Sunscreen and water life: How do eco-friendly sunscreens affect the growth rate of algae or yeast versus standard commercial sunscreens?
- Bioremediation of microplastics: How effective are different strains of yeast or bacteria in breaking down or trapping microplastics in controlled water samples?
- Predicting air quality: How can you use environmental datasets to analyze local patterns in air quality to predict future Air Quality Index (AQI) trends?

These questions and topics can be great starting points to grow your own project.

Thanks for reading this issue of the
VJAS Voice!

To submit an article for the next issue, please check the form
on the VJAS Instagram page.

If you have any questions, email:
voice@vjas.org

Resources:

VJAS Website: vjas.org

VJAS Handbook: [https://vjas.org/students-
virginia-junior-academy-of-science/](https://vjas.org/students-virginia-junior-academy-of-science/)

Stay Connected:

X (formerly Twitter): @VJASsymposium

Instagram: @vjas.symposium

Published October 2026