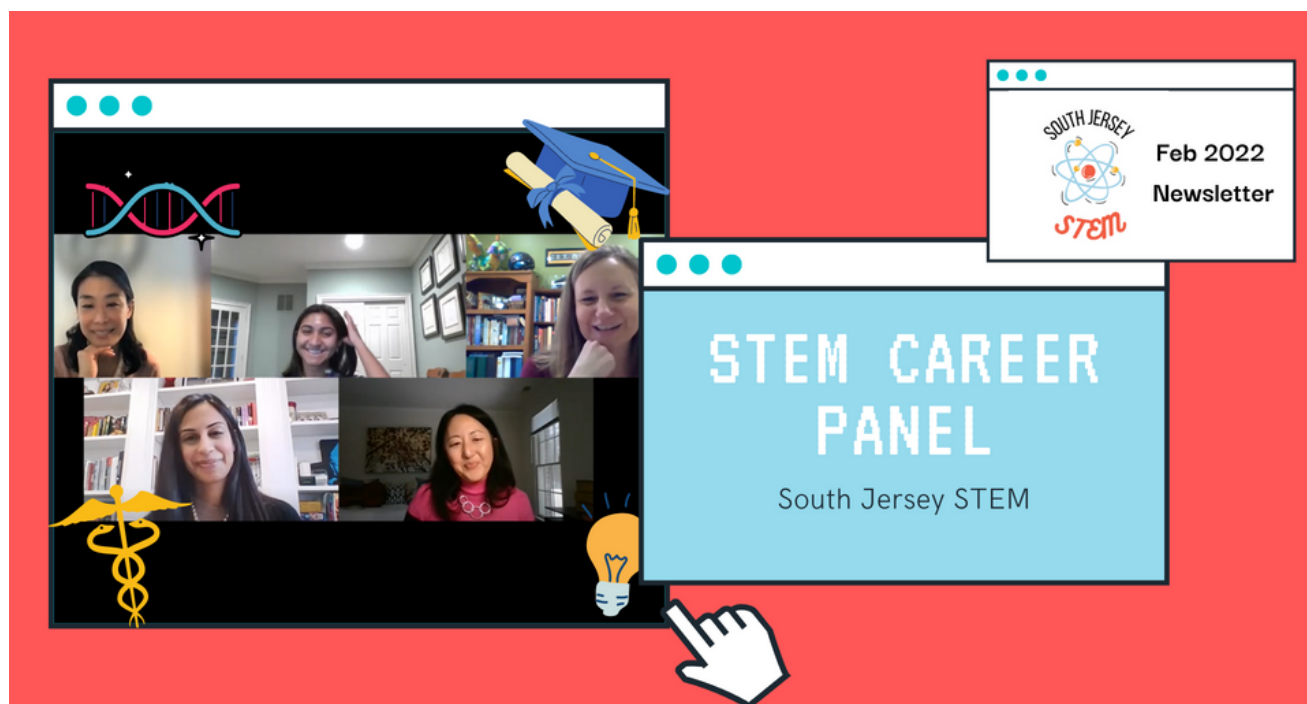


THE SOUTH JERSEY STEM NEWSLETTER



The newsletter for all things STEM!



STEM CAREERS

Interview by Maya Butani

An interest in STEM can open countless doors in terms of career pathways. In order to present these options to you and demonstrate the possibilities, we have gathered an incredible panel of STEM professionals to discuss both their current careers and their journeys to this point. We hope you enjoy the their experiences and advice! Click [here](#) to access the panel on YouTube.

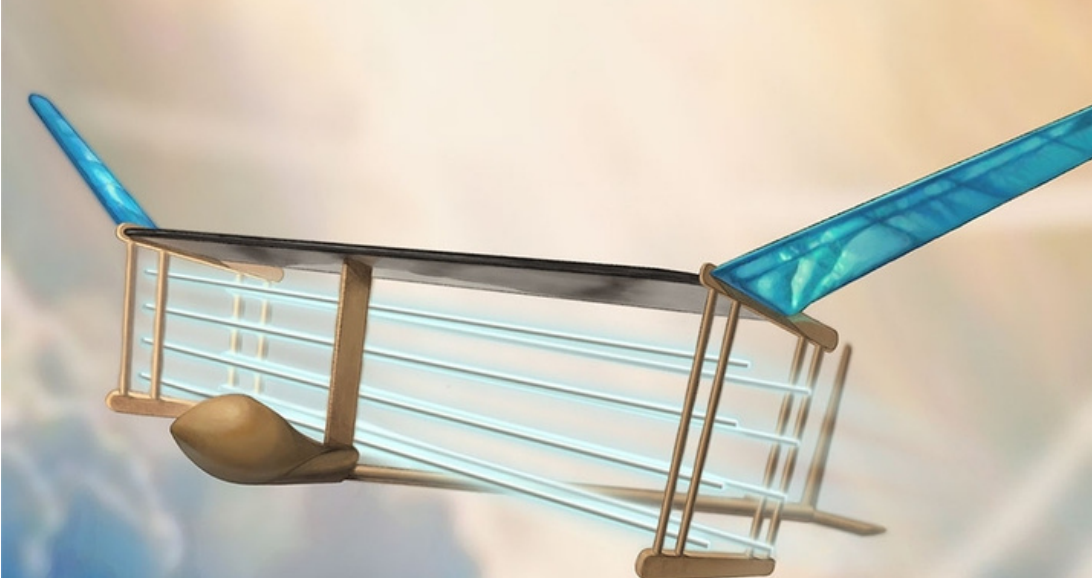
Special thanks to the speakers for providing their valuable insights for this panel.

- **Aoy Mitchell**- Professor of Pediatric Cardiothoracic Surgery at the Medical College of Wisconsin
- **Melonie Teichert**- Assistant Chemistry Professor at the US Naval Academy
- **Neha Vagadia** - Pulmonary critical care physician at Virtua Health
- **Gloria Kolb** - CEO and cofounder of Elidah

CHECK OUT WHAT ELSE IS INSIDE!

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A diagram of the motionless MIT plane. The tan component contains batteries which supply charge to the electrodes (silver rods). Ultimately this set up provides a flow of electrons to move the plane.

A NEW AGE OF AVIATION

Written by Leo Wylonis

Aeronautics is an industry that always has new innovations and groundbreaking discoveries. One of these innovations is the Massachusetts Institute of Technology's new airplane, the first ever airplane with no moving parts. You may think that it is surely impossible to have an airplane propel itself with zero moving parts, but Steven Barrett, a professor at MIT discovered that a flow of ions on the wing of the plane can produce an "ionic wind," which can power the airplane for a sustained flight. The ionic wind is created by passing a current between thin and thick electrodes underneath the main wing of the plane. This creates just enough propulsion to power the airplane without any external forces. This design is completely silent and does not create direct carbon emissions like jet engines. Scientists are working on applying this technology for practical purposes such as drones, where the lack of noise would be very helpful and zero movement would cause less wear and tear on the aircraft.

There are also many large-scale innovations in the aeronautics industry right now. Earlier in 2021 the US aviation subcommittee held a hearing on various projects such as electric aircrafts, supersonic aircrafts, and unmanned aircrafts. The aim of this meeting was to certify many of these innovations so that they can advance from experimental projects to being in circulation in the next few years.

One technology that the US aviation subcommittee hearing has certified is fully electric aircrafts, which would be groundbreaking for reducing carbon emissions. Aircraft produce about 3 percent of all carbon emissions in the United States. This may not sound like a lot, but that equates to millions of tons of carbon dioxide emitted every year. The first ever commercial, entirely electric aircraft, the eBeaver, is a massive step in making these aircrafts a reality. It was made back in 2019, and it has the ability to fly up to 5 people. With this aircraft being certified now, engineers have full freedom to convert our old, carbon-producing plane designs into fully electric aircrafts. Roei Ganzarski, CEO of magniX, says we are at the beginning of the "Electric Age of Aviation."

WRITTEN BY

**Leo
Wylonis**



Leo is a senior at Conestoga Senior High School. An accomplished scientist, he has a patent and several winning science fair projects in engineering.

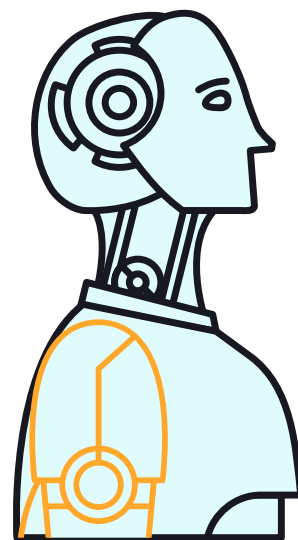
WHAT IS ARTIFICIAL INTELLIGENCE?

Written by Maya Butani

Let's run a quick experiment! If I say, artificial intelligence (AI), what do you think of? Is it evil robots and a technological apocalypse? Or perhaps floating cars and futuristic machines! Though, believe it or not, AI is not some far-off concept. It is quite present in our lives today. If you've ever used Apple's face ID, a social media "For You" page, or an Amazon Alexa you have already engaged directly with AI. But what exactly is artificial intelligence?

Artificial intelligence is a branch of computer science that develops smart algorithms that can "perform tasks that typically require human intelligence". Interestingly, AI is not directly programmed to execute specific actions. Instead, the algorithm is provided with data, called "training data", and learns to recognize patterns within that dataset. For instance, say I wanted to teach an AI algorithm to categorize pictures as either cats or dogs. The AI program would be provided with cat and dog pictures along with their true animal identification. In this way, the AI algorithm is not explicitly programmed to identify the animals. Instead, data has been provided, and the algorithm "learns" to guess whether a picture is a cat or dog as accurately as possible. To get a bit more technical, AI algorithms are trained to minimize "loss" or the "penalty for a bad prediction". An accurate prediction results in a loss that is equal to zero. Therefore, the AI algorithm is simply programmed to be as correct as possible.

There are a few different categories that an algorithm can fall into. These options include regression, classification, and neural networks, and they all are used to solve different types of problems. For instance, neural networks are most frequently used to identify visual data. The diversity of algorithm types allow AI to be used to solve a variety of problems. Frequently, AI is used to make life more convenient. Amazon Alexas are a great example in which AI is used to recognize speech. Beyond that, Alexas can even learn! For instance, if you command Alexa to do something and it does not understand, it may "learn" what that prompt means for the future.



Beyond convenience, AI has tremendous potential. AI provides a quick and powerful way to make sense of biological information for medical purposes. One interesting example is the use of AI to diagnose conditions such as tuberculosis based on x-ray images. This solution would overcome the physician shortage in many developing nations. Machine learning could also be used to identify which cancer patients may be responsive to immunotherapy, streamlining the treatment process for those in need.

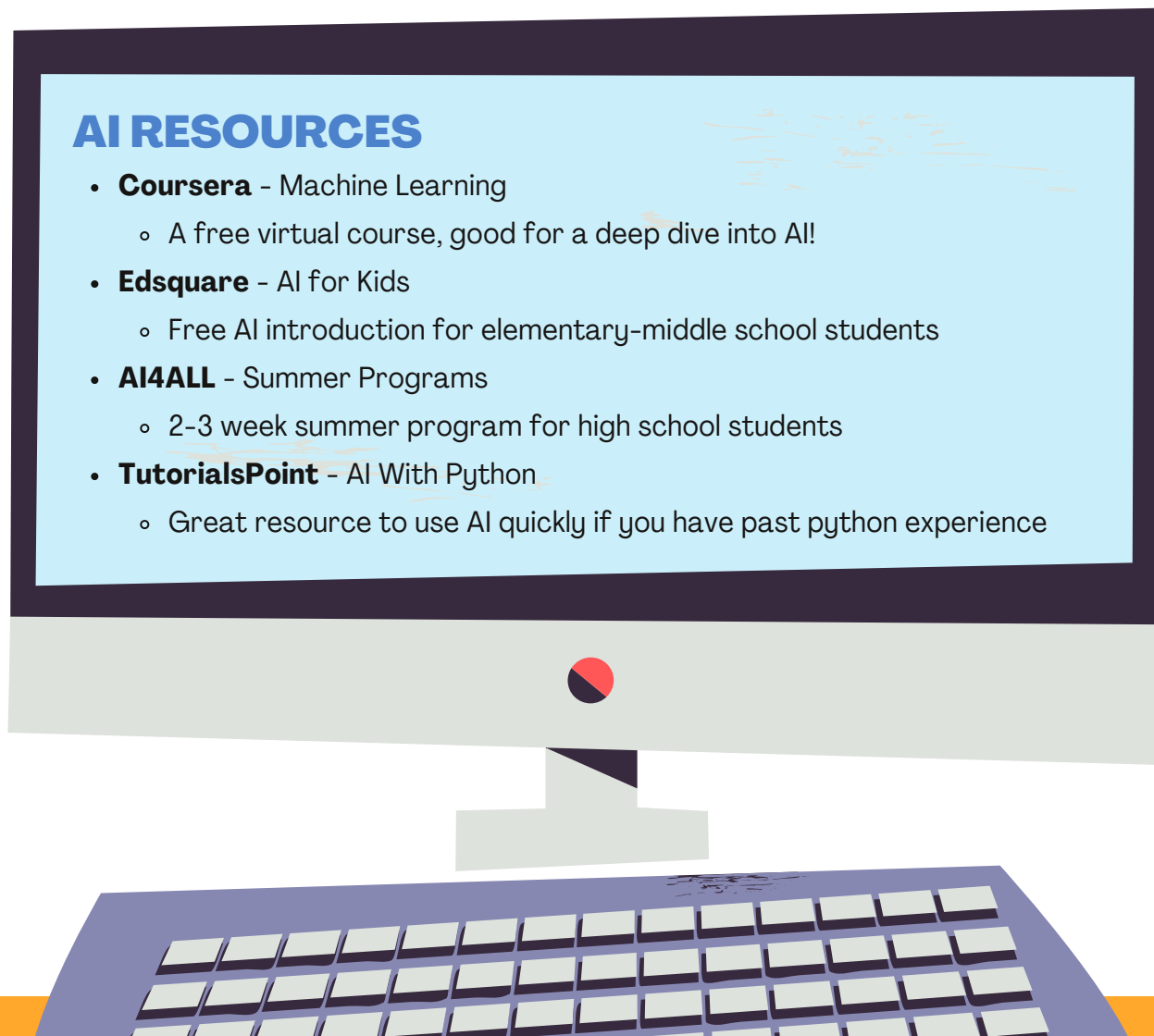
WHAT IS ARTIFICIAL INTELLIGENCE (CONT.)

While these prospects are quite promising, they still require further refinement. The potential of AI is vast, but since the technology could be used for such important tasks, it is critical that it is as accurate as possible. For this reason, ethics is a significant consideration with AI and machine learning.

AI is becoming increasingly important and common in our world. How could you use AI to solve a problem? Whether the issue is personal or global, machine learning could likely confront the issue in some way. One nice feature of working with AI is that lots of algorithms are already written. It's simply a matter of learning how to use them! Libraries like scikit-learn and TensorFlow already have written machine learning algorithms if you have some experience in python (a programming language). But what if you want to learn AI on a deeper level? Well firstly, I commend you on your initiative! Artificial intelligence is an incredibly valuable tool for anyone interested in the sciences. Check out the information below for some great programs and resources to learn AI. **Happy coding!**

AI RESOURCES

- **Coursera** - Machine Learning
 - A free virtual course, good for a deep dive into AI!
- **Edsquare** - AI for Kids
 - Free AI introduction for elementary-middle school students
- **AI4ALL** - Summer Programs
 - 2-3 week summer program for high school students
- **TutorialsPoint** - AI With Python
 - Great resource to use AI quickly if you have past python experience





Global Current Event: Electrical Work for your Brain?!



Written by Isabella Moccia

The Mayo Clinic defines Parkinson's Disease as a progressive nervous system disorder that affects movement and neurological functions. It is most often a result of genetic factors, namely gene mutations, that cause dopamine-producing nerve cells to break down. This hindrance can completely obstruct the nervous system, causing a multitude of neurological and emotional issues. These include tremors, slowed movements, rigid muscles, impaired posture/balance, loss of automatic movements, and speech changes. Since dopamine is a neurotransmitter that's responsible for the regulation of emotions and movement, not only do those with Parkinson's Disease suffer from the above symptoms but they may also experience severe depression, sleeping problems, fatigue, and memory issues as a result of the loss of dopamine-transmitting neurons.

However, as detrimental as Parkinson's Disease often is, there are currently no treatments that effectively cure this ravaging condition. The only treatment options that exist in the medical field at this time are medications that mitigate some of the effects of Parkinson's Disease by naturally increasing dopamine levels in patients. A few of these drugs include levodopa medications/infusions, dopamine agonists, which are used to stimulate parts of the brain that dopamine normally would, and several other inhibitors. At best, these treatments can reduce nausea, lightheadedness, and tremors, although they unfortunately have side effects that may worsen hallucinations, confusion, etc. (which unfortunately can also be symptoms of Parkinson's).

One potential treatment that's still being developed and studied for numerous conditions is a surgical procedure known as Deep Brain Stimulation (D.B.S.). According to the Cleveland Clinic, the process of deep brain stimulation involves the implantation of electrodes in the brain to deliver electrical impulses that may block neurological abnormalities. Because these abnormalities result from disorganized electrical signals in the brain, this treatment can be effective when it modifies the electrical signals in targeted areas of the brain. By normalizing the electrical activity, motor symptoms are fixed. In terms of the actual procedure, neurosurgery is done to map the brain and implant electrodes in specific areas. Then chest wall surgery allows the surgeon to place a battery-operated pulse generator near the patient's collarbone (done under general anesthesia). Several weeks after the procedure, a patient's primary physician will program the pulse generator via remote control to best fit their needs. Those undergoing D.B.S. can experience their treatment(s) anywhere from 24/7 for 6 months to several hours of the day for just a few months; this factor is modified based on the severity of one's condition and thereby determined by a doctor.



Global Current Event: Electrical Work for your Brain?

Written by Isabella Moccia

In the field of Parkinson's Disease treatment, Deep Brain Stimulation has made much progress since its original approval in 1997. D.B.S. has been successful in limiting dyskinesia, tremors, and the neurological effects of Parkinson's although it is not a fully effective treatment nor one without risk. Like any other surgery, there are always risks of bleeding in the brain, infections, heart problems, etc. There are also several side effects such as pain at the implantation site, dizziness, confusion, and even strokes. As such, these treatments are only recommended for patients with long-term symptoms that regularly interrupt them and/or are resistant to medications.



The Journal of Neurosurgery cites a study of past patients who received D.B.S. for Parkinson's Disease to assess the long term effectiveness of the procedure. Because all of the subjects received their treatments from 1999 to 2007, the study was able to test their 10-year success rates. What scientists and doctors found was a mean 10-year survival rate of 51%. After the study was completed, tests concluded that D.B.S. could not stop the progression of this disease but was able to relieve many of patients' symptoms with a resoundingly high satisfaction rate.

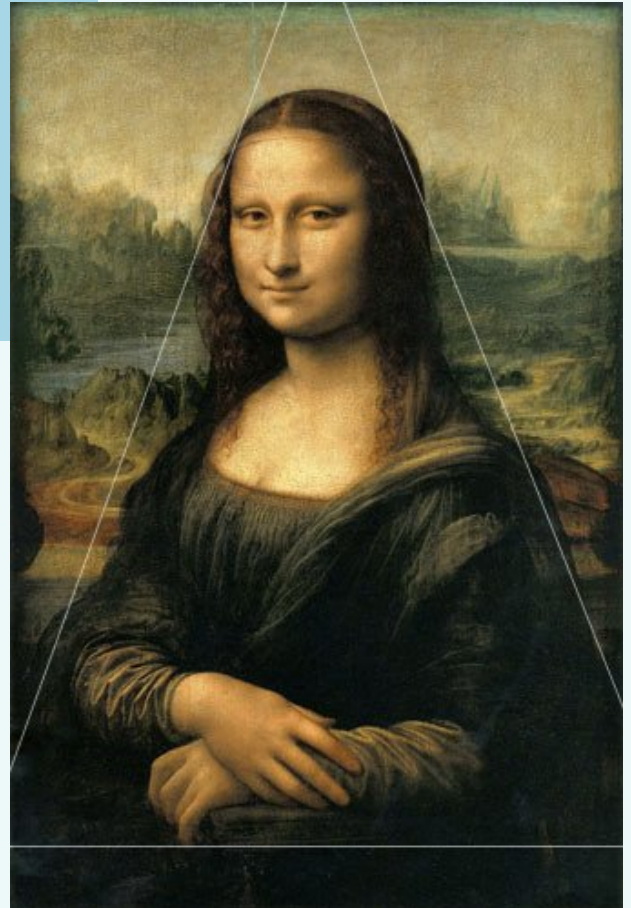
Although there is still no treatment for Parkinson's Disease with a definite success rate or an ability to mitigate all the effects of the disease, deep brain stimulation has proven to be a monumental step in the fight to cure Parkinson's Disease in its entirety.



Art in STEM!

Written by Anya Patel

People often think art and STEM are completely different fields but there are many ways they overlap! There are many geometric and psychological elements that help make art as rich as it is! Balance and compose has been perfected over thousands of years. Even paintings like 'The Last Supper,' by Leonardo DaVinci in the late 1400's have shown a use of lines, shapes, and perspectives to make beautiful and timeless pieces. The triangle had been considered to be the 'golden shape' of art and it's subconsciously eye-catching when an artwork feels balanced. Perhaps it wasn't apparent to artists at the time but their use of geometry is used consistently today.



Cabbage pH Indicator!

Written by Kejal Patel

In order to test the pH level of different household substances, you will need to have a designated compound that will change colors based on the pH level of the substance. One way to test the pH level of household substances without pH test strips would be with cabbages! Be sure to test out this simple experiment at home!

Materials: one red cabbage, test tubes/glasses, eye droppers, vinegar, and laundry detergent

Test Substances: bleach, orange juice, pickle juice, salt, shampoo, tomato sauce, and window cleaner

Fun fact:
Anthocyanin is the compound that makes this work!

Procedure

1. Coarsely cut the red cabbage, place the pieces in a pot, and cover the pieces fully with water
2. Heat the mixture over medium heat for about 15 minutes (or until you can see that the water has absorbed the purple pigment from the cabbage)
3. Strain the cabbage, reserving the liquid
4. Pour the cabbage liquid into two test tubes or glasses until they are about $\frac{1}{4}$ of the way full
5. In the first test tube, mix in one dropped full of vinegar (a known acid), and watch the liquid turn red
6. In the second test tube, mix in one dropper full of laundry detergent (a known base), and watch the liquid turn green
7. After knowing that acids turn red and bases turn green as per the cabbage indicator, we can begin experimenting with the test substances
8. Pour the cabbage liquid into a test tube or glass until it is about $\frac{1}{4}$ of the way full
9. Mix in one dropper's worth of any of the test substances and check the color of the substance to see if it's an acid (red) or a base (green)
10. Repeat steps 8 and 9 with all of the test substances



NOT SEPARATE AND NOT EQUAL: THE DATA GAP IN WOMEN'S HEALTH

Written by Jillian Smith

The differences between male and female reactions to disease and treatments make separate analyses necessary, from a cellular level to clinical trials. Unfortunately, many studies do not do this, or even include a proportion of females equal to the proportion affected in the general population. The result is dangerous to women given treatments that have only been proven to work in male subjects. As students pursuing knowledge in STEM fields, we should be aware of this issue and others as we begin to work in these fields.

There are significant differences between males and females of a species, even on a cellular level, that makes data for both needed. Researchers have found differences between males and females in every tissue and organ system, in the “prevalence, course, and severity” of disease, and evidence is “mounting” that there are differences between male and female cells as well, even when controlling for hormones. Because of these differences, from cells to gene expression to disease, drugs and vaccines yield different reactions and side effects. The influenza vaccine, for example, has increased efficacy in women but a lower chance of adverse side effects in men. According to Klein and Pekosz (2014), “the defined strategy to improve influenza vaccines in females might be very different from those indicated for males.” It is clear that there are differences in men and women’s medical needs and differences in the possible solutions to these needs.

Yet many clinical, animal, and cell studies have all- or mostly-male sample populations, or do not report the sex at all. A review of surgical research found that of animal studies that reported the sex studied, 80% were all-male; 71% of cell studies that reported the sex studied were all-male. Even when studying diseases more prevalent in females, only 12% of animal studies that reported the sex studied included females at all.

This trend carries to clinical trials in humans as well. Women only made up only 11.1% of participants in studies looking for a cure for HIV, significantly less than the proportion of women affected by the disease. Similarly, a review of cancer research found that “the majority of studies analyzed included a lower proportion of women than the proportion of women among patients having cancer of that type in the general population”. Such a small proportion of women in these studies could have distorted the data, especially if it was not analyzed separately - and it most likely was not. A Pain Magazine review of its previous publications found that even in studies that included both sexes, the results were not analyzed separately two-thirds of the time. As a result, female reactions to drugs and other treatments are not as well known.

Not including enough women or disaggregating data in CRT-D (cardiac resynchronization therapy device) studies risks lives: a review by the FDA found that the threshold to get the device determined from 80% male sample populations was too high for women. Had women with electrical wave rates slightly lower than this threshold been given CRT-Ds, their chance of death would have decreased 76%. Similarly, women are much more likely to experience complications when having a pacemaker implanted, not surprising considering only 4% of trials for approved medical devices analyzed data from female participants separately.



NOT SEPARATE AND NOT EQUAL (CONT.)



Written by Jillian Smith

As mentioned earlier, drugs can have different effects in men and women, and this has cost lives as well; those used to regulate high blood pressure actually increase the death rate in women. When researchers fail to include a representative sample population in their research, or even disaggregate data within their sample population, the knowledge they gain is biased. Much of our current medical knowledge is biased towards the male body.

If this crisis is to be managed, researchers need to form representative samples, and there needs to be a call for change. Young people like us are already beginning to take internships and research positions in the STEM field. As we become part of the search for knowledge, especially surrounding medicine and disease, we need to be aware of the weaknesses of past research to be able to improve it and make a difference.

Fun Facts!

Written by Jenna Ference-Salo



Octopuses have three hearts, nine brains, and blue blood

Approximately about one percent of a human's genes come from plants, fungi, and other germs



A human heart beats about 100,000 times a day

There are 50 billion galaxies in the universe

20% of Earth's oxygen is produced by the Amazon rainforest



Hawaii moves 7.5cm closer to Alaska every year due to shifts in tectonic plates

Stomach acids is strong enough to dissolve stainless steel

In a person's entire life, the average person walks the equivalent of five times around the world



Venus is the only planet to spin clockwise

Bananas are slightly radioactive due to the potassium within them



WHO NEEDS SLEEP? (SPOILER: ALL OF US!)

Written by Jason Wang

After an exhausting evening of homework, I turn to my phone for a break around midnight. I text my friends asking if anyone was awake, and sure enough, each and every one of them were up working on homework or studying for tests. I have a brief conversation with them, browse social media for a bit, and as I return to work I can't help but realize that almost 30 minutes had passed. "Great," I think to myself, as my Physics lab report due tomorrow still lay half-finished in front of me.

Sound familiar? We're talking about sleep deprivation. According to the Center for Disease Control and Prevention (CDC), 58% of middle schoolers and 73% of high schoolers are consistently sleep-deprived.¹ Teens today, more than ever, have their hands full with school assignments, work obligations, social life, and sports. There's an overwhelming pressure to be high-achieving and successful, but these efforts come with an unavoidable reality: sleep deprivation. Especially in recent years, sleep deprivation has dramatically become much more prevalent across teens, so much that it has been declared to be a serious public health epidemic.^{2,3}

We live in a culture that values activity over sleep, which makes it easier than ever to get caught in a vicious cycle of late nights and lethargic days. It's natural to want to do "more", whether that's completing extra work, involving yourself in activities, or simply having fun with your friends. With this mindset, however, sleep often becomes secondary and the "item" that you can sacrifice.



Now don't get me wrong, as a high school senior myself I've experienced all of this, whether it's completing procrastinated homework late into the night or binging that Netflix show instead of going to bed. While we all know of that supposed "recommended minimum 8 hours of sleep" in the back of our minds, it's progressively lost meaning over time. The saying "easier said than done" gets taken to an entirely new level—we tell ourselves that we're going to sleep early, but as it approaches 10 or 11pm, the urge to stay up becomes stronger and stronger.

Over time, I've become more and more aware of sleep deprivation's little negative impacts on my health—drowsiness, headaches, and lack of focus all interfered with my day-to-day life. In fact, I was surrounded by so many of my friends who were going through the same thing, and I soon became curious about our health: how much can this widespread sleep deprivation impact us, especially our developing teenage brains?



WHO NEEDS SLEEP? (CONT.)

Since then, my curiosity has propelled me to pursue my own research project into the detrimental effects of sleep deprivation. Through sleep-depriving mice and analyzing their brain tissue, I've come to discover a fascinating link between sleep deprivation and neurodegenerative diseases such as Alzheimer's or Parkinson's disease. In particular, I found that sleep deprivation causes the body's immune cells to enter the brain and induce brain inflammation, which in turn increases the risk of developing neurological disorders in later life. In other words: bad. While this research ultimately landed me a spot at ISEF, it also has taught me so much about my own health—prompting me to rethink my choices on those late nights when I'm deciding between finishing my Physics lab report or going to bed.

So the next time you consider clicking that tempting “next episode” button on Netflix before you go to sleep, consider not only the short-term effects you'll feel the next day, but more importantly the long-term effects you'll experience 40 years later.

To improve your sleep schedule...



WRITTEN BY



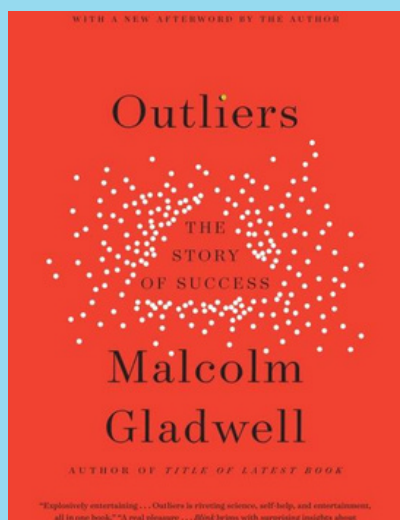
Jason Wang

Jason is a senior at Germantown Academy. A passionate STEM student, he is an ISEF winner who researched sleep-deprivation for his project.

THE BOOK CORNER



Reading is a pleasure that's often forgotten. Amidst the chaos of unending assignments and interminable testing, students in STEM often can't find the time to read. We at South Jersey STEM recognize that the free time can be limited so we've picked out the stories that are most worth your time. We strongly encourage you to pick up these books if you get the chance!

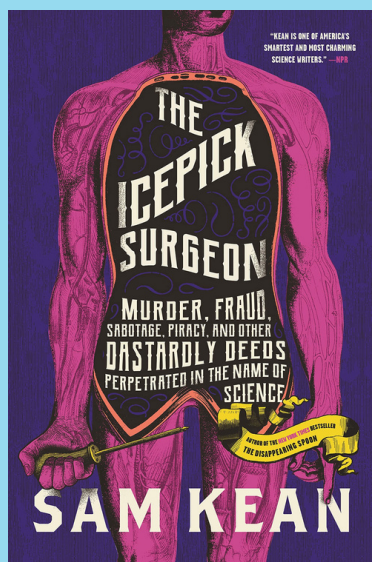


Outliers

Malcolm Gladwell

Goodreads Score: 4.17 Stars

Where does success come from? Gladwell examines the answer to this question through fascinating chapters full of examples told in a narrative form. This novel promises to change the way you think about success by presenting unique insights. I would certainly recommend reading this book for all aspiring entrepreneurs, scientists, athletes and everyone in between.



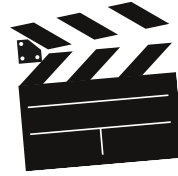
The Icepick Surgeon

Sam Kean

Goodreads Score: 4.00 Stars

Sam Kean navigates incidents where ethics were abandoned through history in this book. He discusses heavy topics in an engaging way and raises thought-provoking questions about how and why ethical lines are crossed and the human motivations for doing so. If you have an interest in the sometimes-dark history of science, this is a fascinating read!

THE MOVIE THEATER

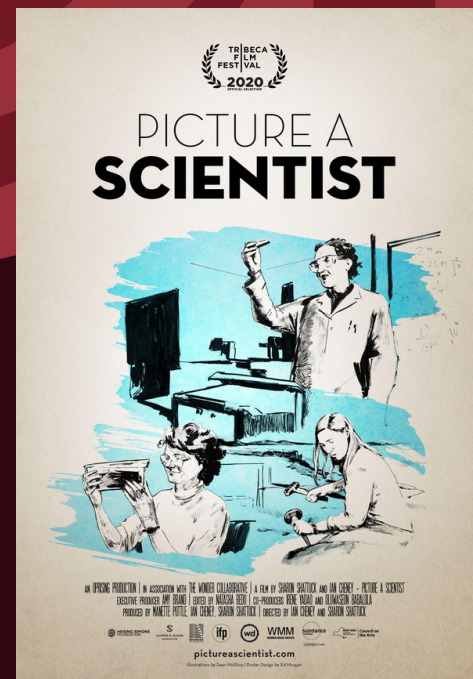


Looking for something to watch? You've come to the right place! From insightful analyses to lighter entertainment, here, we include our top selections for movies, TV shows, documentaries and more. With some relation to science, these other forms of media are a great way to learn about something new while passing the time!

Picture a Scientist - 1h 43m, documentary

This brilliant film follows several impactful women in STEM as they discuss past barriers, and new hopes for female scientists.

Available on:



Night on Earth- 40-52m, 6 episode docuseries

This docuseries is a journey that brilliantly shows the interactions between wildlife under the night sky. This show is incredibly fascinating and a great way to introduce stem into your entertainment!

Available on:





CURRENT CANCER RESEARCH

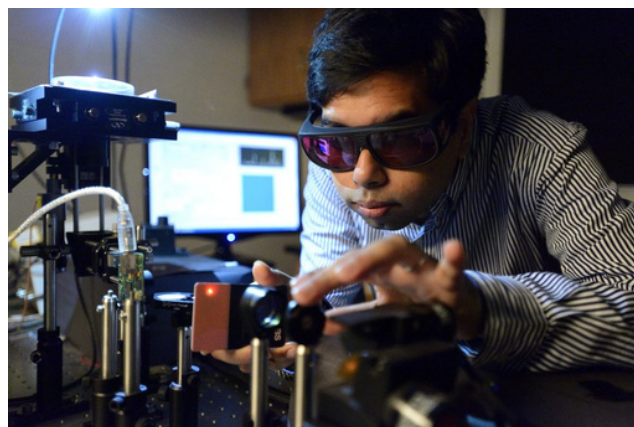
Written by Jenna Ference-Salo

Sadly, cancer is a disease that affects everyone in one way or another. Everyone either has been the victim of cancer or has known someone to be the victim of cancer. Because cancer is such a prevalent disease, there are many people, like oncologists, working to improve cancer treatment. Breast cancer is a type of cancer that affects our society most harshly.

Johns Hopkins University is working on a new way of detecting the early stages of breast cancer. Assistant professor, Ishan Barman is working on helping doctors detect early stages of cancer by combining medical imaging, machine learning, and spectroscopy techniques to dramatically decrease cancer morbidity. One of the biggest indicators of breast cancer is “microscopic areas of calcium deposition in the breast tissue”. Typically, patients undergo a test to tell whether these deposits are benign or malignant, but often these diseased tissues can be hard to detect. The tests may also fail to accurately tell whether the deposits are malignant or not. Because of this uncertainty, Barman has turned to Raman spectroscopy. Raman spectroscopy is a chemical analysis technique that provides information about the chemical structure, crystallinity, and molecular interactions. This technique is based on the interactions of light with the chemical bonds within a material. It works by shining laser light on a substance and analyzing the scattered light. Microcalcifications, such as the calcium depositions doctors look for when diagnosing breast cancer, have strong Raman signatures. Barman, and his students, have built a miniscule Raman spectroscopy probe. They have integrated this probe into a biopsy needle so that when a doctor inserts the needle into the breast, the probe shines light and captures images of scattered light.

From there, these images are sent to a computer where machine learning techniques are applied to analyze the images and determine whether the deposit is malignant or not. Right now, tests with the spectroscopy probe have led to a near-perfect accuracy at breast cancer detection. Yet, cancer research is not limited to imaging alone. Barman is also working on creating a ‘lab-on-a-chip blood test’ that would not only eliminate the need to search for calcium deposits by hand but would make it easier to monitor patients' response to treatment.

In addition to Barman's work, other researchers at Johns Hopkins Applied Physics Laboratory are teaming up with radiologists from Johns Hopkins Medicine to advance the accuracy of breast cancer screening. They are doing this by using an upstream data fusion method. Annual mammograms, an X-ray picture of the breast, have been shown to decrease the breast cancer mortality rate by 38% by detecting early stages of breast cancer. However, there are still limitations. Oftentimes, the normal breast tissue overlaps and prevents lesions from being seen.

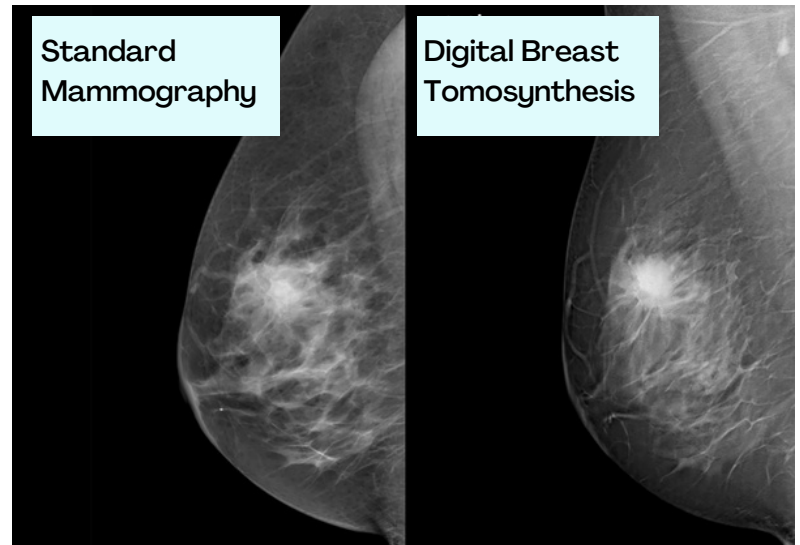


Professor Ishan Barman uses a beam of photons with his Raman spectroscopy scope to detect microcalcifications as an indicator of breast cancer.

CURRENT CANCER RESEARCH (CONT.)

Written by Jenna Ference-Salo

Digital breast tomosynthesis (DBT), which is sometimes referred to as 3D mammography, is able to combat this problem. DBT creates 1-millimeter slices of the lesions that lessen the overlap of tissue. By doing this, DBT makes it easier to detect lesions and, thereby, increases the likelihood and accurate diagnoses. Even though DBT improves some limitations typical mammography has, DBT has its own limitations. Similar to normal mammography, DBT has a difficult time diagnosing cancer in patients who have dense breast tissue. DBT's, also, produce a lot of data per study. Typically, more data is helpful, but in some cases, too much data can be overwhelming. It can also be difficult to interpret mammography. DBT is also known to generate false positives.



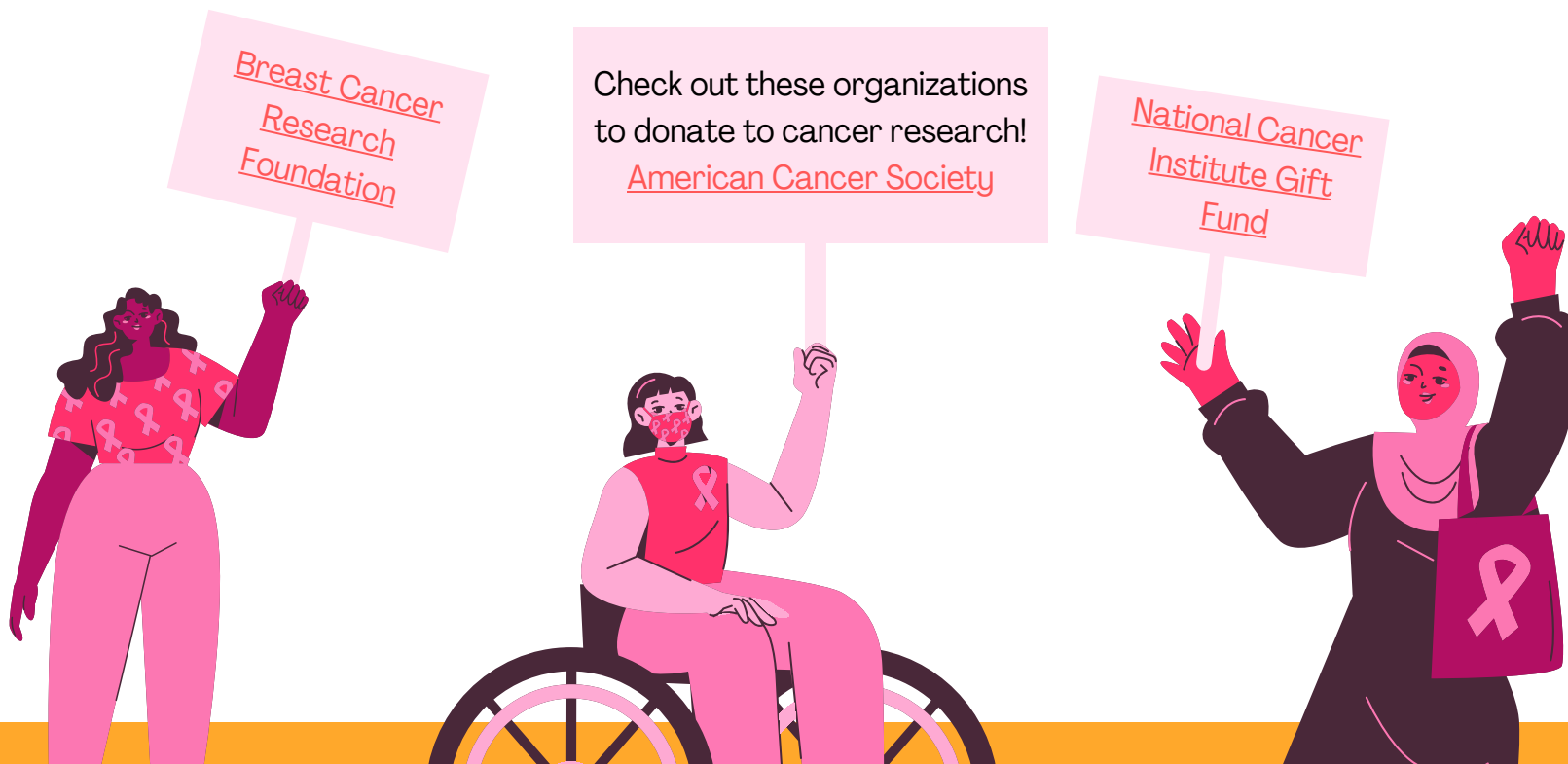
The visual quality differences between standard mammography (the current practice) and digital breast tomosynthesis (a newer technology) are apparent.

Overall, Johns Hopkins, and many universities alike, are making outstanding strides in breast cancer detection. The field of oncology is beginning to utilize computer science and machine learning to detect early stages of cancer. As computer science continues to be incorporated into the medical field, advancements in treatments and disease detections are bound to occur.

Breast Cancer
Research
Foundation

Check out these organizations
to donate to cancer research!
American Cancer Society

National Cancer
Institute Gift
Fund



BE THE TIME MANAGEMENT MASTER!

Written by Anya Patel

Let's take a look at the average student's day. Many students up between six and six thirty AM, barely get ready in time for the bus, and even skip [breakfast](#). This crazed morning is followed by seven hours of learning, with a mere twenty minutes to eat lunch. After a long day with hours of work to complete, exhaustion finally hits as students rest for the first time that day, but having to find the motivation to move forward is probably the hardest part of your day.

When students don't submit on time, they often get labelled as 'procrastinators' or plain 'lazy' when in reality, it's possibly a result of [burnout](#). They are told to get better 'time management skills,' but what does that really mean and how can you achieve it?

First of all, the ability to balance all aspects of your life will take time and It's okay to feel stressed out! People lose motivation due to the size of their workload, so putting yourself in the right mentality is key! The most effective strategies to manage procrastination and a stressful workload can vary from person to person, so let's look at some of the most popular time management [techniques](#) to find the one best suited for you!

Pareto Analysis

Pareto analysis was created by [Vilfredo Pareto](#), and this tool can improve prioritization of your tasks. This method follows the idea that 20% of your actions control 80% of your outcomes! To do Pareto Analysis, identify the root of your problems, and how this root influences other aspects of your life (like other problems you may have). Then, make a plan to change the source of the problem! This technique works best if there is an imminent issue that needs to be addressed.

Pomodoro Technique

Created by Francesco Cirillo in the 1980s, the [Pomodoro Technique](#) highlights taking frequent but very short breaks. To practice the Pomodoro Technique, first set a timer for an increment of time (try not to exceed 60 minutes at first). Once the timer runs out, take a short break (around 5-10 minutes). Once you've run through the cycle a few times, you can allow yourself a longer break! This incentivizes working while also allowing your mind to rest for some time in between.

Eisenhower Matrix

This technique was created by former president, [Dwight Eisenhower](#) who uses a grid (or a matrix) to visualize priorities. Each section is split by Urgent vs. Not Urgent, and Important vs. Unimportant. For example, if a task is urgent and important, it should be at the top of your priorities. On the other hand, if something is urgent and unimportant, that task can be regarded as "Second Priority".

	Urgent	Not Urgent
Important	do it now!	make a plan to do it soon!
Unimportant	2nd priority!	Only do it if there's spare time!



Parkinson's Law

British Historian [C. Northcote Parkinson](#) created Parkinson's Law. Parkinson theorized that if someone was given more time, they would take longer to finish a task. Perhaps there is some truth to this idea. For instance, when your teacher pushes back a deadline, you may spread out your work more. Accountability is the main principle of this technique, for example, give yourself a deadline even if the real one is much farther away. Planning ahead may make your workload better in the end.

As a creative person in the STEM field, I recognize that school, hobbies and extracurriculars can create a tricky balancing act. Therefore, it is especially important to be mindful of your work and complete it efficiently! Today, there is immense pressure for students to maintain an abundant college resume along with a fulfilling life. Fortunately, by practicing these time management techniques you will be able to maximize your productivity and make the most out of your time!



STEM OPPORTUNITIES

Science is a broad field that is best enjoyed with hands-on opportunities. However, we at South Jersey STEM know that summer camps, competitions, and other events can be hard to find. Therefore, we've compiled a list for you to use below. From math to programming to team competitions and more, we have it all, and everyone will be able to find something. Enjoy, and happy learning!

Coriell Science Fair - Camden County regional fair

Registration Deadline: Feb. 21
*Visit [here](#) to find other county fairs

Junior Science and Humanities Symposium - science fair opportunity

Registration Deadline: Varies from Jan. - Feb. (based on your region, find it [here](#))

First Lego League - Team Robotics Competition

A team robotics competition comprised of different leagues. Find yours [here](#).

USA Biology Olympiad, US National Chemistry Olympiad, Mathematical Association of America, US Physics Team, US Medicine Olympiad, USA Computing Olympiad

These competitions consist of different levels of qualifying tests, and often feed into prestigious international olympiads. The deadlines for each vary and can be found at their websites.

High School Hackathons - 24 hour event for programmers to complete a task together.

The given link provides all the upcoming hackathons! Many require no programming experience, but it varies between each event.

TEDx Events - An independent branch, these events are a great chance to learn new ideas!

The link given will allow you to find upcoming events near you!

Maker Faire - Opportunity to present your creations and see others!

Find your closest Maker Faire [here](#)

National Science Bowl - Science quiz bowl for teams of 4-5

Find your region [here](#)
*This competition is through the schools, information about starting a chapter is also on the website

Pathway to Science.org - Science program resource

This website is constantly updated with different scholarships, camps and science opportunities!

**STEM
Opportunity!**

WEBMEDICS

What Is Webmedics?

Web Medics is a student organization for teenagers interested in diving into the world of medicine! Web Medics provides medical enthusiasts with the opportunity to virtually shadow medical professionals, solve case studies, and more.

Why Webmedics?

Web Medics is focused on spreading interest in medicine and inspiring the next generation of medical professionals. We provide all aspiring medical professionals with better opportunities to engage with the field. Web Medics works to educate the public with basic medical information for better decision-making.

Visit or follow us
(instagram:
[@web_medics](https://www.instagram.com/web_medics))!





STEM CAMP OPPORTUNITIES

One of the best times to pursue STEM-based opportunities is in the summer, so below, we have compiled a list of some of the best camps and opportunities that we have come across. These programs vary in subject matter and length of time, so there is something for everyone! The dates in the boxes are the current deadline for application to the programs. For boxes without dates, either the application hasn't opened, or the deadline is not published. Visit the links in each box for more information!

Rowan Biomedical Scholars - June 28

Two-week program to learn lab techniques for biomedical research.

AgDiscovery - March 31

Program at Iowa State University about conservation, medicine, engineering and more.

Eureka! - (8th grade start)

5-year magnet program with opportunities ranging from mentorship to internships.

NASA STEM Engagement - March 31

NASA offers a vast array of different internship opportunities for high school students.

Monell Summer Program - 7 week paid

research internship for students interested in biomedical science with taste and smell.

Boston University RISE Program - Feb 14

6-week program for research projects and developmental workshops

Boston Leadership Institute- Both remote and in-person opportunities for a wide range of STEM fields.

Cornell CURIE Academy- March 1

1 week program for high school girls who are interested in exploring engineering

W.E.B Du Bois Summer Institute- 4 week program with classes in business, leadership, engineering, pre-med/neuroscience.

Girls Who Code Summer Immersion Program-

2 week opportunity to prepare female students for a career in technology.

Engineering Summer Academy at Penn- Mar 26

3 week program that combines complex lessons with hands-on experience at UPenn.

Waksman Student Scholars Program- A year

long opportunity begins in the summer as a project in molecular biology

Inspirit AI Summer Program -

Year-long programs to learn about the basics of artificial intelligence programming in the world.

Inspira Health Volunteering - Hospital

volunteering with customer service, emotional support and other aid.

WHAT IS CLIMATE CHANGE?

Written by Leila Quartoze

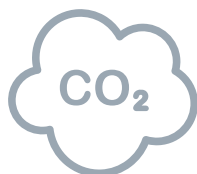
The phrases “climate change” and “global warming” have become more commonplace in government and academic settings. However, you may be asking yourself, isn’t the planet always evolving? If so, why is the changing of our planet so dire? Well, climate change is defined as changes that result from man-made issues rather than natural occurrences. Climate change is caused by heavy energy usage, transportation, resource extraction, rapid industrialization, and many other factors. Ultimately, it causes rising temperatures, unpredictable weather patterns, and a loss of wildlife and biodiversity.

But climate change is not a new phenomenon, it was predicted by Victorian scientists in the mid-nineteenth century. These scientists conducted CO₂ experiments that connected thermodynamics, chemistry, and molecular physics. In the nineteenth century, Joseph Fourier wondered why the earth was so warm. He estimated the amount of solar energy that hit the earth, and then hypothesized that gases in the atmosphere created barriers and trapped heat.



Because of Joseph Fourier's paper in 1824, Eunice Newton Foote conducted an experiment where she took several glass cylinders filled with carbonic acid (now called CO₂) and control cylinders with regular air and placed thermometers at the bottom. Her results demonstrated that the cylinders with carbonic acid became much hotter than the air containers. With these findings, she concluded that CO₂ trapped heat in her 1856 research paper.

Later, in 1988 James Hansen, who was a climate scientist for NASA, testified before the Senate. Hansen claimed that as a result of greenhouse gases, the climate was warming up. Gas produced by cars, natural resource extraction, and pollution caused CO₂ to become trapped in our atmosphere. Furthermore, James Hansen stated if nothing was done to stop this unnatural phenomenon, the Earth’s temperature would rise 3-9 degrees Fahrenheit from the year 2025 to 2050. He predicted that such a rise in temperature could trigger a domino effect: melting polar ice caps would give rise to elevated sea levels and evaporated lakes. Ultimately, these geographic changes would kill wildlife and decrease biodiversity.



WHAT IS CLIMATE CHANGE?

(CONT.)

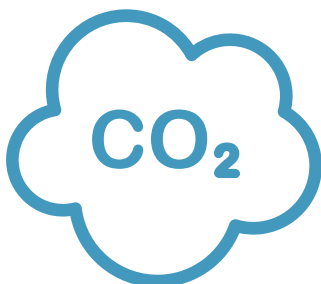
Written by Leila Quartoze

There have been centuries of research predicting the climate change phenomenon. So who is at fault for global warming? Well, many major oil companies knew about climate change but chose profit over preservation. A company that has been called out especially is Exxon Mobil. In 1957 a scientist at ExxonMobil, which was called Humble Oil at the time, published a paper stating that large amounts of carbon dioxide have been added to soils because of the extraction and tilling of land. This study demonstrates that Exxon was aware of the consequences of oil magnet practices. Exxon has contributed to climate change through energy use, resource extraction, and pollution. However, Exxonmobil is just one of the many major oil companies that have contributed to climate change.

Another dominant cause is the current deforestation in the Amazon rainforest. The Amazon rainforest produces six percent of the world's oxygen and absorbs 123 billion tons of carbon dioxide from the atmosphere. The reason for Amazon deforestation is consumer demand for lumber and livestock. The deforestation of the Amazonian rainforest increases atmospheric CO₂ causing the planet to overheat.

Lastly, a major cause of climate change and global warming is the trade industry. The overconsumption of goods, transportation, and energy has a major impact on our planet. Let's take the clothing industry as an example. Companies use unsustainable fabrics such as polyester, linen, rayon and resources, which end up in the ocean after trend cycles change. Furthermore, industrial factories produce toxic gases such as methane and carbon dioxide, which end up in our atmosphere. Through transport as well, airplanes, trucks, and ships dump profuse amounts of oil back into the soil. Unfortunately, this carbon-based waste often evaporates into our atmosphere, contributing to CO₂ levels.

After finding out what climate change is and how it came to be, it's time to ask the big questions. What changes can be made in our society to make our future less deadly, and who is responsible for that task?



INVENTING THE FUTURE

Written by Kejal Shah

According to [LiveScience](#), scientists and inventors often get credit for innovations that advance the human condition, but it is engineers who truly change the world. In the past decade, new inventions have advanced human life, and they have added new elements to previous ones. New inventions are created every day, and like the inventions from the past decade, they may significantly change how people in today's society live. Let's take a look at some of the most formative inventions of the past decade.

In May of 2016, the [Google Assistant](#) was created, and it has surpassed many other smart speakers in its ability to accurately understand humans. The Google Assistant is considered "general artificial intelligence." This invention can answer human commands by composing messages, making calendar reminders, scanning the internet for answers to questions, translating spoken words into different languages, and much more. The Google Assistant has the ability to make one's life much more [efficient](#) in daily routines, communication, reminders, and phone functions. As of January 2020, the Google Assistant had about [half a billion](#) users around the world, and the platform is only growing.



[Consumer LED Light Bulbs](#) have been introduced to the market after 2010. LED Light Bulbs use only about [twenty percent](#) of the energy that incandescent light bulbs require. Not only are LED light bulbs much more energy efficient than incandescent light bulbs, they are also more cost-efficient since they last longer than their predecessors. According to the [United States Energy Information Administration](#) (EIA), eighty-six percent of households reported using at least one LED bulb in 2015. Nationwide, eighteen percent of households reported having no incandescent bulbs in their homes in the same year. Because [LED Light Bulbs](#) need less heat, produce more light, and have a lower cost in the long run, people who switch to using LED bulbs often gain a range of benefits.

INVENTING THE FUTURE (CONT.)

Written by Kejal Shah

The Ring Doorbell was invented in the past decade by Jamie Siminoff. Siminoff first pitched his smart doorbell on Shark Tank in 2013, where he was unanimously rejected (a good reminder to never give up!). However, in 2018, Amazon bought his company for \$1 billion. The Ring Doorbell works by allowing you to see who's at the door whenever there is any detected motion. The app also offers many more features that allow people to make their homes more secure. According to BusinessWire, Ring sold more than 1.4 million doorbells in 2020, and this invention may be making communities safer. In 2015, the LAPD found that Ring Doorbells reduced burglaries in neighborhoods by as much as fifty-five percent in seven months.



More recently, self-driving cars have taken the world by storm. Google and Apple began testing their full autonomous cars in the first half of the decade, and most major car manufacturers began following suit. According to James O. McKinsey, autonomous cars are said to take up about sixty-six percent of traffic by 2040. Researchers hope that self-driving cars may help to prevent car crashes, while also providing a more cost efficient and accessible option, especially for the elderly and those with disabilities. Self-driving cars, though not fully available yet, would change the travel industry completely.

New engineering inventions created in the past decade have substantially affected today's daily life. With the invention of the Google Assistant, consumer LED light bulbs, the Ring doorbell, and self-driving cars, modern society is more protected and efficient than ever. New engineering inventions will continue to improve society far into the future!



NEW BLOOD TEST: VIRUS OR BACTERIA?

Written by Sonia Leo

The pandemic has increased anxiety among patients even though their affliction might only be a cold or a flu. As a result, blood tests have become more common, since the pandemic. Furthermore, patients anxiously await blood test results that usually take a day or two.

Besides, doctors may be conflicted about whether a patient has contracted a bacterial or viral illness. In many cases, determining whether the cause of the illness is caused by a bacterium or virus is critical to the doctor's treatment plan. Sometimes with an unknown infection, doctors order a lab test or immediately try antibiotics. Since lab tests may not be fast enough, doctors usually rely on the patient's symptoms to determine whether a pathogen is a virus or bacterium. However, solely relying on symptoms is not always precise; for example, if an antibiotic is prescribed excessively without necessary reason, dangerously resistant bacterial strains can follow.

To solve this issue, infectious disease specialists such as Ephraim Tsalik decided to take action. Specialists have developed a lab test that diagnoses patients with a viral, bacterial, or noninfectious disease through blood tests. This development is extremely effective, since it is able to scrutinize the RNA pieces of the pathogen and determine its type.

Tsalik and his team paired up with BioFire, which is a company that helps speed up lab tests to make them more efficient and rapid. Eventually, because of their collaborative work, the result time for lab tests could be truncated to just an hour. The new process was tested on approximately six hundred patients. Ultimately, the test proved to be extremely accurate and efficient!

Tsalik and his team's work have been greatly appreciated by other researchers worldwide. After closely examining this new tool, they saw that it could be used effectively throughout the world because doctors can effectively determine the difference between a bacterium or a virus. Not only could it be used in the United States, where this new technology was developed, but it could also benefit poorer countries. Therefore, having this new technology can have an intense impact in stopping the rise of antibiotic resistance. Especially when fighting a viral pandemic, technological improvements such as these are vital in aiding medicine.



Meet the Authors!



Maya Butani - Founder/President of South Jersey STEM

Articles: What is Artificial Intelligence?

Maya has competed in many science fairs for her biomedical engineering research which she pursues at Rowan University in the Vega Lab. She founded South Jersey STEM after recognizing the value of experiential learning in science education and truly believes in the power of science to better society. mbutani718@gmail.com



Jenna Ference-Salo

Articles: Fun Facts, Current Cancer Research

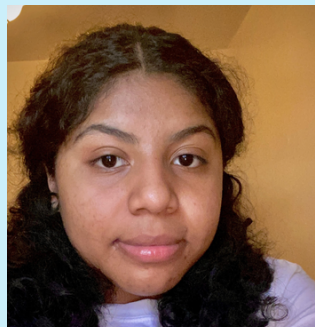
Jenna is passionate about STEM and in programming, she is working on issues regarding GI cancer and studies how AI could be used in healthcare. Outside of school Jenna loves to dance and even teaches younger students! Jenna is a wonderful leader and is excited to bring STEM to younger students.
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Jillian Smith -

Articles: Not Separate and Not Equal

Jillian is a senior in high school and loves math and science. She is passionate about helping her community by providing mentorship and service in STEM and music. She is currently researching hydrogels for nerve grafts and spacers to protect cancer patients from radiation. She hopes to instill a love of learning and science in younger students!
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Alicia Garcia-Rivas -

Alicia has competed in past science fairs with projects mainly in biochemistry. Beyond math and science, Alicia advocates for social justice topics, while giving back and helping out in her community. Her goal is to increase youth awareness and enjoyment of STEM fields!
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Meet the Authors!



Leila Quatorze -

Articles: What is Climate Change?

Leila loves all things science and engineering. She is very interested in environmental, biomedical, and industrial engineering. She is currently researching photo patterning and cell morphology at Rowan university and hopes to share her knowledge while also making environmental science more accessible to students in her community!

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Anya Patel -

Articles: Art in STEM!, Be the Time Management Master

Anya loves everything about creativity. Working to blur the lines between STEM and art, she hopes to create a unique environment to make the field a little more fascinating and exciting than it already is! She's happy to be working with such accomplished girls and is excited to blend ideas with people with different STEM backgrounds.

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Isabella Moccia

Articles: Global Current Event

Bella loves all things science! With a particular interest in biochemistry and neuroscience, she is looking to pursue higher-level research and learning opportunities within the medical field. Bella is very excited to share her passion for medicine and gain valuable experiences in STEM with girls of all different backgrounds and interests!

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Sonia Leo

Articles: New Blood Test: Virus or Bacteria?

Sonia loves everything about science and math. She cares deeply about educational equity and is a strong advocate for STEM education especially for girls and low-income students. She wishes to use her experiences with this club to create more opportunities for elementary and middle school girls in STEM!

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Meet the Authors!



Rachana Raja

Articles: Webmedics

Rachana is a junior who's passionate about Neuroscience. She loves all things science and hopes to pursue higher-level research in the medical field. She's excited to have the opportunity to teach people about STEM!

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Kejal Shah

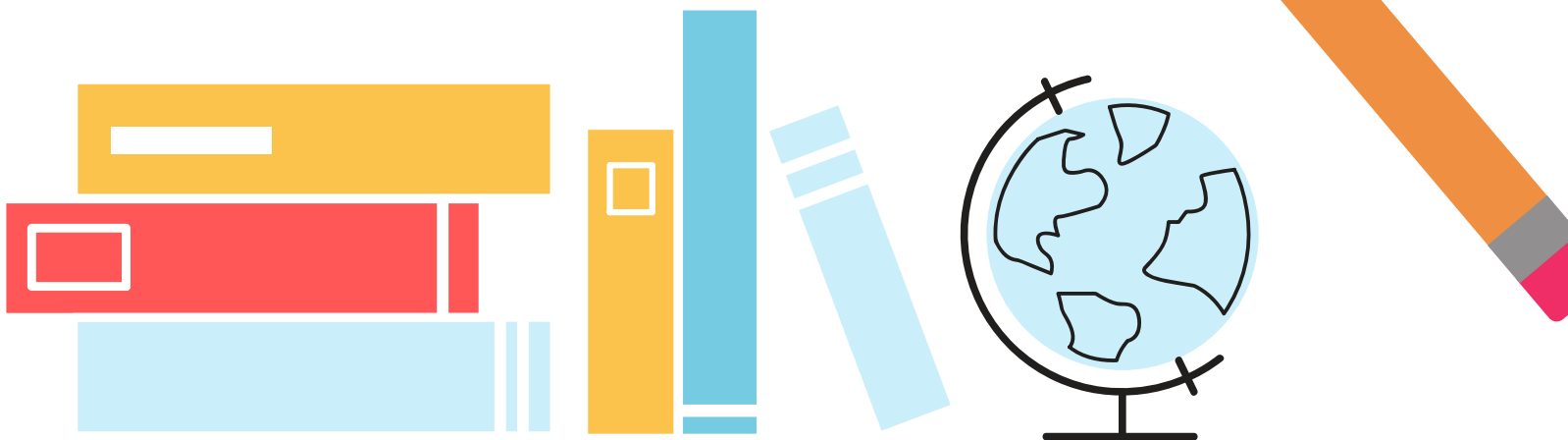
Articles: Cabbage pH Indicator, Inventing the Future

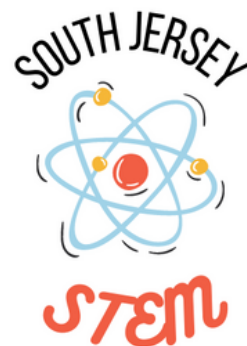
Kejal is very passionate about environmental science and engineering. She takes part in her school's robotics and environmental club, and she enjoys giving back to her community. In the future, Kejal hopes to be able to learn more about science and share what she knows with others!

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Want to see your name here?

If you have an interest in STEM and want to share your experiences or passions contact us at mbutani.stem@gmail.com! We'd love to hear from you!





Thank you!

For all of your support!

If you can, please leave feedback for us [here](#)! We want to keep improving for future editions. And if you liked us, please spread the word! If you want to get involved, visit us [here](#) or email mbutani.stem@gmail.com!

Next Edition:
Middle of April

