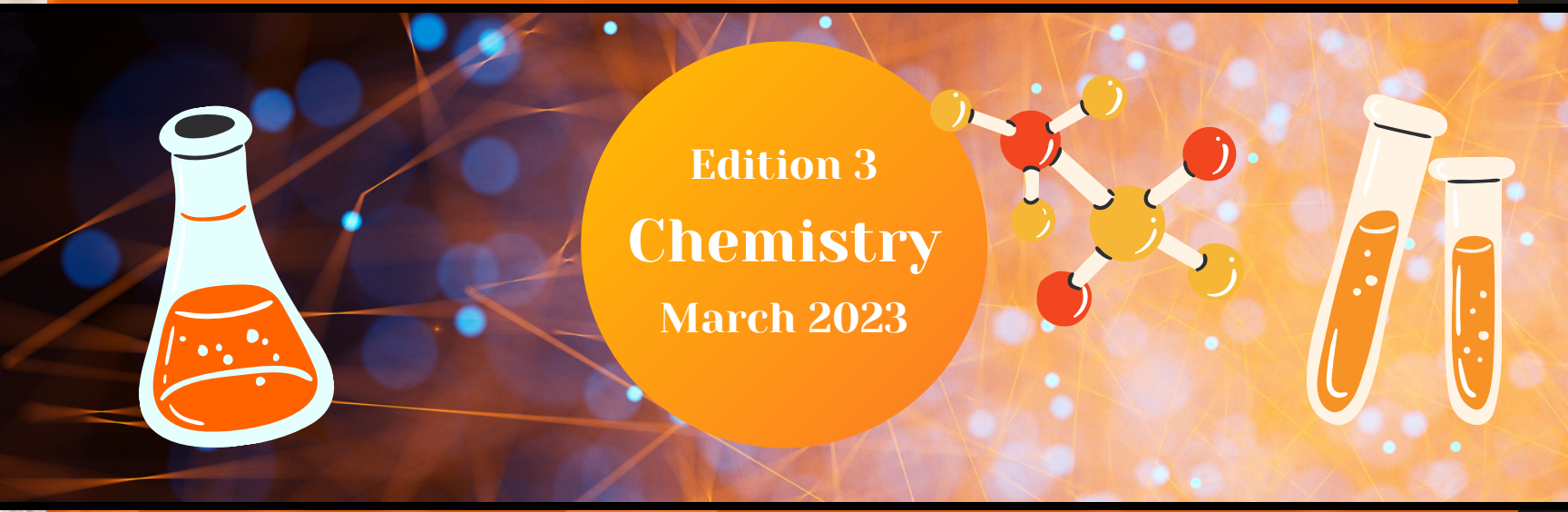
The STEAM-steinettes Gazette



Edition 3

Chemistry

March 2023

"Don't let anyone rob you of your imagination, your creativity, or your curiosity. It's your place in the world; it's your life. Go on and do all you can with it, and make it the life you want to live."

Mae Jemison

How An Accident Led To A Scientific Breakthrough | By: Sofia

During an experiment involving N-heterocyclic carbenes (organic compounds with great versatility and stability used to stabilize Si═Si double bonds), chemists in Japan accidentally discovered a chemical reaction that creates four new bonds to one carbon atom in a single step. There are many chemical reactions involving the addition of carbon atoms to a substrate molecule; however, almost no experiment has ever used a reaction with a single-carbon atom transfer. Since this unprecedented discovery, a team at Osaka University, Japan, has invented a way to tame atomic carbon, which is normally extremely unstable, and utilize it as a viable reagent. By a process known as resonance, N-heterocyclic carbene molecules contain a stabilized version of a carbon atom equivalent and six valence electrons, which allows them to act as a "carbon donor" through the loss of a 1,2-diimine moiety. In conclusion, this strategy succeeded in using an atomic carbon equivalent to form four chemical bonds in one step, which can quicken the process of developing pharmaceuticals and other established drugs. This experiment demonstrates that occasionally, the most significant and life-changing discoveries can be discovered by making the simplest mistakes.

Read on!

FEMALE SCIENTIST SPOTLIGHT

By: Jasmine

DR. MARIE MAYNARD DALY

Marie Maynard Daly was the first African American woman in the United States to receive a doctorate degree in chemistry. Born in Queens, New York in 1921, she had a passion for science from a young age. She went to Hunter College High School, an all female institution where many encouraged her to explore her passions. Later, in 1942, she graduated magna cum laude in the top 2.5% of her class from Queens College. Here she was offered a fellowship to pursue graduate studies while working as a part time laboratory assistant at Queens College. She completed her master's degree in just one year and proceeded to pursue a doctorate's degree at Columbia University.

Under the instruction of Mary L. Caldwell, Daly researched how compounds produced in the body affect and participate in digestion. She also studied and identified histones, essential proteins in DNA. Her research helped to understand how cells determine which part of the genome to read. In 1947, just three years after beginning the program, she earned her doctorate's degree, becoming the first African American woman to obtain a Ph.D in the U.S. Daly proceeded to teach at Howard University for two years. For seven years after that, she studied composition and metabolism components of the cell nucleus (Science History Institute).

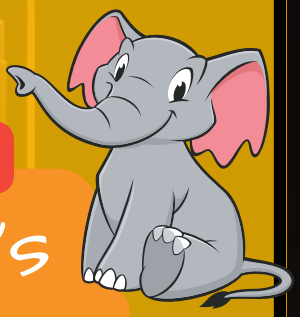
In 1955, she returned to Columbia University to research the causes of heart attacks. The studies showed a connection between high cholesterol and clogged arteries, which helped open a new understanding of how diet can affect cardiovascular and circulatory health (Biography). She also made the connection between high blood pressure and atherosclerosis (yourgenome).

She taught biochemistry and remained a professor at Albert Einstein College of Medicine from 1960 until her retirement in 1986. Her studies were groundbreaking in providing more information on the human body and making great leaps for women in similar fields. Aside from her life in the biochemistry field, she also worked on helping minority students get into medical school and graduate science programs. In 1988, she established a scholarship fund for African American science students at Queens College.

"Courage is like-it's a habitus, a habit, a virtue: you get it by courageous acts. It's like you learn to swim by swimming. You learn to courage by couraging." - Marie Maynard Daly

Science Experiments!

By: Hitej



INTERMEDIATE

Fruits Have Genes Too!

Fascinated by genetics? Watch this instructional tutorial and use some household items to extract the actual DNA from a strawberry!

CHECK IT OUT!

ADVANCED

Elephant's Toothpaste

Tired of seeing those boring baking soda and vinegar volcanoes? Amp up your experiment with this colorful and foamy explosion instead!

CLICK HERE FOR THE STEPS!

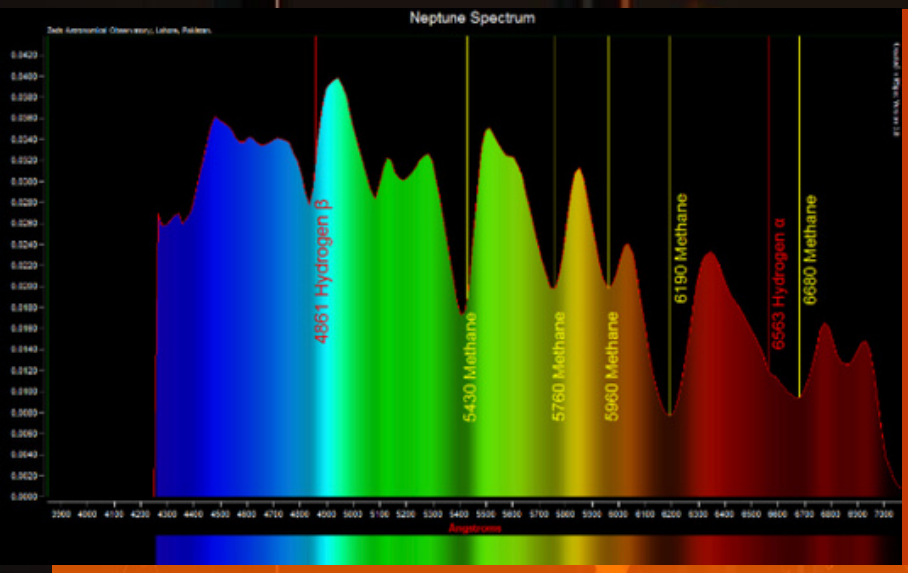
Global Science Happenings

By: Hitej

New technology to analyze ice cores deep under the Earth's surface is in development.

A greener replacement to plastic is in the works with the recent development of bio-degradable polyester, with similar qualities to plastic.

Clay has nanopores that can be used to capture CO_2 in the atmosphere.



SPECTACULAR SPECTROSCOPY + ASTROCHEMISTRY

By: Barros

Planets. You know them. From Mercury to Neptune (RIP Pluto's status), you've most likely learned the names of the planets of the solar system at one point, even if you've forgotten their order by now. Chances are, you also know the colors of said planets. Mars is red, Uranus is light blue, Venus is cream, etc. Did you know though, that these colors actually mean things? Depending on the color of the planet, scientists can use spectroscopy (a fancy term for light-detecting telescopes) to determine what a planet - or any other celestial object - is made of!

When we look at pictures of planets like Neptune, we see blue. Most of us leave it at that. For the scientists among us however, they tend to wonder why. The reasoning behind the planet's enchanting blue shade is due to the chemicals in its atmosphere. They absorb the red and infrared light, and reflect primarily blue light back at us. If we were to point a spectroscopic telescope at Neptune, we would see the picture shown above. As you can see in the chart, there is a lot of methane detected, which is what absorbs the red light and reflects primarily blue, depicted by the raised blue side, and lowered red side.

Just how do we know what these colors mean though? How do we know that this color spectrum means there's methane? If you look closely, you'll notice that the lines coming up from the graph where the yellow and red labels are are just above the darker parts of the colored sections, known as absorption lines. (Notice how there is a lot more absorption on the red side!) The following link will lead you to a periodic table composed solely of these absorption lines, showing just how unique each element is and how their lines differ. Methane is not on the periodic table due to it being a compound, not an element, but the table should serve as a good example for why spectroscopy is a wonderful tool for understanding the composition of the universe.

Check it out! https://miro.medium.com/v2/resize:fit:828/format:webp/1*b21XvgYNLXxXvzNoUrVYzg.jpeg

Movie Review: Radium Girls

By: Barros

Radium Girls is a wonderful and exciting non-fiction movie based on the true story of sisters Bessie and Josephine "Jo" Cavallo, as they begin work at a watch dial painting factory. The movie follows their terrifying struggles as they begin to suffer from strange medical issues, and as they move quickly to figure out exactly why, following the events of their fellow workers beginning to turn up in similar conditions. Walk along with the girls as they figure out the sinister meaning behind these ailments and fight alongside them as they battle the intense misogyny of the time to be heard by those attempting to hush them up. This movie is a wonderful insight into the dangers of radium, as well as an impactful representation of how science and the opinions of the elements and chemicals within it can change drastically over time with newer research and the potentially unfortunate consequences of use.

Spoilers Rating: 4/10

Movie Rating: PG-13

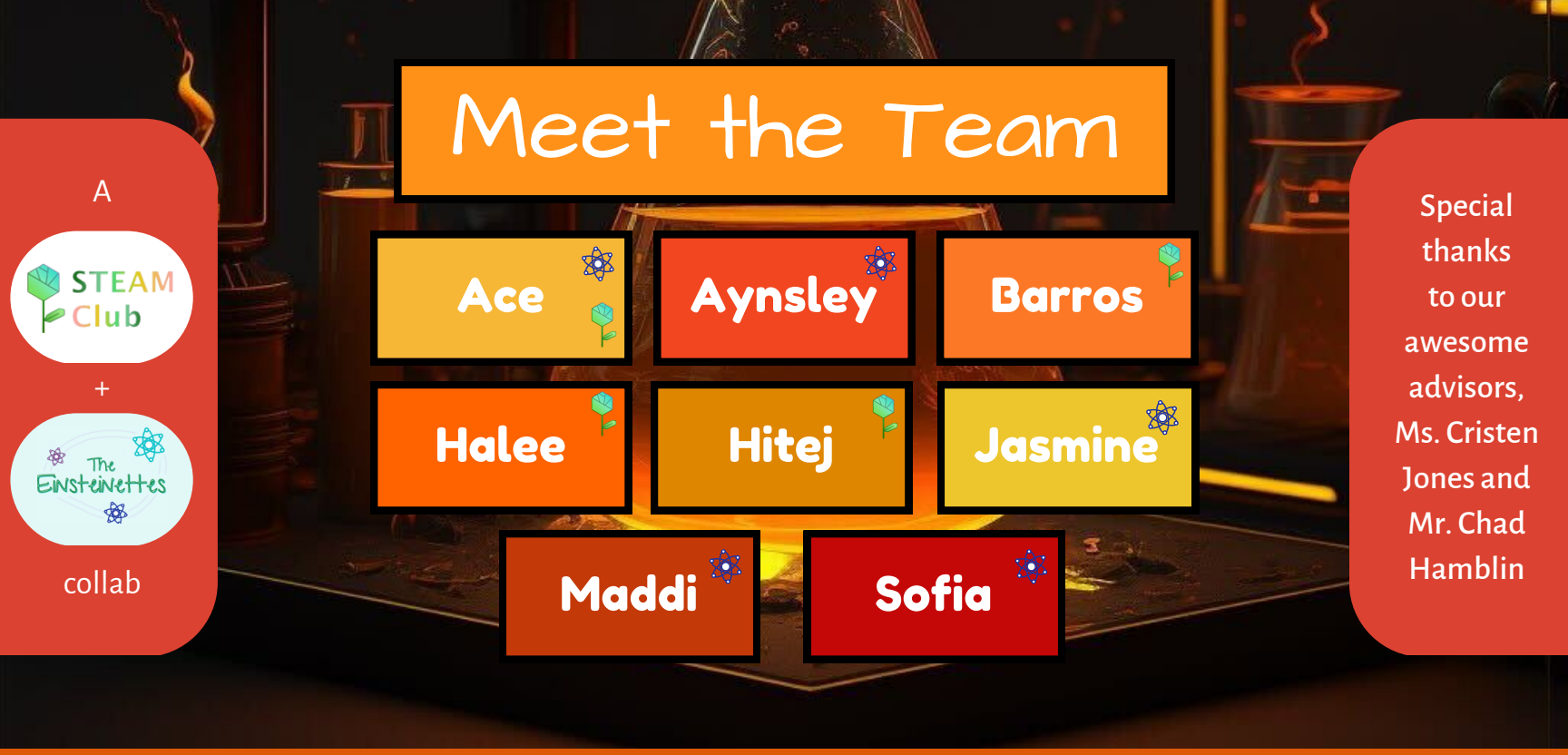
Fantastic Facts!

By: Aynsley

Fire is not a plasma, or even a state of matter - it's energy!

Tires are giant pieces of rubber, made of one massive chain link of polymers.

If you decrease the air temperature to -190°C, it would become liquid!



A STEAM Club + The Einsteinettes collab

Special thanks to our awesome advisors, Ms. Cristen Jones and Mr. Chad Hamblin

The STEAM-steinettes Gazette is an interclub collaborative science newsletter created entirely by POA students from STEAM Club (6-12) and The Einsteinettes (9-12). A new issue will be published monthly for grades 6-12, each focusing on a different realm of science.

Works Cited

Front page article:

Durrani, Jamie. "Four New Bonds to One Carbon Atom, in a Single Step." *Chemistry World*, Chemistry World, 2 Feb. 2023, www.chemistryworld.com/news/four-new-bonds-to-one-carbon-atom-in-a-single-step/4016933.article.

Nicholls, Thomas P, and James R Williams. "Reactivities of N-Heterocyclic Carbenes at Metal Centers." *Advances in Organometallic Chemistry*, Academic Press, 18 Mar. 2021, www.sciencedirect.com/science/article/abs/pii/S006530552100006X.

Tobisu, Mamoru. "This One-Atom Chemical Reaction Could Transform Drug Discovery." *ResOU*, 2 Feb. 2023, resou.osaka-u.ac.jp/en/research/2023/20230203_1.

Female in STEM article:

Marie M. Daly - Life, Facts & Family." Biography, 12 Jan. 2021, www.biography.com/scientists/marie-m-daly. Accessed 19 Feb. 2023.

Science History Institute. "Marie Maynard Daly." Science History Institute, Science History Institute, 14 Nov. 2018, www.sciencehistory.org/historical-profile/marie-maynard-daly.

"Unsung Heroes of Science: Marie Maynard Daly." @Yourgenome · Science Website, www.yourgenome.org/stories/unsung-heroes-of-science-marie-maynard-daly/.

Science facts:

Puiu, Tibi. "17 Amazing Chemistry Facts That Will Blow Your Mind." ZME Science, 29 Jan. 2021, www.zmescience.com/science/chemistry/amazing-chemistry-facts/.

Cleary, Patricia M, et al. "100 Fun Chemistry Facts (with Awesome Explanations!)." Chemistry Hall, 10 Apr. 2020, chemistryhall.com/fun-chemistry-facts/.

Spectroscopy article:

"Spectroscopy: Reading the Rainbow." *Hubblesite*, NASA, 30 September 2022, https://hubblesite.org/contents/articles/spectroscopy-reading-the-rainbow. Accessed 17 February 2023.

"Spectroscopy 101 - Introduction." *Webb Space Telescope*, Space Telescope Science Institute, 7 July 2021, https://webbtelescope.org/contents/articles/spectroscopy-101--introduction. Accessed 17 February 2023.

"Neptune in Primary Colors." *Jet Propulsion Laboratory*, NASA, 2 August 1998, https://www.jpl.nasa.gov/images/pia01284-neptune-in-primary-colors. Accessed 17 February 2023.

"Spectroscopy of Planet Neptune." Eden Astronomical Observatory, 5 July 2016, https://www.edenobservatory.com/stellar-spectroscopy/2016/7/5/spectroscopy-of-planet-neptune. Accessed 17 February 2023.

Science happenings:

Wiley. "A New, Stronger and Recyclable Plastic." SciTechDaily, 19 February 2023, https://scitechdaily.com/a-new-stronger-and-recyclable-plastic/. Accessed 20 February 2023.

"Can Clay Capture Carbon Dioxide?" ScienceDaily, 9 February 2023, https://www.sciencedaily.com/releases/2023/02/230209141518.htm. Accessed 20 February 2023.

"New Technology Revolutionizes the Analysis of Old Ice." ScienceDaily, 16 February 2023, https://www.sciencedaily.com/releases/2023/02/230216172216.htm. Accessed 20 February 2023.

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