GIRLS IN STEM

SUMMER ISSUE | JUNE 2025

THE MAGAZINE

WITH 10+ NEW ARTICLES AND 5 INTERVIEWS WITH *GIRLS IN STEM*

RUN BY GIRLS FOR GIRLS ★

@girlsinstemmsgazine

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who are we?

Launched in September 2024, Girls in STEM is a passion project born from a moment of self-reflection, a time when I felt torn between the path I had chosen in university and the realization that I was drawn to the world of STEM which had never been presented to me in the right way. I wanted to do something meaningful, but I didn't see how I could make that transition. That's when the idea for this magazine took shape: a place where young girls, who may feel the same way, can find motivation, inspiration and role models to encourage them to pursue STEM with confidence and passion. Through stories of real women in STEM fields, insightful interviews and informative content, this magazine is dedicated to sparking curiosity, breaking down barriers and inspiring future innovators. With every issue, we hope to bring a little more confidence, a little more curiosity and a whole lot of inspiration to the next generation of girls in STEM.

letter from the editor

My dear readers, here we are with the summer issue, it's been hard (as always, to be honest) because your lovely editors have been incredibly busy with exams and other projects, for example my co-editor Yaiza, has also been getting ready to co-host a workshop on Artificial Intelligence in Scientific Research (for which you can still apply, so check our instagram for all the details). Anyway, summer is the perfect season to dive deeper into the questions that spark our curiosity, whether in the lab, in nature or through the stories of those who push the boundaries of science and innovation. In this issue we celebrate the spirit of exploration, through space to biology, from groundbreaking technology to inspiring women in STEM. As always, Girls in STEM, aims to lift the voices of women in science, technology, maths and engineering and build a community. I hope this issue inspires you to stay curious and bold.

I would like to, personally, thank everyone who worked on this issue with me, everyone who shared their passion and spent time to make all of this possible. Here's to you!

Arianna Moreo

section one: articles

An Experiment on a Bird in the Air Pump,
Joseph Wright of Derby, 1768

The Influence of Early Vaping on Adolescent Attention Span and Cognitive Function

This paper explores the impact of vaping from a young age on attention span and cognitive development. With an increasing number of adolescents engaging in e-cigarette use, it is essential to investigate how nicotine affects their developing brains. The study examines neurobiological impacts, such as alterations in neuroplasticity, attention processing, and memory function, alongside psychosocial outcomes, including dependency and academic performance. Findings suggest that vaping from a young age compromises attentional capacity, contributes to attention deficit-like symptoms, and impairs memory formation. The paper emphasizes the urgent need for public health initiatives aimed at reducing youth exposure to nicotine.

In recent years, electronic cigarettes, or “vapes”, have become prevalent among adolescents, a demographic particularly vulnerable to nicotine addiction. Though initially promoted as a safer alternative to traditional cigarettes, vaping has raised new public health concerns. Adolescents represent a critical group for studying the impacts of nicotine exposure due to the ongoing development of cognitive systems. Of specific concern is how nicotine consumption from vaping may compromise attentional processes, vital for academic success, personal growth, and overall well-being. Understanding these effects provides insights for addressing public health risks associated with vaping in younger populations.

Nicotine's Effect on Adolescent Neurodevelopment

The adolescent brain undergoes significant structural and functional changes, notably in the prefrontal cortex and limbic system, regions responsible for impulse control, memory, and attention. Nicotine affects these regions by binding to nicotinic acetylcholine receptors, which stimulate dopamine release. This “reward” feedback can disrupt normal neurotransmission and reinforce addictive behaviors.

Vaping and Attention Deficits

Early research on nicotine and attention underscores that nicotine exposure in youth impairs cognitive flexibility and attention, similar to symptoms of Attention Deficit Hyperactivity Disorder (ADHD). Findings indicate that young users exhibit lower performance on attentional tasks compared to non-users, with deficits in sustained attention and working memory. The neural changes triggered by nicotine, particularly in the prefrontal cortex, may cause young users to develop attentional vulnerabilities.

Nicotine and Memory Impairment

Nicotine influences the hippocampus, a brain region critical for memory formation and retention. Studies suggest that vaping affects long-term potentiation (LTP), a key process for encoding memories, resulting in compromised memory performance. Impaired memory affects attention indirectly, as individuals may struggle to retain focus due to difficulties in recalling previous information.

To assess vaping’s impact on adolescent attention span, this study analyzed data

from 1,000 adolescents aged 13-18, comprising both vapers and non-vapers. Participants underwent a battery of cognitive tests designed to measure attentional capacity, working memory, and reaction time. Additionally, self-reported surveys gathered data on nicotine use, academic performance, sleep patterns, and symptoms associated with attention deficits.

Neuroimaging Data Collection

A subset of participants (n=100) also underwent functional MRI (fMRI) scans to measure activity in the prefrontal cortex and hippocampus during attention and memory tasks. This allowed for a direct observation of neurobiological differences correlated with vaping behavior.

Attentional Deficits in Young Vapers

Analysis revealed that adolescent vapers scored significantly lower on sustained attention and reaction time tasks compared to their non-vaping peers ($p < 0.01$). Vapers also demonstrated higher rates of inattention and impulsivity as measured by the ADHD Rating Scale, suggesting that nicotine may contribute to attention-deficit-like symptoms.

Neurobiological Changes in Vapers

fMRI scans indicated reduced activity in the prefrontal cortex and hippocampus during attention tasks among vapers, supporting the hypothesis that nicotine disrupts neural pathways essential for focus and memory. These findings align with prior studies linking nicotine exposure to compromised neuroplasticity, reinforcing the long-term risks of adolescent vaping on cognitive functions.

Memory Impairments and Academic Consequences

Vapers scored lower on working memory and retention tasks, with a 15% decrease in task accuracy compared to non-users. This memory impairment has practical implications, as it often correlates with lower academic performance. Self-reported survey data showed that vapers were more likely to report difficulties with school assignments and exams, attributing challenges to reduced focus and forgetfulness.

The Neuropsychological Risks of Vaping for Youth

These results underscore the neuropsychological risks of adolescent vaping. Nicotine's ability to interfere with the prefrontal cortex and hippocampus compromises attention and memory, skills essential for academic success and social development. The study's findings align with existing literature on adolescent neurodevelopment, which warns that any disruption to cognitive growth during this period may yield long-term consequences.

Implications for Public Health and Education

The prevalence of vaping among adolescents calls for immediate action to mitigate these cognitive risks. Schools, parents, and health organizations play critical roles in educating youth about vaping's impact on attention and learning capacity. Interventions that combine education, behavioral therapies, and regulatory policies can help reduce adolescent nicotine exposure and protect brain development.

INTERVIEW

Interviewer: Thank you for joining us today. To start, could you share a bit about when you began vaping and what got you into it?

Patient: Sure, happy to share. I started vaping when I was about 15. It was pretty common among my friends, and we didn't really think it was dangerous. It seemed less harmful than smoking, and honestly, it was just everywhere at school. So, it just sort of became something I did regularly.

Interviewer: How soon did you start noticing any effects on your attention span or focus?
Patient: I think it took a few months, but it really started to hit when I was in class. I noticed I couldn't concentrate like I used to. My grades started slipping, and I'd get frustrated easily because I felt restless and couldn't stay focused. I'd start zoning out during lectures, and it was just hard to stay engaged with anything for long.
Interviewer: Did you notice any changes in your memory or ability to retain information?
Patient: Yes, that was actually one of the biggest problems. I'd study for hours, but then I couldn't remember any of it during exams. Even if I wrote notes, I'd forget where I put them or mix up details. It was like my brain couldn't hold onto information, and that made studying really stressful.
Interviewer: That must have been difficult. Did you also experience any symptoms of withdrawal or irritability if you didn't vape for a while?
Patient: Definitely. If I went without vaping, I'd get really antsy and irritable. It was like this constant need for a break to vape. I couldn't just sit through an hour-long class without feeling like I needed it, which only made focusing even harder. It was affecting my sleep, too, which I'm sure didn't help with concentration during the day.
Interviewer: How did these issues impact your daily life, outside of school?
Patient: It definitely impacted my social life and mood. I'd get frustrated with myself for not being able to remember things or focus on conversations. Even when I'd hang out with friends or family, I'd zone out or feel like I wasn't present. Eventually, it affected my confidence because I felt like I was struggling to keep up, mentally.
Interviewer: That sounds really challenging. How did you eventually decide to quit, and what was that process like for you?
Patient: I realized I needed to quit after a conversation with my doctor about the long-term effects on my brain. It wasn't easy, though. I had to go through withdrawal symptoms, like feeling even more restless and anxious at first. But over time, I felt more focused and clear-headed. My memory started improving, and my mood got better. It took a lot of effort and support, but I'm glad I made the decision.
Interviewer: What advice would you give to other young people who might be considering vaping or struggling with similar issues?
Patient: I'd say, don't underestimate how much it can mess with your mind. I didn't think vaping would have such a big impact on my attention or memory, but it did. If you're vaping, take a step back and think about whether it's really worth it. And if you're struggling, reach out for support. Quitting can feel hard, but it's definitely worth it for your mental health and focus.
Interviewer: Thank you so much for sharing your experience. I think your story will resonate with a lot of young people.
Patient: Thank you. If sharing my experience helps someone else avoid or overcome this, I'm glad to help.

This study highlights that vaping from a young age impairs attention span, memory formation, and overall cognitive development, posing a threat to the academic and social success of adolescents. These effects underscore the urgent need for comprehensive public health initiatives to curb vaping among youth. Future research should continue to explore the neurobiological underpinnings of nicotine exposure in young users and develop targeted interventions to counter these adverse effects. By prioritizing youth education and support, society can better protect young minds from the cognitive risks associated with vaping.

The Neurological roots of Alcoholism

Introduction

The scientific debate over alcoholism leaves people divided. As you may expect, there is significant evidence proving that environmental and social factors encountered throughout a person's lifetime play a huge role in one's risk of developing Alcoholism Use Disorder (AUD). Contrary to popular belief, there is also significant evidence to prove that genetics may provide a predisposition to AUD which will be discussed in this article. Investigations so far (primarily involving monozygotic and dizygotic twins) have found that the risk of developing AUD is 50-60% related to your genetics and 40-50% related to psychosocial factors.

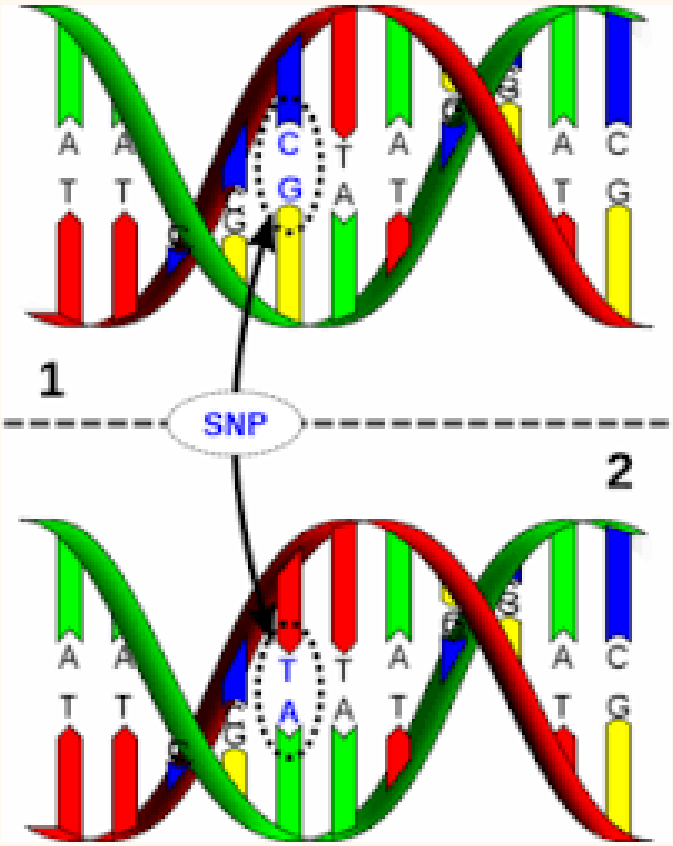
The Dopamine Dilemma

Dopamine is a crucial neurotransmitter in understanding addiction. Dopamine is the "chemical messenger" giving you that "feel good feeling" when petting a dog, hearing your favourite song, receiving a compliment or parallel parking on the first try, however substance abuse elicits this same chemical response. When consumed, alcohol activates certain opioid receptors concentrated in a group of subcortical nuclei (responsible in the brain for executive function and emotional behaviors). When these opioid receptors are stimulated, dopamine is released, forming an association between alcohol and reward. When an individual then encounters a cue that predicts reward, previously enforced by that alcohol-dopamine association, a psychological mechanism called "Incentive Salience" is triggered which contributes to abusive alcohol consumption. Now that you have a brief understanding of how the brain's reward system responds to alcohol, we can delve into what exactly a genetic predisposition to alcohol entails.

DRD2: The gene that makes happy hour *too* happy

The gene encoding for the dopamine D2 receptor (the 2nd of the 5 dopamine receptor subtypes) is called DRD2, associated with increased alcohol consumption, through methods involving incentive salience. But why does this vary between individuals? We all possess the DRD2 gene but the nucleotides it is composed of vary. A single nucleotide polymorphism (SNP) is a genetic variation at a single position in the DNA sequence. If an SNP occurs within DRD2, its genetic sequence changes and the Dopamine receptor's structure and function may be altered, affecting its behavior. A preliminary study investigating how specific SNPs are related to alcoholism was conducted by the National Drug Dependence Treatment Centre (NDDTC) in New Delhi and documented at the BMC Medical Genetics journal. The study involved 90 alcoholics and 60 unrelated, age-matched control subjects; DNA was collected from each participant and then genotyping techniques were used to extract the variation in the DRD2 gene in each individual. The identified SNPs were then compared between alcohol dependent and control subjects. They found a strong link between the –141Cins allele and alcohol dependance and a possible link between the TaqIA1 allele (a polymorphism located within the DRD2 gene) and AUD. The combination of both alleles present in an individual increased risk

of developing AUD by 250%. Not only this, TaqIA1 is a variant of an SNP associated with lower dopamine reception- leading to weaker dopamine signaling in response to reward stimuli, increasing susceptibility to alcohol dependency as people may seek stronger stimuli to compensate.



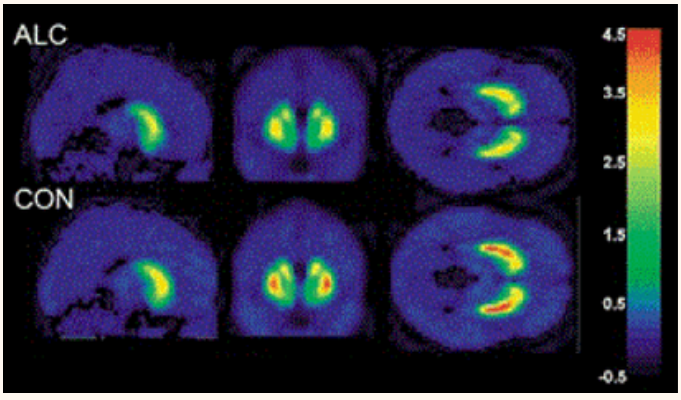
SNP, the conversation.com

Can you undo that genetic cocktail you were born with?

In short, no you cannot. In terms of genetic inheritance, SNPs are passed down from parents to children, just like height or eye colour causing a genetic predisposition to AUD. Interestingly, some SNPs once provided an advantage like disease resistance and therefore persist in populations. But blaming evolution for your drinking habits? Darwin would like a word. These evolutionary differences mean genes related to AUD vary within cultures. The experiment conducted by the NDDTC only involved participants of Indian descent making their results unapplicable to all regions. In fact, other experiments documented that showed positive results for European or European American populations but generally negative findings for studies conducted with a Taiwanese population.

Conclusion

While Psychosocial factors undeniably influence alcohol consumption, the correlation between genetics and AUD cannot be ignored. Research into the DRD2 gene and relevant SNPs highlights how genetic variations can impact dopamine signaling and subsequently AUD. Understanding the neurological and genetic underpinnings is crucial for prevention and treatment of alcohol abuse. Though we cannot currently change the genetic "cocktail" we are born with, developing genetic engineering technology may make that possible in the near future, allowing for personalised interventions to mitigate the risks associated with genetic predispositions. But generally, an understanding of both the genetic and environmental factors will allow an individual to make informed decisions relating to alcohol consumption. So no, you cannot entirely blame your ancestors for your hangover, though they may have passed down the love for "just one more".



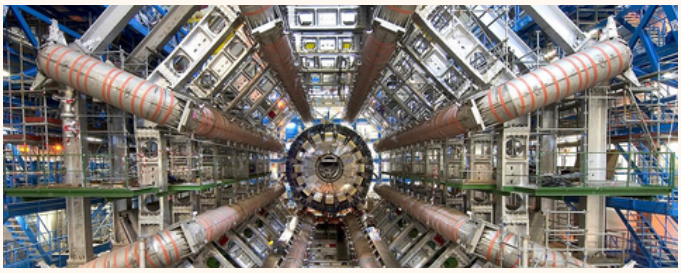
comparison between alcohol-dependant patients and control subjects, Longdom Publishing SL

What is CERN's Third Long shutdown and why is it happening?

CERN, which is the largest organisation for particle physics, is planning to close in July 2026, which will be it's third long shutdown (LS3), to increase the Large Hadron Collider's (LHC's) luminosity.

What does this mean for the collider? Well, an increase of luminosity means a reduction of the size of the beam at the collision point within a detector, and luminosity is proportional to the number of collisions per unit time, meaning the detectors can observe more data to analyse rare processes. Since the phenomena scientists want to see has an extremely low probability of occurring, therefore the more data available to observe allows for more potential occurrences, so the scientists can have a better understanding of what is happening. The collider is planned to be closed for 4 years, only reopening in mid-2030, and during this time, many engineers and physicists will work together to ensure that the High Luminosity upgrade will be done correctly and effectively.

Work has already started on the collider, in April 2018 an 80 metre shaft was dug, as well as 300 metre service tunnels at the sites of ATLAS and CMS. Four connections have been made between the new and old infrastructure, as well as 5 surface buildings to house electrical, cryogenic, and cooling and ventilation systems for the new HL-LHC equipment. Equipment is currently being manufactured in Europe, Japan, the United States, China, and Canada. Each of the experiments will be getting upgraded to handle the increase of data by HL-LHC. When the collider undergoes it's third long shutdown, most of the work will take place on the actual collider, given that it won't be



running for approximately 4 years.

The upgrade is set to cost approximately 1 billion Swiss Francs (1.2 billion USD) from 2015 to 2029 and will also receive contributions from global laboratories. CERN is supported by 20 countries; therefore this international collaboration will benefit everyone involved and the rest of the world. The HL-LHC will allow for more training for physicists, engineers and technicians. At the moment, there are more than 200 bachelor's students, master's students, doctoral students, post-doctoral researchers, and fellow researchers participating in the project. There will be many jobs provided by the upgrade, as there are major civil engineering projects happening, and teams of technicians and physicists will be working together to ensure the project is carried out successfully.

The HL-LHC aims to improve fundamental knowledge, which is the main mission of CERN. To develop the HL-LHC, CERN will push several commonly used technologies, such as superconductors, vacuum technologies, computing, electronics, and industrial processes. The greater knowledge of these technologies means that these innovations can be better integrated into our daily lives. For example, an increase of knowledge of superconducting applications in medical imaging means better cancer diagnosing, and treatment using particle beams (hadron therapy).

Epistemic Injustice and its Connection to Healthcare Stigma

Epistemic Injustice is a term which was coined by Miranda Fricker in 2007, which labels occurrences of being disregarded in your personal lived experience. You aren't treated as if you are a knower, regardless of your knowledge of an experience, you are brushed off. There are two types of Epistemic Injustice: Testimonial, and Hermeneutical. With Testimonial Injustice, you are not listened to due to prejudice, "surely you can't know that because you're too young!". Hermeneutical Injustice is the label given to the idea that you haven't been given the correct tools by society to express your experience. A really good way to explain this is when women didn't have the label "sexual harassment" to explain the unwanted attention they were receiving from people in the workplace. There was a time where the term was unheard of, giving rise to Hermeneutical Injustice. This is the example that Fricker gave in her book *Epistemic Injustice: Power and the Ethics of Knowing*.

So how does this relate to Healthcare Stigma? Canonically, people in social minorities have been treated with stigma in their healthcare. This means that patients are judged, disbelieved, and treated unequally by healthcare professionals and the wider healthcare system. It can show up in countless ways: women are routinely undiagnosed with Endometriosis; racial stereotypes see Black and Hispanic patients labelled as "less educated"; people experiencing mental illness experience pervasive stigma from the very people who are supposed to heal them. Regardless of the type of social minority a person is in, it seems that they will experience some kind of healthcare stigma. Aren't healthcare professionals there to treat people with kindness during their care?

This stigma doesn't just create bad experiences, it causes significant harm. People delay care. They stop trusting providers. Their conditions worsen. All because their knowledge of their own bodies and experiences is treated as less credible than that of the healthcare professional. Aren't healthcare professionals there to treat people with kindness during their care?

Whether they experience Testimonial or Hermeneutical Injustice during healthcare, it is a wholly inappropriate and unnecessary experience for people to suffer. By giving people the tools and language they need to communicate their experience, we can help to combat Hermeneutical Injustice. This might mean creating space for new terminology, validating stories that don't fit in the textbook, or developing systems of care that reflect diverse ways of expressing pain, distress, or need. Testimonial Injustice is tougher to tackle because it requires the listener (the healthcare provider) to confront their own bias and choose to listen differently. It demands humility. It demands change. But it's not impossible.

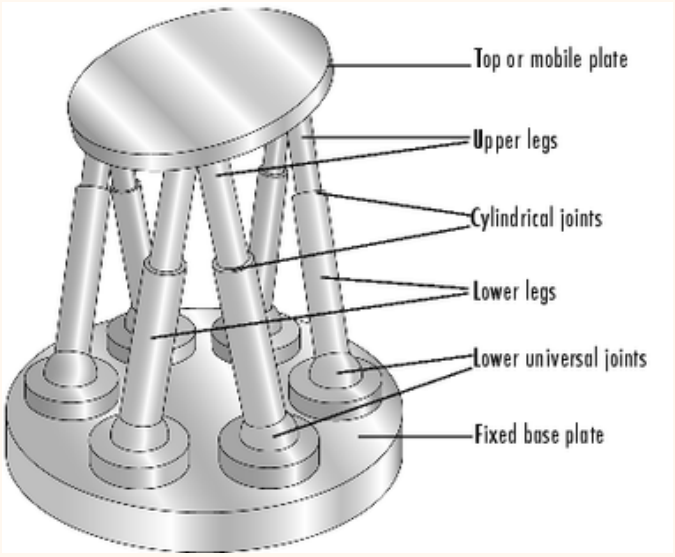
Understanding epistemic injustice doesn't just help us describe the harm. It gives us a way to reflect on how we listen, how we care, and how we value the people at the heart of healthcare. Healthcare shouldn't only be about treating symptoms. It should be about seeing people for who they are and recognising that patients aren't just passive recipients of care, but knowledgeable individuals who understand their own bodies, histories, and lives. That knowledge deserves to be taken seriously.

Looking at healthcare stigma through the lens of epistemic injustice helps us see that the issue isn't just clinical: it's ethical. That's important, because if something is socially constructed, then it can also be socially challenged and changed. Each of us has a role to play in creating that change. Whether it's through questioning our assumptions, listening more openly, or advocating for others to be heard, we can all help move healthcare closer to what it should be: compassionate, equitable, and grounded in trust.

Dignity is not an extra, it's part of what healing requires. And everyone deserves to be recognised not only as a patient, but as someone who knows.

The Stewart Platform: The Six-Legged Marvel Powering Simulators, Surgical Robots, and More

Whether in flight simulators, surgical robots, or precision motion platforms, the need for accurate and stable control in six degrees of freedom has made the Stewart Platform a cornerstone of modern engineering. First developed in the 1960s, this parallel manipulator remains highly relevant across industries thanks to its compact design, exceptional rigidity, and unparalleled motion control.



the Stewart Platform, Acrome Robotics

What's a Stewart Platform?

At its core, the Stewart Platform is a mechanical structure that resembles something out of science fiction, like a six legged robotic spider. It consists of a rigid upper platform connected to a fixed base by six independently controlled linear actuators. By precisely adjusting the length of each actuator, the upper platform can move in any combination of translations (up/down, left/right, forward/backward) and rotations (pitch, roll, yaw), giving it six degrees of freedom. Unlike traditional robotic arms, which use a serial chain of joints and are prone to flex and accumulated error, the Stewart Platform's parallel configuration offers high stiffness and stability. This makes it ideal for applications that demand coordinated, dynamic motion with extreme precision, from industrial machining to advanced medical procedures.

Applications Across Industries

Now, you may be wondering: where exactly is the Stewart Platform used? Its versatility has led to its adoption in a wide range of industries, each leveraging its unique strengths.

Flight Simulation

One of the most iconic applications of the Stewart Platform is in full flight simulators. These platforms are designed to replicate the full physical experience of flying an aircraft, a task that requires motion in all six degrees of freedom. The Stewart Platform enables this realism by moving a replica cockpit in perfect sync with visual, audio, and control feedback. This use case gained traction in the early 1960s, when Redifon, a pioneer in simulation technology, began incorporating Stewart Platforms into flight simulators for major aircraft like the Boeing 707, Douglas DC-8, Vickers Viscount, and Lockheed C-130 Hercules. These systems provided pilots with immersive training environments that simulated both aircraft motion and environmental conditions, long before the term "virtual reality" became mainstream.

Driving Simulators and Motion Platforms

The Stewart Platform also plays a crucial role in driving simulators, which often pair it with large X-Y translation tables to replicate vehicle dynamics. While short-term accelerations, like quick turns or bumps, are simulated by moving the platform itself, long-term forces (such as going uphill or sustained braking) are mimicked by tilting the platform to create the illusion of continuous acceleration. Finding the ideal balance between platform motion and perceptual realism remains an ongoing research challenge in this field.

Surgical Robotics

Perhaps less widely known, but no less significant, is the Stewart Platform's role in surgical robotics. In minimally invasive surgeries, where millimeter-level accuracy can mean the difference between success and complication, the Stewart Platform offers surgeons unprecedented control. It can hold and maneuver tools or cameras with surgical precision, filtering out unwanted vibrations or hand tremors in real time. Modern robotic-assisted surgical systems often embed the Stewart mechanism within larger robotic arms or patient positioning systems. For example, an endoscopic camera might be stabilized by a Stewart Platform that tracks and adjusts to the movement of both the patient and the surgeon's controls. Its compact footprint, rigidity, and precision enable movements that would be difficult, or even impossible, to achieve using traditional mechanical designs.

Robotic-assisted surgery system, Elixirr

But Where Did It All Begin?

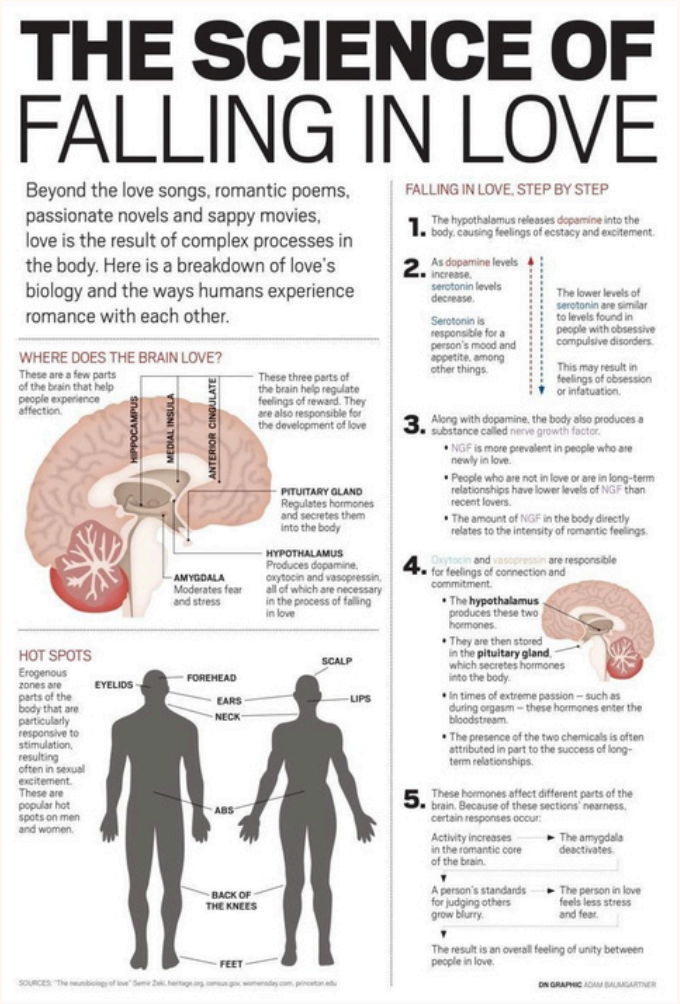
The Stewart Platform's story begins in 1965, when British engineer D. Stewart introduced a revolutionary parallel mechanism intended for aircraft landing gear testing. His paper brought attention to the idea of a six degree-of-freedom motion platform built from six variable-length actuators arranged in a closed-loop configuration. However, credit for the original concept also goes to Eric Gough, who had independently developed a similar mechanism at the Dunlop Rubber Company in the 1950s for tire testing. As a result, many engineers now refer to it as the Gough–Stewart Platform. What began as a mechanical curiosity quickly evolved into a foundational tool across industries. Its unique combination of precision, rigidity, and versatility has enabled innovations in everything from transportation training to advanced medicine and as new frontiers in robotics and virtual environments continue to emerge, the Stewart Platform is likely to remain at the heart of many engineering solutions.

The Science Behind Falling in Love: Love and the Brain

Love is a universal human experience that has long been regarded as one of the most mysterious and powerful emotions across every aspect of our existence. With this complex emotion underlying the brain, neuroscience provides new insights into how love manifests in our brain. By examining and understanding the neural mechanisms involved, the emerging field of neuroscience explores the study of love and the brain, uncovering one of the most discrete areas that drive human connection and feelings.

Early Stages of Love

To fall in love is to feel the release of adrenaline. Beginning with just a simple crush can trigger the hormones that flood our brain, causing the production of physical and emotional responses. Both sweaty palms, racing hearts, flushed cheeks, and the feelings of passion and anxiety are the trigger responses our brain can offspring when falling in love. Feelings are tense and you are helpless when you have fallen. These are the early stages of love.



You Brain on Love, Meet Mindful

"And from a neuroscientific viewpoint, we can really say that love blossoms in the brain," states neuroscientist Stephanie Cacioppo, PhD, author *Wired for Love: A Neuroscientist's Journey Through Romance, Loss, and the Essence of Human Connection* (Macmillan, 2022). As much as we think euphoric love can be, it's an undeniable feeling that consumes us in every possible way, and it begins with the brain. The early stages of romance can be described as an intoxicating and infatuating feeling, expressed as deep desire and euphoria. The reasoning behind this sudden lovestruck is the stimulation of the reward system in our brain. The reward system of the brain is like a drug; it can easily be triggered with an addiction. The reward system is summarized as oxytocin, vasopressin, norepinephrine, and especially dopamine. Due to the stimulated reward system built in our brain, the romance we feel with an individual captivates us to feel addicted. The vision we see through them is in "rose-colored glasses". This intense and thrilling feeling triggered by the reward system in our brain causes us to occupy our thoughts with the person we're in love with. It's an undeniable and helpless feeling to be in love, for sure.

Connections defined by neurotransmitters

As we delve into the early stages of love, a very primitive part of the brain's reward system is activated. This sudden activation in the rewards system tells us that romantic love is a drive to basic need. The mesolimbic system (reward system), which is in the midbrain, releases several neurotransmitters of dopamine and norepinephrine. The release of dopamine is caused by experiences of pleasurable stimuli, including falling in love. The release of norepinephrine causes energy levels to rise in abundance and a general sense of excitement. With the combination of the two neurotransmitters; dopamine and norepinephrine, they forge a dynamic "honeymoon phase" effect that is characterized as absolute euphoria. Dopamine is the drive to pursue your love interest with norepinephrine acting like butterflies in your stomach. As dopamine and norepinephrine release, two important hormones intertwine: oxytocin and vasopressin. Oxytocin is a chemical that is released from the brain's hypothalamus. Oxytocin is sometimes referred to as the "cuddle hormone" to promote bonding and chemical connection. Vasopressin, also released from the brain's hypothalamus, is dignified to play a role in social bonding. The merging between these two hormones often works together to create defensive aggression as a coping mechanism. To add, another chemical that is released when the reward system of the brain is triggered is serotonin. As we all know, serotonin is a neurotransmitter that is used to regulate and balance emotion levels. Serotonin is a feeling that tends to fluctuate in the early stages of love and it is strong. Many studies have shown that serotonin levels in newly in love people is equivalent to serotonin levels in individuals with obsessive compulsive disorder. This information explains why early romance is known to feel intense. As you fall in love, the brain floods itself with chemicals that create feelings of pleasure, infatuation, and motivation. They combine altogether to foster social connections by reshaping your brain when you are in love. As love is a complex emotion, so are the works of the brain when you are in love.

Connections activated by brain regions

In addition to the romantic and daring feelings of first love, there is to know that love also deactivates the neural pathways that are responsible for making critical assessments on others. Love makes us blind and makes us forget about all the negative ideas of someone we're in love with. You may question, what are these neural pathways and regions of the brain? Together, they work to infuse the emotions we radiate in love. To begin with, the ventral tegmental is quite an active area seeking an experience of romantic attraction. The VTA is responsible for producing dopamine by seeking social bonding and driving us to pursue the love we long for. The VTA influences our likes, dislikes, addictions, and stress management. It is no wonder why love is identical to such feelings as these. Other regions of the brain that are affected by love include the amygdala, hypothalamus, hippocampus, and prefrontal cortex. Love in the brain is not just simply infatuated with addiction but also help to process these complex emotions. Good thing the amygdala guides us to process these emotions we feel. This is relevant due to the powerful associations made during the early stages of love. Another region of the brain that guide us to confusing emotions with romance is the hypothalamus. This region of the brain aims to focus on regulating our emotions and emotional bonds. It helps orchestrate our body's response to love including physiological changes of increased heart rate and body temperature. When in love, the hippocampus plays a role in processing our complex emotions and molding them into long-term memories related to those intense feelings. To extend, the hippocampus is sensitive to ideas that induce pleasure,

including the idea of love. To include surrounding areas of the brain region, the prefrontal cortex also plays a role when falling in love. This region in the brain is responsible for decision-making and for rational thoughts. When you're in the spotlight of infatuation; the area of this brain tends to slow down and decrease the negative judgements of the person you're in love with. Although, the increase in susceptibility takes over, overlooking your significant one's flaws. When experiencing romantic love, specific brain regions activate and harmonize together to contribute to the reward system in our brain. Brain regions tackle our intense emotions when in love and it is significant to know what their responsibilities are in the presence of romance.

Bilingual Brains Build Stronger Connections, Neuroscience News

Long-term Attachments

There is an evitable change over time from passionate love to compassionate love. As early stages of romance become a passerby, feelings and emotions change over time. It is crucial to know that compassionate love is deep, but incomparable to the early stages of love. In 2011, a study from Stoney Brook University, New York, shares that it is possible to be in love with someone after many years of marriage. To delve deeper, this research included MRI scans on couples who had been in love for many years. They found the same intensity of dopamine as found in the brains of couples who were newly in love. You may wonder, why is this? The passion of romance remains, but the stress component of early love goes away over time. This is caused by the neutralization of serotonin levels and the effects of oxytocin. The interaction between vasopressin and oxytocin work together to maintain romantic love. Love over time lets us see our partner in a way that nobody else can. We begin to understand their emotions and perspective, with the increased in bonding over time. Thomas Sherman, Professor at the School of Medicine, states, "You could say that love begins as a stressor, but then love becomes a buffer against stress." (Djanpranata, 2024). Though feelings come by and go, long-term attachments are possible, and they continue to thrive for many long-term relationships.

Benefits of Long-term Attachments

Many benefits radiate in eternal love. Long-term love is the foundation of a healthy lifestyle and promising fulfillments. In the brain, long-term love is beneficial as it increases the cognitive area of the brain. This area can be justified as the angular gyrus. This region is associated with complex language functions and the mirror neuron system, an area that enables you to anticipate one's actions. The angular gyrus contributes to the development of cohesive narrative in one's romance. The complex language functions participate in one's romance by facilitating the sharing of thoughts and feelings. With this, the complex language system strengthens deep emotional connections and intimacy between you and your lover. This system fosters mutual connections and a deep understanding in each other's minds. The mirror neuron system enables empathy and understanding in romance. The responsibility of mirror neurons is to help couples understand each other's emotions, fostering empathy and strengthening emotional connection between the two.

Mirror neurons create a sense of safety and security in relationships. Harmonized as one, the complex language and the mirror neuron system seek to maintain long-term romantic relationships. Language allows love to be maintained with deep emotional connections, whereas the mirror neuron system allows the enhancement of empathy and understanding in love.

The science behind falling in love begins with the brain. It is to no doubt that love is a mysterious phenomenon that cannot be fully understood. Physical and emotional expressions of romance are triggered by a series involving hormones, from the neural pathways located in the brain. With the connections made through romance, complex insights with the neural mechanisms involved are all thanks to the study of neuroscience. If love is a complex feeling to understand, so are the neural mechanisms involved that trigger a wave of responses through our brain. With the help of neuroscience, it is now possible to understand the mysteries of love and the brain, though complexities linger.

The Benefits of Being Bilingual in STEM

There is a wide range of careers and sectors within STEM, but the skill set held by a successful scientist is fairly constant among them all. It may come as a surprise that many of these skills are also key skills of a linguist; however, this is not by chance. Psychologists have, for decades, acknowledged the links between bilingualism and improved learning and communication, and more recently the neuroscience behind these links has been uncovered.

One of science's most influential thinkers once wrote, "Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world." Albert Einstein was a key believer in the importance of creativity in the scientific process, and the sheer volume of his work is a testament to the validity of these beliefs. Science has always been interdisciplinary; you cannot view it (ironically) under a microscope. In order for great discoveries to be made, we must take pieces from all different areas and use a creative approach to find the string that connects them. Behaving similarly to the expected relationship between imagination and science, the regions of the brain involved with creative thinking are usually antagonistic. However, the ability to generate creative ideas is linked to the connectivity between these two regions, the default mode network (DMN) and the inferior prefrontal cortex (IPC), with highly creative individuals having significantly greater connectivity than less creative individuals. Moreover, for those that speak multiple languages, the strength of connectivity of the DMN with various regions of the IPC was greater than that of their monolingual counterparts. This suggests that the creativity of a scientist is likely to be significantly higher if they are able to speak multiple languages.

While fluency in a second or third language is incredibly beneficial, just the learning process can aid in developing the skills required for a career in STEM. Whether it's reaching a diagnosis as a doctor or overcoming obstacles in designs of machines as an engineer, problem solving is, in my opinion, the most important ability you can have within science-related jobs. Being able to identify and solve issues to improve the outcomes of your projects is essential in advancing the field you are working in. The eureka moment when you reach a satisfying conclusion is theorised to be the result of a dopamine release into a brain formation called the nucleus accumbens (NA). This region is responsible for reward processing, motivation and goal-directed behaviour, all vital parts of a scientist's search for knowledge. The dynamic restructuring model of neuroplasticity (DRM) suggests that with frequent use of a skill, the neural pathways created during the learning of the skill are grown and less efficient pathways are pruned. In language acquisition, this suggests that language learning, and hence the functional changes to the brain, are not linear but increase exponentially with increased experiences with the language. Applying the DRM to the NA, scientists found a positive correlation between the number of bilingual experiences and the volume of the region.

Through the lens of Skinner's reinforcement theory of motivation, put simply, that rewards increase motivation, we can assume

that increasing the volume of reward processing regions such as the NA would increase motivation to reach a goal or solve a problem.

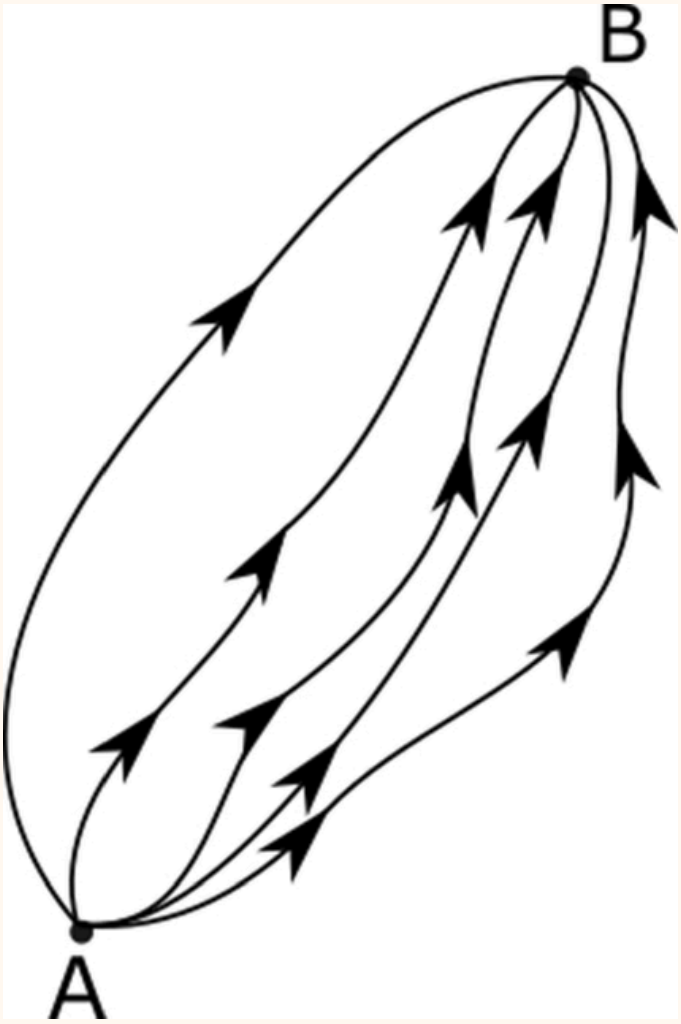
When you reach this goal, the next challenge you will face is how you should go about sharing your ideas and theories. This is one reason that good communication skills are important in STEM subjects. Furthermore, how we talk about science can be vital in influencing the general public opinion on major political topics, something that has been made clear over recent years. Misinformation on topics including abortion and vaccination can be especially harmful, given the treatment of such issues as debates. Improving science education and providing communication of science to more people can help to reduce this bias towards incorrect ideas. Successful communication is not an innate behaviour but rather one that is developed over time, and it is apparent that being bilingual can increase the rate at which this development occurs.

In my own language learning experience, I have noticed that since becoming more comfortable speaking in Spanish, I am also more comfortable speaking in English. I notice subtle nuances in the word choices of others and myself when in conversation, and this has allowed me to adapt my language to better communicate my ideas. It is my view that this is down to the amount of time I've spent comparing English and Spanish grammar, finding links and places of contrast between the two and translating back and forth when reading Spanish books. Being someone who sees the world in quite a methodical manner, it was very easy for me to treat Spanish as a science. Memorising grammar tables and looking for logic in cognates was my natural approach; this has changed. With time vocab lists became redundant, replaced by literature and music, and my enjoyment of the subject increased proportionally to my fluency. The creative approach to language acquisition has reflected onto other aspects of my life, such as my ability to understand and explain complex ideas in science subjects, and I hope that this article inspires other scientists to consider taking up a new language.

The Relatable World of Quantum Mechanics

For most people, quantum mechanics seems counterintuitive and paradoxical. Whether it's Schrödinger's famous cat which is simultaneously alive and dead, or strange entities that behave both like particles and like waves, quantum mechanics is full of strange results that seem nothing like the world around us. But if you've ever been busy or lazy, been uncertain or unreliable, perhaps you can relate to the weird and wonderful quantum universe.

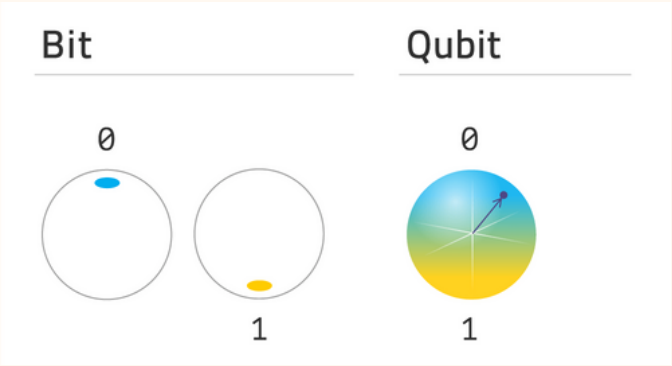
Imagine placing a tiny particle such as an electron on the table in front of you. If you then looked away and did not interact with this particle you might expect it to stay perfectly still. However, according to quantum mechanics, if you look back the particle may not be exactly where you left it. It could be a few nanometres to the right, or on the other side of the room, or even on the other side of the universe! This is because quantum theory states that a particle can be in a superposition of states, meaning that while you're looking away from your particle and not interacting with it, it is simultaneously in infinitely many different places. On looking back at your new pet particle, it 'decides' on a place to be. Feynman's Principle of Least Action states that all the possible paths a particle can take, no matter how bizarre or unlikely, can be added together and a resultant probability can be found. By far the highest probability is for the particle to have barely moved, if at all, but there is a small but non-zero chance of it having moved much further. So, if you've ever felt so busy that you feel like you're everywhere simultaneously, or wished you could be in two places at once, maybe you and your strange particle have more in common than you think. But there's also no need to feel bad about being lazy, quantum particles usually are too, so by staying on the sofa all day, you're technically just obeying the Least Action Principle!



A diagram showing some of the possible ways for a particle to get from A to B. In reality it will simultaneously travel all of these routes

This principle of superposition also applies to states, and this is the basis of quantum computing. In a classical computer, a signal is either 1 or 0, but in a quantum computer, a particle can act as a qubit that's a mixture of both states. This provides far greater computing power, which makes quantum computing very useful for handling and analysing vast amounts of data, giving it exciting applications in drug development,

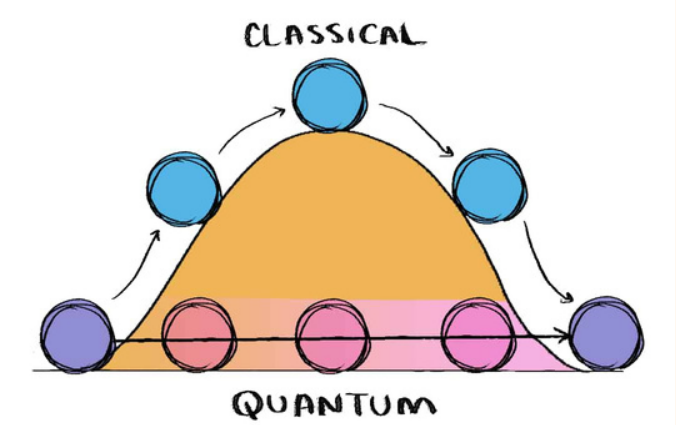
climate science, and energy storage. So perhaps being confused or undecided isn't such a bad thing!



A diagram illustrating how a qubit is a mixture of two states

And if you've got a particularly unreliable friend, perhaps they're just behaving like a quantum particle. Heisenberg's Uncertainty Principle states that the more accurately you know a particle's position, the less accurately you know its momentum or velocity. Therefore, if you take an electron and confine it to a small space using an electric or magnetic field, you can accurately determine its position, but there is a high uncertainty in its velocity. In other words, you know where this particle is, but you have no idea where it's going, much like that one friend at a party who was definitely in the kitchen a few seconds ago, but could now be headed anywhere!

If you like to feel in control of your life, all this talk of inherent randomness and uncertainty in the universe can be quite unnerving. But instead, try to think of it as liberating. Take quantum tunnelling for example. In classical mechanics, if a particle doesn't have enough energy, there is no way for it to overcome a barrier without gaining any more. However, quantum particles have wave-like properties, and this means there is a chance for them to bypass the barrier completely!



An illustration of quantum tunnelling

So, while quantum mechanics is random and confusing, maybe it can be relatable when you feel uncertain, busy, or even lazy. Perhaps we should all behave a bit more like quantum particles and try to overcome some otherwise impossible barriers, because after all, in the quantum world, nothing is set in stone.

The Quantum Leap of Consciousness: How Quantum Physics Could Unlock the Mysteries of the Mind

We have all heard of ‘quantum physics’ but what does it actually mean? Quantum Physics is a branch of science that explores the behavior of matter and energy on the smallest scales, like atoms and subatomic particles. But how can we use this to unlock the mysteries of the mind?

The link between quantum physics and unlocking the mysteries of the mind lies in the idea that the brain might operate, or at least be influenced, by quantum processes in some way.

A well known theory in the relationship to consciousness is the orchestrated objective reduction. According to this theory, microtubules are structures inside neurons that help maintain their shape in which quantum computations occur in. They are thought to be capable of quantum-level processing, and their quantum states might somehow give rise to consciousness. The idea of objective reduction suggests that quantum events might be "orchestrated" within the brain to give rise to conscious awareness, blending physics and biology in ways that could explain subjective experience.

Quantum physics can also be used to explain the unit of consciousness which is the idea that the sense that our thoughts and perceptions are integrated despite being the result of many different processes in different parts of the brain.

However, one challenge is the large scale of scepticism surrounding the theory as there is a lack of research that can be conducted due to the challenges of testing quantum effects in the brain, given the warm, wet environment of the brain, which is thought to be hostile to quantum phenomena. This creates the question, could this theory be proven?

Therefore, the ongoing exploration of quantum consciousness remains an exciting frontier, and future breakthroughs in both neuroscience and quantum physics might eventually bring us closer to understanding whether quantum mechanics has a role in how our minds work.

The Flight for Feminism: An Attempt at Empowering Women in Aeronautics

Since 1963, when women first set sail on our cosmic ocean, there have been female engineers, scientists, and astronauts who have made daring and dire contributions to aeronautics and space exploration. Sally Ride, Kathryn Sullivan, and Suni Williams are just some of the inspiring astronauts that have worked hard to make their names known among their male counterparts in the space industry and have proven to young girls that they too, belong in science.

Jeff Bezos, founder and CEO of Blue Origin, and his fiance Lauren Sanchez wanted to be a part of inspiring girls and women to pursue the STEM fields and quite literally shoot for the stars by showcasing more women in space. Sanchez chose a crew of women to do so: Katy Perry, Gayle King, Kerianne Flynn, Aisha Bowe, and Amanda Nguyen.

When this eclectic group of space tourists was announced, eyebrows were raised and questioned the women chosen for the eleven minute low orbit flight. Many were confused why the pop princess Perry, TV personality King, and film producer Kerianne Flynn joined Sanchez on the flight, as they had no education or credentials to offer them a ticket to fly. In a time where political turmoil has impacted funding towards science education and exploration, many viewed these crew members' participation as unfair, undeserving, and inconsiderate. While the crew aimed to encourage girls to pursue careers in STEM, this may not be accessible for them, as the Trump administration proposes extreme budget cuts to the National Science Foundation and the National Aeronautics and Space Administration.

Managing to escape the criticism, Aisha Bowe and Amanda Nguyen were encouraged to fly on Blue Origin's NS-31, as they were the only two women with the education and career in aerospace and science that warranted their trip to the stars. Many stated that the entire crew should have consisted of women with degrees in aerospace engineering like Bowe, or women

who have fought against sexual harrassment to have a place in the male dominated field, like Nguyen.

Many believe that not only do girls need to see female representation in space flights, but they must see representation in the stages of life before space flights, working hard in high school calculus, pursuing a physics degree in undergraduate school, getting a Ph.D. in STEM. Girls who want to pursue a STEM career must see women like Bowe and Nguyen who have gone through what they have, and see them flourish in their careers.

While the six space tourists took off on April 14th to the Karman line, the boundary between Earth's atmosphere and outer space, controversy and debate concerning the flight immersed back on the ground. People were curious to see how the women would spend their brief eleven minutes above earth in zero gravity space, but when footage was released from the flight, not many were impressed.

The main points of criticism were not primarily towards what the women did while in space, besides the jokes made of Perry holding a daisy to the camera, but rather the cadence and the claims made by the "astronauts" at their point of return back on planet Earth.

As soon as Perry walked out of the space capsule, opened by Bezos, she immediately bent down and kissed the ground. A few minutes later, she explained in an interview how she felt connected to love, power, and most importantly, our wonderful world.

Perry told Blue Origin reporter, "I feel super connected to love," and that the experience showed her that "you never know how much love is inside of you, how much love there is to give, and how loved you are until the day you launch". Gayle King also reported that while in space, Perry sang "What a Wonderful World" by Louis Armstrong. When asked why she chose that song, she replied, "It's not about me, it's not about singing my songs. It's about making space for future women and taking up space and belonging". While appreciating her acknowledgement of paving the way for women in STEM, many felt that her cadence was dramatic and out of touch, implying that you can only feel how loved you are until you have millions of dollars to spend on going to space.

Using celebrities in an attempt to promote space and curiosity for the cosmos is not new, from Bill Nye to Neil Degrasse Tyson, there have been science figures in entertainment and media that have encouraged the public spanning multitudes of generations to shoot for the stars. These science communicators have relied on charisma, warmth, and creativity to make complex, scientific ideas accessible to those of all ages, however when we see this attempted to be done with those with little to no scientific background, the message gets murky. Undoubtedly, Katy Perry and Gayle King have an influence on girls and women, but what exactly is the message they are trying to send? The message that going to space means you feel loved?

The issue lies within the depth and meaning of the women's message as they ventured on this journey and their witness upon return. While Perry spoke of love, wonder, inspiration, there was no discussion surrounding the scientific phenomena she experienced, such as floating in zero gravity space, how the spacecraft work, or what science was being conducted, if any.

In an interview with AP News Entertainment prior to lift off, Perry expressed her enthusiasm for "STEM" and discussed how she took the initiative to educate herself. She told AP News, "I'm really excited about the engineering of it all, I'm excited to learn more about STEM and just the math about what it takes to accomplish this type of thing." Comments in response on social media include:

"I thought 'California Girls' was slightly making fun of vapid valley girls with subtext, but it seems she devoutly believes every lyric without any hint of sarcasm."

"This is genuinely disrespectful to all the women who dedicated their lives to STEM."

"There are so many people who already know about STEM who are sitting at home with their doctorates wishing they had this opportunity."

While ruthless, the criticism was reasonable. Those who do hold doctorates raised eyebrows at her statements of learning about the "STEM and math about what it takes", as this kind of math requires knowledge in high level calculus, differential equations, and linear algebra mainly taught in graduate school. She continued on about her nightly readings of Cosmos by Carl Sagan and string theory, one of the most complicated topics in physics that discusses complexities in quantum mechanics, quantum field theory, and general relativity. To top it off, she named her three favorite sciences: "I've always been interested in astrophysics and interested in astronomy and astrology". A general conclusion made by the working class determined that she did not, in fact, know the STEM of what it takes, and was not as familiar with the cosmos as she made herself appear to be.

The disconnect of these women and their involvement of true dedication to STEM leads to the larger question, what was the goal of this mission? Was it actually meant to inspire? Or was this just a joy ride for those who could afford it? If Bezos and Sanchez truly wanted to inspire and educate girls, they could have taken further steps to do so. These educational touchpoints could include Q&A sessions with aerospace engineer Aisha Bowe and bioastronautics

researcher Amanda Nguyen, behind the scenes looks at features and technology of the NS-31 spacecraft, or the physics governing the zero gravity spaceflight.

Instead of focusing the flight on science education and communication, this mission opted towards optics, images of celebrity women hugging, making statements of love and belonging, and high emotion. While this may have resonated with some, a girl in her high school physics class doubting whether she belongs in STEM may not have benefited much from this mission.

Rather than benefiting high school girls, it benefited the Hollywood headlines. In a time where science research, careers, and exploration are threatened and minimized by government proposals, genuine representation and education matters.

If we aim to inspire the future generations of scientists, engineers, and mathematicians, and teach them that the sky isn't the limit, we must offer them more than just stardust and symbolism, we must give them the access, education, and tools to turn their dreams into discoveries.

Why We Age and Can We Stop It? Telomeres, Senescence, and Longevity Science

50 is the new 30? and 70 is the new 60? Ageing is an inevitable part of life, but many wish they could stop or slow down the biological process. With all the new scientific developments up and coming, this begs the question: can science stop ageing?

Telomeres, Senescence, and the Science of Longevity

Why is ageing inevitable? Why do our bodies weaken over time, and can science intervene to slow, stop, or even reverse this process? Modern biology is beginning to unravel these questions, with particular attention on three key players: telomeres, cellular senescence, and longevity science.

Telomeres

Telomeres are repetitive DNA sequences that cap the ends of our chromosomes. Every time a cell divides, its telomeres get a bit shorter. Eventually, they become too short to protect the chromosome, triggering the cell to stop dividing. This limit is known as the Hayflick limit which highlights that normal human cells can only divide a finite number of times. Shortened telomeres are strongly associated with aging and age-related diseases. In fact, people with longer telomeres tend to live longer and stay healthier. Interestingly, an enzyme called telomerase can help to rebuild telomeres, and is active in stem cells, germ cells, and certain white blood cells. However, most somatic cells (body cells) have very low telomerase activity.

Cellular Senescence

When telomeres become critically short it enters a state called cellular senescence. These senescent cells no longer divide however, they do not die. Instead, they secrete inflammatory signals and harmful molecules that disrupt the surrounding tissue. These “zombie cells" are increasingly believed to be major drivers of ageing and chronic diseases like arthritis, fibrosis, and even cancer. By targeting senescent cells has become a promising strategy in longevity science. Drugs called senolytics are being developed to selectively remove these dysfunctional cells, potentially reducing inflammation and rejuvenating tissue.

The Frontier of Longevity Science

Scientist now have the view of ageing as a collection of biological processes and key areas of longevity research include:

- Caloric restriction and mimetics: Eating fewer calories without malnutrition extends lifespan in multiple species. Scientists are working on drugs that mimic this effect.
- Epigenetic reprogramming: By manipulating gene expression (without changing the DNA), researchers hope to reset cells to a more youthful state.
- Stem cell therapy: Replacing damaged or aged cells with healthy stem cells could regenerate tissues and organs.
- CRISPR and gene editing: Some labs are experimenting with editing genes involved in aging, like FOXO3 or Klotho, to boost cellular resilience.

By understanding the mechanics of telomeres, senescence, and molecular aging pathways, researchers are laying the groundwork for interventions that could extend not just lifespan, but healthspan.

Henrietta Lacks: The Woman Behind the First Immortal Cells

If you've received the COVID-19 vaccine, know someone treated for cancer, or have undergone an X-Ray, then your life has been influenced by HeLa cells: the first immortal human cell line. Since their discovery in 1951, their resulting advances in biomedical research have led to three Nobel prizes, vaccines that have saved millions of lives, the birth of genetic medicine, and many more crucial stepping stones in the biomedical world.

But what are these immortal 'HeLa' cells? And how did they become immortal?

Entering John Hopkins hospital, Virginia, circa 1951, Henrietta Lacks, a young African-American mother of 5 was seeking treatment for aggressive cervical adenocarcinoma (cancer). John Hopkins was the only nearby hospital accepting patients of colour. At the time, the standard treatment was radium therapy (this is no longer used due to the long term cell damage it causes). She never complained and always assumed that the doctors knew best. Given that patient consent wasn't yet formally recognised, Henrietta's gynecologist, Dr. Richard TeLinde, never asked permission to take a sample of her cervical tissue whilst she was sedated, nor to give some of it to a researcher at the hospital: Dr. George Gey. TeLinde had been taking samples for Gey from any black woman who entered the ward, without their knowledge or consent. At the time, it was believed that as these patients didn't pay for treatment it was fair to use their bodies for research as a way of payment, regardless of the patients' knowledge.

For a long time, Gey had been attempting to grow cells continuously in culture. His

Henrietta Lacks

attempts thus far had only been unsuccessful, and he was desperate to find a cell line that would grow. Gey had developed a culture medium composed of chicken plasma, calf embryo extract and human umbilical cord blood. He kept Henrietta's cells in this medium using 'roller drum technique' in which a large wooden drum holds small 'roller tubes' that slowly and continuously rotate. This is used to imitate the constant motion of blood and fluids in the body. Much to his surprise, the cells not only lived, but doubled every 20-24 hours! Ecstatic with this new discovery, Gey shared samples of HeLa cells with his colleagues, then the country, then the world.

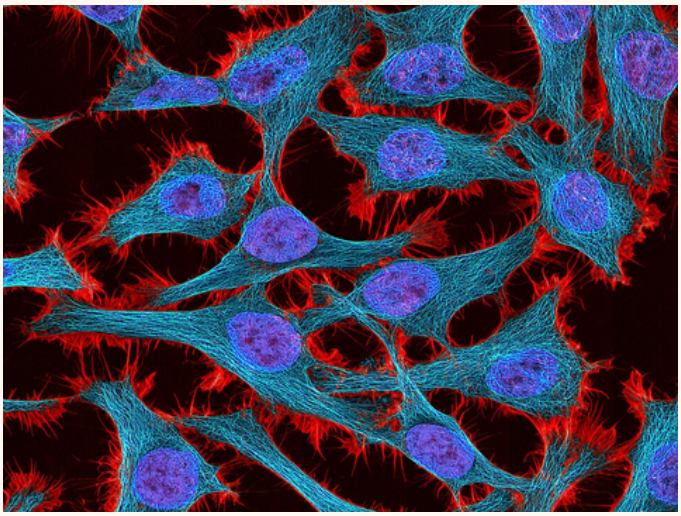
Dr George Otto Gey

Although Henrietta's radium treatment initially shrank her tumours, they eventually took over her whole body, leaving her weak, immobile and full of agonising pain. She passed away aged 31 on the 4th of October, 1951, unknowing of the extraordinary significance her cells would hold. Beyond Henrietta's death, HeLa cells were transported all over the globe, with over 50 million tonnes of the cells being replicated. Scientists used them for human cell and cancer research, leading to many crucial advances in technology, medicine, and biology.

Over several decades, HeLa cells were:

1950s

- Mixed with a special liquid that allowed researchers to view and count each chromosome, leading to the discovery that humans have 23 pairs of chromosomes and the beginning of genetic medicine.
- Helped create the first successful polio vaccine, eventually eradicating polio altogether and saving millions of children from paralysis.
- Used in one of the first experiments on the effects of X-Rays on human cell growth; laying the groundwork for X-Ray safety precautions and methods practiced today.



Multiphoton fluorescence image of HeLa cells stained with the actin- binding toxin phalloidin (red), microtubules (cyan), and cell nuclei (blue). Nikon RTS2000MP custom laser scanning microscope.

1960s

- Taken aboard some of the very first space capsules; providing initial insight into how space travel would affect astronauts in future missions.
- Used to study the benefits of hydroxyurea in cancer treatment. Hydroxyurea is now used as a chemotherapy medication for leukemia, head and neck cancer, a painkiller for sickle cell anemia, and more.

1970s

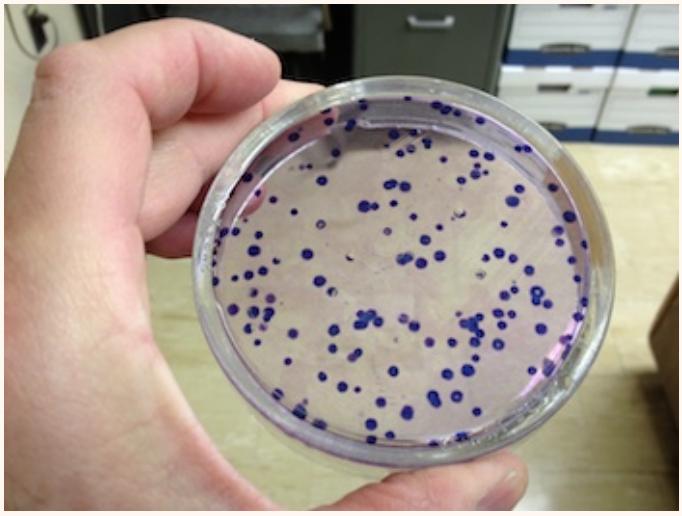
- Observed to determine how salmonella infects the body; enabling development of new methods to diagnose and treat it.

1980s

- Used to discover the effects of HPV and how it can lead to certain cancers.
- Tested with a drug called 'Camptothecin', which was found to slow cancer growth

and is now a successful form of treatment.
- Used to study how HIV-AIDS works; later facilitating certain drugs being developed to limit the spread of infections.

1990s – present day
- Used to discover telomeres; revolutionising the study of aging as we know it.
- Tested to unveil how thalidomide (an anti-morning sickness drug used by pregnant women) was causing birth defects; helping to end the 'thalidomide crisis'. This study also helped apply thalidomide to stopping cancer's effects instead.
- Helped develop now widely-used microscopic techniques that allow on-going cell processes to be viewed and analysed.
- Used in research for the synthesis of the COVID-19 vaccine which put an end to the 2020-2021 pandemics.



White cell culture image

While it's important to appreciate the positive impact that these cells have caused, it also can't be forgotten where these cells came from. It wasn't until 25 years after Henrietta passed that her family first learned of how scientists were experimenting on her cells all over the world. The Lackses were incredibly upset that their mother wasn't being recognised by the medical community. There was some debate over where the 'HeLa' name came from (Helen Lane? Heather Lawrence?) as Henrietta Lacks had never been formally recognised as the source of these miraculous cells.

Henrietta's true story finally came to light, 60 years later, through Rebecca Skloot's book 'The Immortal Life of Henrietta Lacks' (I highly recommend) which was then turned into a film starring Oprah Winfrey. In the book, it was revealed that Henrietta's family received no compensation and struggle to fund care for various medical issues, while large companies profit greatly from HeLa cells. In 2023, the Lacks family won a significant lawsuit against Thermo Fisher Scientific (a huge biotechnology company profiting greatly from Henrietta's cells) under the claim that the company was "unjustly enriched' by its use of HeLa cells.

Some of the Lacks family with a statue of Henrietta

In the future, the Lacks family's lawyers are hoping to go after more companies profiting from Henrietta's cells and finally bring justice to her name. Additionally, this settlement has started an important conversation around medical discrimination and giving patients a property stake in their tissues, and has brought to light many similar cases which could start unjust enrichment lawsuits just like this one.

Should Doctors Be on Social Media?

We all know the power of social media, with it being able to reach thousands and have a significant impact, but what role does social media play in healthcare ?

The importance of healthcare communications helps patients understand diagnoses, treatment plans, and medication instructions. When healthcare professionals communicate empathetically and transparently, patients feel heard and respected. This trust boosts treatment adherence and patient satisfaction.

When qualified doctors are taking on social media, they can use their medical knowledge to debunk false claims and promote science and research based evidence as in the age of TikTok, YouTube, and WhatsApp, health myths spread fast. Additionally, using inclusive language and culturally sensitive approaches ensures everyone, regardless of language, background, or ability has equal access to care and understanding. Public health depends on good messaging to reach and resonate with diverse communities.

For example, in 2020 the COVID-19 pandemic resulted in the public health campaign of “Stay Home, Protect the NHS, Save Lives” in order to:

- Urge people to stay home to stop virus transmission
- Prevent overwhelming the NHS
- Emphasise the seriousness of the pandemic

This highlights the importance of communications within healthcare, making sure the public is healthy and safe.

While the majority of healthcare professionals use social media to educate, raise awareness, and connect with younger audiences, there are clear risks when boundaries are not respected. Some may argue that they may break certain confidentiality restrictions or lose focus and place a greater focus on the number of likes and shares as opposed to the patients themselves. Such as, certain plastic surgeons have been filming and sharing videos of patients being operated on. For example, Dr. Grawe, a plastic surgeon in the US, had her medical license revoked after live-streaming procedures on social media platforms. The medical board found that her actions compromised patient privacy and violated professional standards.

Therefore, maintaining professionalism is key. Social media may offer an easy route to instant fame, but the responsibility that comes with being a medical professional is paramount. Doctors and other healthcare professionals must ensure that their online presence reflects the same ethical standards they uphold in their practice.

However, it’s not all negative. Social media can offer a humanizing and more accessible side of healthcare that brings doctors and patients closer together which can help break down barriers and make healthcare feel more approachable.

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How AI is Transforming Healthcare: From Diagnosis to Discovery

Artificial intelligence (AI) is not a thing of the distant future anymore. From using Chat gpt to help us write our essays could we use AI as a force to reshape the way we approach medicine. From diagnosing diseases faster than ever before to discovering groundbreaking treatments, AI is revolutionizing healthcare on every level. But how exactly is this transformation happening?

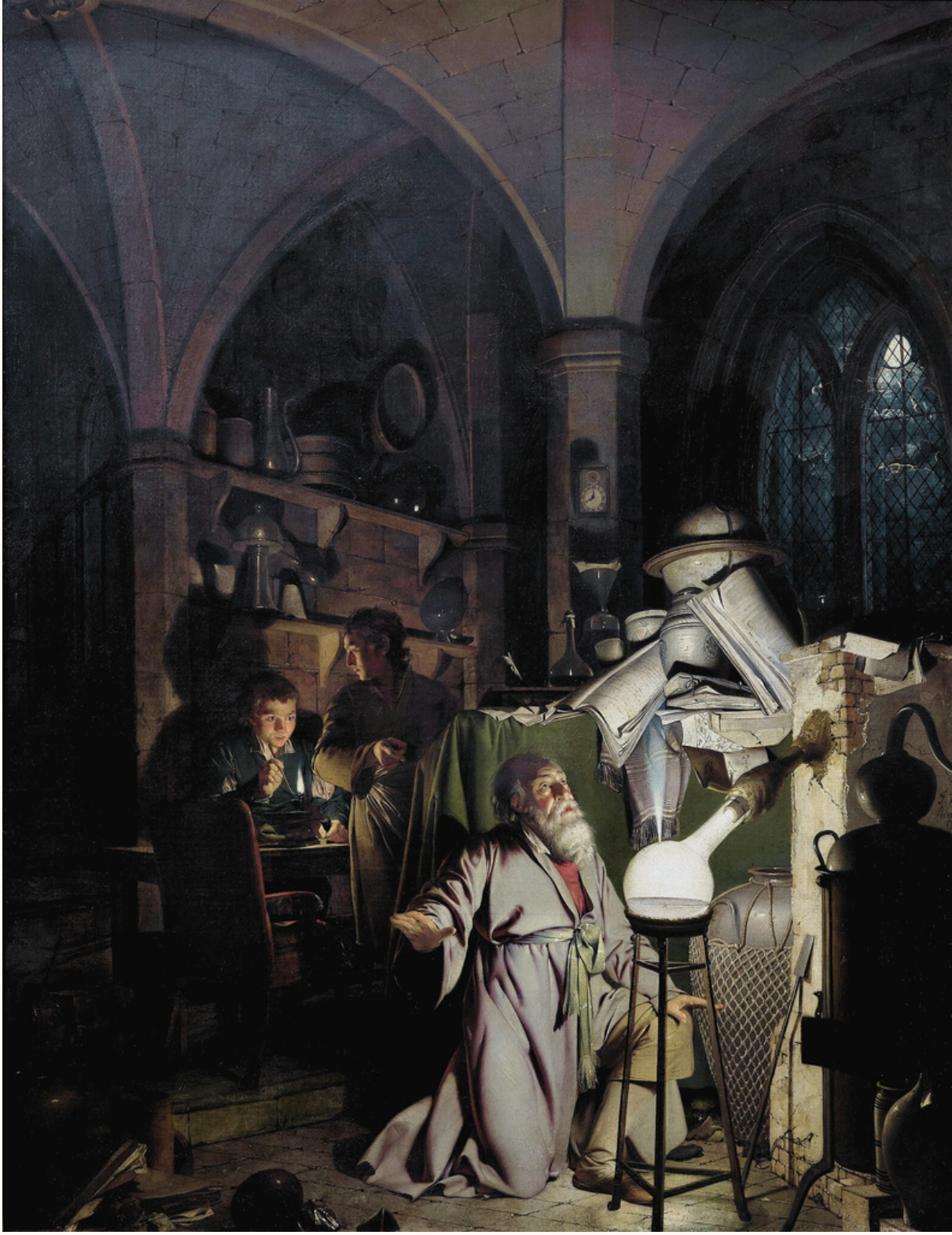
Faster diagnosis
AI-powered tools are helping doctors diagnose conditions with speed and accuracy. For example, Google's DeepMind developed an AI system that can detect over 50 eye diseases as accurately as world leading ophthalmologists. Algorithms trained on thousands of medical images can now detect diseases like cancer, stroke, and pneumonia, sometimes with accuracy rivaling top radiologists. This is significant because early diagnosis saves lives and reduces treatment costs, especially in under resourced healthcare settings.

Personalized Medicine
Using AI in healthcare allows patients' treatment plans to be tailored to them as individuals. Taking into account each patient's genetic makeup, lifestyle, and medical history. This goes beyond a one-size-fits-all approach, offering customized therapies with higher success rates. For example, AI models analyze genomic data to identify the best cancer treatments for specific patients which have increased effectiveness and fewer side effects, leading to better outcomes.

Enhancing Medical Imaging & Radiology
AI doesn't just interpret medical images, it actually has the ability to improve them. Algorithms can enhance image clarity, highlight abnormalities, and even reconstruct 3D models from 2D scans. This is significant in helping radiologists detect tiny tumors that may go unnoticed by the human eye, resulting in increased precision in surgery planning and early intervention.

Planning future disease outbreaks
AI analyzes massive datasets to predict disease outbreaks, assess risks, and improve healthcare delivery on a population level. For example, using AI models could help predict COVID-19 and other disease epidemics that spread patterns and inform public health responses. This allows better resource allocation and prevention strategies. While the promise of AI in healthcare offers a vast range of positive improvements, we also have to consider the challenges of data protection, patient confidentiality, bias in algorithms, the ethics in decision making around health and the regulation of the role of AI in healthcare.

It is necessary to have responsible innovation and clear policies for AI to be used safely and equitably in healthcare.



The Alchemist in Search of the Philosopher's Stone, *Joseph Wright of Derby, 1771*

section two: interviews

TARA SMITH

Owner & founder of *Simply Sorted CA*
Advisor – Development Engineering
Long Term Planning, OVINTIV

Tara Smith is a Canadian Professional Engineer with over 16 years of experience in the energy sector. A graduate of Chemical Engineering from the University of Louisiana at Lafayette, Tara returned to Canada to build her career in Calgary, Alberta. Entering a predominantly male industry early in her career, she quickly became aware of the unspoken expectations placed on women in STEM, from how to dress and communicate to the need to constantly prove her competence in rooms where she often stood out. Despite years of progress, she continues to witness gender disparities across all levels of leadership in her field. Motivated by both her personal experiences and a desire to create change, Tara was inspired by her daughter's natural love for science and engineering. Watching her build pulley systems, repurpose recyclables into inventions, and experiment with Excel, Tara realized that real change begins at home and within herself. This realization led her to reconnect with her authentic self and channel her creativity into launching a brand at the intersection of STEM and art. Through this project, Tara designs products that amplify and celebrate women in STEM, making visibility, pride, and empowerment central to her mission. Her ultimate goal is to grow the brand into a force for good: one that not only inspires confidence in women and girls but also gives back to organizations that champion girls in STEM.

We are very interested in your company, can you tell us more about it? How it started, your goals... Where do you draw inspiration from, when designing new pieces and are there any collaborations or projects you're excited to pursue in the future?

Simply Sorted began as a passion project after more than 16 years working in the oil and gas industry. Over that time, I saw firsthand how little had changed in terms of embedded corporate culture. While more women were entering the field, the frameworks they were stepping into weren't designed with their experiences in mind. I felt strongly that if we want to retain and empower women in STEM, we need to shift what visibility, belonging, and leadership look like. Simply Sorted is my way of doing just that, using the intersection of art and STEM to help shift the equity landscape in a tangible, creative way. At its core, Simply Sorted exists to amplify female voices, empower women to proudly represent their technical passions, and increase the visible representation of women in science, technology, engineering, and math, because if you can see it, you can be it. It's well-documented that girls begin to lose interest in STEM around the ages of 10 to 12. My long-term vision is to grow Simply Sorted into a platform that doesn't just celebrate women in STEM, but actively invests in them, by supporting organizations that run programs for young girls and help keep their curiosity and confidence alive. If my work can help even one girl see herself in STEM and truly believe she belongs there, that would be more than enough. One of the projects I'm most excited about is our Not-So-Disney line, a collection that reimagines classic princesses as modern STEM role models. These women aren't waiting in towers; they're building labs, launching missions, and writing code. It's my way of flipping the script on who girls are told to admire, not someone who waits in a castle, but someone who builds it herself.

Given your interest in the intersection between engineering and art, do you see creativity as essential to being a good engineer? Have you always felt a creative interest alongside

your technical career?
Absolutely. Creativity is fundamental to engineering, it's how we problem-solve, design solutions, and adapt in real time; fundamentally it's the root of innovation. People often see STEM and art as opposites, but they're really both about building something meaningful from a blank slate. I've always had a creative streak, from organizing chaos to designing systems and, now, creating physical products. Creativity helped me connect dots others didn't see, especially when I was leading complex projects in fast-moving environments. Simply Sorted is just another expression of that problem-solving spirit, this time, through mugs and sweatshirts instead of chemical process models.

Despite some progress, gender disparity still exists in STEM, what changes have you observed over your 16-year career and what are some barriers women still face in STEM workplaces?
There's more conversation now, which matters, but conversation isn't the same as change. Representation hasn't meaningfully shifted in the past decade, with women still earning only about 35% of STEM degrees. And with many DEI programs now being scaled back or eliminated altogether, I worry we're losing the momentum needed to build teams that reflect the diverse perspectives essential to real innovation and effective problem-solving. Meanwhile, the technical world has accelerated. The pace is faster, the stakes are higher, and capital decisions carry more pressure than ever. Home life has evolved too, the old "village model" for raising families is increasingly rare, while expectations on parents, especially mothers, have intensified. One of the most persistent barriers is still the invisible load: the unspoken expectation that women will mentor, manage conflict, and carry the emotional labor, all while delivering at the highest technical level. With these dual pressures, we need workplace cultures and policies that view employees as whole people, not just producers. Because when people feel seen, supported, and valued, they don't just stay. They lead, they innovate, and they change the game.

How has being a mother influenced your perspective on gender roles and representation in STEM?
Motherhood didn't dull my ambition, it clarified it. It made me more aware of how narrowly we define success, and who's truly allowed to show up fully in technical spaces. I want my kids to grow up knowing that leadership can look like empathy, and that you don't have to choose between being a present parent and a driven professional. Representation isn't just about getting a seat at the table anymore, it's about redesigning the table entirely, so the next generation doesn't have to squeeze themselves in. If my daughter chooses STEM, I want her to take her seat unapologetically, and know, without question, that she belongs there.

Engineering is definitely a very hard degree, how did you stay focused and how did you overcome difficulties, during your time in school but also after you graduated. Did you have any role models to inspire you?
I didn't always feel like I had all the answers, but I always had a plan. As a Division I volleyball team captain on scholarship while studying engineering, staying focused wasn't optional, it was essential. I had goals, and I was steadfast in pursuing them. Whether it meant taking exams early before tournaments, hitting office hours to stay ahead, or leaning on strong classmates for missed notes, I always found a way forward. I kept a detailed planner, woke up early on weekends (even after a late night out), and made sure the work got done, no

excuses. I was disciplined, but I wasn't doing it alone. I leaned on community, friend, classmates, professors, people who challenged me and lifted me up. Over time, my role models became the women I saw leading, often informally, with both competence and candor. They didn't pretend to know everything, and that gave me permission to let go of the idea that I had to be perfect or all-knowing before speaking up. They didn't shrink to fit the room, they reshaped it. That's the kind of presence I strive to bring into every space I enter.

What drew you to study chemical engineering in the first place and what kept you engaged in the energy sector over the past 16 years?
I was initially drawn to chemical engineering because it felt like a passport, a way to solve real-world problems across a wide range of industries using both logic and creativity. I loved that versatility. Ironically, once I entered the oil and gas sector, I found that same variety within a single industry. Over the years, I've had the opportunity to take on a range of roles, each one pushing me to grow in new ways, personally and professionally. What's kept me engaged is the constant evolution. As technology advances, we push technical and operational boundaries, which creates the need for entirely new solutions. It's an ongoing cycle of innovation and learning that keeps the work dynamic and meaningful. Recently, I've shifted from boots-on-the-ground operations into long-term strategic planning, and I've loved it. It's allowed me to round out my toolkit, pairing commercial acumen with a strong operational foundation. That balance of technical depth and big-picture thinking is what keeps me energized for what's next.

You also mentioned your daughter being interested in STEM as well, if she follows in your footsteps, what's one lesson you'd want her to carry with her? And what would you tell to other young girls who feels they're not good enough for the STEM field?
I'd tell her, and any girl who's questioning her place, that there's no one way to be brilliant. STEM needs all kinds of thinkers: dreamers, builders, leaders, quiet observers, and loud question-askers. You don't have to fit a mold. You just have to stay curious and keep showing up. The myth of "not good enough" is just that, a myth. Confidence is built by doing the work, failing, learning, and trying again. I want my daughter to know she belongs, not because someone gave her permission, but because she claimed her space and brought others with her.

If you want to know more about her project, follow her instagram: simplysortedca

Check her designs at page 54

JESSICA MCLOUGHLIN

PhD student
Graduate Teaching Assistant

Jess, 25yo, is a PhD student specialising in microbiology and immunology, currently 18 months into her research at Edge Hill University. With a strong academic foundation, including a biology degree, two Master's (in biological research and teaching in higher education), she's also an active lecturer, teaching topics such as medical microbiology, cell culture, and anatomy. Beyond the lab and lecture hall, Jess recently presented her research at a conference in Austria, where she was awarded a travel grant, and she's just celebrated her first scientific publication. This summer, she'll be presenting again in Liverpool and attending Parliamentary Links Day at the Houses of Parliament to discuss current issues within science with the current government. Passionate about science communication and encouraging women in STEM, Jess also shares her journey on TikTok (@jessm.xx1*)*

What is your PhD research about, and what drew you to microbiology and immunology? Since you're 18 months in your journey, how has it been so far?

My PhD research explores the effects of Selective Estrogen Receptor Modulators (SERMs) and Selective Estrogen Receptor Degraders (SERDs) on the phagocytic clearance of wound-associated bacteria specifically Staphylococcus aureus and Pseudomonas aeruginosa by macrophages under hyperglycaemic conditions. The study aims to investigate whether compounds like tamoxifen, raloxifene, and fulvestrant can enhance innate immune responses in diabetic environments, potentially reducing reliance on antibiotics for chronic wound infections such as diabetic foot ulcers (DFUs). What initially drew me to microbiology and immunology was the complex interplay between pathogens and the immune system, especially how underlying conditions like diabetes impair the body's ability to fight infection. I've been fascinated by the dynamic nature of immune cells like macrophages since my undergraduate dissertation project and how their behaviour can be modulated in different environments, from this I chose to complete my masters degree. Combining that with a growing interest in microbiology, my PhD project seemed the perfect next steps. Now, 18 months into the PhD journey, it's been both challenging and deeply rewarding. I've gained extensive hands-on experience with advanced in vitro techniques like cell differentiation, host-pathogen interaction assays, flow cytometry, and ELISA. Working on a project that sits at the intersection of immunology, microbiology, and wound healing has broadened my understanding and appreciation for translational research. There have certainly been hurdles, especially in optimizing cell culture conditions and maintaining consistency across experiments, but each challenge has pushed me to grow both as a scientist and a problem-solver.

You're attending Parliamentary Links Day this summer, what are you hoping to take away from that experience and what are you hoping to bring to the table?

Attending Parliamentary Links Day this summer is an exciting opportunity to see how science can influence policy at the national level and vice versa. I'm hoping to gain a deeper understanding of how scientific research is communicated to and considered by policymakers. I want to learn how researchers can better engage with Parliament to ensure that evidence-based decisions are made. I'm also looking forward to connecting with other researchers and policy leaders to explore how science can play a more active role in shaping public health strategies. One key takeaway I hope to gain is insight into the current governmental priorities for science funding and how early-career researchers like myself can contribute to that dialogue. In terms of what I hope to bring to the table, I want to share my perspective as a

biomedical researcher working at the intersection of microbiology, immunology, and endocrinology. With the rising challenge of antibiotic resistance and the increasing burden of conditions like diabetes, I believe my research offers a timely case study in why investment in translational, interdisciplinary science is crucial. I also hope to advocate for more platforms where young scientists can contribute to science policy conversations, ensuring that future research aligns with both societal needs and clinical realities

I read your recent publication (congrats!!) and I found it extremely interesting. For those who haven't read it yet, could you break down the key points or the parts you found most interesting?

Absolutely, thank you so much! An amazing team worked on this particular paper, so it was an honour to be a part of the work. The study focused on how estrogen influences macrophage behaviour, particularly their polarization into different functional states. We discovered that estrogen promotes the alternative (M2) activation of macrophages through estrogen receptor alpha (ERα) signaling pathways. This M2 polarization is associated with anti-inflammatory responses and tissue repair mechanisms. Key findings included; Estrogen enhances M2 marker expression: Macrophages treated with estrogen showed increased expression of M2 markers such as CD206 and IL-10. ERα is crucial for this effect: Using selective agonists and antagonists, we demonstrated that the activation of ERα is necessary for the estrogen-induced M2 polarization. Potential implications for disease modulation. These findings suggest that estrogen, through ERα, could modulate immune responses in diseases where macrophage polarization plays a role, such as chronic inflammation and metabolic disorders. This understanding that estrogen influences macrophage polarisation provides an insight into sex-based differences in immune responses and disease progression. This knowledge could inform the development of targeted therapies that modulate the development of targeted therapies that modulate activity in various diseases. (*Link for the article down below*).

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As a woman in STEM, have you faced any gender-related challenges, and how have you navigated them? What do you think needs to change to better support women in scientific research?

One of the more disheartening experiences has been receiving negative and dismissive comments on platforms like TikTok, where I share aspects of my research and lab life. While many people are genuinely curious and supportive, there's still a noticeable undercurrent of scepticism or belittlement; things like questioning my credibility, or just generally nasty comments with the aim of dampening my confidence or achievements. Navigating that has required a thick skin, but also a strong sense of purpose. I remind myself why I started to make science more accessible, especially to younger women and girls who might not see themselves represented in these spaces. I've found that building a supportive network, both online and in academia, has been essential.

You mentioned having a TikTok account where you share your research, do you think social media is changing the way scientists connect with the public?

Absolutely, I think social media is fundamentally reshaping how scientists engage with the public, and platforms like TikTok are a big part of that shift. Traditionally, scientific communication has been confined to journals, conferences, or academic press releases, spaces that aren't always accessible or engaging for the general public. Social media breaks down that barrier. By using TikTok, I've been able to present my research in microbiology and immunology in a way that's digestible, visual, and sometimes even entertaining. That approach can spark curiosity in people who might not otherwise engage with science at all. What's really exciting is that platforms like TikTok allow scientists to show the human side of research, the behind-the-scenes of experiments, the challenges, the wins, and the passion that drives us. That helps build trust and interest, especially among younger audiences. It also opens up important conversations about public health, science literacy, and even misinformation, all of which are incredibly relevant today. Of course, it's not without challenges. There's still scepticism from some parts of the academic community about using these platforms, and occasionally you have to deal with negative or dismissive comments. But overall, I think the benefits outweigh the drawbacks. Social media is giving scientists a powerful tool to connect, educate, and inspire and I'm excited to be part of that movement.

Where do you see yourself after your PhD, continuing in academia, teaching, industry, or something else?

To be honest, I'm keeping an open mind about where my career will take me after my PhD. I'm genuinely enjoying research at the moment, I love the process of asking questions, designing experiments, and contributing to a broader understanding of microbiology and immunology. At the same time, I'm also finishing a Master's in Teaching in Higher Education, which reflects how important education and mentoring are to me. I want to be fully prepared for opportunities in both academia and teaching, but I'm also very open to roles in industry, science communication, or policy, anywhere I can apply my skills in a meaningful way. For me, it's about staying flexible and choosing a path that allows me to keep learning, have an impact, and continue growing as both a scientist and a communicator. Whether that ends up being in a lab, a lecture theatre, a biotech company, or a public engagement role, I'm excited to see what doors open next.

Being in STEM can be tough, and imposter syndrome is something a lot of people struggle with. Have you ever experienced it yourself? If so, how did you deal with it and what advice would you give to someone going through the same thing?

Absolutely, imposter syndrome is something I've definitely experienced, and I think it's more common in STEM than people often admit, especially for women and early-career researchers. There have been times during my PhD when I've questioned whether I'm "good enough" to be here, especially when experiments fail or I'm surrounded by people who seem more confident or experienced. One thing that's helped me is reminding myself that nobody starts out knowing everything, expertise is built over time, not something you magically have on day one. I also try to reframe imposter syndrome as a sign that I care deeply about doing well, and that's not a weakness, that's actually a strength. Talking to others has been crucial. Once I started opening up about it, I realized how many of my peers and even mentors have felt the same way. That really helped normalize it. I also keep track of small wins whether it's getting a good result, receiving positive feedback, or helping someone else understand a tricky concept

because those moments remind me that I do belong in this space. My advice to anyone dealing with imposter syndrome is: you're not alone, and those thoughts don't define your actual ability. Focus on progress, not perfection. And remember, most of the people you admire have probably had the same doubts at some point, they just didn't let them stop them from moving forward.

If you want to know more about her, follow her TikTok: jessm.xx1

NOËLLE

neuroscientist – PhD student

Noëlle is a 26-year-old neuroscience PhD student at Lund University in Sweden, currently in her second year of a four-year program. Originally from the Netherlands, she holds two neuroscience degrees and has completed multiple neuroscience related internships, including a year-long project in Spain. Her current work explores fluid biomarkers for Alzheimer's disease. Outside the lab, Noëlle runs the Instagram page @neurosciencenoelle*, where she shares accessible content on aging neuroscience, the life of an international PhD student, and science communication. She's passionate about bridging the gap between academia and the public, helping people understand complex research and encouraging critical thinking in the age of information overload.*

What drew you to neuroscience in the first place? Was it something you've always wanted to study or was there a turning point

I first became fascinated by the brain when I was around 17. A few years earlier, a close family member had been in a severe car accident that caused substantial brain damage. Having seen first hand how their brain was able to bounce back from these major injuries, seeing them regain some abilities the doctors said were lost forever, sparked a deep curiosity in me. I wanted to understand what the brain was capable of. At the time, I hadn't even properly studied biology in high school, so my knowledge was very limited, but this real-life experience made me want to know more.

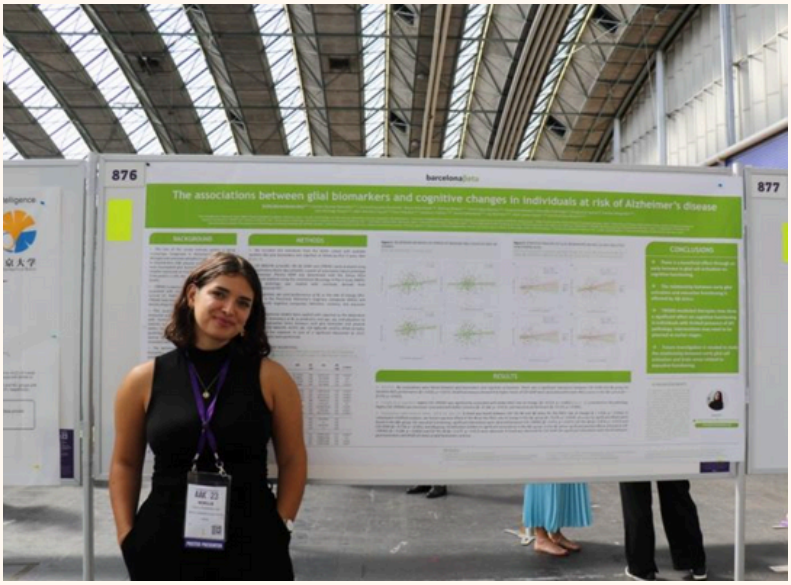
The place where she did her internship in Spain (2022-2023)

You mentioned doing many neuroscience related internships, how did your past experience with those, especially with the one in Spain, influence the way you approach your research now? Can you tell us more about your work there?

Yes, in total I've done three internships, all on a different area of neuroscience. My first internship during my bachelor's degree involved analyzing electroencephalography (EEG) data that had already been collected. My second internship, during my master's, was more preclinical, I worked on a project involving electron spin resonance (ESR) to study the effects of microplastics in the human gut, with the broader aim of understanding implications for the brain. After that, I spent 9 months in Barcelona where I worked with clinical data to explore how glial cell biomarkers in cerebrospinal fluid are associated with cognition in

individuals at risk of Alzheimer's disease. By then, I'd tried out a few different topics within neuroscience, with different methods and different kinds of data. It's during this internship that I realized how much I enjoyed working with human data and clinically relevant questions, which led me to pursue a PhD in a similar area. What I value most about having done these three very different internships is that they gave me a broad understanding of neuroscience, from imaging to translational research to clinical applications. Even though I now work with clinical data, I do have some understanding of wet lab methods and imaging too, which helps me appreciate and interpret a wide range of research across the field.

We are very fascinated by your PhD topic, what can you tell us about it and what has been the most surprising or exciting thing you've discovered during your research so far?



She presented her research at the Alzheimer's Association International Conference in 2023

Thanks! My research focuses on the use of blood-based biomarkers for Alzheimer's disease. Currently, Alzheimer's disease is quite hard to diagnose early because cognitive symptoms are similar across different types of dementias. We have other tools that can help, like analyzing proteins in one's cerebrospinal fluid or doing a PET scan to check for Alzheimer's pathology, but these methods are too expensive for widespread clinical use. That's where blood biomarkers come in, because blood tests are much easier to implement globally into routine clinical: they don't require so much expensive equipment and it's a procedure that is very commonly done. When I started my PhD about a year and a half ago, several promising blood biomarkers for Alzheimer's had been discovered already, but we didn't know yet how well they would work in real-world clinical settings. In our recent study, published in Nature Medicine, we showed that a simple blood test measuring a protein associated with Alzheimer's disease, p-tau217, could detect abnormal levels of Alzheimer's disease pathology across five different European clinics. This felt like a big moment, it really showed the potential of blood tests in the real world. Ultimately, this could help clinicians make more accurate and faster diagnoses, which means more clarity and future perspective for patients and their loved ones.

PhDs kind of have a reputation for being exhausting: no sleep, no social life and lots of stress. Is that what it's really like? What does a typical day look like for you and have you faced any of those challenges?

I know! That stereotype is one of the things that made me very hesitant to do a PhD. But honestly, it hasn't been like that for me. I'm a morning person so my typical workday starts around 7.45 and ends by 16.30. My tasks vary depending on the stage my projects are in. Right now, I'm collecting data for one project and writing a manuscript for another, so it's nice to change between tasks. I try to keep my evenings and weekend free for non-PhD activities like exercising or hanging with friends. I rarely work on weekends unless there's an important

deadline. That said, when I was preparing for my half-time defense seminar (in Sweden you have basically a mini-defense half-way through to see how you're progressing), I did put in quite some extra hours and was definitely stressed, which also affected my social life. But isn't that the case for any job when you have an important deadline? Overall, I'd say my PhD experience is challenging, but definitely manageable and enjoyable!

Life is hard for international student, but definitely incredible, what was it like studying in Sweden after completing two degrees in the Netherlands? Did you notice any changes in the academic life? What is the hardest part of living abroad?

Yes, being an international student can be tough, but it's also super, super fun! I've only had to take a few research courses here in Sweden, so my experience with the learning structure is limited. However, based on that I'd say the academic structure seemed quite similar to the one in the Netherlands. In Sweden, academia is more informal though, like addressing professors by their first name, etc., so there's a bit less of a hierarchy compared to the Netherlands. Otherwise, I don't think it's so different! Regarding living abroad, I've moved to 3 different countries by myself now, so when I moved to Sweden, I was quite confident about how to go about things. The hardest part for me is being away from family and friends. When I am back home, I'm on a tight schedule, and it's super hard to choose between who to see and who not to see. This is the most challenging part to me, missing important moments or not being able to just have a quick coffee or dinner with them.

What kind of feedback or conversations have you had with your audience that made you feel like you're making a difference?

Some of the most meaningful moments have come from unexpected messages, friends, former classmates, or even strangers reaching out to say they enjoy my content or find it helpful. One of my favorite recent moments was when someone from my previous degree told me they'd shown my content to a group of bachelor students, and some of them ended up following me because they were really inspired. That honestly made my day. It's exactly why I started sharing science, to make it accessible and to hopefully spark curiosity in others.

What's your biggest tip for someone who would like to start sharing science online?

Just start! I'd been dreaming about sharing science online for quite some time, but never found the courage to start because I was afraid of what other people would think, and because I was scared I'd never be able to take a break from neuroscience/work ever again. However, then I decided that if I never tried, I would never know, and that it's ultimately something I'm doing for me, my future career and my own sense of purpose. So yes, do it scared! Other people will have opinions, but if it excites you and aligns with your goals, that's the most important!

If you want to know more about her, follow her instagram: neurosciencenoelle

HOLLIE

Master student

At just 21, Hollie is already making meaningful strides in the field of biomedical science. Currently pursuing a Master of Research in Biomedical Science in the UK, she previously completed a BSc in the same subject and her sights are also set on a PhD, with a focus on microbiology or molecular biology. Her academic journey is marked by a strong passion for infectious disease research, especially antibiotic resistance. During a summer studentship, she became the first person to determine the macrolide resistance rate of Mycoplasma pneumoniae in Wales following a recent epidemic, a milestone that sparked a deeper interest in the organism. Now, her master's research continues to explore the genetic and antimicrobial resistance patterns of M. pneumoniae, a unique and often-overlooked bacterium with many atypical features. Driven by curiosity and a commitment to impactful research, she is part of the next generation of scientists pushing the boundaries of what we know about microbial pathogens and how we combat them.

Since you focused on Biomedical Science both in your Bachelor's and Master's, what sparked your interest for this field in the first place?

It's interesting because there aren't many scientists in my family, my sister has always been very artistic; my mum is much more into maths and my dad couldn't tell you what DNA is even though I've explained it to him in extreme detail more times than I could count. Somehow though I've always been the most interested, and best, at biology and chemistry. When I was little, I'd look at the cancer research adverts on the TV and say that that was what I was going to do, mostly because of how cool the multi-channel pipettes and different equipment looked. As I grew up, I loved the fact that every why I asked in science could be either be answered with a simple theory, or would be a puzzle that I could work to figure out. I was originally going to just apply for university to do biochemistry, but I did some work experience in a local hospital pathology lab, where I was advised to do Biomedical Science instead and then specialise post-degree. I will forever be grateful for that advice, as I did the worst in my biochemistry modules during my undergraduate modules, and without that advice I wouldn't be down the path I am now! It's given me the ability to explore multiple fields and figure out I like Microbiology best, which is why I'm specialising in that a bit more in my Master's.

What was it like transitioning from your BSc to your current research-focused Master's?

I was very lucky because I didn't spend that much time out of the lab in the summer between my undergraduate and postgraduate degrees as I had a summer lab studentship, so in terms of lab skills and comfortability in running certain experiments it was quite a seamless transition. For everything else, it's been a definite learning curve! Overall I prefer my MRes to my BSc, it's tailored to my interests and everything I'm doing for it feels intentional and like something I'll actually use in my career. I'm only a few months in and I've already been given so many opportunities to develop myself as a researcher, speaking at conferences, holding journal club meetings, designing my own protocols and more. I also have no exams because I chose the MRes over the MSc, all of my assessments are hand ins/coursework which is a definite plus over my BSc, where every module had some form of exam attached to it. I do find that by doing a course that is learning by research/doing over learning by taught content/lectures, I have to be incredibly vigilant about staying on track and doing enough work day to day. With only having one or two lectures a week, most of my week is "free time" I

need to fill with lab work, researching my projects or writing up my results. Having the willpower to get myself into uni when there's nothing bar myself to motivate me to get there has sometimes been tough, but again, it's a skill I'm improving on. Overall, I'm basically riding without training wheels. My BSc has set me up well with the base knowledge to do good research, with lots of support and help and people there to make sure I don't fail too often, and my MRes is me testing out what I learned and learning that to really get better, you have to fail a lot!

How did you first become interested in Mycoplasma pneumoniae? And for those who aren't familiar, what makes Mycoplasma pneumoniae such an atypical bacteria?

My supervisor for my BSc research project, and now my Master's is one of the leading researchers in the study of *Mycoplasma spp.* I didn't have much control over what my undergrad project was, so it was on enriching *Mycoplasma genitalium* in urine samples for detection, classy, I know. I originally had no clue what *M.genitalium* or the family of Mycoplasma were, but the more I researched the more interested I was! My supervisor was also super supportive of me throughout the whole project, and so I knew I wanted to do my MRes with him as my PI. He had some plans for projects on *M.pneumoniae* which related to my summer studentship project, and I liked the sound of them so I dived in head first. *Mycoplasma pneumoniae* is an interesting organism for so many reasons! First of all, it's a significant cause of community acquired pneumonia, often referred to as 'walking pneumonia' as the symptoms it most often produces can be mild or even asymptomatic. In severe cases it can cause serious illness like encephalitis, but most people will be fine after being treated with antibiotics. Bacteria are characterized by multiple different traits, like having a distinct cell wall, their size etc. The bacterial family of Mycoplasmas are some of the smallest free-living organisms, on average 0.2-0.5µm (an *E.coli* cell being about 1-2 µm for reference). They also lack the presence of a cell wall, which makes them intrinsically resistant to Beta-lactam antibiotics, and many Mycoplasma species require sterols (like cholesterol) in their cell membranes, which is highly unusual for bacteria. When trying to diagnose Mycoplasma infections, they're often initially missed. The way that samples have to be processed to deplete human cells/reduce debris in the sample also kills and clears the Mycoplasma, creating false negatives. Specific PCRs must instead be performed. *M.pneumoniae* in particular also has a structural attachment organelles called a tip, which it uses to attach to lung cells and induce inflammation. The tip structure is made up of multiple proteins, particularly the P1 gene which is one of the few variable regions of the small *M.pneumoniae* genome that we know of. Different P1 variants have been found to confer different virulence to hosts, be more/less transmissible and also be more/less likely to develop resistance to macrolides. It's fascinating how a few base changes in the genetic code can change so much about how an organism works!

Your studentship in Wales seems fascinating, can you tell us more about it and what it felt like to be the first person to conduct that analysis?

Of course! The studentship was funded by Applied Microbiology International as part of their summer studentship grant aimed at undergraduates or recently graduating students. I've mentioned in my previous answers about the intrinsic resistance that M.pneumoniae has against most antibiotics, giving us very few options for treatment. Macrolides have been the first choice for treatment for a long time, as it produces the fewest side effects in children, however we've seen a sharp rise in M.pneumoniae becoming resistant against macrolides. In

some parts of Asia, the resistance rate is up to between 90 and 100% of cases being resistant. In the UK, we're a lot more fortunate where we have a resistance rate of about 5.7%. Resistance data is pooled from samples across all the regions, meaning that we had no idea if there was a difference between the rates in England to the rates in Wales. It was possible that there was no presence of macrolide resistance in Wales entirely. My work was to answer that question, and I did! I was a bit unlucky as multiple samples I was working with were too degraded to get any solid results from, but I did find macrolide resistant M.pneumoniae in Wales. From my work we've found that the rate during a recent epidemic was likely lower than that of the UK average, but we need to continue this testing to know for sure. It's very cool to be able to say I was technically the first to do this research, but for me its more cool that the work that I've done can be used to push for improvements in routine macrolide resistance testing in M.pneumoniae samples. Hopefully, if we can improve macrolide resistance surveillance, we can help to reduce the rate with better prescribing policies.

You mentioned looking into antibiotic resistance in your Master's, it is definitely a growing global concern, what have you learned from your work that the general public might not know?

I don't think a lot of people know that bacteria can hold intrinsic resistance to multiple antibiotics, which means that for some species, there's only a select few antibiotics that will work as a treatment. Bacteria are all incredibly diverse, and different families of antibiotics (e.g. Beta lactams, Fluoroquinolones) target different processes/structures within the cells. If a bacteria doesn't naturally have that target, it's intrinsically resistant, for example Beta lactams target bacterial cell walls, so any bacteria without cell walls like Mycoplasmas will never be affected by Beta lactams. If a species holds a lot of intrinsic resistance to multiple families of antibiotics, resistance to those families that are effective can be incredibly concerning as it further narrows down a smaller pool of treatment options for a patient. We're researching new antibiotic compounds every day, but development is incredibly slow and it's likely we won't create new compounds fast enough. Ethical antibiotic stewardship and surveillance of resistance are our main lines of defence at the moment!

After your PhD, do you plan to stay in academia or are you also interested in roles in public health, industry or clinical diagnostics?

I definitely want to stay as research heavy as I can! I've done some work experience in clinical labs, and I found the monotony and automation of the lab kind of boring. Clinical work is vital to keeping hospitals running and patients healthy, but it's just not the kind of thing I could see myself doing long term. I think my ultimate goal would be to become a lecturer and mentor other researchers, perhaps start my own little research group. If I get to that through university researcher positions, or by spending time in industry R&D I don't mind, as long as I get to be in a lab, learning and running experiments.

What advice would you give to other students who want to get involved in research? Do you think enough is being done to support women in microbiology and molecular biology research?

Advice I would give is to get very comfortable with failure. Most of research is failed experiments, which can get really disheartening, as it's often not a quick fix that will get you results. However, failing means a learning opportunity, and I've had the most growth as a researcher as a result of failed experiments which have lead me down a more interesting path.

So even though it's tough, keep pushing through and you'll get to a better spot! Also don't let your degree consume your life. I knew people who would consistently revise or work for 12-13 hours every day, and wouldn't take any time off to see friends, relax or just have fun. It wasn't healthy, and it gets to a point where your brain can't take any more info in. Be strategic about how you study, with active recall/blurting exercises, and make sure you fully understand the basics before trying to remember the more complex things.

For the second part of the question, in my experience, the majority of people on my course and in the teaching teams have been women, and I've never felt like I've been barred from anything because I'm a woman. My answer might be different if I'd gone to a different uni, but even at conferences where I've met researchers from all over the globe, everyone has been supportive and gender hasn't made much of a difference. I have had some really interesting conversations with female lecturers about how they've had to transition out of the lab due to having kids as the often unpredictable schedule you must keep as you're running experiments is not compatible with family life. It's definitely something I'm going to have to keep in mind in the future, but that's a long way off for me, so hopefully by then I'll have a plan in place or more support will be there to keep me researching for as long as I can!

If you want to know more about her, follow her instagram: rosalindfranklinfanpage

TAREN

astrobiologists - Master's student

Taren is a Master's student at the Earth Life Science Institute in Tokyo, where she is studying the origins of cellular life by doing simulations and lab work. Before she moved to Tokyo, she went to school at McMaster in Canada where she studied in a program called "Integrated Science" where she learned everything from historical led makeup to wine science. Right now, she is focused on astrobiology broadly, and she will be continuing with her PhD.

What drove you into choosing astrobiology?

My undergraduate program was called *Integrated Science*, in which we did all the sciences. The problem was that I really enjoyed doing multiple sciences, and most university programs cater you a little bit more specifically. I wanted to do biophysics and physics, which is what I concentrated on, but then I learned about astrobiology as a broader field. It's so integrated with all disciplines, and you need to use all sciences, it just seemed like a really perfect fit. Also, I feel it's a pretty catchy science, when you mention that you study things related to aliens and searching for life, that's pretty exciting. I was just very intrigued by the idea of something that could really integrate.

Could you describe what your past and current research involves?

At the moment, there are a couple of articles in preparation at my old lab, which focused on historical white lead cosmetics and interactions with skin. However, my first paper that was published was in December, and that was about my undergraduate thesis work, in which computer simulations called molecular dynamics simulations were used to look at fatty acid membranes. Modern cell membranes are very complicated, so what we did was simulate a simpler lipid, a simpler amphiphile, which is fatty acids. Specifically, my work in that project was looking at how salt and environmental salinity could stabilize membranes when we only use deprotonated fatty acids, looking at very specific environmental conditions that may have occurred on early Earth. What we found was that when you only use a certain type of fatty acid, high salinity actually stabilizes the membranes, which isn't necessarily what we expected to see, because a lot of the literature says that salt will disrupt membranes, which is still very true for especially for strongly charged salts, divalent cations. Nevertheless, in the context of what we were looking at in a specific environment, salt was stabilizing.

Furthermore, I'm currently finishing my master's thesis, which is actually due in one month. For that project, I'm also doing simulations, but this time I'm focusing on how amino acids could interact with very similar membrane structures.

What have been the major challenges you have encountered in your professional journey and how have you navigated through them?

I think definitely the biggest change was moving from Canada to Japan for grad school. Very, very different environment, very different culture, other side of the world from home. I didn't necessarily expect just how much would be different about the working environment, and what was the easiest way to navigate was just giving it time. Diving into a new language, new everything takes a lot of time, and you have to be gentle with yourself and let yourself get settled in with everything.

Apart from that, in undergrad, I did transition from focusing on lead makeup for four years. I loved that project, I just didn't want to do it forever. In that project, I was in the lab every day, doing *hands-on wet lab* work. Now, I do also do wet lab, but I do a lot more simulation work. It's just a different working environment and you have to do a lot of background research when you pivot from project to project. That's one of the downsides of very interdisciplinary research: you have to be prepared to spend a lot of time doing literature review and a lot of time pointing yourself in many different fields so that you're ready to go.

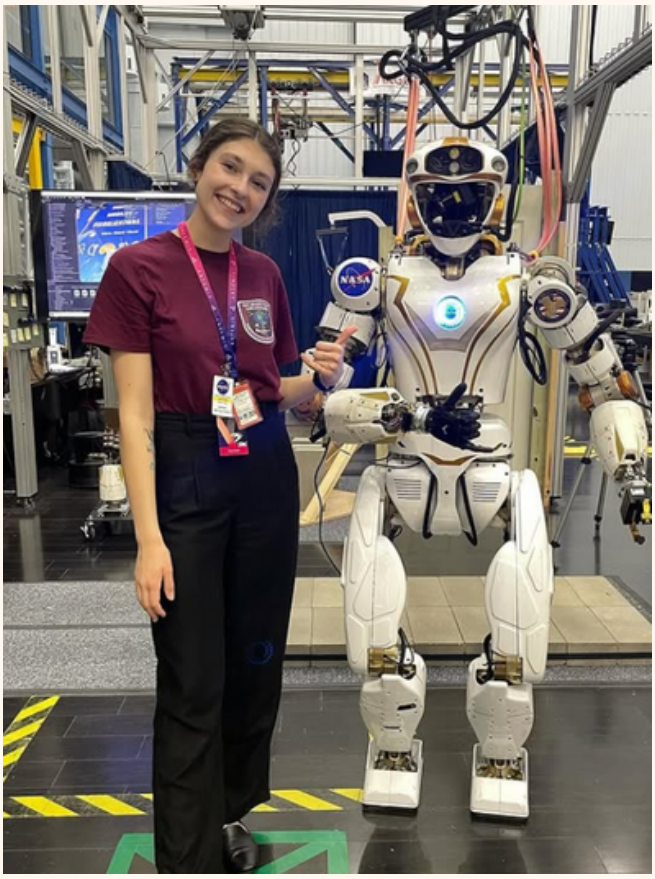
In your view, what are the essential qualities that have contributed to your success?

You need to be passionate about what you're studying and enjoy it, because you're going to be spending a lot of time with your research. So if you don't enjoy it, that's not going to be a good experience for you.

On the other hand, something I think is very important that you don't always realize when you're in your undergrad necessarily, is that passion is not enough for what you're doing. It's not enough to really love what you do. You need to also work really hard. However, there is also an element of knowing what your strengths are and using those to your advantage. I had an undergraduate professor in physics who said he had a lot of students that would come up and say “I love physics, but I'm just terrible at it. I can't do it.” And he was like, you know, it's wonderful that you love it. But if you want to pursue it, it's also a good idea to have it be at least aligned with your skill set.

Especially when you get to a higher level, if it's something that really doesn't click with your style of thinking, it might not be the most natural flow. It’s about kind of having an intersection of passion and skill and dedication. You have to sometimes force yourself to really bear down and keep working on it, which is sometimes frustrating.

But it's rewarding in the end. It's kind of a combination of those characteristics that I think make it the most useful. And of course, being naturally curious.



How do you communicate your work and make it digestible to the public? Do you think it's important to break down scientific concepts to the general public?

Absolutely. In terms of the importance, I had a professor in undergrad, who always said, science is not science until it's communicated, and that really kind of sticks with everything that I do. If you're just doing science alone but you're not communicating that work, it doesn't matter if you make a groundbreaking discovery. If you're not able to share that and disseminate that information, it ultimately won't be contributing to our greater knowledge. And I do think that being able to communicate your work across all sorts of different ranges is not just like a luxury or the thing that some people should do in science. I think it's essential. Right now, there's a lot of mistrust in science communication broadly. And when you are a scientist, and you have the ability to change that narrative by communicating what you do, I think that's really, really valuable. So what I always kind of try to do is communicate my results without completely removing myself from the situation and becoming very robotic, which I think can be a bit of a default with science. I always try to speak with as much passion for what I'm doing as I can. And in terms of different audiences, I also think it's good to be able to explain what you're doing to somebody who has no knowledge of the field. So I always keep that in mind when I prepare a presentation, especially interdisciplinary, like how would I explain this to a kid? How would I get someone excited about this if they don't understand anything? I'm not going to jump in and be like, well, the chemical structure of a phospholipid makes it very challenging to synthesize under Miller-Urey synthesis. I'm going to start wirh aliens. You have to know where you're playing to your audience when you're communicating. So social media is really useful for that because you can reach such a big community. You can reach so many people. You can just have fun with it and show that it doesn't need to be serious all the time. And I think that that's very valuable.

What's the next big breakthrough you hope to see in astrobiology in the next 20 years?
It really depending on how the funding situations evolve, because right now with everything that's happening down in the U.S., there's a lot of uncertainty with funding for future missions. Prior to the last five months I would have said a lot of the deep space missions are going to try to detect biosignatures or conditions that could be ideal for life on exoplanets. Now I do still think that exoplanet biosignature detection is very, very promising. However, I think we're going to see a lot more about where you can detect gases and atmospheres that could be conducive to life. I also think a lot of people, at least at the Institute thatI'm at, are focusing on the protein evolution. So I think we're going to understand a lot more about how life steps can be contributed to that.

What advice would you give to young scientists who are interested in biology? What would you say to them?
Pursue your interests, follow what you like. I think especially when you're early in your scientific career or journey, that is the time to explore different fields and explore all sorts of different routes that you can take, because you really haven't walked anything down yet. If you find a professor, for example, whose research is really interesting, see if you can meet with them. See if you can ask them more questions, and maybe that can lead to a position in a lab. That'll really show you if you enjoy doing research as a possible career, or if it's maybe more of a theoretical aspect you're looking at.

Also, connect with people that can help you with mentoring. There are usually support systems in place in many communities, and if they're not in your community, there are often online groups dedicated to helping young scientists connect with different opportunities. So I would say just stay really curious, do your best to get involved, and try to explore as many different disciplines as you can, so that you can figure out what you love the most.

Finally, is there anything you would like to say to our audience?
I know that the United States does not reflect the whole world. I'm from Canada, but I also know that often the policies that we see there have a lot of repercussions across many different countries and cultures. Right now, we're seeing that there's a lot of new momentum towards reducing diversity in science, cutting funding to science, minimizing the voices that we see in science, and not celebrating the diversity of thought that we experience.

I would just say that if you are interested in science and you are feeling concerned that maybe this is not the environment for you, there are so many people in your corner. There are so many people who will help you, and cheer you on, and support you, and I know that the systems are really hard to go up against, but science needs diversity. Science needs people from all backgrounds who can share their lived experiences, and without that, it can't continue. That's what makes it so wonderful. If you are feeling disheartened by looking at the changes in policies, just know that there are many people fighting for you, and the way forward is by continuing to push for increased diversity and more voices to be heard. Lots of people want you to succeed, and there is a place for you in science.

If you want to know more about her, follow her TikTok: tarenstudies

section three: art

The Astronomer, *Johannes Vermeer, 1668*

tara smith

Tara is a professional engineer (P.Eng) with over 16 years in the oil and gas industry... and an artist. STEM is where she has built her career, but art is how she processes, reflects and connects. Whether through watercolor portraits or graphic designs for her brand Simply Sorted (a Females-in-STEM amplification brand), her work explores the intersection of science, identity and the emotional complexity of being a woman in STEM.

Not-So-Disney Series (Inspirational Digital Illustration / Wearable Art)

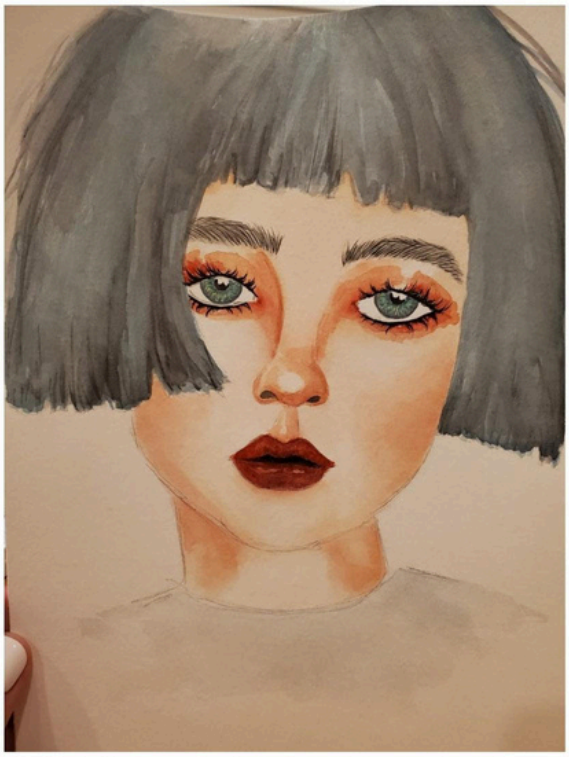
A reimagined cast of iconic princesses, now as modern-day STEM professionals. This series was created to give girls new kinds of role models: brilliant, bold, and rooted in real-world careers. Each character is designed with intention, from their wardrobe to their tools, to reflect the field they've stepped into, which includes nods to their classic characteristics.

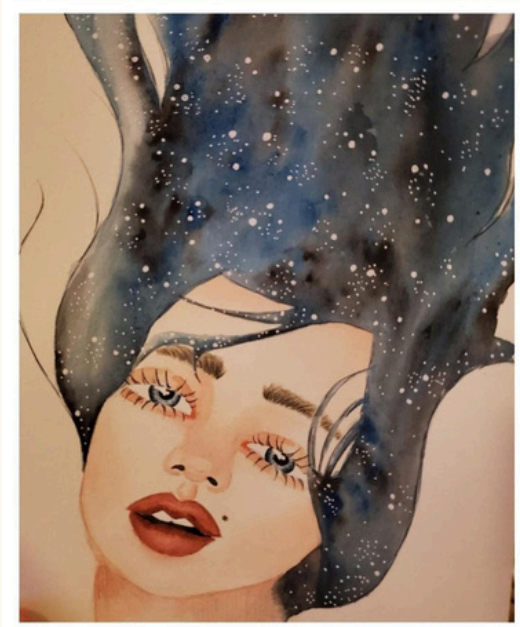
- **Dr. White** (Snow White) – Veterinary Epidemiologist = leading field research in zoonotic disease, trading poisoned apples for peer-reviewed papers
- **Belle Marais** (Belle) – Botanist & PhD Candidate in Restoration Ecology = still the girl with her nose in a book, now it's filled with species surveys and soil data
- **R.P. Zellman** (Rapunzel) – Full Stack Developer & Tech Startup Founder = no longer locked in a tower, she built her own. Founder of R.P.ZL Tech Tower
- **Ella Cinders**, P.Eng (Cinderella) – Lead Designer in Wearable Tech = designing smart fabrics that blend her mechanical engineering background with tech-elegance. No more glass slippers, just smart soles
- **Jaz Ameen** (Jasmine) – Astrophysicist & Astronaut = reaching for the stars, literally. A cosmic trailblazer exploring whole new worlds
- **Ari Ellis** (Ariel) – Ecohydrologist – Wetlands Specialist = you would find her on the gulf coast, where land meets the sea; protecting endangered ecosystems with data and boots in the marsh

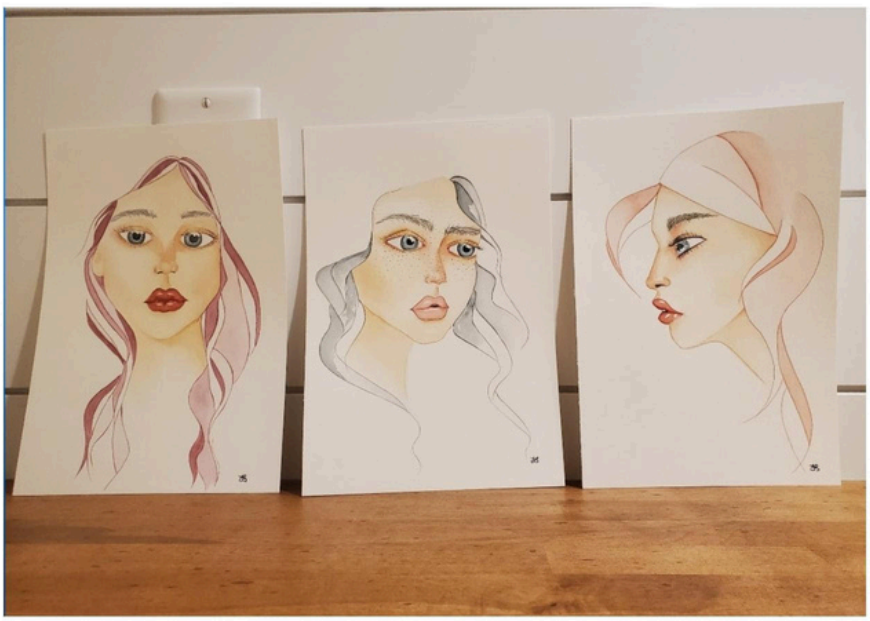
Simply Sorted STEMinist Collection (Empowering Minimalist Art)

"This sticker sheet is part of my creative venture, Simply Sorted, a brand I founded to amplify female voices in STEM through design, fashion, and storytelling. Each illustration is a minimalist celebration of science, strength, and identity. From florals growing out of test tubes to silhouettes filled with formulas, this piece was created to turn everyday items like laptops and lab notebooks into empowering reminders that smart is stylish, and STEM is for all of us".

Original Watercolors (Fine Art)







"*These portraits were created during moments of reflection, visual metaphors for emotional resilience, curiosity, and the burden of scientific leadership*".

- **Pensive Brilliance** = a quiet, powerful gaze that captures the calm intensity of problem-solving minds. She doesn't need to speak to be heard, her focus says it all
- **The Masks We Wear** = created during the pandemic, where the gold mask represents the burden and brilliance of scientific recommendations in uncertain (dark) times
- **Cosmic Mind** = a portrait of expansive thought and untamed imagination. Her hair, transformed into a swirling night sky, represents the galaxy of ideas, questions, and dreams that exist in a curious mind. It's a visual tribute to women who carry entire universes in their heads, quietly exploring, questioning, and connecting the dots others can't yet see
- **The Beauty in the Undone** = three watercolors exploring the strength in unfinished edges and undefined shapes. A reminder that we don't always need to see the full picture to be beautiful, or know the full picture to be worthy

If you want to know more about her project, follow her instagram: simplysortedca

And we also interviewed her at page 35

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