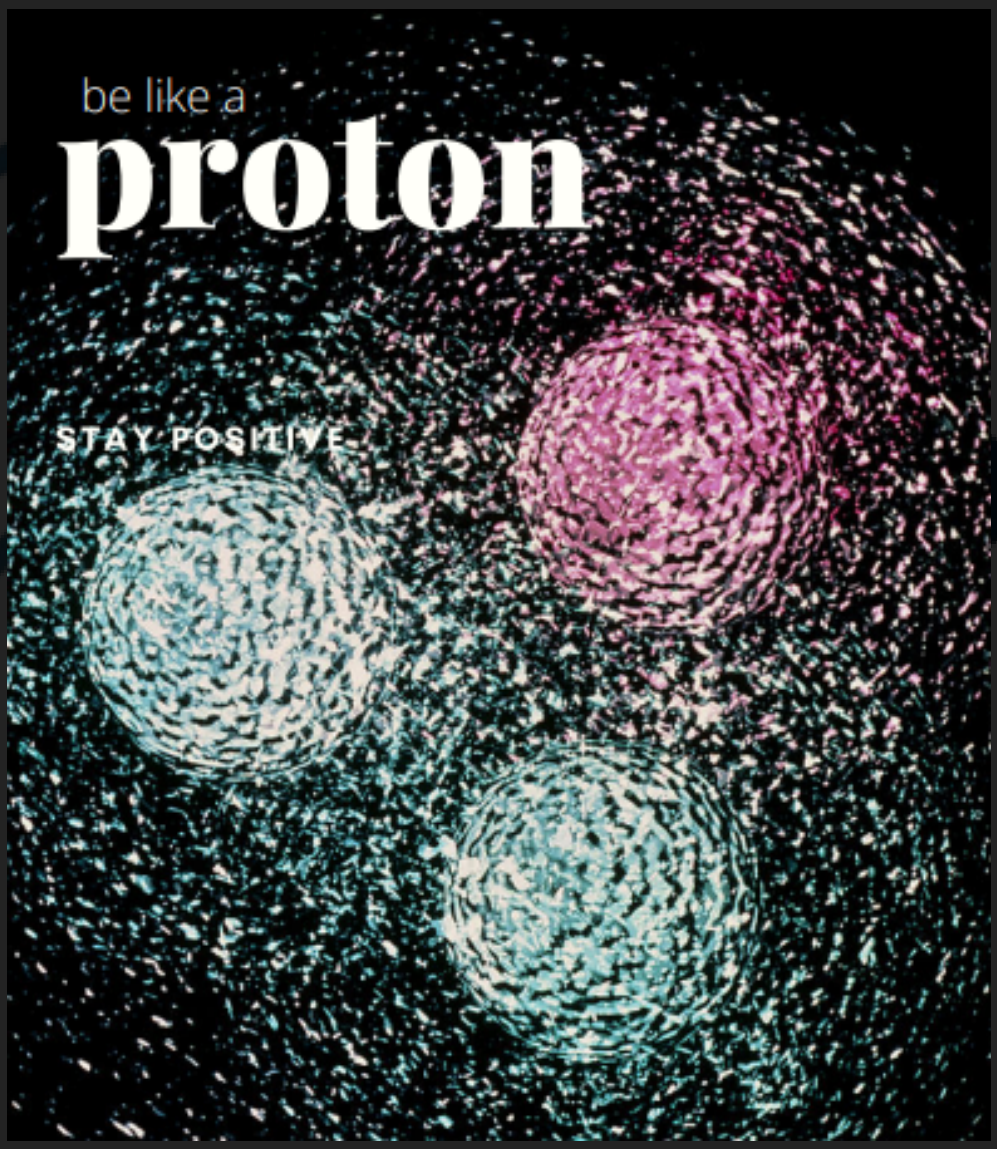
MARCH 2021, ISSUE 1

# THE STEM TABLE

-STEM FOR HIGH SCHOOL AND COLLEGE STUDENTS-




Cover art by Alina Gao

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# From The Tech and Management Director

Neha  is the founder of The STEM Table and a high school sophomore from India. She is a Lumiere Research Scholar and an SSI Cohort Scholar. She is published in several literary journals, does graphic design, and loves making new friends!
Instagram: @thelittlechocolatetruffle

## Director's Note

Dear readers,

Thank you for being among the first to read our March 2021 launch issue! The STEM Table has been going through an absolute lot behind the scenes. From writing articles to revising, designing, and doing outreach, it's been a lot of work to get this to you. We are overjoyed to have reached three hundred subscribers to our magazine in less than one month, and we thank you, our subscribers, for being part of our founding journey! This month's theme is Protons- sure, it's an element of the atom, but its positive charge signifies more than just its contribution to making the atom wholly and electrically neutral. It's a symbol of positivity and balance in our own lives, especially when we're all going through this uncertain time which symbolizes TST's brainchild. Our first issue does more than impart some knowledge to you and awe you with the wonders of STEM. It is a reminder to each and every one of you to learn from protons and face life with the optimism and positive outlook you ought to show every obstacle, every challenge in the way. Also, to balance your life out and everybody's else too,  and do and be what matters most. We're all in this together! So many contributors worked so hard on this launch issue. I would like to thank everyone, our contributors, readers, and helpers, for making our launch so successful. Enjoy reading, and send any kind of feedback to thestemtable@gmail.com. We love your opinions and suggestions!
-Neha Varadharajan

# From The Journalism Director

Hi! I'm Shreya, the Director of Journalism here at The STEM Table. I'm a sophomore in high school and I have a strong passion for science, especially medicinal science, as I aspire to be a medical researcher after college. In my free time, I enjoy writing (of course!) and have been learning dance for the past 7 years. I look forward to working with everyone!

Dear readers,

One of the first things we learn in life is that negative times never last forever, giving people in vulnerable positions hope for a positive future. In science, one of the most important discoveries ever made was the proton, the positively-charged subatomic particle positioned in the center of the atom. The proton is more than just an unimaginably small particle; it's a representation of individual identity and stability, in atoms and in life. Small particles of happiness in life make up the individuality of a person, with no one going through the same experiences as one another, analogous to each element being unique because of the number of protons it has. However, as proven by the movie *Inside Out*, happiness is often accompanied by sad moments. Just like protons are a representation of identity, the negatively-charged electron is the keeper of stability. Without electrons, an atom would be unstable and incomplete, with the attraction between positivity and negativity serving as a constant reminder of how both need one another to keep the atom stable. Accepting the negative aspects of life is just as important as cherishing the positives, if not more.

This month's edition of The STEM Table magazine revolves around the concept of the proton and its associated happiness, and the influence it can have, in both a scientific and philosophical sense. I hope you enjoy reading the different authors' takes on this month's theme, and reading them brings some positivity to your day!

# Other Directors

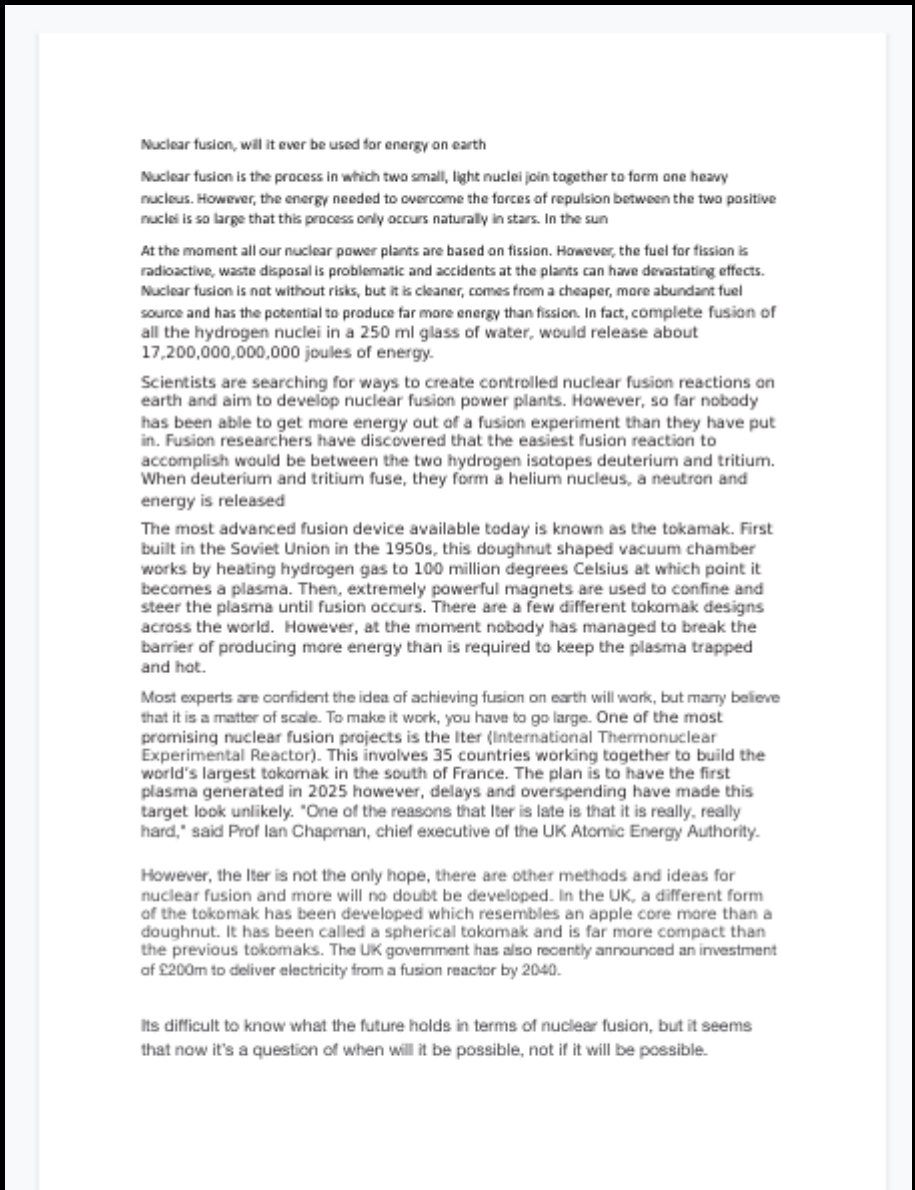
## KELLY CHEN: DIRECTOR OF DESIGN

## EMMA FURLONG: PUBLIC RELATIONS SPECIALIST

# This Month's Article Features

Enjoy our favorite picks from our magazine contributors with their portrayal of the month's theme!

## Nuclear Fusion by Josie Marshall



Nuclear fusion, will it ever be used for energy on earth

Nuclear fusion is the process in which two small, light nuclei join together to form one heavy nucleus. However, the energy needed to overcome the forces of repulsion between the two positive nuclei is so large that this process only occurs naturally in stars. In the sun

At the moment all our nuclear power plants are based on fission. However, the fuel for fission is radioactive, waste disposal is problematic and accidents at the plants can have devastating effects. Nuclear fusion is not without risks, but it is cleaner, comes from a cheaper, more abundant fuel source and has the potential to produce far more energy than fission. In fact, complete fusion of all the hydrogen nuclei in a 250 ml glass of water, would release about 17,200,000,000,000 joules of energy.

Scientists are searching for ways to create controlled nuclear fusion reactions on earth and aim to develop nuclear fusion power plants. However, so far nobody has been able to get more energy out of a fusion experiment than they have put in. Fusion researchers have discovered that the easiest fusion reaction to accomplish would be between the two hydrogen isotopes deuterium and tritium. When deuterium and tritium fuse, they form a helium nucleus, a neutron and energy is released

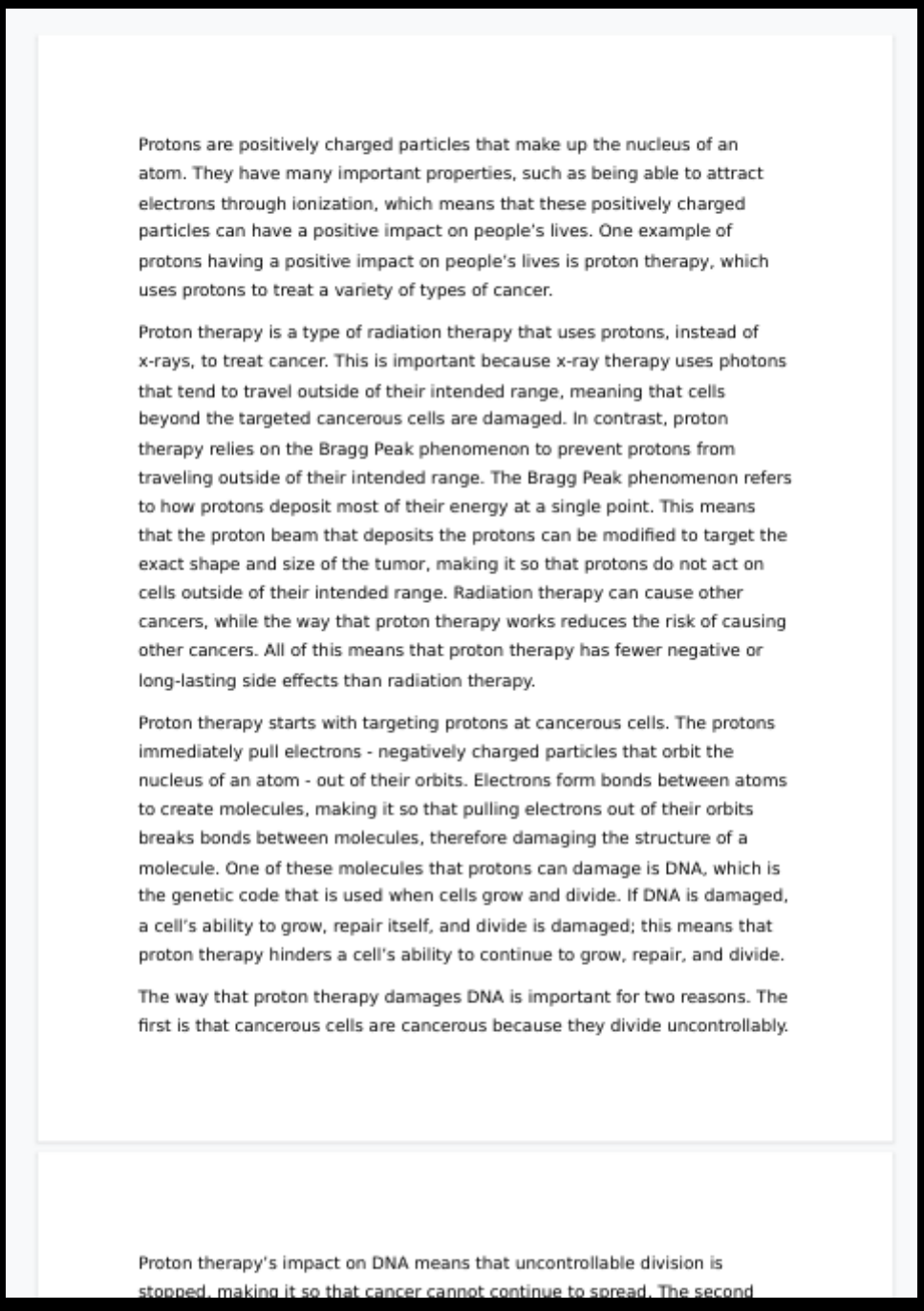
The most advanced fusion device available today is known as the tokamak. First built in the Soviet Union in the 1950s, this doughnut shaped vacuum chamber works by heating hydrogen gas to 100 million degrees Celsius at which point it becomes a plasma. Then, extremely powerful magnets are used to confine and steer the plasma until fusion occurs. There are a few different tokomak designs across the world. However, at the moment nobody has managed to break the barrier of producing more energy than is required to keep the plasma trapped and hot.

Most experts are confident the idea of achieving fusion on earth will work, but many believe that it is a matter of scale. To make it work, you have to go large. One of the most promising nuclear fusion projects is the Iter (International Thermonuclear Experimental Reactor). This involves 35 countries working together to build the world's largest tokomak in the south of France. The plan is to have the first plasma generated in 2025 however, delays and overspending have made this target look unlikely. "One of the reasons that Iter is late is that it is really, really hard," said Prof Ian Chapman, chief executive of the UK Atomic Energy Authority.

However, the Iter is not the only hope, there are other methods and ideas for nuclear fusion and more will no doubt be developed. In the UK, a different form of the tokomak has been developed which resembles an apple core more than a doughnut. It has been called a spherical tokomak and is far more compact than the previous tokomaks. The UK government has also recently announced an investment of £200m to deliver electricity from a fusion reactor by 2040.

Its difficult to know what the future holds in terms of nuclear fusion, but it seems that now it's a question of when will it be possible, not if it will be possible.

# Proton Therapy by Anastasia Gaskamp



Protons are positively charged particles that make up the nucleus of an atom. They have many important properties, such as being able to attract electrons through ionization, which means that these positively charged particles can have a positive impact on people's lives. One example of protons having a positive impact on people's lives is proton therapy, which uses protons to treat a variety of types of cancer.

Proton therapy is a type of radiation therapy that uses protons, instead of x-rays, to treat cancer. This is important because x-ray therapy uses photons that tend to travel outside of their intended range, meaning that cells beyond the targeted cancerous cells are damaged. In contrast, proton therapy relies on the Bragg Peak phenomenon to prevent protons from traveling outside of their intended range. The Bragg Peak phenomenon refers to how protons deposit most of their energy at a single point. This means that the proton beam that deposits the protons can be modified to target the exact shape and size of the tumor, making it so that protons do not act on cells outside of their intended range. Radiation therapy can cause other cancers, while the way that proton therapy works reduces the risk of causing other cancers. All of this means that proton therapy has fewer negative or long-lasting side effects than radiation therapy.

Proton therapy starts with targeting protons at cancerous cells. The protons immediately pull electrons - negatively charged particles that orbit the nucleus of an atom - out of their orbits. Electrons form bonds between atoms to create molecules, making it so that pulling electrons out of their orbits breaks bonds between molecules, therefore damaging the structure of a molecule. One of these molecules that protons can damage is DNA, which is the genetic code that is used when cells grow and divide. If DNA is damaged, a cell's ability to grow, repair itself, and divide is damaged; this means that proton therapy hinders a cell's ability to continue to grow, repair, and divide.

The way that proton therapy damages DNA is important for two reasons. The first is that cancerous cells are cancerous because they divide uncontrollably.

Proton therapy's impact on DNA means that uncontrollable division is stopped, making it so that cancer cannot continue to spread. The second

Read more here:
https://docs.google.com/document/d/12gIRUyROZg_a3K8X4hQuzR0NTL6-yTmt7dc-yb-rNpo/edit

# Negativity Provides Opportunity for Positive Growth by Kanakdeep Kaur

## Negativity Provides Opportunity For Positive Growth

Everything in equal amounts is essential in life. Just as an atom cannot sustain without electrons, even we can't survive without negativity. Doubtful? Well, read on to find the explanation. For example, you've made a painting and you're showing it to your friends. One of your friends tells you that you missed out on a spot or you could've done better on the painting. Now it's on you for how to take on this comment. Should you take it as that person's saying this because he wants you to improve or is there any other reason? When you take this as honest feedback and think that yes, I can improve myself is when you'll be more successful in life. When you give yourself the chance to be open to more opportunities and feedbacks and is when you'll be able to grow. It's very well said that 'A negative thinker sees a difficulty in every opportunity however a positive thinker sees an opportunity in every difficulty.'

Negativity in the right amounts helps you to improve yourself and grow into a better version of yourself. At the same time, you should also know how to handle it properly. Perspective is something that's very important in life and It's the perspective that matters.

# What are Protons? by Insia Ahhmed

A proton is a subatomic particle that has a mass of 1.67262 × 10−27and a positive charge, the protons and neutrons make up the nucleus of an atom. The amount of neutrons and protons are the same and define the atomic number of an element on the periodic table, except hydrogen which contains one proton. Protons were first discovered by Rutherford in 1919 when his scintillation detectors sensed a hydrogen nuclei when a beam of alpha particles were shot in the air. Upon further examining, he discovered it was created from the nitrogen atoms in the atmosphere, then he fired beams of alpha through pure nitrogen gas and saw that more hydrogen nuclei were produced. He concluded that hydrogen nuclei were from a nitrogen atom which proved that the hydrogen nucleus was a part of all other atoms. Later, he named the hydrogen nuclei, as we know it today, a proton. But what if protons did not exist? Elements would not be distinguishable and elements would not serve a purpose making earth inhabitable. As shown, atoms are the building blocks of life and without the protons giving off a positive charge it could change our entire world as we know it. So if one person could give off a positive charge to others it could cause a butterfly effect that allows our world to function how it is. If there was no positive energy the world would be in chaos and there would be no balance. Positivity is needed to balance the world.

# This Month's Art Features

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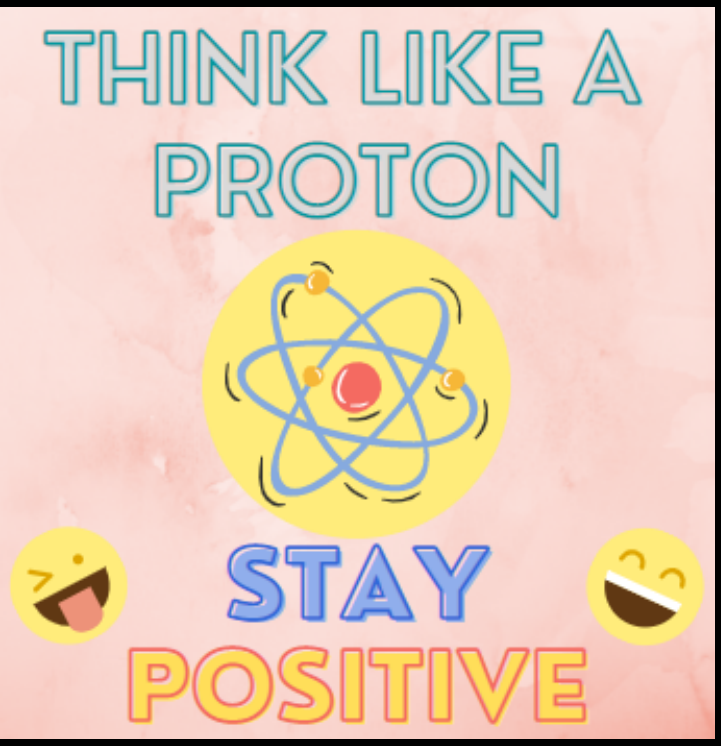
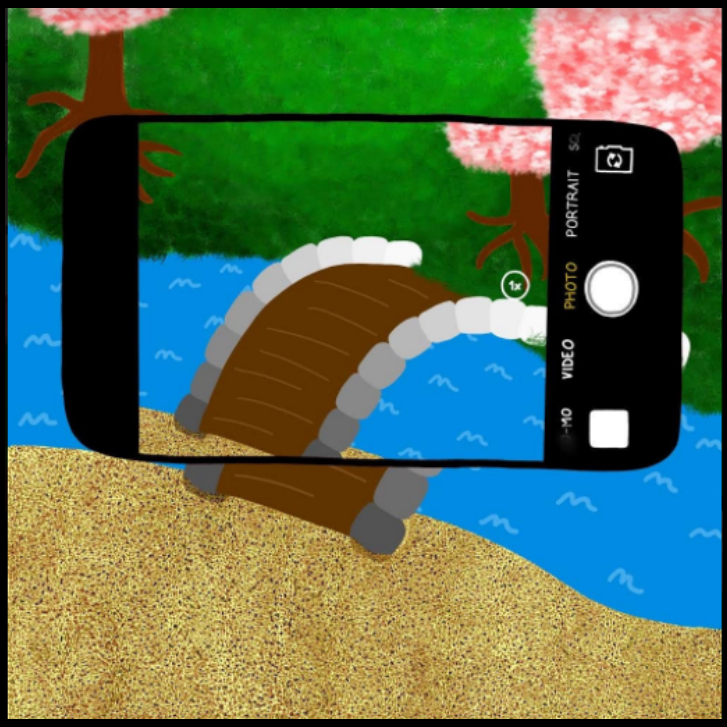
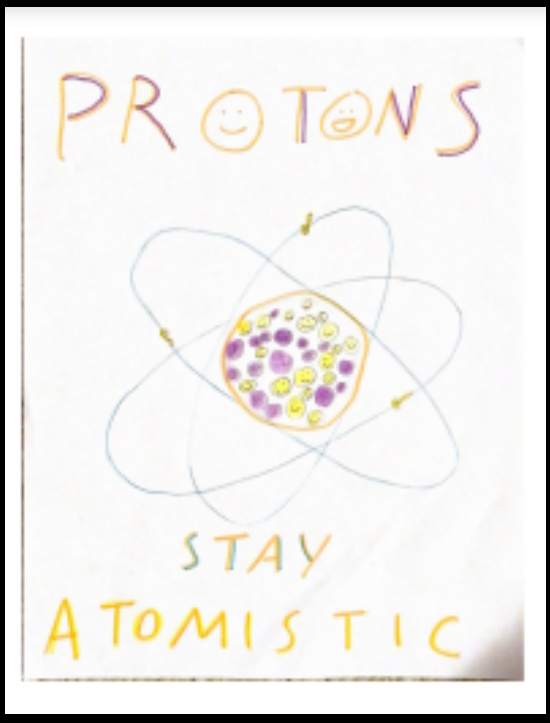




By Kelly Chen




By Valerie So




By Alina Gao

# Opportunities Pick

This is the official opportunities list for high school students, with scholarships, volunteering opportunities, internships, programs and more!

NSTEM Internships:
https://www.nstem.org/internships

Google Science Fair:
https://edu.google.com/

MathCamp:
https://www.mathcamp.org/admission/

Aspirnaut Summer Research Internships at Vanderbilt:
https://aspirnaut.org/high-school-internships/

PFLAG National Scholarship:
https://pflag.org/localpflagscholarshipprograms

# thank you for reading!

This was our initial launch issue, and we went through challenges and problems we tried our best to overcome. We anticipate improvement in our publication with each issue, and we appreciate your support in our founding journey- thank you!

Join our 50+ and growing team: https://docs.google.com/forms/d/e/1FAIpQLSfyw1aRh9qy9QUZoQNdMmdYp-GbwllntuZhVHbCQCS-kbhfiw/viewform

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