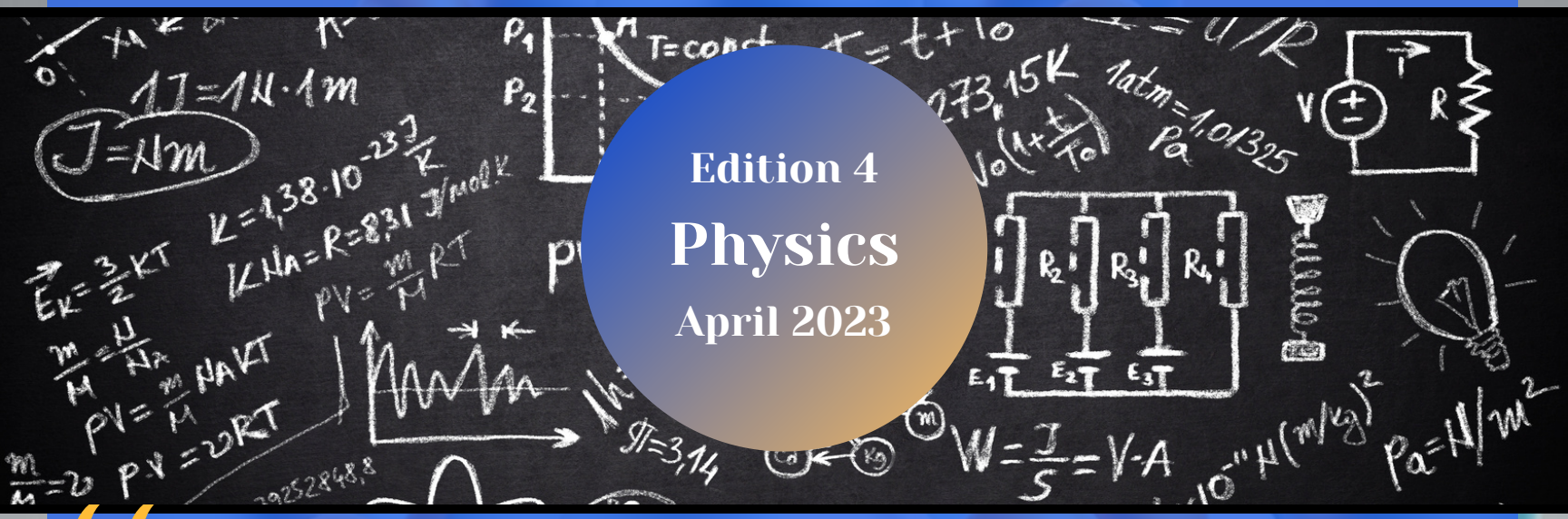
The STEAM-steinettes Gazette



Edition 4

Physics

April 2023

"Above all, don't fear difficult moments. The best comes from them."

Rita Levi-Montalcini

What Was Once A Theory Becomes Reality

By: Sofia

If you only remember one thing from this article, it should be to never doubt yourself, your expertise, or your truth. Over ten years ago, Masahiro Hotta, a theoretical physicist at Tohoku University in Japan, proposed the concept of quantum energy teleportation, which is a study that explains how energy can be retrieved from an energy vacuum. In other words, using quantum mechanics, energy can be pulled from one location to another "out of thin air." At the time of Hotta's initial proposition, many doubted this theory, considering pulling energy from the quantum vacuum was not credited as a realistic operation. In 2008, Hotta published a paper outlining a scenario in which two people can perform this experiment. One person can inject energy into an energy vacuum at a fully equipped lab in a distant location, learn about its fluctuations, message another person about the vacuum in their location, and that person can use their newfound knowledge to time the fluctuations and extract energy from the vacuum. The experiment retained the basis of the law of conservation of matter – "energy cannot be created or destroyed" – because the second person could not extract more energy than the amount injected into the first vacuum. Now, after ten years, researchers have been able to teleport energy across microscopic distances in two separate quantum devices, proving the credibility of Hotta's theory.

Read on!

FEMALE SCIENTIST SPOTLIGHT

By: Aynsley

MILEVA MARIC EINSTEIN

Mileva Marić Einstein was born in present-day Serbia on December 19, 1875, and excelled in math and physics as a teenager (Biography). She was allowed to attend a prestigious all-boys school (Biography) and her teachers evaluated her as "Brilliant" (Tromel-Plotz), a trend that continued as she enrolled in Zurich Polytechnic School, a top-tier university for which an applicant had to pass an extra math examination to be admitted. As a student, therefore, Mileva Marić Einstein was truly an "Einstein" in the modern sense of the word: fiercely pursuing higher and higher levels of academic achievement, eagerly exploring mathematics and physics not because she was forced to - seeing as this was a time when women were barely allowed to study these subjects at all - but because they excited her.

At Zurich Polytechnic School, Mileva was already making waves as the sixth woman to be registered in the physics department, and later became "the second woman who completed a full course of study" (Tromel-Plotz). And it was here that she met Albert Einstein; the two became very close and soon were in a romantic relationship (Biography). While much attention is given to how she was failed in her final exam twice and left school because she was pregnant with Albert's daughter (Biography), there isn't enough given to how the cards were stacked against her so tremendously at this male-dominated school, where, as Senta Tromel-Plotz notes, "male professors had no positive expectations for women students" (Tromel-Plotz). For instance, the fact that, instead of giving up, she toiled through an entire additional year of studies in an attempt to retake the final exam is a testament to her devotion to her scientific and mathematical pursuits.

Unfortunately, the remainder of Mileva's story is not a happy one. Albert Einstein ultimately grew disdainful of her, secretly contemplating how best to get a divorce even as he was becoming the most well-known physicist of his time (Tromel-Plotz). In the end, Mileva died in poverty, exhausted from the struggle of being a single woman whose husband had financially abandoned her, But we can't turn her into yet another "forgotten wife" or symbol of the tyranny of misguided men. Mileva Marić Einstein was a brilliant mind, a devoted mathematician and scientist, and a trailblazer at a time when so many shackles were clasped around the wrists of women everywhere. She was a human being with incredible potential, and her story teaches us that we have that potential, too.

Science Experiments!

By: Hitej

TRY IT OUT!

There are all sorts of liquids around us — water, vinegar, detergent, oil, and so on. To explore the different densities of these liquids and make a colorful looking jar, try out this easy-to-do at-home experiment!

Rainbow Jar

INTERMEDIATE

ADVANCED

Microwave Lightbulb

Have you ever wondered how lightbulbs work? Or even electricity? Explore these concepts by turning on a lightbulb with a MICROWAVE!

CLICK HERE FOR THE STEPS!

Global Science Happenings

By: Hitej

Time reflections of electromagnetic waves have been confirmed, like an echo, except electromagnetic.

Scientists caught individual atoms using light waves.

Breakthroughs in Germany and Scotland highlight a more energy-efficient way to light up electronic displays.

THE FANTASTIC PHYSICS OF FIREWORKS

By: Barros

In this article, I will be delving into the intriguing science behind the chemical aerial artistry we know as “fireworks”! Fireworks are relatively simple things, made of “glitter, gunpowder and pigments,” according to a very simplistic explanation by Wired. Ask the American Geosciences Institute, however, and they’ll give you a more detailed answer. While the explosions themselves are still set off by gunpowder, the flashes and big bangs are created by aluminum powder, and those shiny sparks are created by iron fillings. Sounds terrifying, right? Yeah, that’s part of why they tell you not to get close to a firework being set off. Just the heat and force of the explosion itself can do some real damage! Interestingly enough, the colors of the fireworks aren’t just your typical powdered dyes. For example, red is made of strontium, and blue is made of copper, with purple being made of both. Now, just how do they work?

When we ask how fireworks are set off, it’s important we consider what kind of fireworks are being used. Are they backyard fireworks, or more professional aerial fireworks to be shot over lakes? For the professional fireworks, the firework shells are placed into metal tubes called “mortars” that are laced with wires. Once these wires are given an electric charge, a small explosion in the firework's bottom is set off, the shell’s fuse is lit, and it’s launched high into the air, where the fuse runs out, lights the explosives, and we see the spectacular show. For smaller consumer fireworks, it’s a similar process. A stake or other strong object is hammered into the Earth, and a tube is attached securely. A firework rocket will have a stick on the side that should fit right into the tubing without any force. Once the setup is complete, the fuse at the bottom is then lit, and after a moment, lights the first stage of the rocket, where the initial explosion is set off, sending the rocket into the air. The second explosion is then set off, creating a colorful work of art.

Now that I’ve explained the wonderful world of fireworks, hopefully they’re less scary to those who get frightened by the loud sounds and warning signs plastered all over the packaging, though I do sincerely apologize if I’ve ruined the magnificent magic of fireworks to the avid enjoyers of such an enticing and awe-inspiring experience.

Movie Review: The Theory of Everything

By: Barros

Spoilers Rating: 4/10

Movie Rating: PG-13

The Theory of Everything, directed by James Marsh, is a heartfelt and deeply personal take on the life of Stephen Hawking as he bursts into another exciting year of university as a physics PhD student at Trinity Hall, Cambridge. Viewers watch closely, on the edge of their seats and with avid concern, as the young physicist begins to experience problems moving his muscles properly, starting in his hands and progressing down to his legs. Sympathy is garnered throughout the movie as the beautiful storytelling and incredible videography unearth the true struggles of taking care of a person with a progressively worsening illness through the experiences of his wife, Jane, and as she attempts to find solace in other places, including a church choir. Jump up and cheer with face-splitting smiles and pride as Mr. Hawking perseveres through his illness and powers through idea after idea, publishing his findings alongside his colleagues and coming just this much closer to finding his life's goal as a physicist: The Theory of Everything.

Fantastic Facts!

By: Jasmine

Particles behave differently when observed.

The most abundant atom in the universe is Hydrogen.

Atoms contain smaller particles known as quarks and leptons.

Meet the Team

A STEAM Club + The Einsteinettes collab

Ace

Aynsley

Barros

Halee

Hitej

Sofia

Jasmine

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 quantum physics:
Wood, Charlie. "Physicists Use Quantum Mechanics to Pull Energy out of Nothing." *Quanta Magazine*, 22 Feb. 2023, www.quantamagazine.org/physicists-use-quantum-mechanics-to-pull-energy-out-of-nothing-20230222/.
Newcomb, Tim. "Scientists Defy Physics, Basically Pull Energy out of Thin Air." *Popular Mechanics*, Popular Mechanics, 24 Feb. 2023, www.popularmechanics.com/science/energy/a43027420/scientists-pull-energy-out-of-thin-air/.

Mileva Maric Einstein article:
Cassidy, David C. and Esterson, Allen. "Does Einstein's First Wife Deserve Some Credit for His Work? That's the Wrong Question to Ask." *TIME*, 14 March 2019, https://time.com/5551098/mileva-einstein-history/.
Finkbeiner, Ann. "The Debated Legacy of Einstein's First Wife." *Nature*, 5 March 2019, https://www.nature.com/articles/d41586-019-00741-6.
Tromel-Plotz, Senta. "Mileva Einstein-Maric." *FemBio*, n.d. https://www.fembio.org/english/biography.php/woman/biography/mileva-maric-einstein/.
"Mileva Einstein-Maric." *Biography*, 2 April 2014, https://www.biography.com/historical-figure/mileva-einstein-maric.

Global happenings:
Germany Trade and Invest. "Energy Efficient Lighting Breakthroughs Made in Germany." *PR Newswire*, Cision, 22 June 2011, https://www.prnewswire.co.uk/news-releases/energy-efficient-lighting-breakthroughs-made-in-germany-145318115.html. Accessed 24 March 2023.
Advanced Science Research Center, GC/CUNY. "Scientists Demonstrate Time Reflection of Electromagnetic Waves in a Groundbreaking Experiment." *ScienceDaily*, 13 March 2023, https://www.sciencedaily.com/releases/2023/03/230313120947.htm. Accessed 24 March 2023.
Optica. "In the World's Smallest Ball Game, Scientists Throw and Catch Single Atoms Using Light." *ScienceDaily*, 9 March 2023, https://www.sciencedaily.com/releases/2023/03/230309124939.htm. Accessed 24 March 2023.

Physics experiments:
"Rainbow Jar." *Playdough to Plato*, n.d., https://www.playdoughtoplato.com/rainbow-jar/. Accessed 24 March 2023.
"Microwave Light Bulb." *The Experiment Archive*, n.d., https://www.experimentarchive.com/experiments/microwave-light-bulb/. Accessed 24 March 2023.

Fireworks article:
Greenberg, Julia. "What's Inside Fireworks: Glitter, Starch, and Gunpowder." *Wired*, 3 July 2015, https://www.wired.com/2015/07/whats-inside-fireworks/. Accessed 18 February 2023.
"What Minerals are Used in Fireworks?" *American Geosciences Institute*, n.d., https://www.americangeosciences.org/critical-issues/faq/what-minerals-are-used-fireworks. Accessed 18 February 2023.
King, Dr. Hobart M. "The Art and Science of Fireworks Displays: Art, Chemistry, Physics and Math Light Up the Fourth of July!" *Geology.com*, n.d., https://geology.com/articles/fireworks/. Accessed 18 February 2023.
Siegel, Ethan. "The Physics of Fireworks." *Forbes*, 1 July 2016, https://www.forbes.com/sites/startswithabang/2016/07/01/the-physics-of-fireworks/?sh=d2b4a51eee39. Accessed 18 February 2023.

Physics fun facts:
Ashwin. "10 Amazing Physics Facts That Might Shock You." *Unfoldanswers.com*, 28 June 2020, https://unfoldanswers.com/amazing-physics-facts/. Accessed 14 March 2023.
"Relatively Special Facts about Physics." *Factinate*, 22 Jan. 2017, www.factinate.com/things/32-relatively-special-facts-physics/. Accessed 14 March 2023.

Background AI generated art on pg. 1, 2, 3, 4, 5, and 6 by Barros + MidJourney AI