A Message from the NJAS President

Dear NJAS Members,

This season of year always reminds me how fortunate, honored, and thankful I am to represent such a wonderful organization, NJ Academy of Science, that is focus on advancing science in NJ. It’s a fantastic moment to think about all the activities we have done for our organization over the year (the NJAS annual meeting, the NJAS seminar series and the release of the Bulletin 2021 edition) despite the current societal challenges. I’m looking forward to what we’ll accomplish in the future with your support.

I consider you all to be a tremendous asset to our organization. Thank you so much for your membership and for helping to make this year such a huge success. I wish you a wonderful Thanksgiving filled with pleasure and plenty.

Maria Agapito, Ph.D
President - NJ Academy of Science
President Maria Agapito, Ph.D.
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Funding Program Development Coordinator Melisa Baralt, Ph.D.
Membership Program Development Coordinator Mohamed Mohamed, Ph.D.

Opinion: Why New Jersey is the “Medicine Chest of the World”? 


- New Jersey’s life sciences industry has a 135-year legacy.
- 14 of the world’s 20 largest research-based biopharmaceutical companies maintain a headquarters or significant presence in New Jersey. 1
- 11 of the world’s 20 largest medical technology companies maintain a headquarters or significant presence in New Jersey. 2
- New Jersey is one of the top two states in the nation for the most facilities manufacturing FDA-approved products. 3
- #2 state for biotechnology strength. New Jersey’s biotechnology community has grown by more than 400 percent in less than two decades. 4, 5
- #3 New Jersey/New York region rank on the Genetic Engineering & Biotechnology News (GEN) top 10 U.S. biopharma clusters list. 6
- #1 state for life sciences manufacturing employees. 2
- Highest concentration of scientists and engineers per square mile in the U.S. 2, 4
- #3 state for employed biochemists and biophysicists. 4
- 9th ranked state for medical devices. 7
- Nearly 1,600 life sciences establishments operating statewide in 2019. Between 2014-19 New Jersey’s pharmaceutical sector grew by 15 percent. 8
- Diversity and communities of interest are a great strength. New Jersey is the 7th most diverse state in the nation, with the third-largest foreign-born population. 9

Welcome to Our New NJAS Executive Board Member

Dr. Agnes Berki MSc Ph.D
Chairperson of the Science Program

Dr. Agnes T. Berki is a Professor of Biology at the School of Natural Sciences, Caldwell University, Caldwell, NJ. She has around 10 years of teaching experience, and she is also an independent researcher in the areas of COVID-19 variant analysis, cancer research, microbiology and natural product testing. She is an active member of the Caldwell University community serving on various committees and chairing the Academic Research Committee and has a handful of publications in various reputed journals. We are pleased to welcome you to our organization. We anticipate that your skills and experience will be an asset to our organization and we look forward to working with you.

November is STEM Month: Support Women in STEM

Abstract Excerpt: Recently there is widespread interest in women’s underrepresentation in science, technology, engineering, and mathematics (STEM); however, progress toward gender equality in these fields is slow. More alarmingly, these gender disparities worsen when examining women’s representation within STEM departments in academia. While the number of women receiving postgraduate degrees has increased in recent years, the number of women in STEM faculty positions remains largely unchanged........We describe the following three factors that likely contribute to gender inequalities and women’s departure from academic STEM fields: (a) numeric underrepresentation and stereotypes, (b) lack of supportive social networks, and (c) chilly academic climates. We discuss potential solutions for these problems, focusing on National Science Foundation-funded ADVANCE organizational change interventions that target (a) recruiting diverse applicants (e.g., training search committees), (b) mentoring, networking, and professional development (e.g., promoting women faculty networks); and (c) improving academic climate (e.g., educating male faculty on gender bias).

Native American STEM Leaders: Suzette La Flesche and Mary Ross

by Cynthia Jacob

Suzette La Flesche Picotte was the first Native American woman in the U.S. to receive a medical degree. A member of the so-called “vanishing race,” Picotte graduated second in her class at Hampton University and became the first to receive federal aid for professional education. Her father, Chief Joseph La Flesche (“Iron Eyes”), constantly encouraged Native Americans to seek educational opportunities, and Picotte was heavily influenced by his words: “Do you always want to be simply called "those Indians" or do you want to go to school and be somebody in the world?” Picotte’s willful drive to become a physician began when she witnessed an Indian woman die from the neglect of a white doctor who refused to provide treatment. Her wish, therefore, was to become someone that would be able to help the people she lived with on the Omaha reservation. Securing scholarship funds from the U.S. Office of Indian Affairs and the Connecticut Indian Association, Picotte went on to attend the Woman’s Medical College of Pennsylvania and graduated in 1889 at the top of her class. In 1894, she set up a private practice that served both white and nonwhite patients, taking prominent steps to eliminate racial disparities in healthcare.

Mary Golda Ross was the first Native American (member of the Cherokee Nation) female engineer. After receiving her Bachelor’s degree in mathematics (1928) and her Master’s degree (1938), Lockheed Martin Corporation, a renowned American global security aerospace company, hired her as a mathematician to work on aircraft designs. Lockheed eventually sent her to the University of California for her professional certification in engineering. She became one of the 40 founding members of Lockheed’s secret Advanced Development Program, Skunk Works. Despite being a female in a professional role that was traditionally held by men, Ross was passionate about her work and persistently strived to work towards her goals.

These are just two examples among many of Native Americans who provided a role model for other Native Americans and allowed for the diversification of STEM fields. Native American Heritage month alone is not enough to honor these brave men and women, and as a community we should constantly be recognizing such leaders for their significant contributions.
NJAS GRANT IN AID (GIA) PROGRAM 2021-2022

CALL FOR GIA PROPOSALS FROM HIGH SCHOOL STEM RESEARCH STUDENTS

Competitive Award Money to Fund High School Student Research Projects

Applications must be received by Monday, January 10th, 2022

NJ high school students grades 9-12 may apply for a grant award of up to $150 by submitting a research proposal on a science or math project they will carry out in the 2021-22 school year. Grant winners must present their research results at the NJ Academy of Science Annual Meeting to be held May 7, 2022, time and location TBD. (check www.njas.org closer to the event date for details). For more information contact GIA Program Director at: NJAS.GIA@gmail.com. See the application below. Make sure both students and mentors submit their respective forms (mentors who have more than one student should submit a form for each student). Visit www.njas.org for program and annual meeting information.

Information on Submission Criterion

https://bit.ly/3bQehuA

Student Application Form

Mentor Application Form

NJ Academy of Science Grant in Aid Program 2021-2022

Reviewers Needed for Proposals

CALL FOR REVIEWERS FOR GIA PROPOSALS FROM HIGH SCHOOL STEM RESEARCH STUDENTS

The Junior Division of the New Jersey Academy of Science (NJAS) sponsors a Grant-In-Aid (GIA) Program whereby students in grades 9-12 submit a 4 page research proposal seeking funds for their proposed science or math experimental projects. Annually, NJAS awards grants up to $150 to the highest ranking proposals to fund supplies and equipment for these student projects.

This call for proposal reviewers asks that you agree to review a couple of 4 page research proposals. Proposals are sent out for review by January 2022, and reviewer's rankings are due back mid February 2022. Reviewers who agree to evaluate proposals receive the student proposals link from NJAS, along with the numeric scoring sheets and preset evaluation criteria. Once the proposals are judged, all you the reviewer needs to do is submit to NJAS your scores with student feedback. For more information contact GIA Program Director at: NJAS.GIA@gmail.com.

Register as a Reviewer
We encourage a diversity of voices and views in our letters. Letters may include a review of a book, opinions about a movie as it relates to science, a scientific question posed to the NJAS community, or even a piece of art in relation to science (may serve as the front page picture!). Opinions on current science news or issues or reference to an article that has appeared within the last two issues of the NJAS newsletter are always welcome.

Letters should preferably be 150 to 175 words and must include the writer’s address and phone number (only the name will be published). A piece of art may be submitted electronically in a JPEG format. Letters or art should be exclusive to the NJAS "Newsletter."

To send a Letter or Art to the Editor: email letter/art to donleo54@gmail.com. Subject line must include "Letter/Art to the NJAS Newsletter Editor."

Aberrant autophagy is suspected in many disease states. Gene and protein expression of autophagy markers are frequently studied and immunofluorescent staining is often done.

Call for Manuscripts for the Bulletin

Please consider submitting your findings to the prestigious NJAS official journal. Peer reviewed and indexed in PubMed, this journal is the perfect location for your research. We are currently on a twice-yearly publication schedule, which consists of a Spring issue and a Fall issue.

Anyone having questions about the review and/or publication process should contact the Bulletin editor at NJAS.publications@gmail.com
NPR recently reported the estate of Henrietta Lacks is suing ThermoFisher Scientific Inc. for the non-consensual use and profiting from her "HeLa" cells.

What do you think?

Opinions (may be published in Spring Newsletter) should be less approximately 250 words or less and must include the writer's address and phone number (only the name will be published). A piece of Art may be submitted electronically in a JPEG format. Letters or art pieces should be exclusive to the NJAS "Newsletter." To send a Letter or Art to the Editor: email letter/art to donleo54@gmail.com, must include email subject as "Letter/Art to the NJAS Newsletter Editor."
A Push for Scientific Discovery

Kevan Shah
Muhlenberg College

The snaps of smartphone cameras and the buzz of anticipation filled the air as President Obama took the podium. Before him stood hundreds of the nation’s most accomplished scientists, physicians, and innovators. He spoke of his lifelong admiration of science and the importance of understanding the human brain. “As humans, we can identify galaxies light years away and study particles smaller than an atom,” he observed, “but we still haven't unlocked the mystery of the three pounds of matter that sits between our ears.” He went on to point out how that mystery had kept us from solving some of humanity's most pressing challenges, including finding a cure for Alzheimer’s.

As a twelve-year-old whose family was just starting to come to terms with a very personal and heartbreaking struggle with Alzheimer’s, those words resonated with me. As he introduced the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative – an undertaking he likened to putting a man on the moon and mapping a human genome – I knew that I wanted to be part of the push to ensure that neuroscience delivers on its promise for those who need it most. In the years since, that desire has led me to research at the lab bench, to presentation at science fairs and symposiums, and to advocacy in the community.

To me, science fairs represent quintessential opportunities to “deliver science” – by lighting a fire for science – to make a difference in young students. Just years earlier, local New Jersey science fairs like the Bergen SciChallenge, middle school fair, had done so for me. My experiences as a participant in, and later as a student director of, this countywide science fair has brought three insights into sharp relief for me.

First, I believe that the opportunity to learn is a great gift and must be shared with others. Science fairs help ignite a passion for science in students and provide an opportunity to turn insights into action. Second, I believe that if your cause is just – giving young children a chance to engage in science – then you must speak. It does not matter if there is only one person in the room or a hundred, and it does not matter if your voice trembles or booms. If your cause is just, then you must speak up for science. Third, that kids – regardless of the neighborhood in which they grow up – have plenty in common. Nearly all of them have an innate sense of curiosity, a desire to learn and accomplish, and an uncanny ability to float to their loftiest expectations. What they too often do not have in common is the opportunity to do those very things. Science fairs are predicated on the belief that everyday people can and must – in some small way, shape, or form – help to close that gap and make all the difference for an aspiring engineer, healthcare provider, mathematician, programmer, or scientist, especially in places where such opportunities were few and far between. With the increasing relevance of science amidst the pandemic, we must continue to promote science fairs, among other opportunities for discovery, so that twelve-year-olds watching the nation’s scientists on television can become scientists themselves, too.
The Little Things We Can Do to Stop Climate Change

Rohit Mantena (grade 12)

Shrinking glaciers... Rising sea levels.... Wildlife extinction.... The world is changing as we know it. As technological development and the human race continue to grow exponentially, climate change is becoming a more and more dire situation. Humans continue to produce greenhouse gases at an alarming rate, and it is evident that we must find a way to significantly reduce the human footprint on nature.

Although Earth's climate and carbon dioxide levels have fluctuated in the past, the increase over the last century is significantly greater than the standard cycle of change. Just in the last 70 years, the carbon dioxide levels have increased from 310 parts per million to nearly 420. To put this in perspective, the atmospheric carbon dioxide levels have never exceeded 300 parts per million in the last 800,000 years. Scientists predict that the global temperature will rise between 2.5 degrees to 10 degrees Fahrenheit over the next century, which will be detrimental to our global ecosystems.

Many seem to believe that the effects of climate change are distant and will not occur in their lifetimes, but this is false. We are already seeing the consequences of our carelessness over the last century, and these effects will only worsen if we continue at this rate. According to the Third and Fourth National Climate Assessment Reports, there are several dangerous events that will begin to occur if we don't reduce climate change. As you might expect, temperatures will rise and, as a result, we will see more droughts and heat waves occur. Similarly, the polar ice caps will begin to melt and the Arctic will become ice free and the sea level will rise by 1-8 feet in the next 100 years. In addition, there will be significant changes in precipitation patterns, and hurricanes and tropical storms will grow more intense. We must act rapidly to ensure that the Earth is not permanently damaged, and that mother nature as we know it does not deteriorate.

However, what exactly can we do? The issue of climate change is an enormous challenge, and it seems impossible to the average person that they can do anything about it. It is true, of course, that an individual cannot drastically reduce carbon emissions or stop production of greenhouse gases by themselves, but if we all collaborate together and make small changes in our lives, we will be able to truly save the planet. Here are 7 changes you can implement in your life that can have profound effects on our battle against climate change.

1. Solar Panels

Solar power is one of the most efficient renewable energy forms, and it is becoming an increasingly popular alternative to traditional energy sources. There are companies such as Tesla that are innovating more affordable solar panel designs, and many governments and organizations around the world are even offering free solar panel installations in an effort to cut down on fossil fuel consumption. As solar panels are a clean energy source and are even cheaper than normal electricity in the long run, consider installing them to your own home. continued.....
2. Using LED light bulbs
   LED light bulbs are a simple alternative to standard light bulbs that prove to be far healthier for the environment. LED light bulbs last as much as 25 times longer than normal bulbs and they use 75% less energy. If used widely, LED light bulbs could save an enormous amount of energy around the world.

3. Washing clothes in cold water
   This may seem too simple, but it is extremely effective. Studies have shown that about three quarters of greenhouse gas emissions from a load of laundry come from the warming of the water—something that is easily avoidable. Cold water has been proven to be just as effective at washing clothes as warm water, so please consider using warmer water the next time you do your laundry.

4. Eating less meat
   Many are not aware of the detrimental effects raising livestock has on the environment. The tremendous amount of methane produced by cows and sheep traps heat in the atmosphere and this is known to be a significant contributor to climate change. Fortunately, many alternatives exist for consumption of red meat. Studies have shown that favoring diets with no meat or poultry and fish leads to an enormous difference. Companies such as Impossible Foods Inc. and Beyond Meat have created 100% plant-based burgers that are nearly identical in texture and taste to normal meat.

5. Avoiding Bottled Water
   Plastic water bottles occupy 2 million tons in landfills and tremendous amounts of oil are used to manufacture these water bottles. The plastic from the water bottles is certainly not the most biodegradable, as they take over 1000 years to decompose. Buying a reusable water bottle and filling it up daily is a much more efficient method, and it is certainly something everyone can do.

6. Recycle
   Recycling is one of the most well-known methods to countering climate change, but it is one of the most functional. According to the EPA, Americans recycled just about a third of their total trash, which is astoundingly low. By recycling common materials such as plastic water bottles and paper, the energy required to produce new versions of these materials will be significantly cut down.

7. Walking
   Walking is one of the simplest, easiest, and most effective ways to cut down on our carbon footprint. Traditional cars use nonrenewable energy sources and their exhaust releases greenhouse gases that lead to global warming. Many studies have shown how humans drive cars at an unnecessarily high rate. By walking to places that are a short distance away, you can cut down on carbon emissions as well as be healthy and exercise.

All in all, these 7 simple lifestyle changes can significantly assist in our efforts to reduce global warming. I implore all readers and people around the world to combine our efforts and fight against climate change so that future generations can experience the beautiful planet that is Earth.
Climate Change’s Exacerbation of Droughts in the West
Neha Vazarkar (grade 12)

During the 18th and 19th centuries, the American West was seen as a region with vast potential for agriculture and natural resources for the newly formed United States. Through manifest destiny and the discovery of gold, the American West began to attract new settlers. As settlers began to populate the west, a scientist named John Wesley Powell investigated the West’s water supply through a trip down the Colorado River. He determined that there was not much land which could be irrigated and cultivated sufficiently. Powell’s discoveries were largely dismissed by members of the government, who wanted to use the land for the expansion of railroads and agriculture. With abnormally high rainfall years following Powell’s discoveries, settlements and infrastructure in the West continued.

As Powell recognized over a century ago, droughts are a common issue in the West during the summertime. However, climate change has exacerbated these droughts, bringing reservoir levels to dangerously low levels, which threatens agriculture throughout the region. The 2021 drought is the most significant drought in over 1200 years. Scientists from Columbia University quantified the effects of climate change on the drought, and found that, on average, human-driven climate change is responsible for 47% of the drought. Rising surface temperatures have led to changes in snow patterns and amounts. In the West, this has led to a shorter season of snowfall and less accumulation of snow. Snow significantly contributes to water in the West, as the melted snow in the spring and summer flows down mountains and helps farmers irrigate their crops. Therefore, as the snowfall continues to decrease, farmers throughout the West will have less water to rely on.

California is a significant contributor to the United States’ agricultural supply and has been one of the hardest hit states by this year’s drought. California supplies over ⅔ of the fruits and nuts produced in the United States. Almost all of the state is currently in the ‘severe’ drought category, with about 75% being in the ‘extreme’ and ‘exceptional’ drought categories. There are many types of droughts, but one of the most significant in California is the snow drought. Over 30% of California’s water supply originates in the snow of the Sierra Nevada mountains, which are highly vulnerable to the effects of climate change. In a 2018 study published in the Geophysical Research Letters, climate change contributed to an estimated 20% loss of snowpack, and each additional degree Celsius of global warming will lead to a 20% drop in snowpack.

The West has experienced droughts for thousands of years and human intervention cannot change that. However, significant intervention by people and the government can lessen climate change’s tangible impact on the exacerbation of these droughts. Providing rural communities with better access to water supplies through new wells or pipelines can increase water supply in these remote areas. Currently, some federal water infrastructure programs in the West restrict the ability for reservoir water to be saved for the next year. Rather than being helpful to communities, this can often lead to wasteful water usage that could have been saved for droughts in the future. Therefore, eliminating these restrictions will have long term benefits for communities by saving water resources for emergency situations. Finally, federal investment into programs which develop methods to capture recycled wastewater and stormwater can increase water supply during droughts. continued....
All of these strategies can have positive benefits for residents if they are implemented throughout the West. However, it is clear that the best way to prepare for future droughts is to do our part in reducing their severity. Climate change is not a problem humanity can wait to grapple with in the future because it is already affecting communities across the country. It is vital that we recognize the significant impact these droughts will have on our nation if they continually worsen, including a significant decline in the agricultural industry’s output. The past few decades have seen the development of various new technologies and sustainable forms of energy which can help us reduce the carbon emissions we produce everyday. But, it is not enough to simply produce these technologies. Our efforts will only be meaningful when we collaborate across communities to successfully implement them across the nation.

Doomsday Glacier

Kanisha Shiv (grade 7) John Adams Middle School

Glaciers in Antarctica are melting everywhere but, only one glacier has earned the most alarming nickname: The Doomsday Glacier. This glacier was originally called the Thwaites Glacier. This mass of ice is located on the western edge of Antarctica and is melting at an alarming rate. The rate at which this glacier is slipping away will cause the sea level to rise. However, that's only half of the reason why scientists are concerned. Behind the Thwaites Glacier lies an even larger block of ice. If the Thwaites Glacier melts away, this larger block of ice will add more water to our ocean as well, which will immensely raise the sea level. Now, scientists are trying to find out when this might happen.

Getting answers to critical questions about the Doomsday Glacier is an international research expedition called “The International Thwaites Glacier Collaboration”. This mission requires scientists to head down to the western edge of Antarctica and inspect the Thwaites Glacier. Like many other glaciers, the Thwaites Glacier has a long tongue of ice that sticks out. If you were to dive in the water and swim downwards, you’d see that the Thwaites Glacier makes contact with a rock. This is called the grounding line. In this area, important melting action occurs. Climate change has warmed ocean water that now swirls around the grounding line. The water is above freezing and melts the glacier faster than it takes for new ice to form. As more ice disappears, less of the Thwaites Glacier sits on the rock. Even with this information, researchers still don’t know when and how much the glacier will melt.

The Thwaites glacier, melting is very concerning. It's large and disappearing faster than any other block of ice in the region. If this glacier completely liquifies, it would raise sea levels by 3 feet! Storm surges during severe weather conditions would reach deeper inland than before! “Thwaites has the potential to be the Doomsday Glacier. It also has the potential for it to be not so bad. But as long as we still have that potential for it to be bad, we need to be doing something about it so that we don’t ten towards the worst-case scenario”, says a researcher. continued......
By “do something” the researcher means addressing climate change. The main root of this problem is human-made climate change. This means that the fate of the Doomsday Glacier is in our hands. It’s time for governments and businesses to tackle the climate change problem and limit pollution. We need to work together and create a world that’s more sustainable and practice using renewable energy. To practice renewable energy we need to constantly use renewable resources and reduce the use of fossil fuels as much as we can. The next thing we can do is eliminate food waste and eat plant-based foods. Becoming vegetarian can cut down our carbon footprint in half. An essential part of fighting climate change is; recycling. Always reduce, reuse, and recycle.

It would be impossible to predict how much sea levels will rise at the exact time and day. Researchers are keeping close tabs on the Thwaites Glacier and will continue to inspect it. Their ability to learn more about glaciers and even the tiniest details puts a positive spin on the Doomsday Glacier!

A Basic Introduction to Machine Learning
Sai Charmitha Yelampalli (grade 11)

We've all heard the words “machine learning” at one point or another, whether it's during a news broadcast about recent developments in technology or through reading scientific journals. But what exactly is machine learning? And why is everyone so interested in it lately?

In order to understand what machine learning is, we first need to understand the world of artificial intelligence. The term “artificial intelligence” was originally coined by Alan Turing in the 1950s, when he used this term to muse about the possibility of machines having human-like intelligence. Ever since then, scientists have argued for decades about the specific meaning of artificial intelligence. Even to this day, there isn't a single agreed upon definition of what artificial intelligence means, but to most people, the term refers to machines that have the intelligence or reasoning ability which equals that of a human.

Now onto our official definition: machine learning is defined as a type of artificial intelligence in which computers learn concepts similar to how humans learn, with the help of human-set parameters, and then make future predictions with previously gathered knowledge. In other words, machine learning is “teaching” a computer.

To get more into the idea behind machine learning, let's consider a simple example. You're sitting down for a Netflix binge, which you've done many times before. As you open up the app, you see all your favorite movies and TV shows, right there on the home page, and even a couple new ones that you've been wanting to watch or that catch your eye. Have you ever thought about how personalized your feed is? How Netflix just seems to magically catch on to what you want to watch and your favorite types of movies and shows? Well, that isn't magic -- it's machine learning. By carefully gauging what shows you've clicked on, what shows you've scrolled past, and what shows you've been watching extensively or repeatedly, Netflix predicts what you want to watch next and recommends similar shows to what you've watched in the past. And it does that all on its own! There isn’t a tiny person in the screen who’s observing you and guessing what you want to watch; it’s all done by the pre-set programming that went into the making of Netflix.  

continued......
Now that we've discussed artificial intelligence and machine learning, you might be wondering -- the words “deep learning” and “neural networks” are also often buzz words that appear alongside the words “artificial intelligence” and “machine learning.” What do those words mean? The diagram goes like this: artificial intelligence → machine learning → deep learning → neural networks. In other words, machine learning is a concept that stems from the area of artificial intelligence; deep learning, in turn, is a subtype of machine learning, and from there, neural networks are a specific concept employed in deep learning.

While machine learning makes use of a computer's ability to learn by itself, deep learning takes this a step higher by further reducing human involvement in the learning process. In deep learning, the computer is able to work with larger data sets by learning all by itself and categorizing raw data into manageable groups. However, in machine learning, the computer requires a human to input parameters that the computer can use to group data together. For example, if you wanted a computer to classify a set of images into certain groups that had similar colors, you would have to manually teach the computer to recognize different colors if you were to use machine learning methods. However, using deep learning, you could just feed the raw images to the computer, and the computer would learn to recognize different colors and categorize the images all by itself.

Going deeper into the world of deep learning, we talk next about neural networks. Neural networks are a type of deep learning that makes use of nodes, or the computer version of neurons. These nodes make up several layers, such as input and output layers with more layers of nodes in between. These nodes are all connected to each other, and they pass data along to the next node through a threshold. If the data that a certain node receives is above the threshold for that node, then it will pass data along to the next node, in which the process repeats. In this way, neural network algorithms are able to teach themselves in a similar way to how a human would teach themselves.

So now you know the basics of artificial intelligence and machine learning. There's a world of possibilities in which machine learning can be employed, in everything from recognizing images of tumors to learning to talk to computer vision; machine learning is a vast and fascinating subject that is a testament to human ingenuity. Have fun exploring!

Sources:
https://www.ibm.com/cloud/learn/machine-learning
https://towardsdatascience.com/machine-learning-basics-part-1-a36d38c7916
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ELECTRIC FLYING CAR

Bhuvana Sri Pasupuleti (grade 9) Edison High School

As today's present-day world starts to grow into a more technological transformation, even the simplest objects like cars are growing along with this new culture. A group of people who are well-versed in their respective field have come together to form a storm of Brilliance and bring to the world a new idea of Electronic Air Mobility vehicles. The two like-minded companies the Porsche and Aerospace company Boeing believe that they have found their ultimate pass to making a successful flying car. In the year 2019, October The two companies have signed their contract promising to create a luxurious flying car.

This new invention advertises the prevention of long traffic on regular roads, and gives access for Rich class people to endure this pleasure. Detlev von Platen, A Member of the Executive Board for Sales and Marketing at Porsche AG says, “We are combining the strengths of two leading global companies to address a potential key market segment of the future.” (Porsche and Boeing to Partner on Premium Urban Air Mobility Market, 1)

The best of the best Engineers have come together from the companies of Porsche and Boeing to form a partnership on this premium Urban Air Mobility Market in order to fully develop the vertical landing and takeoff. Engineers are proposing the new features of this Innovative invention and are trying to fit it in with other mobile vehicles. As they continued to rule out the safety measures and develop a safe and efficient Mobility system, the world is eagerly waiting for the newest and the most dedicated invention yet.

A recent study has just shown that due to all the calamities that are going on in the world right now, Porsche and Boeing Company have slowed down on their latest invention. But The study suggests that the companies will pick up their pace after 2025 and release the terrestrial transport of their invention in the Urban Mobility market making it available for a lower cost and a higher feasibility to serve mankind.

Work Cited:
https://www.trendhunter.com/trends/electric-flying-car
https://globetrender.com/2019/12/02/porsche-boeing-partner-flying-car/
Living with Facial Blindness: Do I Know You?

Eliana Liporace (grade 11)

Imagine walking into a theater to watch a film. 40 minutes in, you find yourself in a haze, questioning whether the man waltzing in place is the protagonist or one of eight other cast members with short brown hair and a standard build. You turn and ask one of your fellow movie-goers and she sighs, correcting you, yet again. So why couldn’t you recognize the thespian’s face following his tenth return to screen?

Prosopagnosia, also known as facial blindness, is a brain disorder that impairs one’s ability to identify or recognize one face from another. Originally coined by German neurologist Joachim Bodamer in 1947, the term comes from the Greek words for face (prosopon) and ignorance (agnosia).

In a New York Times interview, prosopagnosic Dr. Heather Sellers said, “I see faces that are human, but they all look more or less the same. It’s like looking at a bunch of golden retrievers: some may seem a little older or smaller or bigger, but essentially they all look alike.”

Researchers initially believed its derivation to be the rare result of “acquired” brain damage, creating lesions to the occipito-temporal region of the brain. However, a 2006 issue of The American Journal of Genetics Part A, reported a novel finding - evidence of developmental or congenital origins. These cases are more prevalent, and present as a lifelong inability to recognize faces. As many as 1 in 50 have developmental prosopagnosia and may go their entire lives unaware of their inability to identify people as others do. Acquired prosopagnosia is much less common, and patients often recognize their impairment following brain injury.

Prosopagnosia symptoms may include mild facial blindness and a difficulty in differentiating faces among a sea of people. Moderate to severe prosopagnosia inhibits one’s ability to recognize those they’re related to or those they’re in recurring contact with. People at the crest of the spectrum may even find themselves unable to recognize their own faces. Prosopagnosics compensate for their deficits by learning to focus on other visual or verbal cues unique to an individual.

A New York Times interview done with prosopagnosic Dr. Thomas Grüter and his wife detailed their experience with the disorder stating, “...people who have prosopagnosia can tell you exactly why they recognize a person. Thomas consciously looks for the details that others notice unconsciously.”

Returning to our original question, real-life examples put into perspective what might be an otherwise stigmatizing disorder when misunderstood. Prior to a diagnosis, people with facial blindness may be prone to social anxiety disorder and depression. It can seriously impact one’s ability to form personal and professional relationships and may lead to the avoidance of social atmospheres. Most people tend to associate a name with a face. This could be impossible for someone with prosopagnosia. Picture struggling to recognize your child or your boss at a conference. Shining a light on an idiosyncratic disorder few are aware of is the first step in bringing consciousness to an overlooked sense most people take for granted.

Works Cited:

continued...
Just Knock

Kannammai Pichappan (grade 12)

Intro

“Anyone who believes in magic is a fool,” said Harry Houdini, ironically, the most celebrated magician and escape artist to walk the face of the Earth. Thank goodness he was not in the marketing business. Houdini claimed that he could break of any jail in the world. Soon thereafter, a jail that boasted a whopping record of zero escapes, caught wind of this and challenged him. But little did they know that on the day of the event, Houdini had stashed a 10 inch piece of steel in the belt. Houdini had then started picking away at the lock. In one hour, Houdini was bathed in sweat. Houdini, in defeat, then collapsed against the door, which then opened.

It opened, because you see, that door was never locked. But that’s not entirely true is it? That door was firmly and thoroughly locked in Houdini’s mind. How many doors do we think are locked, but aren’t? How many times have we walked away from a door without even knocking?

It is beyond time for us to comprehend that merely because something has not been done before, that does not mean it can never be done, as it is nothing but an invitation for us to do it now. First, I will analyze how and why we assume that the doors to opportunity are locked. Then, I will discuss the effects of failing to open these doors. And finally, I will try to have you consider something that hasn’t been done before- opening doors that are yet to be touched and unlocking your full potential.

Why we assume doors are locked

Scott H. from the University of Arkansas conducted a study where a group of people viewed a painting that was done in 1905. Another group then viewed a painting that was done in 2005 and both groups were asked to rate how aesthetically pleasing the painting was. The painting from 1905 was rated much higher than that of 2005. Let me let you in on a secret, they were both the same painting. Clearly, we like what’s been around for a while. We like what’s been tried and tested. We fear opposing tradition and causing change because we can’t anticipate the outcome… and no one wants to be the test guinea pig. And this mindset has prevented us from reaching our fullest potential.
Effects of failing to knock on doors

According to a 2016 survey by couponbox.com, a savings website, an estimated 34.2 million Americans experience some type of phobia. The most common is a fear of failure, Atychiphobia. And this apprehension of failure and venturing into the unknown is what is holding us back. Students are afraid to apply to schools to become a health professional for fear of rejection. Patients are afraid to seek help for mental health concerns because they don’t know if they will be looked down upon. Surgeons and doctors are afraid of what could go wrong when they are treating a critical patient. These are valid concerns... but do we want to live our lives in fear?

Ladies and gentlemen, it is time to flip the switch.

Opening doors that are yet to be touched

Whenever faced with a tough situation, our mind automatically jumps to the worst case scenario and the bad what if’s. What if I fail? What if this doesn’t work out? But the trick is to train our minds to think of the best case scenario - because what we think, we become. What if it does work? What if I can be the first? What if I can be a miracle? What if I can defy the odds and do what no one thought possible?

Look at what humanity has done. Looking through the human body was thought to be impossible, until X-rays were invented in 1895 by a German physicist. In December 1954, a life was saved by physically moving a kidney from one human to another- something never thought possible. We’ve produced a vaccine for Covid-19 in less than one year- an unimaginable record.

This speech will be a success if even one of you exits this Newsletter knowing that impossible is not something that can’t be done. It is just something that is yet to be done. It is up to us to unlock our potential. To paraphrase Harry Houdini, *our brains are the keys that set us free. And doors that seem locked, may not be. All we have to do... is just knock.*

What is the Internet of Things?

Raunak Singh (grade 7) Memorial Middle School, Fair Lawn, New Jersey

Any device that is connected to the internet is considered to be part of the Internet of Things (IoT). This means that everything from your smart watch to your smart thermostat are IoT devices. But if we use these devices everyday, why has IoT become a big buzz word in the recent years?

Connected to the internet, an IoT device can securely share data about its environment and how it operating through multiple sensors. The idea that a device can record and send data wirelessly has made IoT suitable for many applications like research, robotics, and tele-health, where plugging in a USB cable between the device and a laptop just doesn’t do the job. The data collected can be used to improve the IoT device’s efficiency and performance on the fly. IoT can also provide the data needed for training Machine Learning (ML) models to create amazing technologies that continuously adapt to changing operating conditions. There are already many innovative IoT projects, and one of them is my own creation, Park It!  

*continued.....*
Each year, approximately 60,000 Americans are diagnosed with Parkinson Disease (PD), an incurable progressive nervous system disorder that affects emotions, continuity in voice, and movement. More than 10 million people worldwide are living with PD. Park It! is a complete solution from an IoT (Internet of Things) device made with the ESP32-based AWS IoT EduKit recording Parkinson's symptoms to an Interactive website that displays the measurements taken by the IoT device.

Park It! helps mitigate or "Park" Parkinson's disease by recording key data points/symptoms from one Seeed GSR sensor (wired to the IoT device), a microphone (inbuilt), and a gyroscope (inbuilt) from a Parkinson's patient measured by the IoT device in the AWS Cloud DynamoDB No-SQL database (not to be confused with the SQL IoT rule to transfer from AWS IoT Core MQTT streaming service to the DynamoDB table).

The measurements taken by the IoT Device are fast because of the FreeRTOS multithreading C code I wrote which is running on it. The recorded data in AWS cloud can be accessed on the Park It! doctor & patient portal website built using ReactJS and hosted on AWS Cloud Amplify by the doctor as well as by the patient.

The authentication (sign in/create account) service of the portal is provided by AWS Cognito. The website queries the DynamoDB database using AWS AppSync (AWS GraphQl service) to fetch the patient data from DynamoDB database. The messaging service between patient and doctor is also built using AWS DynamoDB database. The graphs on the website are made in ReCharts library in React. The professional look and feel of the app is made from MaterialUI React library.

The doctor can use the data displayed on an interactive graph to diagnose the patient's current stage of Parkinson's and monitor the patient's health outside of the clinic and virtually. The doctor can also use the website to communicate with the patient through the inbuilt secure two-way AWS messaging system which lets the doctor communicate with the patient. The patient can communicate to the doctor through the same secure two-way messaging system. The patient can also see information about different Parkinson's organizations and mental health activities, different physical exercises to help his/her treatment, and useful products related to Parkinson's for patients to buy eg. Leg Massager, Hand Rehabilitation Ball, Tremor-Resistant Pen.

Below is the design diagram of the Park It! ecosystem:

1. The patient records or "Parks" his symptoms data/measurements data using the:
   - GSR (Galvanic Skin Response) sensor that measures the intensity of the patient's emotions. This can help the doctor to check that the patient doesn't have stress, anxiety, or another high-intensity emotion.
   - Microphone (on the AWS IoT EduKit) records the volume of the patient's voice while the patient is speaking. The volume will be 0 when there is a pause in speech, thus showing that the patient does not have continuity in voice.

continued......
Gyroscope (on the AWS IoT EduKit) measures the patient's Roll, Yaw, and Pitch while the patient is walking or sitting. This detects if the patient is feeling any tremors which are causing their hands to shake.

While the data is being measured, concurrently (using the ESP-IDF port of FreeRTOS) the recent measurements are being updated on the display (on the AWS IoT EduKit).

2. When the patient presses the send button (on the AWS IoT EduKit's display), the measurements data is sent through MQTT to the AWS IoT Core.

3. An AWS IoT Rule takes any incoming measurements data from the topic the AWS IoT EduKit is pushing to (the topic will be in the format YOUR_CLIENT_ID/#) and sends it to an AWS DynamoDB table.

4. On the website or Doctor & Patient portal the user securely creates an account or signs in using AWS Cognito.

5. Once authenticated, AWS AppSync queries the measurements stored in the AWS DynamoDB table and displays the measurements data in an interactive graph on the website.

6. Finally, the website can be viewed by the doctor or patient. In addition to viewing his or her measurements, a patient can see helpful exercises, information, and products to help them with their Parkinson's. A doctor can use the graph and measurements data to help diagnose and monitor the progress of the selected patient's Parkinson disease.

As an added feature in the Park It! Patient & Doctor Portal or Park It! website, the doctor and patient can communicate through a two-way messaging system.

1. The doctor or patient securely signs into the portal/website using AWS Cognito.

2. The doctor or patient can send a message to each other through the "Send a Message" InputBox.

3. The message is inserted into a messages To Doctor AWS DynamoDB table for the Patient and is inserted into a messagesToPatient AWS DynamoDB table for the Doctor.

4. AWS AppSync queries the messages from the messagesToDoctor (for the doctor) or the messagesToPatient (for the patient) AWS DynamoDB table.

5. The doctor or patient can view the most recent messages with the date & time.

Park It! is a complete IoT solution for Parkinson's patients and a big help for medical professionals.
What it Means to be a STEM Advocate: An interview with Emily Mortimer

Emily Mortimer is the Program Director of the Tulsa Regional STEM Alliance and was recently interviewed by Cynthia Jacob (NJAS)

1. As you are the program director of the Tulsa Regional STEM Alliance, could you elaborate on the function of this organization and what inspired you to be a part of it?

Our quick and easy mission is, "All Students STEM Ready." We are a non-profit working to promote STEM equity and access through direct service programs such as events and competitions, summer academies, teacher PD and educator resources and grants. All of our services are free to our community and we believe whether or not a student becomes a STEM professional, they deserve the opportunity to develop STEM skills and mindset to be successful in whatever future they choose. My personal background is Wildlife Biology and I worked as a biologist at the Tulsa Zoo for many years, specializing in working with Birds of Prey such as Owls, Hawks, Falcons, Vultures and Eagles. I've always had a passion for education and equity and access to STEM. As a female in STEM I experienced first hand the barriers that stand in our way and wanted to work to ensure other students were supported in their STEM passions.

2. What were some challenges you encountered while being an active member of the Tulsa Regional STEM Alliance and how were you able to circumvent that? More specifically, in what way has the pandemic affected your organization?

The biggest challenge is knowing there is always more need and demand than what we can provide. We work very hard to provide as much access and opportunity as we possibly can with our resources and time but know there is always a lot more work to do. The pandemic was difficult, as it was for everyone but our team at TRSA is very innovative and quickly shifted our programming to virtual and created new programs that fit the needs of our community. When schools closed we asked schools how we can support them and their feedback was quickly for us to provide STEM enrichment to students at home. We worked with a local public television station to coordinate STEM partners across the region to video 20-30 minute STEM lessons that can be broadcast on this channel and quickly engaged our community in building STEM in a Bag resources for students to be given out a food distribution sites across the county. We went from making and giving out a couple thousand pre-pandemic to giving away 70,000 STEM in a Bag in 2020 and are on our way to surpassing that number in 2021. Now, many teachers use them in their classroom and we send them out for a hands-on component to our virtual events so students have STEM activities in their hands and content, curriculum and videos on the event websites. continued....
3. What is your opinion on the current state of STEM-related educational opportunities in our world? Do you think there are specific methods we can implement to improve it?

Compared to when I was a student there are definitely more opportunities for students through face-to-face and virtual options. I believe there is still a lot of work to be done regarding inclusion and diversity in STEM. There are still a lot of barriers underrepresented students face both through access and inclusion. Innovation is dependent on diversity of thought which is dependent on diversity of perspectives, life histories, geography and so many other facets. Bringing diverse people to the table to innovate and problem solve is essential for the future of STEM.

4. As noted on the Tulsa Regional STEM Alliance website, an increase in STEM workforce is a major contributor to economic vitality. Why and how should we take advantage of this? What are some flaws in the current availability of STEM job opportunities?

A great way to think of it is that the STEM workforce touches all areas of the workforce. Without a diverse and strong STEM workforce it would be difficult to create innovation in any industry. STEM is more of what the acronym stands for, STEM cultivates critical thinking, observation and innovation skills. Within each industry there are microcosms of a STEM workforce driving the innovation that pushes all industries forward. Also, an important way to think about it is thinking about the part of the STEM workforce that directly serves human safety and health. Without those foundational needs society itself will struggle leading to a weakened economy.

5. Lastly, a personal question: Why did you choose STEM? Was there a specific person that inspired you? What is one piece of advice you would give to the younger generation of students who are looking to pursue a STEM-related career in the future?

I always remember being curious when I was young and remember being outside in the forest in Missouri all the time. I grew up on a cattle farm so wildlife and nature was deeply ingrained in my upbringing. My mother and father definitely encouraged me in my passions allowing me to learn and grow in my passions. STEM simply always made sense for me and continues to be a deep passion to this day. Perhaps instead of wanting to be part of the building of knowledge as much as I once was, I am more interested in passing on other's knowledge to inspire the next generation of STEM professionals. A piece of advice is probably my favorite quote, "I am what I am not, yet" by Maxine Greene. Allow yourself openness to explore and cultivate your passions. Don't limit yourself, allow yourself to try new things to find what you are truly passionate about and fits your skills. When you don't limit yourself, you might be surprised what you can really do.
NIH Fellowships (NIH F30, F31, F32 Grants)

Participants: PhD Students and Junior Postdoc Fellows
Activities: Each week, fellows submit drafts of specific grant application components for peer review and comments by the grant coach. Fellows meet as a group with the grant coach for 1-hour a week to discuss parts of the grant application, sponsored programs, peer review, NIH review groups and institutes, and submission of the final grant application in December.

REGISTER HERE!

Meetings will be on Thursdays from 1-2p EST on Zoom starting September 23rd to December 2nd

NJ Academy of Science
General Announcements

NIH Fellowship Grant Writing Training Group
We are excited to support your application for an extramural NIH fellowship (Due in December 2021)!

Lauren Aleksunes, PharmD, PhD
NJ ACTS Workforce Development Core Lead and NRMN Grant Coach
Professor, Pharmacology and Toxicology
Rutgers University

NAAS Affiliated Academies of Science
have the opportunity to become more involved in NAAS and AAAS Affairs.
By Michael Strauss,
The following offices are up for election and NAAS is seeking nominations from the ranks of leadership within the 48 Affiliated Academies

(Three open positions)

NAAS Treasurer (3-year term)
NAAS Newsletter Editor (3-year term)
NAAS AAAS Representative (3-year term)

Non-Voting Members: (Positions Available)
NAAS Member-at-Large (A-Affiliated Academies) Each position carries a three-year (3 yr.) term.
NAAS Member at Large (B-Business) Each position carries a three-year term (3 yr.)
AJAS Member at Large (C-Junior Academies) Each position carries a three-year term (3 yr.)

Deadline for nominations will be at the final day of the AAAS Annual Meeting. Philadelphia, PA, February 16-20, 2022. The Assembly of Delegates usually meets and elects officers at and during the AAAS Meeting. However, AAAS will meet both in-person and virtually so to allow for maximum participation of delegates, the Assembly will convene virtually in early March (time/date TBD).

Please contact Nominations and Awards Committee Chair Michael Strauss to place a nomination:
Dr. Michael Strauss, USDA (retired), 1056 Old Ranch Road, Crawford, TX 76638
michael_strauss1@hotmail.com or Cell: 240-676-7670
"If you can’t explain something simply, you don’t understand it well. Most of the fundamental ideas of science are essentially simple, and may, as a rule, be expressed in a language comprehensible to everyone. Everything should be as simple as it can be, yet no simpler."

Albert Einstein
RESEARCH OPPORTUNITY FOR COLLEGE STUDENTS:
THE STUDENT AIRBORNE RESEARCH PROGRAM (SARP) IS AN EIGHT-WEEK SUMMER INTERNSHIP PROGRAM FOR RISING SENIOR UNDERGRADUATE STUDENTS TO ACQUIRE HANDS-ON RESEARCH EXPERIENCE IN ALL ASPECTS OF A SCIENTIFIC CAMPAIGN USING ONE OR MORE NASA AIRBORNE SCIENCE PROGRAM FLYING SCIENCE LABORATORIES (AIRCRAFT USED FOR SARP HAVE INCLUDED THE DC-8, P-3B, C-23, UC-12B, AND ER-2).
Ph.D Opportunities

EASTBIO DTP invites applications for UKRI BBSRC-funded 4-year PhD studentships for PhD projects, including Collaborative projects with non-academic partner organisations, for a start in the autumn of 2022.

http://www.eastscotbiodtp.ac.uk/how-apply-0

Effective Date(s): immediately

Staff Needed: Teacher Grade 6-8 Science Bilingual

Qualifications:

Hold a New Jersey NJ Elementary Certificate and Middle School Highly Qualified 6-8 in Science
Hold a Bilingual Education Endorsement (N.J.A.C. 6:11 – 8.4), and other appropriate endorsement(s) for the position held (N.J.A.C. 6:11 – 6.1, 6.2, or 8.1 et seq.)
Experience working with elementary and middle school students
Knowledge of assessments and data analysis of instructional purposes
Some experience working with middle school students and with diverse population
Ability to communicate effectively in English and Spanish, both orally and in writing, with staff, students, parents, administrators and the community

Salary: As Per Negotiated Contract

Interested applicants can can contact Mr. Bacchus at sbacchus@paterson.k12.nj.us
SMART PROGRAM at Rutgers NJ Medical School
Presentation and Q/A SESSION

The mission of the SMART Program is to advance the understanding, knowledge and appreciation of science and medicine among students who wish to pursue careers in medicine, dentistry, biomedical research and other health-related careers.

Speaker: Ms. Mercedes Padilla
SYSP/SMART Program Administrator
The program consists of a coordinated set of programs for pre-college students (rising 7th - 12th graders) that include:

- Hands on activities via applied science, mathematics and technology
- Problem solving and critical thinking
- Oral and written presentations
- Career exploration
- Teamwork and leadership training

Tuesday, November 23, 3:00 PM
Webex Link: https://nboe.webex.com/nboe/j.php?MTID=mb34be09fddd7c1539c21ff45695cfd046
Meeting number: 2621 300 6834
Password: FHP2021

Hosted by Future Health Professionals Student organization
Call for GIA Proposals!

NJ high school students grades 9–12 may apply for a grant award of up to $150 by submitting a research proposal on a science or math project they will perform in the 2021–22 school year. Grant winners must present their research results at the NJ Academy of Science Annual Meeting to be held this spring, time and location TBD. (check www.njas.org closer to the event date for details). To request an application for the GIA Program, contact the GIA Program Coordinator, via email at: NJAS.GIA@gmail.com. Visit www.njas.org for program and annual meeting information.
Call for GIA Reviewers!

The Junior Division of the New Jersey Academy of Science (NJAS) sponsors a Grant-In-Aid (GIA) Program whereby students in grades 9-12 submit a 4 page research proposal seeking funds for their proposed science or math experimental projects. Annually, NJAS awards grants up to $150 to the highest ranking proposals to fund supplies and equipment for these student projects.

This call for proposal reviewers asks that you agree to review a couple 4 page research proposals. Proposals are sent out for review by January 2022, and reviewer’s rankings are due back mid February 2022. Reviewers who agree to evaluate proposals receive the student proposals link from NJAS, along with the numeric scoring sheets and preset evaluation criteria. Once the proposals are judged, all you the reviewer needs to do is email NJAS back your scoring sheets with the student feedback.

If you feel you would like to participate in this rewarding program or wish to know more, please submit this form.