Winter 2024

Engineering

VJAS Voice

Presented by the 2023-2024 VJAS Officers

JANUARY 1ST, 2024

VJAS Voice

Winter Edition

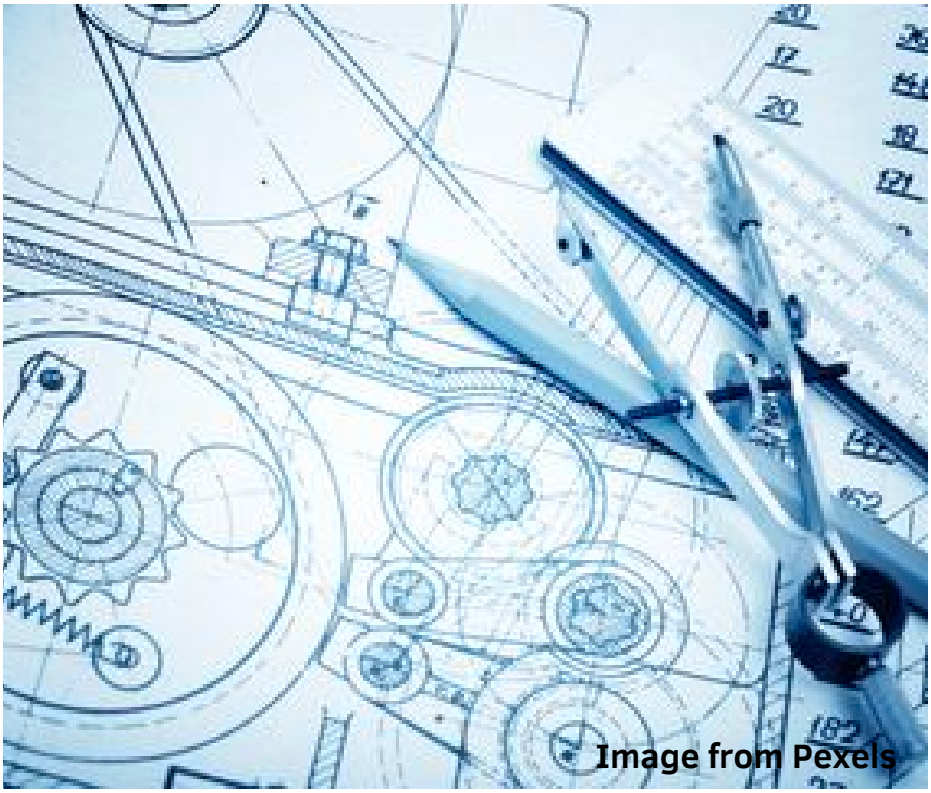


Image from Pexels

“We are continually faced by great opportunities brilliantly disguised as insoluble problems.”

***- Lee Iacocca**, American engineer and automobile executive*

Newsletter Highlights

LETTER FROM THE EDITORS

By Reagan Labert and Brian Zhou

Hello! We hope this letter finds you well, and hopefully you are now fully immersed in researching for your 2023-24 VJAS project. We cannot wait to see what you come up with! Your VJAS officers have been busy at work behind the scenes, primarily with planning the October STEM-inar and working on social media outreach. The editors have been occupied, too! We hope you enjoy this winter edition of the VJAS Voice. If you could not already tell, our theme is engineering, and this edition even features an exclusive interview from a Naval engineer. Read more to find out!

INTERESTED IN BEING A MENTOR?

By Brian Zhou

Each year, the Virginia Academy of Science (VAS) offers its mentorship program for K-12 classrooms across Virginia, pairing scientists with K-12 classrooms to conduct long-term science projects.

Mentors (grad students, postdocs, instructors, scientists, researchers, etc.) have been critical to the success of the VAS Mentorship program! In the past, these mentorships have been in-person, hybrid, and virtual, condusive for sharing this opportunity for mentorship with as many across the Commonwealth as possible.

VAS's hope is to offer students and instructors the opportunity to conduct research projects of local significance or engage in citizen science, helping collect and analyze data for pressing issues in the state of Virginia and beyond.

If you are interested in becoming a mentor, please contact Dr. Mike Wolniak (mwolyniak@hsc.edu) if you would like to become a mentor, or even if you have any questions! We would greatly appreciate it if you could share this call for participation with other prospective mentors as well.

OCTOBER STEM-INAR RECAP

By Hannah Qi

Hello everyone, this is Hannah Qi, your Vice President of the VJAS Student Council!

Our very first STEMinar of the year was held on October 15th, and I am very proud of the number of people that registered to attend. The main topics covered in this STEMinar were: introducing the VJAS and STEMinars, how to start a research project and develop an idea, general tips, and a Q&A session with knowledgeable panelists to answer questions attendees may have had. Thank you to our panelists Susan Booth, Mike Wolyniak, Tarannum Lateef, Yash Saxena, and Nitya Kumar for providing wonderful insight and advice! Our next STEMinar will be held closer to the date of the 83rd annual symposium, and I hope to see many of you all there.

You can find a recording of the October 15th STEMinar here: https://vjas.org/vjas-steminars.html

Missed the first STEM-inar? No worries! Read more about them on the next page.

ABOUT STEM-INARS

By Reagan Labert

VJAS is not just a competition, but a community. One way that you can be a part of and benefit from this community is through attending STEMinars! STEMinars are virtual sessions featuring mentors, judges, and other individuals experienced in research, and they are designed for both students and teachers alike.

The next STEMinar is currently scheduled for February 2024. Be sure to look out for updates on X (formerly Twitter) at @VJASsymposium, and on Instagram at @vjassymposium. If you or someone you know has experience with research and would like to serve on the panel for the next STEMinar, please contact VJAS Director Susan Booth at director@vjas.org. We hope to see you there!

STUDENT PHOTO SUBMISSIONS

By Reagan Labert

We often get to hear about the “big names” of VJAS, such as the student officers, co-chairs, and Symposium winners. But, in reality, VJAS is a complex community made possible by the real MVPs: students. With this in mind, VJAS would love to see what you are up to in your scientific endeavors!

This year, VJAS has created a student photo submission form where students can submit photos to be featured in the VJAS Voice, on the VJAS website, and even on some of our social media platforms! You can submit pictures of something as ordinary as a science lab at school or something as unique as you winning an award! We just ask that you keep it school appropriate, make sure it relates to science in some way, and remember to fill out the Photo Release provided in the submission form.

We can’t wait to see what Virginia science students are up to!

Submit your photos at:
https://forms.gle/HukFm7sYzoTCFjZs7

STUDENT ARTICLE SUBMISSION

Below is an article submitted to us by a high schooler in Virginia! Feel free to send in articles to the VJAS Co-Editors-in-Chief to be published in the Voice! (Articles will have to be approved first).

ALTERNATIVES FOR ANIMAL USE IN MEDICINE

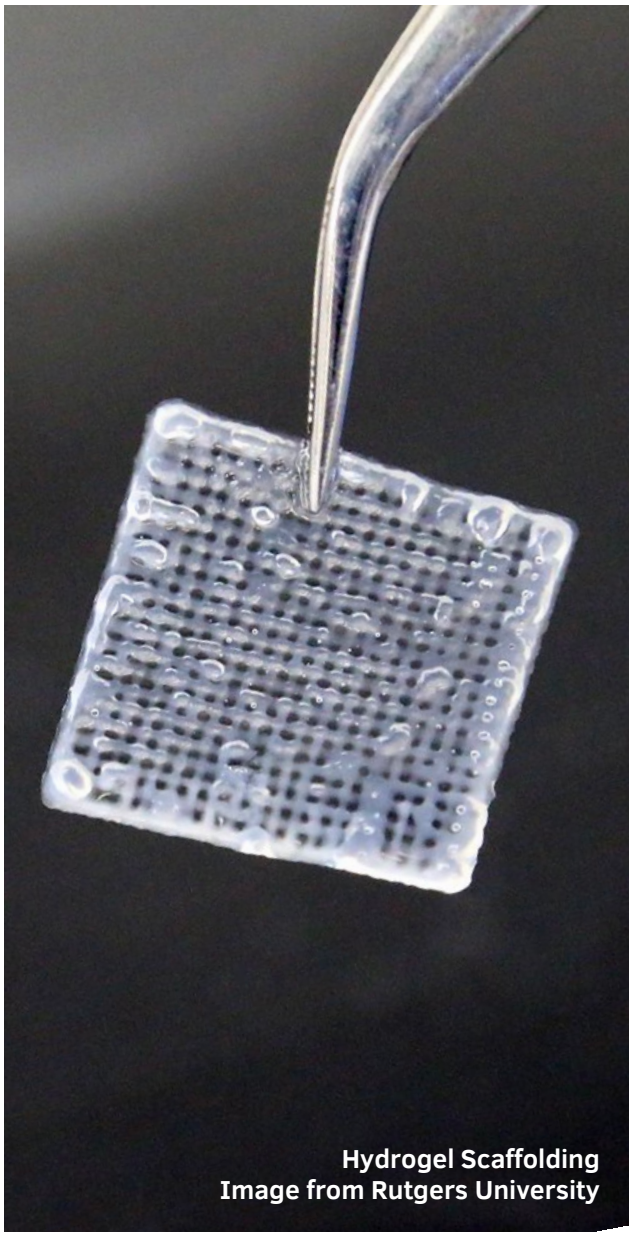
By Erica Rosario

Many animal-lovers worry about animal welfare, especially with regards to the medical field. Experimental compounds are often tested on rats and guinea pigs to test for effectiveness and toxicity, so humans won't suffer any ill effects during clinical trials. Animal skin, bone, and other tissues that are collected for implantation, known as xenografts, help with the healing of injuries such as burns and improve surgical outcomes. Fortunately, tissue engineers have devised several alternatives that can replace animal use in medicine.

Cell culture, the growing of cells outside of the body in a controlled environment, has a great potential to replace animals in drug testing. With cell culture, no individual human or animal is harmed during experimentation since compounds are only administered to isolated human tissues, and variables such as temperature and humidity can easily be adjusted. And although shallow petri dishes are the most commonly associated with cultures, 3D models allow for even more exciting possibilities.

Types of Bone Allografts
Image from PR Newswire

In contrast to 2D models, 3D cell cultures don't grow in single layers on a glass dish. Instead, they may grow over and into scaffolds, structural supports made up of materials ranging from ceramic to silk that guide the formation of the created tissue. This gives cells more freedom to proliferate and behave in ways similar to in vivo structures of the body since the cultured cells aren't limited to a flat surface. In addition to lessening animal experimentation, the use of human cells, the ability to mimic complex natural tissues in the body, and increased control over different variables allows 3D models to produce reliable data that rivals that of animal testing.



Hydrogel Scaffolding
Image from Rutgers University

Autografts and allografts also serve as alternatives to xenografts. Rather than being from another species, autografts are taken from a healthy part of the body and applied to an injured area while allografts are donated from another person. Both of these implants are obtained from people and don't harm animals as a result. On top of that, these human-based grafts are much less likely to trigger an immune response from the recipient.

Animal usage in the medical field has been around for a long time and is currently unable to be completely eliminated due to a lack of research. These alternatives, while promising, have downfalls such as cost, availability, and disease transmission to graft recipients that must still be overcome. With enough research, the use of animals in medicine is sure to be greatly reduced or even completely eliminated in the coming years. You can read more about alternatives to animals in medicine here.

COMPLETING YOUR PROJECT

By Kriesh Tivare

The VJAS Symposium is approaching fast! Projects will be submitted in just a few months, and we are very excited to see what you can achieve! Along the way, there have been many misconceptions or general questions that have been asked about the symposium, so in the spirit of a brand new competition, below is a general guide for preparation! Whether you're a first time or returning participant, there are always ways to improve your project.

1. **Decide Your Topic:** Choose your passion. Your success and progress in your project is highly dependent on having a genuine passion for what you're researching.

2. **Define a Question:** Formulate a precise and focused research question. A well-defined question sets the foundation for a meaningful and impactful project. Consult with mentors or teachers to refine your query and ensure it aligns with scientific principles.

3. **Research:** Dive into existing literature related to your topic. Research will help you understand your topic more, allowing you to get inspiration from other scientists and find areas to focus on.

4. **Design your Experiment:** Your experiment should be quantifiable and repeatable. On top of this, be sure to ensure that your project is in line with all of the rules of the official VJAS rulebook.

5. **Collect Your Data:** Organize and utilize appropriate statistical methods to analyze your findings. More data increases the credibility of your project. Graphs, charts, and tables can be powerful tools to convey your results. A physical journal is a great way to track and jot down your data.

6. **Help is Available:** A good scientist never stops themself from asking questions, or even getting help when needed. This year we are introducing the Virginia Academy of Science (VAS) Mentorship Program, which offers one to one mentoring for students participating in VJAS!

7. **Embrace Challenges:** Welcome challenges as opportunities to grow and learn. Whether it's having low resources, or not being able to understand a topic, there are always workarounds. Take a step out of your comfort zone, and work with what you've got!

8. **Get Feedback:** Seek feedback from peers and mentors. Constructive criticism can provide valuable insights and help you refine your project before the final presentation. Be open to suggestions and use them to strengthen your work.

9. **Stay Organized and On Schedule:** Keeping track of dates is crucial for ensuring that your project is prepared by the time of the symposium. As another reminder, review the guidelines of the VJAS beforehand and make sure that your project aligns with the official rulebook.

INTERVIEW WITH A NUCLEAR ENGINEER

By Reagan Labert

Mrs. Amee Johnson is a current high school physics and chemistry teacher in Virginia Beach, VA, but her path to this position has been non-traditional to say the least. After enlisting in the United States Navy as a Nuclear Machinist Mate, she felt drawn to the Naval Nuclear Program because of the caliber of training and ultimately the value of this academic investment.

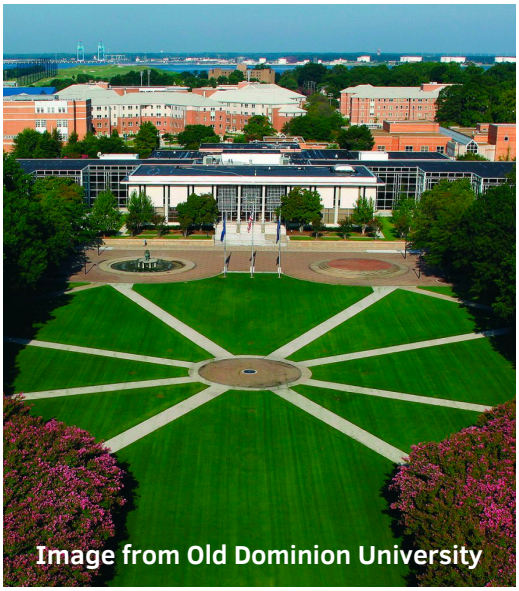


Image from Old Dominion University

Throughout her education and involvement in the Navy, Mrs. Johnson focused on foundational topics in applied mathematical concepts, reactor theory, chemistry and radiological controls, and electrical theory, among others. Mrs. Johnson is a proud alumni of Old Dominion University where she earned her Bachelor's of Science in Mechanical Engineering.

Mrs. Johnson's last assignment in the United States Navy before medical retirement was serving as the East Coast's Surface Prospective Nuclear Engineering Officer (PNEO) Coordinator where she prepared all East Coast carrier junior officers for the written examinations and oral board interviews. Mrs. Johnson ascertains that ending her naval career in a teaching role led her directly to her current position in the classroom.

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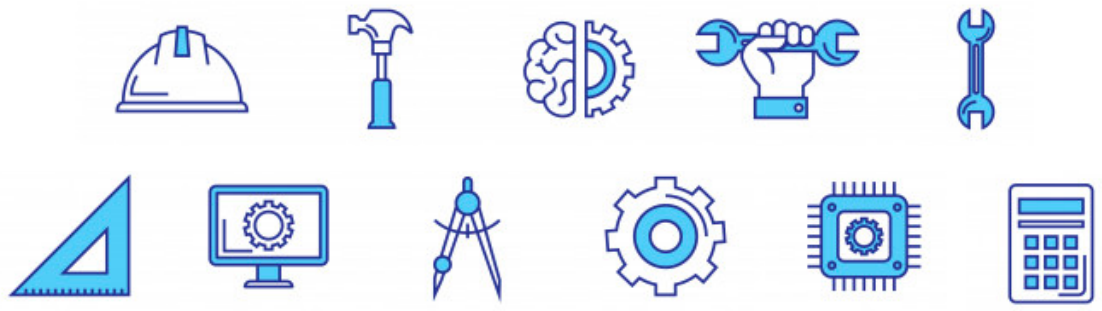
1. **As a student, did you encounter any pivotal moments that prompted your decision to pursue engineering? If not, at what point did you choose to pursue this career?**

   I know that I have always had a strong interest in wanting to understand how things work. My father was an electrician that always had something on his workbench that he was fixing. This was, of course, back when it was cheaper to fix electronics than it was to simply replace them. I think being raised to learn how to fix something inherently teaches you to value how things work.

2. **In retrospect, which academic course or component of your education proved to be the most helpful in preparing you for your career as an engineer?**

   For me, I gained the most from components of my education that incorporated … hands-on learning, [such as] in my upper level courses with lab sections. If I was taking a materials course, I would…truly put the concepts together in the lab when I could see the stress vs strain curve plot in real time while a steel sample deformed through to fracture.

   Hands-on, experiential learning is still a cornerstone of the Naval Nuclear Program and was critical for my preparation not only as an engineer but [for] who I am as a learner and…as a teacher.



3. **What were the most significant contrasts between your educational experience and the professional environment in which you worked? How did you navigate these challenges?**

   …In a professional environment, it is critical that an engineer communicates and collaborates effectively with a team. Sometimes that means acknowledging that you may not have the solution to the problem.

   Do not underestimate the value that a technician brings to the team as compared to the engineer. Though there is something to be said for the education of the professional engineer on a project, for example, a field technician with over 25 years of experience on similar projects has an immense portfolio that may prove just as helpful, if not more, in some cases.

4. What part of your career did you find the most inspirational? What motivates you to continue your involvement in engineering or science as a whole?

Ending my naval career in a teaching position led me to a career switcher program, as they are known in the education world. Helping a junior office prepare for their final nuclear officer boards and written exam was a rewarding experience. When a student did not succeed the first time, we would work together to create a remediation plan to help them achieve success the second time around.

Teaching high school science is that same reward for me now. Seeing a student grasp a tough concept, succeed on something they struggled with previously, and even stare at results of a lab perplexed because it was not what they expected, are inspiring to me. These are all indicators that learning is happening in my classroom.

5. Do you have any guidance for students aspiring to pursue a similar career or an engineering career in general?

..Participate in a few different internship experiences in college if possible. This will give you the opportunity to try out different sectors of engineering professions before you graduate and enter into a career…

Much of the engineering education experience is based in books whereas an entry-level professional engineering experience can be much more based in practice. Taking advantage of varied internships places you in a position to make an informed decision.

Image from Wikimedia Commons

WAIT, WHEN IS THAT DUE?

A VJAS Timeline

November 1, 2023:
Deadline for the Phil Robinson Research Grant

January 15, 2024:
deadline for schools to register their schools on Reviewr and for individuals to contact the VJAS office and register

February 23, 2024:
Deadline for submitting papers, Honor Awards, VJAS officer applications, scholarships, and paying the registration fee

March 4, 2024:
deadline for edited submissions and for sponsors to confirm submitted papers

March 27, 2024:
Notification of meeting participants

April 19, 2024:
Deadline for sponsors to confirm the participation of accepted students, notify the VJAS Office of students who cannot participate, notify the VJAS Office of any name or paper title corrections, and notify the VJAS Office of presentation times requests

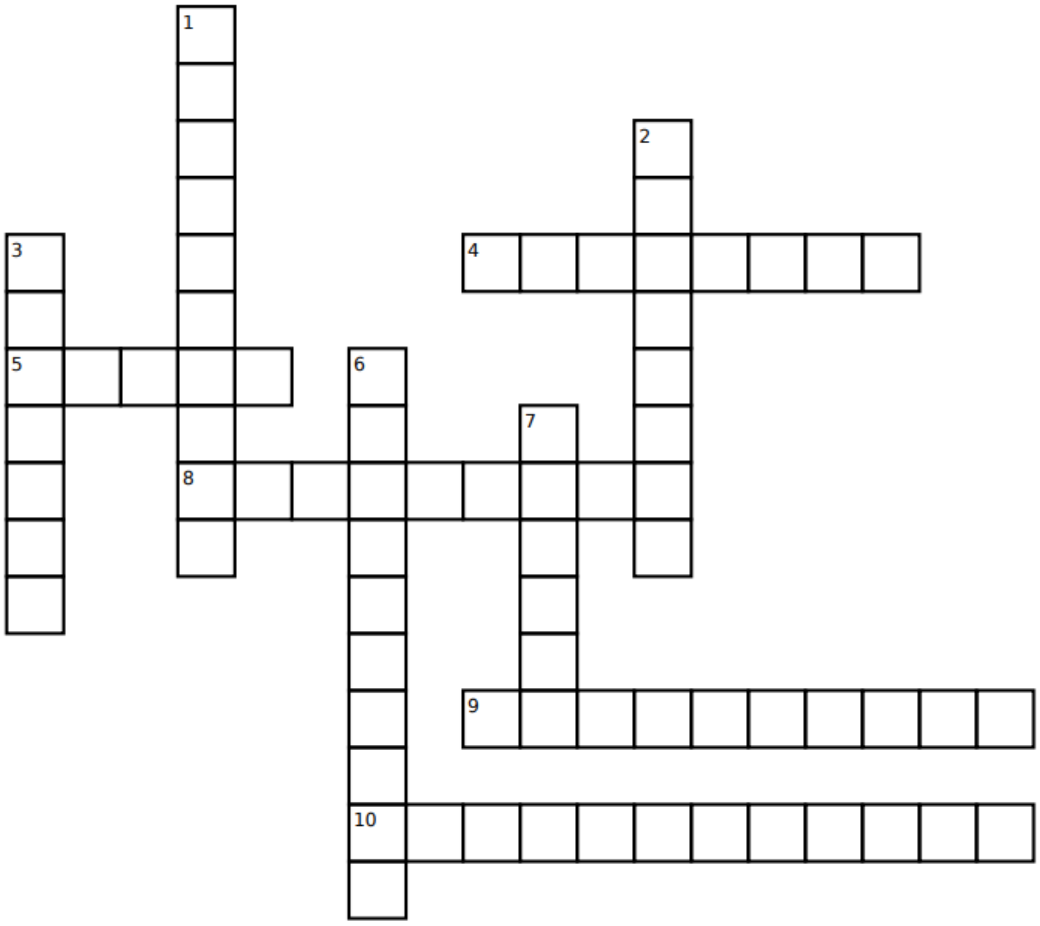
May 3, 2024:
Jeffers Memorial Lecture & general session

May 4, 2024:
VJAS 2024 Symposium!

May 18, 2024:
Awards Ceremony

Fields of Engineering

PRINTABLE VERSION ANSWER KEY



Down:

1. Study the design and application of electronics, electricity, and electromagnetism
2. Oversee the software and hardware of computers and other computing equipment
3. Design and develop nuclear equipment
6. Apply engineering principles to health science and medicine
7. Engineer boats, ships, and submarines

Across:

4. Study the operation, design, and improvement of chemical plants
5. Design and oversee building and infrastructure projects
8. Concerned with the development of air and space craft
9. Design machines, such as electric generators and gas turbines
10. Also known as "biosystems engineering"; this field applies engineering principles to agricultural processes

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

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X (formerly Twitter): @VJASsymposium
Instagram: @vjassymposium

Published January 2024