WINTER ISSUE | DECEMBER 2025

Girls in Stem

"I always loved school, especially science (...)
and all that hard work was for something"

– Ghazal Azhdari, page 07

Girls in a science laboratory at Eastern High School, Washington DC, 1899
Frances Benjamin Johnston

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ABOUT US

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.

"I think it's very important to present STEM in a way that is engaging and interesting, I want to be the person I needed when I was in highschool, someone who tells you that science is not only «learn this formulas by heart»"

LETTER FROM THE EDITOR

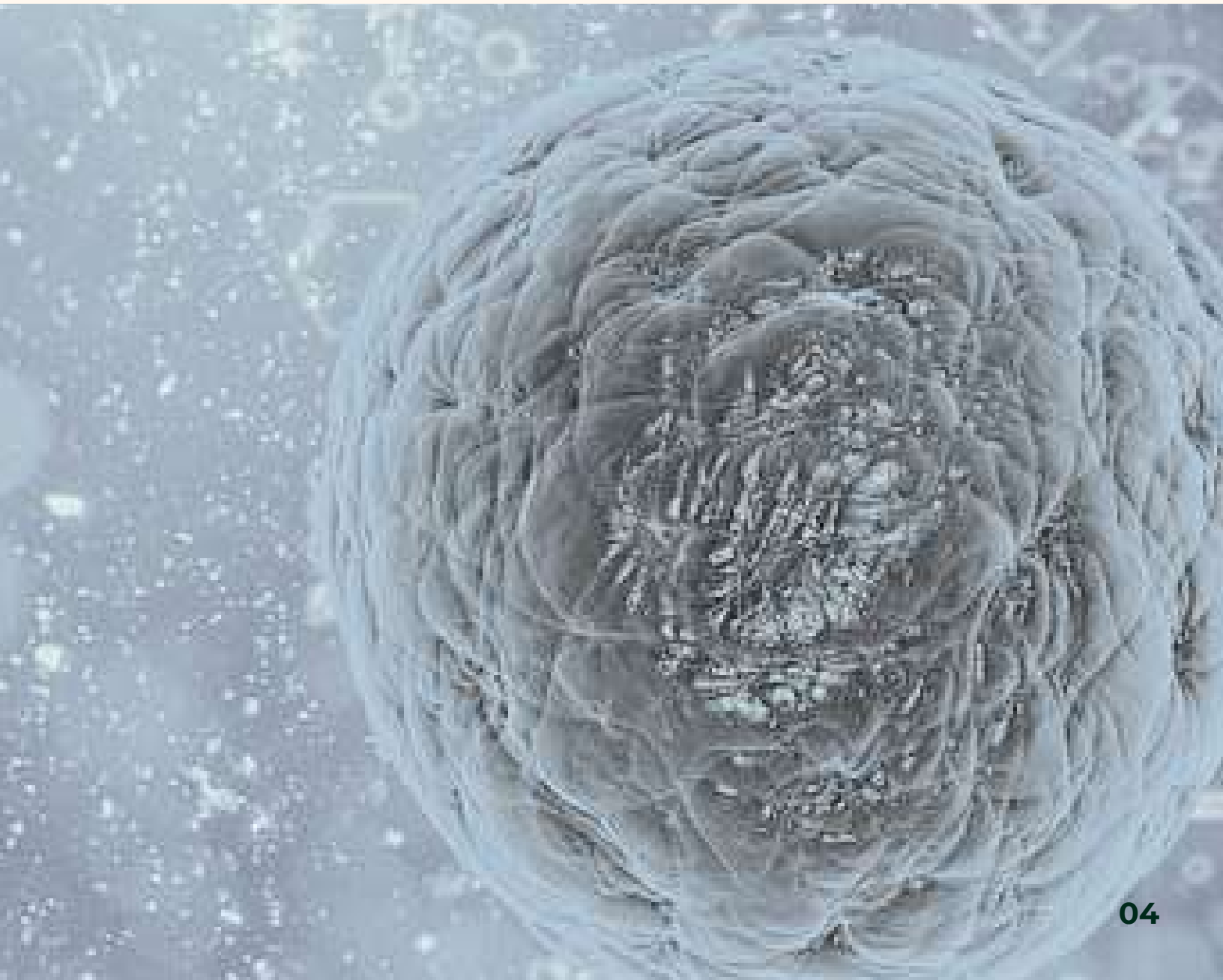
As this issue is released during a season of festivities and New Year's celebrations, we are reminded that winter can hold different meanings for each of us. It may bring joy and connections to some, but it might be hard for others who face anxiety, pressure and loneliness. With this new winter release we hope to offer, not only curious insights and interesting reflections, but also a sense of unity and comfort to those in need, just a quiet space to read, that could help you to free your mind.

As always, I want to thank each one of you, those who contribute in each issue, those who do it occasionally and those who just read every issue (or some of them). This issue wouldn't be possible without all the "behind the scenes" workers, who constantly make sure to listen to every voice and to give them the spotlight they deserve.

As you read this issue, we invite you to reflect on the role science communication plays in shaping the year ahead and we hope that these pages, not only inform you, but also, maybe, encourage you to contribute your own voice to a future issue!

Arianna

SECTION ONE: ARTICLES



NEUROFIBROMATOSIS LIPOIDICA

Neurofibromatosis lipoidica, also known as lipoid necrobiosis, is a rare skin disorder that primarily affects individuals with diabetes mellitus. This condition is characterized by the formation of yellowish-brown plaques on the skin, typically located on the lower legs.

Etiology and Pathophysiology

Neurofibromatosis lipoidica is believed to be associated with metabolic changes related to diabetes. The exact cause of this condition remains unclear, but it is thought to involve a combination of factors:

- Diabetes Mellitus: The majority of cases occur in individuals with diabetes, particularly type 1 diabetes. The skin changes may be linked to microvascular complications associated with prolonged hyperglycemia.
- Genetic Factors: While not inherited in a classic Mendelian fashion, genetic predispositions may play a role in the development of this condition among diabetic patients.
- Inflammatory Response: The plaques are thought to result from an inflammatory response in the skin, leading to lipid accumulation and necrobiosis (tissue death).

The interplay between these factors contributes to the occurrence of neurofibromatosis lipoidica.

Clinical Features and Symptoms

Neurofibromatosis lipoidica typically presents with distinctive clinical features:

- Plaque Formation: The primary manifestation is the development of well-defined yellowish-brown plaques that can appear shiny and waxy. These plaques are often painless but can become itchy or tender.
- Location: Lesions are most commonly found on the lower legs but can also occur on other areas of the body.
- Associated Symptoms: In some cases, individuals may experience discomfort or pain in the affected areas. The plaques can also be prone to ulceration, leading to secondary infections.

The appearance of these plaques can vary amongst individuals.

Diagnosis

Diagnosis of neurofibromatosis lipoidica is primarily clinical, based on the characteristic appearance of the skin lesions. Healthcare providers typically follow these steps:

- Clinical Examination: A physical examination is conducted to assess the appearance and distribution of plaques.
- Medical History: A detailed medical history is taken to evaluate any underlying conditions, particularly diabetes mellitus.
- Histological Examination: In uncertain cases, a skin biopsy may be performed. Histological findings typically reveal necrobiosis and lipid deposits within the dermis.

Early diagnosis is essential to manage symptoms effectively and prevent complications associated with ulceration or secondary infections.

Treatment Options

Currently, there is no definitive cure for

neurofibromatosis lipoidica; however, various treatment strategies can help manage symptoms and improve quality of life:

- Blood Sugar Control: Maintaining optimal blood glucose levels through diet, exercise, and medication can help prevent further progression of skin lesions.
- Topical Treatments: Corticosteroid creams or ointments may be prescribed to reduce inflammation and alleviate itching.
- Surgical Interventions: In cases where plaques become ulcerated or painful, surgical options such as excision or laser therapy may be considered.
- Supportive Care: Regular monitoring for potential complications such as infections or ulceration is nessacary. Patients are encouraged to maintain proper skin hygiene and care.

While treatment can alleviate symptoms, it may not completely resolve the skin lesions. Ongoing research into more effective therapies continues to be needed.

Psychosocial Impact

The psychosocial implications of neurofibromatosis lipoidica can be significant for affected individuals. The visible nature of skin lesions may lead to:

- Emotional Distress: Individuals may experience feelings of self-consciousness or embarrassment due to their appearance. This can lead to anxiety or depression in some cases.
- Social Isolation: Concerns about appearance may result in social withdrawal or avoidance of activities that involve exposure of the legs.
- Impact on Quality of Life: Chronic skin conditions can affect daily activities and overall quality of life. Individuals may struggle with mobility if lesions become painful or ulcerated.

Support from healthcare professionals, family members, and peer groups can play an important role in helping individuals cope with these challenges. Counseling services may also be beneficial in addressing emotional distress associated with this condition.

Conclusion

Neurofibromatosis lipoidica is a rare but impactful skin disorder primarily associated with diabetes mellitus. While current management strategies focus on symptom relief and prevention of complications, ongoing research into better therapeutic options holds promise for improving outcomes for patients with this condition.

As awareness grows about neurofibromatosis lipoidica among healthcare providers and patients alike, there is hope for enhanced support systems and improved quality of life for those affected by this disorder.

Grace A. Singh Smith – Santa Monica College Public Information Office

MORE THAN SOMETHING: FROM IRAN TO SANTA MONICA COLLEGE TO STANFORD

About a month after Ghazal Azhdari immigrated from Iran with her family, she went to enroll at Santa Monica College (SMC). It was the beginning of fall semester 2022. Azhdari approached the first person she saw wearing an employee badge. "*Hi*," she said, in halting English. *"I just arrived here, and I know nothing. I want to continue my education, but financially I'm struggling.*" To Azhdari's amazement, "*He walked me to the financial aid office*," she recalls, "*and stayed to help me through the whole admissions process.*"

Ghazal with her family in Iran, Santa Monica College

"*I always loved school, especially science,*" says the 23-year-old. Back in Tehran, Azhdari had graduated from an accelerated chemistry program in a competitive public-private magnet. The child of college-educated professionals, she grew up "all over Iran"—in Tehran, Isfahan and Asaluyeh. Her parents lived a comfortable life, but they wanted more for their two daughters. So, when the chance to emigrate came up, they took it. *"The first few months in America were very difficult,"* Azhdari recalls. Fortunately, the Azhdaris could lean on extended family. They were welcomed in the Westwood home of a cousin, and another relative pointed Azhdari to Santa Monica College.

Back in Iran, Azhdari had devoured English-language books and binge-watched American television and movies. Her passive language skills were excellent, *"but I was terrible at writing and speaking*," she says.

She enrolled in English 1 with Dr. Brian Rajski and struggled to keep up. "*I literally was at Dr. Rajski's office hours every week,*" she recalls. "*He didn't tell me to 'Go take ESL.' He sat with me patiently. And I got an A in his class.*" In fact, Azhdari got As in all her classes, and left SMC with a perfect 4.0 GPA.

Thanks to senior career services advisor Joan Kang, Azhdari got a technical internship with Kite Pharma. "*That experience was life changing,*" she says, of the 2024 summer program, assisting the Environmental, Health, Safety, and Sustainability (EHSS) team on compliance issues. Her boss at Kite, Sara Hamel, became Azhdari's mentor. The two still have lunch regularly, and Hamel came to Azhdari's graduation.

For such a hard-working high achiever, Azhdari remained conspicuously humble.

Ghazal in the lab, Santa Monica College

The height of her ambition was to transfer to a UC. When her guidance counselor mentioned elite private universities, Azhdari thought she wouldn't get accepted. "But my counselor kept pushing, and finally I applied," she says. Azhdari got into Stanford and started school there in September. Azhdari's top interests are organic chemistry and biotechnology. Down the road, she's eyeing a healthcare career—perhaps an MD/PhD program.

Her parents are proud of her. As she describes what they sacrificed to come to America, Azhdari gets emotional.

"*They left behind relatives and friends, the house they built piece by piece. Their careers They had to start again from scratch,*" she says. Seeing their daughter succeed, Azhdari says, gives her parents the satisfaction of knowing that "*all that hard work was for something.*"

Ghazal graduating from Santa Monica College with her family, Santa Monica College

Molly Abbott

A FINITE DIVE INTO INFINITY

Weird things happen at infinities. Motion seems impossible, space seems simultaneously empty and full, and complex shapes emerge from simple processes. Infinity has fascinated mathematicians and philosophers since the ancient Greeks and continues to puzzle us today. Here's a brief tour of infinity through a series of increasingly rich and complex ideas!

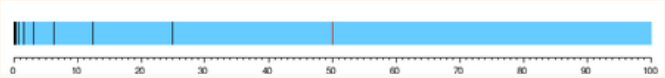
Zeno's Dichotomy Paradox

Zeno of Elea (c.490-c.430 BC) was a Greek philosopher known for his rejection of the existence of space, time, and motion through a series of paradoxes. One of these, the Dichotomy Paradox, starts with a simple premise but ends up challenging our most basic assumptions.

Suppose you want to walk 100 metres, how would you go about doing it? You could start by walking halfway there, and to do that you'd have to walk halfway to that point, so a quarter of the total distance. To walk a quarter of the distance you'd first have to walk an eighth, and so on. The list of distances you have to travel can be listed in the following way:

$$\left\{\ldots, \frac{1}{32}, \frac{1}{16}, \frac{1}{8}, \frac{1}{4}, \frac{1}{2}, 1\right\}$$

The paradox emerges because this is an infinite list, so you'd have to complete an infinite number of tasks, which Zeno claimed was impossible in a finite amount of time. Furthermore, there is no first distance to walk, as you could always half that distance again. Zeno used this to argue that motion was an illusion, in which case there'd be no way to walk 100m!

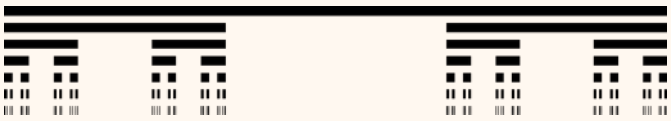


One assumption that Zeno makes is that space is continuous and can always be further divided. If this assumption is false then the paradox is resolved as the list of steps becomes finite, but this means space must be made up of finite and discrete units, which in turn has its own problematic implications: How small are these units? How are they tiled together?

This paradox has real-life resolutions: either using calculus, or even more obviously, just etting up and walking between two points. However, these responses don't show what's wrong with the paradox itself, and to this day a definite and satisfactory resolution has not been found.

The Cantor Set

Take a line of length 1 and remove the middle third of it, leaving you with two lines of length 1/3, then remove the middle thirds of these lines to get four lines of length 1/9. Repeating this process infinitely many times produces the Cantor set, C, after the mathematician Georg Cantor. In each step, the endpoints of each segment are left behind, and so the set will contain infinitely many of these points. But what about the total length of the set?



The Cantor Set (Wikipedia, 2025)

The total length of line removed can be written as the following:

$$2\times\frac{1}{3^2}+2^2\times\frac{1}{3^3}+\ldots=\sum_{n=0}^{\infty}2^n\times\frac{1}{3^{n+1}}=\frac{1}{3}\sum_{n=0}^{\infty}\left(\frac{2}{3}\right)^n=\frac{1}{3}\times\frac{1}{1-\frac{2}{3}}$$

For those unfamiliar with series notation, the large Σ symbol indicates adding together all the terms in the sequence produced with values of n from 0 to infinity. This produces a geometric sequence where each term is the previous one multiplied by 2/3, for which there is a formula that can be applied. In the end, the length of line removed is 1, so the total length of the Cantor set is 1-1=0. In other words, the Cantor set contains an infinite number of points but has no length! This counterintuitive result comes from the step from the finite to the infinite, as if you stopped the process of removing thirds from the line at any point, you'd have a finite list of points and there would be length remaining. This highlights the difference between thinking about infinity as a very large number, and its true meaning as the entirety of the number line or a limit.

Hilbert's Hotel

In 1924, mathematician David Hilbert demonstrated that not only are there different types of infinity, but also that some infinities are bigger than others. Imagine a hotel with infinite rooms and doors numbered 1, 2, 3, … with no limit. It's a busy day and the hotel is full of an infinite number of guests. If a new guest arrives, what room do you send them to? You can't send them to room (∞+1), since there won't be a door with that on it, remembering that infinity is not a number, but rather all the numbers. Hilbert proposed that to accommodate this guest, each current guest should move from their initial room n to room (n+1). This gives each guest a room number that exists for them to find, and leaves room 1 free for the new guest.

Similarly, if a coach with infinitely many passengers arrived, you might start to panic, but the solution is remarkably simple. Move each guest from room n to room 2n so that all the even rooms are filled and the infinite new guests can move into the infinitely many odd-numbered rooms.

The Grand Hilbert Hotel (Institute for Advanced Study, 2016)

What if an infinite number of coaches, each with infinitely many passengers arrives? At this point you might be tempted to stop taking guests for the night, but it is actually still possible to accommodate them all! One method is for each guest in room n to move to room 2^n and then assign each passenger on the first coach an integer c and get them to go to room 3^c. For the next coach repeat the process but using increasing prime numbers, so 5^c, 7^c, 11^c etc. There are infinitely many prime numbers, so each guest will end up with their own room, although not every room in the hotel will be filled.

All of these situations are resolvable because they use countably infinite sets. This means that you could line all the guests up and count them, even though you'd never finish because it'd be an infinite line. We've been dealing with integers, in particular the natural numbers (1, 2, 3, …). However, if a coach arrived with as many real numbers (so now including decimals and irrational numbers like √2 and π) as there are between 0 and 1, we wouldn't be able to find enough rooms in our countably infinite hotel. If you tried to start counting your guests, you might try and count 0, 0.1, 0.2, but what about 0.01 and 0.02? If you counted in tenths, you miss out the hundredths, and if you counted in hundredths, you miss out the thousandths. Clearly, it is impossible to accommodate all these guests. We call this an uncountable infinity, and since we can't accommodate it, it must be bigger than any countable infinity. Thus, not all infinities are

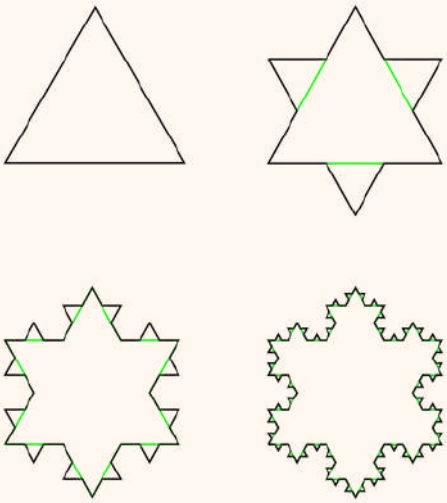
created equal, and you should probably ask your boss at the hotel for a pay rise!

Fractals

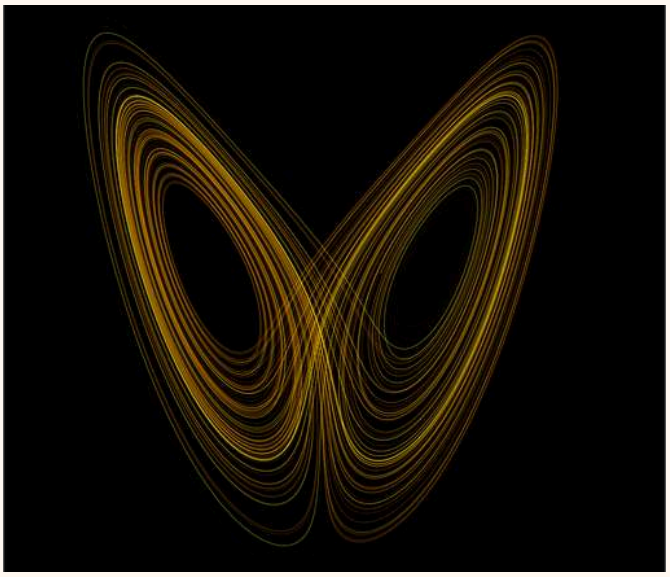
Fractals are shapes often formed from iterative processes repeated infinitely many times. Infinite geometric replacement forms fractals like the *Koch Snowflake* with a finite area in an infinite perimeter, whereas differential equations produce chaotic strange attractors. The *Lorenz attractor* is formed from solving three differential equations with respect to time and are typically plotted in three dimensions. They are particularly relevant to chaos theory due to their sensitivity to initial conditions and are closely tied to predicting atmospheric conditions and weather but are applicable to lasers, dynamos, and chemical reactions. Perhaps the most famous and beautiful fractal is the *Mandelbrot set*, formed by performing iterations on complex numbers and plotting the results depending on whether the sequence stays bounded or diverges.

Fractals often contain infinite detail in a finite area, and have infinite self-similarity, meaning they look nearly the same when viewed at any scale. Approximate fractals appear frequently in nature, most obviously in snowflakes but also in lightning bolts, neurons, Brownian motion, crystal structures, and even in the brain during psychedelic experiences!

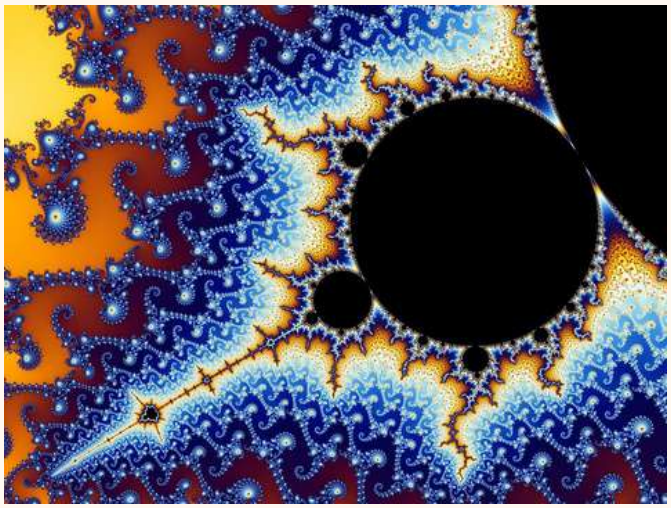
For further reading on fractals and chaos theory I'd recommend "Chaos: Making a New Science" by James Gleick, and "Things to Make and Do in the Fourth Dimension" by Matt Parker for a broad yet in-depth journey into brilliant corners of mathematics. This is just a finite overview of the endless properties and consequences of infinity. After all, you wouldn't want this article to go on forever!



The Koch Snowflake, Wikipedia, 2025



The Lorenz attractor, Wikipedia, 2025



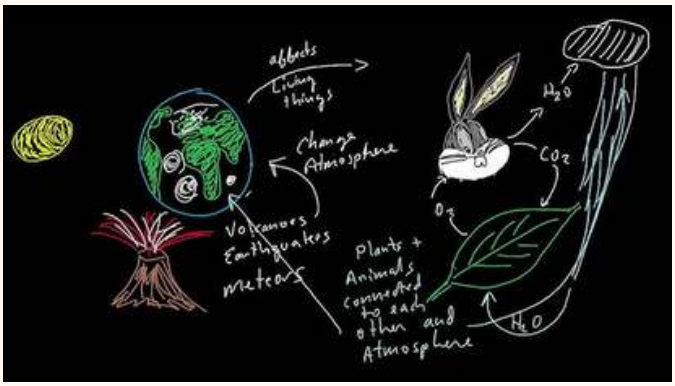
The Mandelbrot set, Wikipedia, 2025

Arianna Moreo

MOTHER EARTH'S SUPERORGANISM: THE GAIA HYPOTHESIS

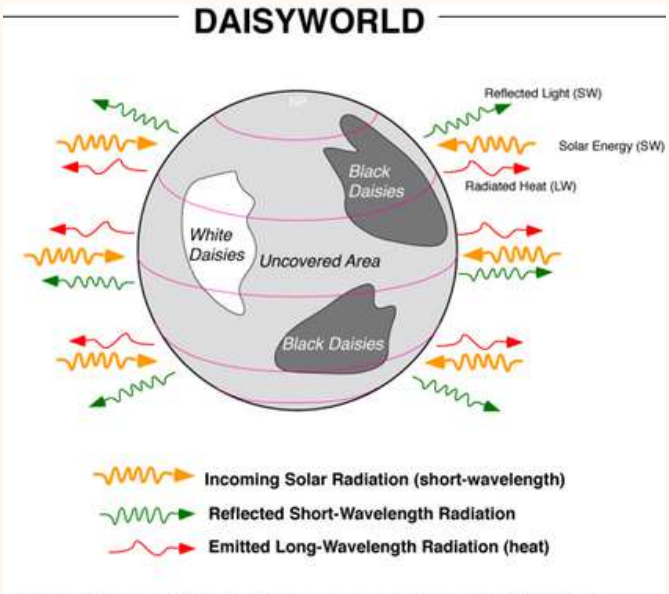
Earth is often described as the only planet that hosts life, but if that life does a bit more than just inhabit it? What if living organisms actively shape and regulate those specific conditions that make life possible in the first place? This is the Gaia Hypothesis.

James Lovelock and Lynn Margulis are two scientists who highlighted how the emergence of life on Earth has contributed to maintaining a relative stability of planetary conditions. In 1979, Lovelock published "*Gaia: A New Look at Life on Earth*", in which, together with Margulis, he formulated the Gaia Hypothesis. The name Gaia, refers to the Greek primordial deity Gaea, that means "Mother Earth". According to this theory, living organisms interact both with one another and with inorganic components of the planet, such as rocks, the atmosphere and the oceans, forming a complex, synergistic, and self-regulating system capable of maintaining conditions favourable for life.



Gaia Hypothesis, Youtube

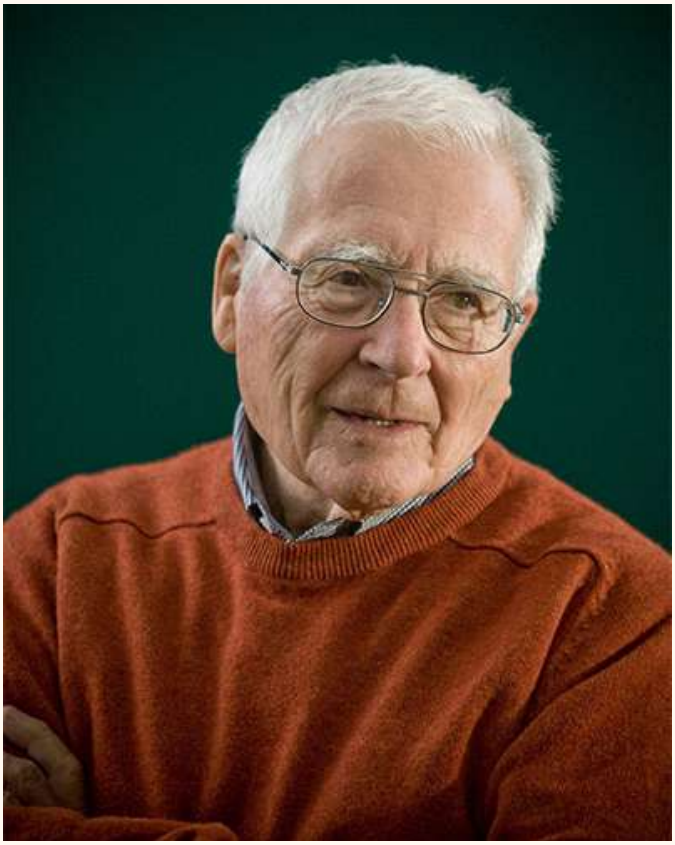
To illustrate this idea, he introduced a conceptual model known as Daisyworld. He imagined a planet similar to Earth, inhabited solely by two types of daisies: black and white. These two varieties interact differently with incoming solar radiation. Black daisies absorb radiation and warm the planet by emitting heat, while white daisies reflect solar radiation, contributing to cooling. In this way, the daisies influence the planet's albedo, defined as the fraction of solar radiation that a surface is able to reflect. In our world, natural elements such as polar ice caps play a crucial role in regulating albedo: when they melt, albedo decreases, leading to changes in climate.



Daisyworld Model, personalems.edu

Another key aspect of the Gaia Hypothesis is the idea that the evolution of living organisms is closely linked to the evolution of the physical and chemical environment in which they exist. Together, organisms and their environment form a single, co-evolving process. However, this process is sensitive to disturbance: when perturbed, it can trigger a cascade of reactions throughout the

system. It is therefore important to recognise that climate, lithological structure, the atmosphere, and the oceans are not determined solely by geological history, but are the result of long-term co-evolution with life itself.



James E. Lovelock, internationaltimes.it

From the work of Lovelock and Margulis emerged the field of geophysiology, which studies the flows of matter and energy that regulate life on Earth and the functioning of the planet as a whole. Within this framework, vital processes help maintain stable internal conditions despite external changes, in accordance with the principle of homeostasis, which is the ability of systems to preserve internal stability in the face of environmental variation. This regulatory capacity functions effectively when changes are gradual, but if disturbances are too rapid or too intense, the system can enter a state of crisis.

According to the Gaia Hypothesis, the Earth system operates through collaboration rather than competition. From this perspective, the ultimate interest of nature is to perpetuate itself, and cooperation proves more effective than competition in achieving this goal. Natural systems therefore tend to function cooperatively, and numerous examples of collaboration can be observed among their components. Because of the slow pace at which the planet responds to certain disturbances, humanity often struggles to intervene in time. As a result, our actions can only aim to mitigate and halt the causes that give rise to these destabilising dynamics.

Lynn Margulis' contribution

Lovelock is more commonly seen as the father of the Gaia Hypothesis, but Lynn Margulis' addition was fundamental in developing the theory. She was a microbiologist who initially sought out the advice of Lovelock for her own research, she stated that she was "trying to align bacteria by their metabolic pathways", in fact she had noticed that all kinds of bacteria produced gases. Oxygen, hydrogen sulfide, carbon dioxide, nitrogen, ammonia, more than thirty different gases are given off by the bacteria whose evolutionary history she wanted to reconstruct. At that time scientists believed that the only biological gas was oxygen and they told her to talk to Lovelock who believed, instead, that many key gases in the atmosphere were strongly influenced by life. When she met with him he explained his Gaia hypothesis to her and they started to collaborate. While Lovelock had the initial concept, Margulis provided the biological framework, showing how life maintains homeostasis (stability) through microbial processes, influencing atmospheric gases and ocean chemistry. Moreover, her deep knowledge of endosymbiotic theory (the theory states that mitochondria, plastids such as chloroplasts, and possibly other organelles of eukaryotic cells are descended from formerly free-living prokaryotes taken one inside the other in endosymbiosis), about which she developed her own

ideas, made her conscious about the fact that life's evolution involves constant cooperation and integration, not just competition, making Earth a vast, interconnected ecosystem. In conclusion, if we can call Lovelock the father of Gaia Hypothesis, I believe it’s safe to say that she can be our Mother Earth.

Lynn Margulis, vidas scientificas

Olivia Nutter

FREE WILL VS DETERMINISM: ARE WE RESPONSIBLE FOR OUR OWN ACTIONS?

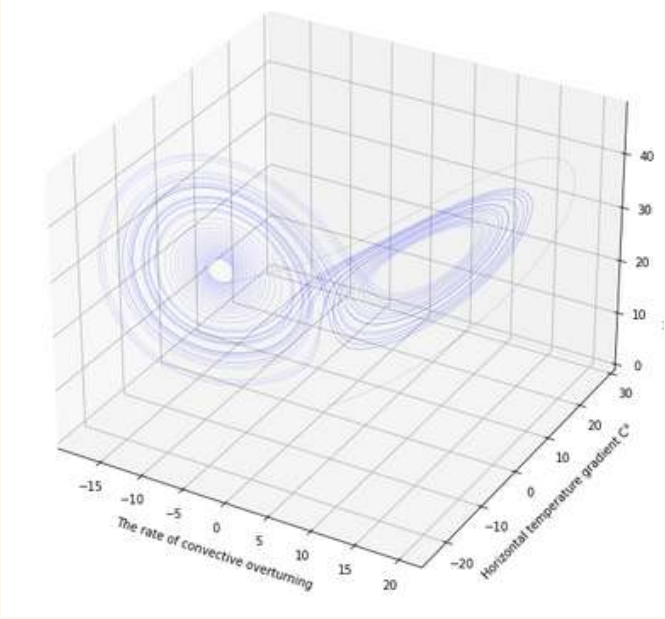
The current political climate necessitates conversations around integrity and our responsibility to make informed decisions. Future research and scientific progress are dictated by the decisions we make now. The debate of free will vs determinism has been brought into question since the 4th century; when someone refuses to give a colleague their due credit, or when history keeps "forgetting" women in STEM, is that a conscious choice or a predetermined destiny? Albeit an infuriating one, and which is worse?

Free will is defined as "*The power of acting without the constraint of necessity or fate; the ability to act at one's own discretion*"; as a result, you would be well within reason to assume determinism directly contradicts this definition. However, modern scholars have proposed the idea that we can have free will within a deterministic and probabilistic universe. Proposing that the two theories can co-exist.

Determinism

An example of a deterministic universe can be described by the butterfly effect. Theorised by Edward Lorenz, it is the most common example used to describe chaos theory. Lorenz proposed humble starting events, travelling a non-linear path can lead to hugely significant outcomes, as is the case of the flutter of a butterfly's wings resulting in a tornado on the opposite side of the world. This theory, viewed through the lens of women in STEM, raises the question of how deeply rooted the historical patterns are that contribute to the systemic ostracisation of women. Additionally, if we consider George Berkley's thought experiment when he was defining sound in the context of determinism, it prompts the question: if we never see the effects that the initial conditions have on the outcome, did they have an effect at all? In consideration, just because we do not yet have the tools to view the exact path of deterministic events within the universe does not mean it is not active; therefore, a lack of achievable proof is not a justifiable reason to dismiss determinism and chaos theory as concepts for the universe.

Although we cannot currently determine the perfect initial conditions needed to achieve a prediction, this does not imply that the system is non-deterministic. It simply means we cannot prove that the system is deterministic.



A 3D visual of Edward Lorenz's butterfly effect, attributed to the chaotic butterfly-esque appearance. Plotted by the author using Python software.

Quantum Mechanics

The Heisenberg interpretation provides mathematical evidence as to why we cannot simultaneously know the precise momentum and location of a particle; Heisenberg logically concluded that we will never be able to obtain every piece of information about our present environment. The concept of determinism relies on the assumption that it would be possible to ascertain 100% of information, 100% of the time, to input into an equation of the universe. However, we can see below that this is unattainable using Schrodinger's equation.

However, in quantum mechanics, the wavefunction of a particle contains all obtainable information for said particle. The wavefunction represented by Ψ(t), forms part of the Schrödinger equation shown below.

$$i\hbar\frac{d}{dt}|\Psi(t)\rangle = \hat{H}|\Psi(t)\rangle$$

While the Greek alphabet and alien symbols may seem daunting, the key point is that the Schrödinger equation can be used to calculate exact wavefunctions at a specific time based upon an initial known wavefunction and time; those results can then be used to predict probabilistic outcomes of the time and momentum of a particle. Here is a prime example of determinism and 'free will' coexisting. It is not unreasonable to consider that the outcome of a deterministic event could result in making a choice; therefore, if initial conditions led to an outcome where a decision occurred, free will can exist within determinism.

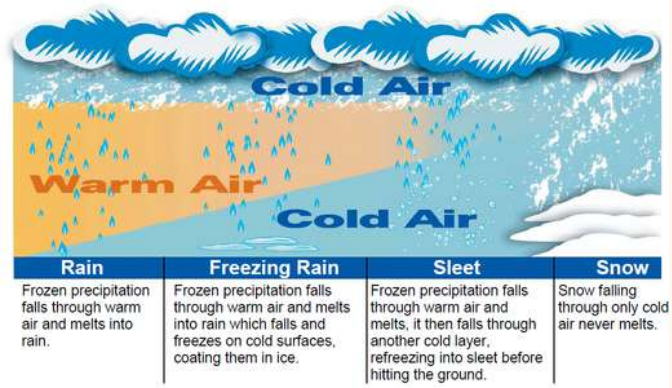
A Neuro Perspective

There have been multiple neurological studies into how our brain receptors react before making a decision, to try to determine the point at which we make a conscious choice. Most notably, Libet and Fried both carried out similar experiments, and both concluded that the motor function was carrying out the body's action before the participants had time to consciously consider whether to carry out the task or not. Fried also concluded that while the participants believed that they were consciously deciding to act, this wasn't necessarily the case. The patients were actually experiencing a delay in their body's motor reaction when asked to stop carrying out the task given. It must be noted that these results are not conclusive and are still a heated topic of debate amongst the neuroscience community. Therefore, it can be argued that what people perceive as free will is actually just a misunderstanding of how the brain reacts to commands and actions. However, this is only applicable to actions that are carried out following instructions. If we were to consider someone who had to make an unexpected decision, for example, their fight or flight reflex had been activated, then the results of these experiments may be very different. The outcome may lead to the person's neurons becoming active after the person has made the decision, meaning a will to choose would be present in that person. Despite Libet's and Fried's experiment not producing the results they desired, this is not final proof that free will is not present.Through this reasoning, free will remains very much a possibility. Whether it is present alongside a deterministic aspect or a sole influence amongst day-to-day actions, the results of these concepts would occur regardless of whether they could be proven or quantified. Free will and Determinism can act concurrently in certain systems, displaying potential for one or both theories to be a force present in the consequences of actions, events, and decisions.

Have you chosen to read this article, or have countless determining factors compounded, resulting in you, the reader, absorbing this piece of media? And is it the why that is important?

Sophie Harrison-Farrimond

THE SCIENCE OF SNOW



As it gets to this time of year, in the northern hemisphere, some of us are fortunate enough to experience it snowing. Whether there are several inches down, or mere millimetres, if you have had the chance to experience this phenomenon, chances are you have enjoyed it. So, this begs the question, how does this happen, how is it that sometimes when it is freezing cold, all it does is rain, but every so often it snows so heavily you can't even leave your front door? Well, it isn't always so simple as saying that any clouds that form whilst it is bitter outside mean it's going to snow, as there is a fascinating process behind the whole phenomenon

However, before discussing the entire process, there are some common misconceptions about snow. For example, it always must be 0°C (32°F) or less for it to snow, sometimes the best snowfall happens at about 2°C (35.6°F)! There is also the idea that all snow is the same, but this is also not the case. Some snow is light and fluffier, whereas some snow feels wet, and every snowflake is different. This due to how the ice crystals are formed, which will be discussed later. You may have also heard the term 'blizzards' and 'snowstorms', but what separates them from your typical snowfall? Well, there are different rates at which snowalls, so the heavier the snow falls, combined with high winds, causes your snowstorms and blizzards. The final fact is something I find quite interesting, which is about glaciers. They are formed from 1000's of years of compressed snowfall, forming very strong ice structures.

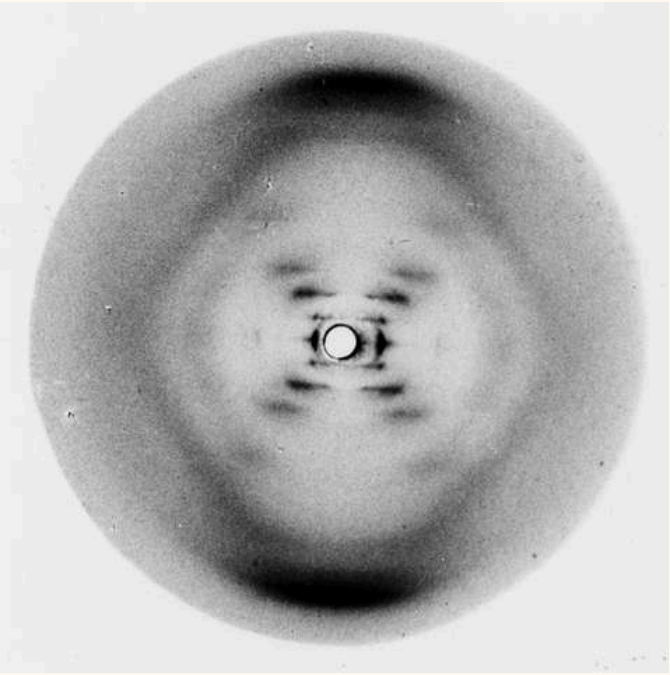
So now, the snow formation itself, how does this happen? It starts as a similar process to rain: water is evaporated from the ground, clouds are formed, and some moisture is left in the air. However, the interesting part happens when temperatures drop. The clouds and moisture in the air condense into tiny ice crystals. These crystals then stick to other crystals. As the mass of the larger crystals increase, they eventually become too heavy to stay aloft, therefore they fall. Since the crystals arrange themselves in a random way, no two snowflakes look the same. The composition of the snowflakes depends upon the conditions. If it is slightly warmer, the snowflakes will often be larger and wetter, which is better for your snowmen or other snow construction projects. The colder it is, the smaller the snowflakes often are, leading to fluffier snow landing on the ground. There are certain conditions the air needs to have for snow to land on the ground. If there is a lot of warmer air, then the snow crystals formed near the clouds will melt before landing on the ground.

So, the next time your town gets blanketed with snow, you now know how it happens, and be grateful for these moments, as they are often few and far between, especially where I live, and if you are one the lucky ones who lives somewhere where it snows every winter, appreciate the science that may bug you every year.

Alyssa Chitolie

THE NEUROSCIENCE BEHIND BELIEVING IN YOURSELF: WHY YOUR BRAIN NEEDS YOU TO BACK YOU

Marie Curie didn't win two Nobel Prizes because she "felt confident every day." She worked in a drafty shed, stirring radioactive material with metal rods for hours, being told over and over again that women did not belong in science. Chien-Shiung Wu who is "the First Lady of Physics", re-engineered beta decay experiments so brilliantly that her male colleagues won the Nobel Prize using her data. Rosalind Franklin used X-ray crystallography to capture Photograph 51 (the image that cracked open the double helix) yet her contribution went uncredited for decades.None of these women succeeded because they never doubted themselves. They succeeded because they kept going despite the doubt.



Photograph 51, Phocus Magazine

And here's the part most people never talk about: *Their brains were working with them and not against them*. Confidence isn't an attitude you're born with; it's a biological process that your brain can train, strengthen, and amplify.

Confidence Starts in Your Prefrontal Cortex

The prefrontal cortex (PFC) is the logical, planning, decision-making part of your brain. When you're confident, your PFC lights up, making you:

- think more clearly
- solve problems faster
- regulate emotions
- keep going even when experiments (inevitably) fail

And just like a muscle, the PFC strengthens with practice. Every time you consciously decide, "I can do this," your brain reinforces that neural pathway. Confidence isn't an emotion. It's repetition and neuroplasticity This means your brain adapts, changes, and grows based on experience. You don't have to be naturally confident, you don't have to fake it, you can build it. Research shows, your brain is constantly rewiring itself to support the person you're becoming.

Imposter Syndrome Isn't a Personality Trait: It's a Brain Loop

Research shows that girls in STEM experience imposter syndrome at nearly double the rate of their male

counterparts not because they're less capable, but because of how the brain's threat system works. The amygdala fires when it senses danger, even "intellectual danger," like:

- answering a question wrong
- speaking up in class
- presenting research
- feeling like everyone else is smarter

Your amygdala isn't telling you the truth. It's telling you, "This is unfamiliar." However the amygdala's fear signal weakens each time you face the situation again. Exposure literally rewires your fear response, every presentation, every lab report, every failed attempt. Your brain is learning and changing through courage.

Dopamine: Your Internal Cheerleader

Dopamine is a neurotransmitter in your brain linked to reward, motivation, and learning. This is important because STEM is built on micro-victories that add up and every small success creates a dopamine loop that encourages you to keep going. So actively celebrate our tiny wins. They're not small, they're chemically rewiring your motivation system.

So How Do You Rewire Your Brain for Confidence and Self Belief ?

Believing in oneself is not merely a motivational concept but a neurocognitive process grounded in the brain's capacity for plasticity, emotion regulation, and reward learning. Confidence can be strengthened by strategically engaging neural circuits associated with executive function, reward processing, and threat modulation.

One effective method is cognitive reframing, which recruits the prefrontal cortex (PFC) to reinterpret self-doubt as a challenge rather than a threat; repeated activation of this circuit enhances synaptic efficiency, gradually reducing the amygdala's fear response to academic or professional stressors. Additionally, habitual recognition of small achievements triggers incremental dopamine release within the mesolimbic pathway, reinforcing approach behaviours and increasing intrinsic motivation which is an effect well-documented in reward-learning studies.

Furthermore, research shows that self-affirmation practices also produce measurable changes in neural activity, particularly increasing PFC engagement during stressful tasks, thereby supporting better decision-making and working memory performance.

Finally, exposure to role models, especially women in STEM, enhances social-cognitive processing in the fusiform gyrus and promotes a sense of belonging, which is associated with lower cortisol levels and improved academic persistence. Together, these neuroscientifically informed strategies demonstrate that confidence is not a fixed trait but an adaptive neural pattern that can be cultivated through deliberate practice.

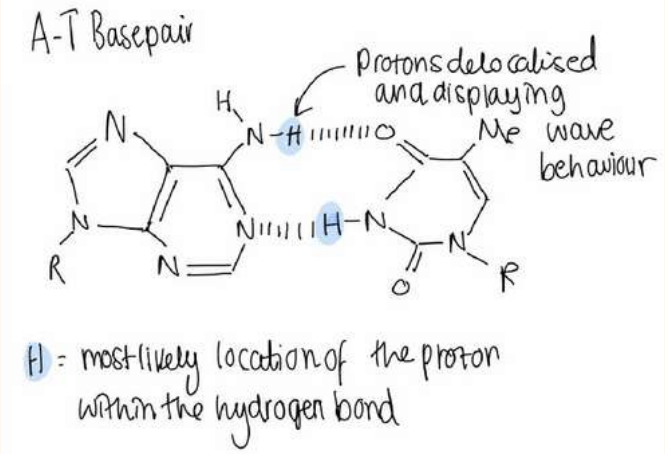
India Buckley

A BRIEF HISTORY OF QUANTUM GENOMICS/ TAUTOMERISATION, LAMARKIAN MUTATION AND OUR CELLS AS QUANTUM SUPERCOMPUTERS

It should be common sense that life, made up of the very same subatomic particles and controlled by the very same forces as physical science, would too be at its root quantum. This is not the case. For years the top physicists at institutions such as Harvard and MIT laughed off the idea that the messy, high entropy, warm (for the most part), accumulations of cells we call organisms, could act on principles only defined within machines such as quantum computers. One scientist went as far as to describe such notions as 'crackpot'. So why can we see it occurring time and time again?

From Lanark's theory of inherited adaptive change, our ideas about genetic mutation and evolution of life on earth have come a long way. Darwin, Mendel, Franklin and onwards through groundbreaking discoveries in genomics and evolution lead to the discovery of Tautomerisation as a driving force for spontaneous point mutations in the genetic code by Watson and Crick in 1953.

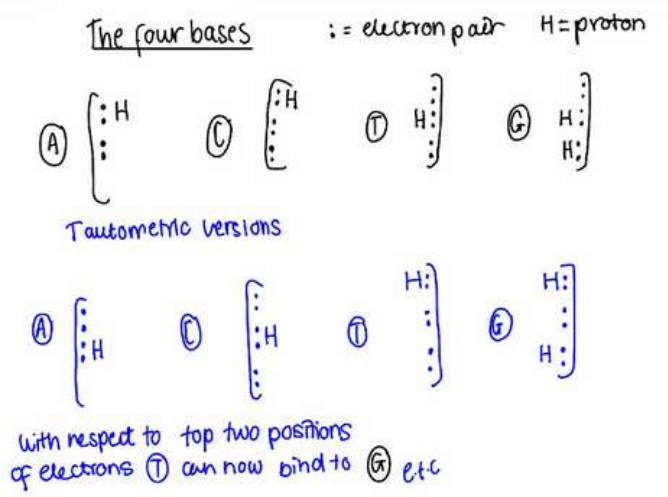
To dive deeper into how this mechanism works, let's take for example the A-T nitrogenous base pair.



A-T nitrogenous base pair, India Buckley

As you can see in this figure, the two base pairs are held together by two hydrogen bonds. Within these bonds the shared protons are delocalised and behaving as waves rather than particles. This wave behaviour allows us to describe their location using probabilities, with the areas highlighted blue representing the most probable locations of each. The location of these protons is specific to the bond, it allows only for the correct base pairs to bind to each other, adenine to thymine, guanine to cytosine. Tautomerisation occurs when the protons in the bond 'jump' and move positions, forming the tautomer form. This causes mutation during replication of DNA due to the bonding patterns of these tautometric bases, with tautometric thymine binding to guanine rather than adenine. This subsequently leads to the incorporation

of guanine into replicated DNA molecules in place of adenine.



India Buckley

In 1946, Per Olow Löwdin introduced a groundbreaking hypothesis suggesting that protons could move across hydrogen bonds via a process called quantum tunneling. This quantum-mechanical explanation provided an alternative pathway for genetic mutations that the classical model could not sufficiently describe. The prevailing classical explanation for tautomerization—the shift of a proton within a molecule that changes its structure—did not align with experimental observations, prompting the need for a more comprehensive theory.

Löwdin's quantum model was crucial because the existing physical explanations were inadequate. Specifically, the idea that a collision with water molecules could trigger the necessary proton transfer in DNA was inaccurate, primarily because there are very few water molecules in close proximity to the crucial coding sections of the DNA double helix. Quantum tunneling, which allows a proton to "tunnel" through an energy barrier instead of going over it, offered a more plausible and elegant mechanism for these subtle but significant changes within the genetic code.

More recently, research conducted at Duke University provided compelling evidence supporting this mechanism. Their findings demonstrated that these rare, quantum-induced tautomeric forms could, in fact, be successfully incorporated into replicating DNA because they fit within the active site of the DNA polymerase enzyme. This vital proof confirmed that quantum mechanics plays a direct role in genetic processes and provides a robust explanation for how spontaneous mutations can occur at the molecular level.

Per Olow Löwdin, Taylor & Francis Online

NORI RACING TEAM

In a world where innovation shapes the future and technology drives global progress, the voices, ideas, and leadership of young people have never been more essential. Nowhere is this more evident than in STEM fields that continue to expand, challenge boundaries, and redefine what is possible. Yet, despite the rapidly changing landscape, many young individuals, especially girls, still face outdated stereotypes suggesting that leadership and technical excellence belong to only a select few (read men). This belief is not only inaccurate but deeply limiting, and it is precisely the kind of narrative today's youth are rising to dismantle.

One team leading this change is *NORI Racing*, a dynamic group of six passionate STEM enthusiasts from HKFYG Lee Shau Kee College, boldly stepping into the F1 in Schools competition. What sets NORI Racing apart is not just their ambition to design, build, and race a miniature Formula 1 car, but their shared belief that STEM belongs to everyone with passion, curiosity, and determination. Their teamwork is not merely functional, it is a family bond built on trust, creativity, and a shared dream to push boundaries and leave a mark in the world of STEM racing. For them, engineering a high-performance model car is not just a competition task; it is a symbol of possibility, resilience, and equal opportunity.

NORI Racing operates with a clear mission: to foster a passion for STEM through hands-on learning, to strengthen collaboration among students, and to inspire others with their innovation and unity. Under their SideBySTEM initiative, they embrace a powerful philosophy: every student has the

ability to shape their world through STEM, especially girls, whose talents and perspectives are often underestimated or overlooked. Their message is simple yet urgent: "If not us, who? If not now, when?" In SideBySTEM, girls and boys stand shoulder-to-shoulder, learning, leading, and building the future as true equals from day one.

This belief in equity, representation, and unapologetic leadership echoes the messages shared in the two articles that follow. In *Lead Unapologetically—You Belong in Leadership*, project manager Ashley reminds young women that leadership is not defined by traditional stereotypes or outdated expectations. True leadership is not about authority or toughness, it is rooted in empathy, collaboration, resilience, and the courage to step up even when you feel uncertain.

Similarly, in *Dare to Dream in STEM—Resilience & Representation*,

Sophie illustrates how representation and perseverance can transform not only an individual's path, but the paths of the girls who follow. Her story underscores a crucial truth: STEM thrives on diversity, fresh perspectives, and voices that challenge the norm. When girls see themselves in roles that were once dominated by men, the entire landscape of innovation expands. Together, the mission of NORI Racing and the insights shared by Ashley and Sophie remind us that leadership and STEM excellence are not reserved for a select few, they are for anyone bold enough to believe, to try, and to persevere. These articles stand not only as guidance, but as a call to action for the next generation of thinkers, builders, dreamers, and leaders.

LEAD UNAPOLOGETICALLY—YOU BELONG IN LEADERSHIP

Leadership isn't a "guy thing", it's for anyone brave enough to step up, and that means you. As a project manager who's led teams and navigated male-dominated rooms, I know your greatest strengths, empathy, collaboration, attention to detail, are leadership superpowers, not weaknesses.

I once doubted if I was "tough enough" to lead, but I quickly learned: great leadership isn't about barking orders. It's about listening, uniting people, and turning setbacks into solutions. You don't need to wait for permission or be "perfect", leadership starts today, when you speak up, volunteer, or lift a friend up.

Don't shrink to fit outdated ideas of what a leader "should" be. Be unapologetically you, kind, bold, driven. The world needs your voice in leadership. Step up, own your power, and lead like only you can. You were made for this.

Ashley, Project Manager for NORI racing team

DARE TO DREAM IN STEM—RESILIENCE & REPRESENTATION

When societal stereotypes whispered that "girls don't belong in engineering," I almost let them hold me back. Today, as a Sponsorship & Marketing Manager actively raising awareness for STEM programs for girls, I'm part of silencing those myths and you can too.

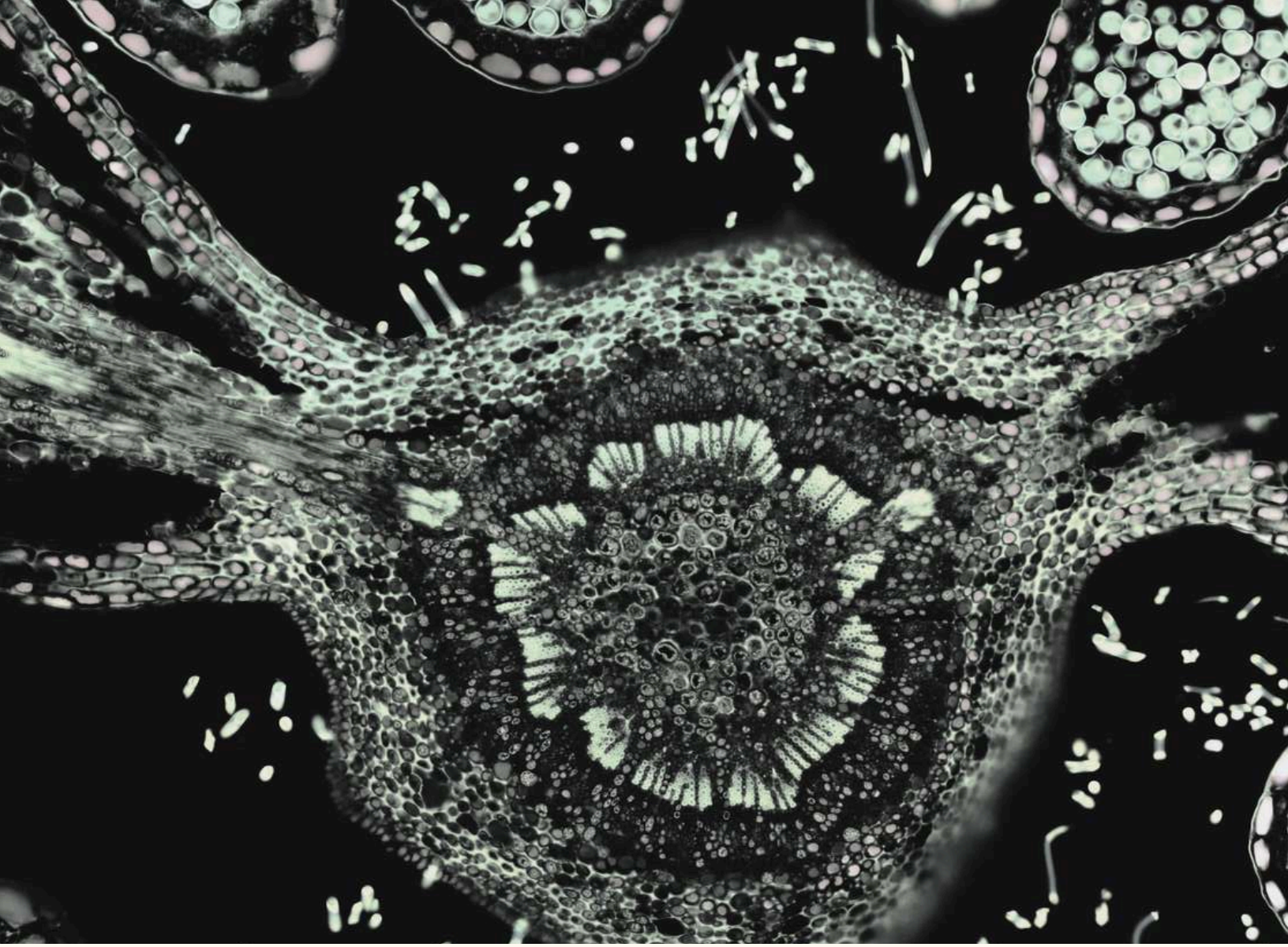
STEM isn't a boys' club, it's a space for curiosity, problem-solving, and your unique ideas. I secured a significant sponsorship right after validating my data, and the encouragement from the team members inspired me to keep moving forward confidently. I leaned into my perspective as a woman in STEM, crafted pitches that centered girls, and secured partnerships that fund STEM awareness programmes to give back to the community.

Here's the truth: STEM needs you. You don't have to be "super smart", just curious. Ignore the stereotypes, embrace resilience, and take up space.

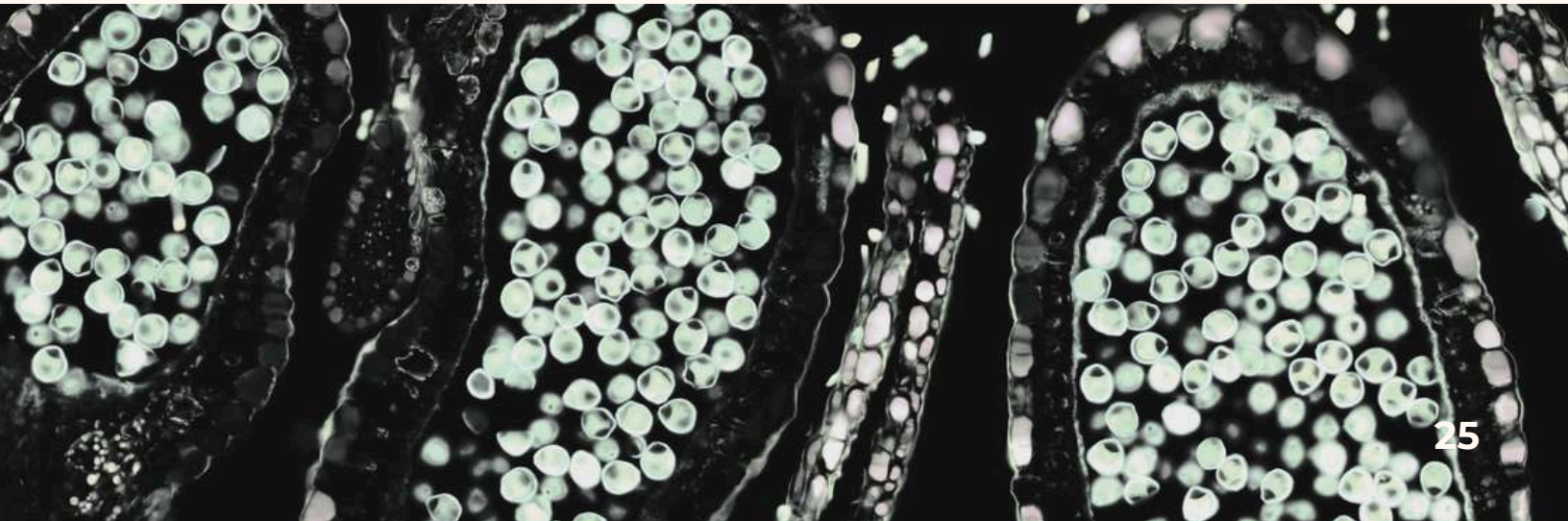
Representation matters, when you dare to dream in STEM, you pave the way for the girls after you. The future of STEM is female, and it's bright, don't let anyone dim your light.

Sophie, Sponsorship & Marketing Manager for NORI racing team

Would you like to know more about them? Go follow them!
IG: @nori.racingg

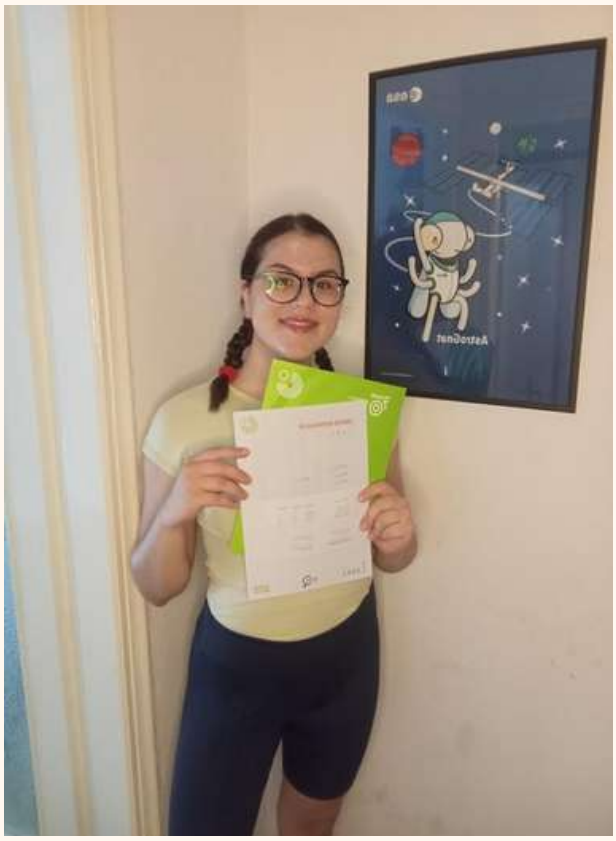


SECTION TWO: INTERVIEWS



NINA GKOUDLI

Νινα Γκουδλη is an environmental engineering student with a lifelong passion for space exploration, inspired from an early age by astronomy and human spaceflight. With a strong interest in becoming an astronaut, she combines scientific training with a diverse skill set that includes scuba diving, languages, sports, and first-aid volunteering. Deeply motivated by sustainability on Earth and beyond, she is particularly fascinated by future Moon and Mars missions and envisions a career that bridges engineering, exploration, and responsible space development.



What first sparked your dream of becoming an astronaut at the age of seven?
On my seventh birthday, I was gifted a children's space encyclopaedia. As I read through the pages, I was fascinated by what happens outside our atmosphere and mostly by human space exploration. I then read that people have walked on the Moon, but not yet on Mars and wished to become one of the first to achieve the latter. Sometime that year, we also visited my great-uncle, who owned a telescope and we saw Mars through it. That's when my dream started burning even stronger.

How have your studies in Environmental Engineering shaped your perspective on space exploration?
Environmental engineering is the science of sustaining or even restoring a natural or human-made environment to its healthy state, while maintaining a balance between society, economy and the environment. We have lessons such as atmospheric pollution and antipollution technologies to potable water, hydraulics, energy consideration designs for buildings, liquid and solid waste management. As an astronaut, I could later design, monitor and even repair water supplies on a space mission, as well as maintain atmospheric and air-regulation systems, and so much more. As for how they shaped my perspective, I am nowadays a greater fan of Mars terraformation, but with the belief that creating a second home should never mean abandoning our own planet or destroying Mars. Just fix the place so we can inhabit it, treat it better this time, to create a solarpunk place to live. That's kind of a dream of mine.

You have trained and developed several skills (scuba diving, robotics, languages, sports, etc.), how do these diverse expertise connect to your astronaut ambition?

Being an astronaut is not easy; the competition is always tough. Only those who have a diverse skillset can be accepted. As an astronaut, you need to be a scientist or engineer. Any STEM field is important for the mission, mostly for research. Any technical skills are always welcome and help you train and adapt to new things. Astronauts are also multilingual, as they need to train in many countries. English and Russian are the most important, but surely other European (or non-European) languages are a bonus. Multilingualism is also a sign of good communication skills.

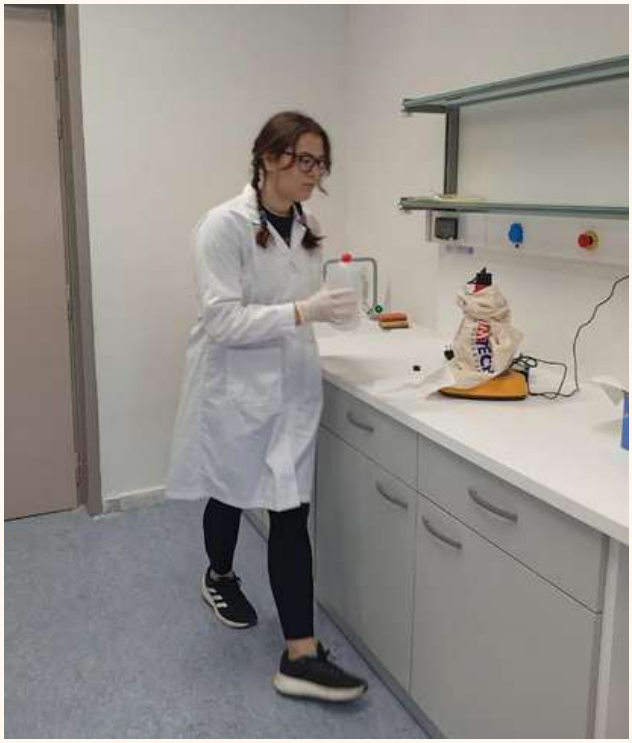
A scuba diver is also more likely to be selected as an astronaut, as they have already been training in a contained-oxygen environment and can adapt more easily to neutral buoyancy, simulating microgravity. I am studying environmental engineering, learning German officially (French and Russian on my own) and speak Greek (native language) and English (I consider myself almost as fluent as in Greek), train in scuba diving, keep my body healthy with good sleep and eating habits as well as sports (I am currently training in Taekwondo and about to receive the blue belt in December 2025) and never miss an opportunity on volunteering or seminars about first aid etc.

What excites you most about space exploration today?

I am mostly excited for the upcoming Artemis missions, as during my lifetime, there has not been much mobility on the Moon, on missions with humans. I am hoping these will bring Mars closer for my generation.

How do you balance your love for science with artistic side in music and singing?

I perceive art and science as not much different. They are both made by humans for humans. In our modern society, we have to pick and can't usually do both. But I know that at least as a hobby, music is a huge part of me and could never let it go, just because I'm a scientist.



What advice would you give to young girls who dream of careers in STEM but feel intimidated?

STEM gives so many opportunities for you to develop professionally, academically and personally. It is inspiring in any way, gives you so much to think about all day long, you'll never be bored, it will change your life to the better and it is challenging.

It surely is not easy and it might seem intimidating, as it is mostly dominated by boys, but keep reminding yourself, that all people can equally succeed in STEM, no matter their gender. I always remind myself that, if they can do it, I can too! Not that we should copy other people, but doing it "your way" includes being inspired and encouraged by other people's journeys. So, if you are thinking of having a career in STEM, just go for it. I promise you, you won't regret it!

Where do you see yourself in 10 years?
In ten years, I hope to have earned my PhD, already been a part of analogue missions around the world, also have worked for ESA, at least as a young graduate engineer and hopefully do research in harsh environments, such as Antarctica and the NEEMO project (NASA Extreme Environment Mission Operations). I also want to be able to speak German, French and Russian fluently and hopefully a little bit of other languages as well, according to the countries I will have worked in.

Would you like to know more about her? Go follow her!
IG: @cool_esa_stargirl

ALYSSA CARSON

Alyssa Carson is an astrobiologist and PhD candidate in the biology department at the University of Arkansas, specializing in the study of life's potential beyond Earth. Her research focuses on microorganisms and the possibility of past life on Mars, with the goal of informing future robotic and human missions. Widely recognized for her long-standing commitment to space exploration and science outreach, Carson advocates for interdisciplinary collaboration, early STEM engagement, and the importance of teamwork in advancing humanity's presence in space.

You hold a Bachelor in Science in Astrobiology and are currently a PhD candidate in the biology department at the University of Arkansas. How do you anticipate your scientific expertise in astrobiology, focusing on biologicak and microbiological factors will directly contribute to the scientific objectives of the first human mission to Mars, particularly in terms of investigating soil or water samples?

My interest in space has always been broad, but identifying where I best fit within the space industry was a gradual process. I developed a strong interest in astrobiology because it is highly interdisciplinary compared to other areas of space science. I enjoy combining multiple scientific disciplines into a single research focus, which ultimately led me into astrobiology.

During my undergraduate research, I focused largely on plants, specifically how microorganisms could be used to promote plant growth and productivity in microgravity. While that work was fascinating, for my doctorate I became more interested in studying life itself and the potential for life beyond Earth. In practice, this means researching microorganisms that could potentially survive in extraterrestrial environments.

My current research focuses on the potential for past life on Mars. I investigate whether organisms we know on Earth could have survived under historical Martian conditions, particularly when Mars had more water. By placing different organisms in environments that simulate what Mars may have once been like, we can better understand where life may have existed.

This research could help guide future missions to Mars by identifying potentially habitable regions worth exploring. It may also help determine whether certain areas are viable targets or if resources would be better allocated elsewhere. Overall, this work contributes small but important pieces to the larger puzzle of Mars exploration and future human missions.

What foundational scientific discovery are you most eager to make on Mars, and what is the most compelling reason—beyond setting records—for humanity to undertake such a dangerous journey?

One of the biggest challenges in space science is the number of assumptions we must make. Much of what we believe we know about Mars and the solar system is based on indirect evidence. Although Mars is the most studied planet after Earth, we have never returned a direct sample from its surface.

Meteorites believed to be from Mars have been altered by their passage through Earth's atmosphere, and unlike the Moon, humans have never traveled there to collect samples firsthand. Much of our current understanding comes from satellite data and rover observations, which are limited.

Human missions would allow for faster decision-making, direct sample collection, and a more comprehensive understanding of Mars. Rovers move slowly, data transmission takes time, and interpretation can be delayed. Humans on the surface could streamline research and make real-time decisions, ultimately accelerating our understanding of the planet.

If you could solve one major obstacle in space exploration—travel time, communication lag, or radiation exposure—which would you prioritize?

Travel time is currently the biggest challenge for human missions to Mars. Longer missions increase complexity, risk, and resource requirements such as food and supplies. While we have experience with long-duration missions on the International Space Station, a Mars mission presents far greater logistical challenges.

Shortening travel time would alleviate many of these issues. A shorter mission would reduce concerns related to supplies and overall risk. Advances that could reduce travel time from six months to several weeks would make missions far more feasible.

Radiation exposure would be the next major obstacle. Earth provides natural protection through its atmosphere, but astronauts traveling through space and living on Mars would face significant radiation risks due to the planet's thin atmosphere.

As space exploration becomes more commercialized, who should be responsible for governing, funding, and setting ethical standards for humanity's expansion into space?
Space is becoming its own unique domain for research, work, and opportunity. Currently, space exploration is moving toward a collaborative model involving government agencies and private entities. NASA's Artemis program, for example, involves partnerships with international agencies and private companies.

A mission to Mars will be even larger in scale and will likely require collaboration across multiple sectors. It is unlikely that a single organization could manage such a mission alone. The future of space exploration will likely continue to be a mix of public and private efforts, with responsibilities shared depending on expertise and resources.

What non-cultural elements are most vital for maintaining team cohesion, mental wellness, and morale during long-term missions such as colonization efforts?
Mental health has always been a major consideration in space travel. Being far from friends and family is challenging, but similar situations exist on Earth, such as military deployments or studying abroad. These experiences show that humans can adapt to long separations.

Astronauts train together extensively before missions, building strong bonds and a sense of community. Teamwork and mutual reliance are essential, especially in high-risk environments. That shared preparation helps crews manage mental challenges and maintain cohesion during missions.

You are the first person to complete the NASA passport program by visiting all 14 NASA visitor centers and the only person to attend all three NASA space stops. What message do you hope this sends to people who believe space exploration is only for a select few?
When I was younger, my interest in space was often dismissed because of my age. Many people assumed I would outgrow it. I hope my experiences show that it is possible to work toward your goals from a young age.

Supporting young people's interests—through science clubs, robotics teams, or hands-on experiences—can have a significant impact. These opportunities help individuals discover what they enjoy and guide long-term career paths. I hope this encourages others to pursue their interests early and continue developing them over time.

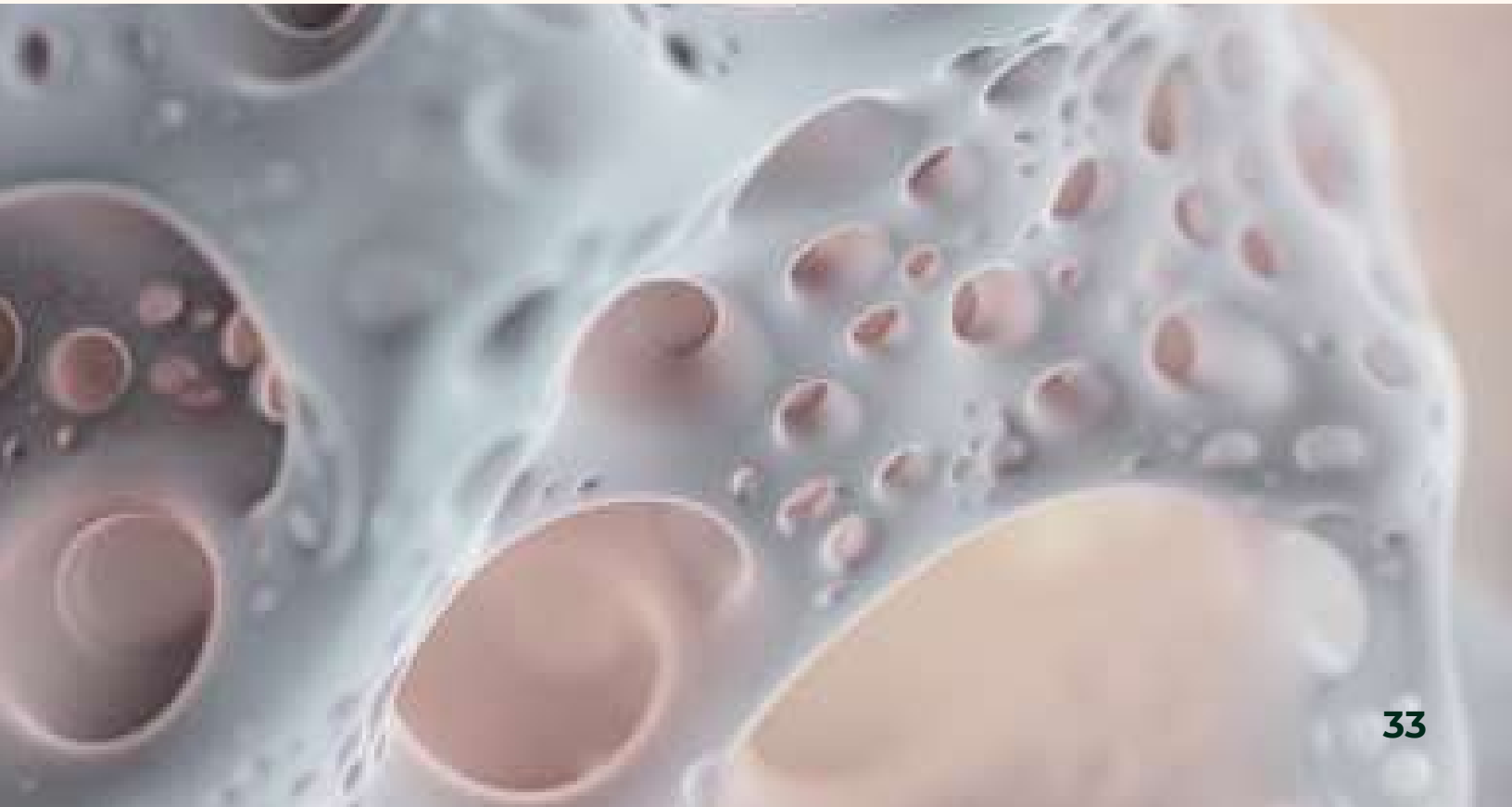
You have said that water survival training taught you the importance of relying on teammates. How does this philosophy translate into leadership and operational trust during high-risk missions?
Space exploration is inherently collaborative. No one can succeed alone because the field requires diverse skills and expertise. Missions involve people from many backgrounds, including science, medicine, engineering, and operations.

Trust is built through years of preparation, training, and collaboration. While missions may appear sudden to the public, they are the result of decades of work by thousands of people. Every detail—from engineering to food preparation—is carefully considered.

These missions demonstrate what is possible when people work together toward a common goal. Teamwork, preparation, and trust are what make space exploration achievable.

Would you like to know more about her? Go follow her!
IG: @nasablueberry

SECTION THREE: ART

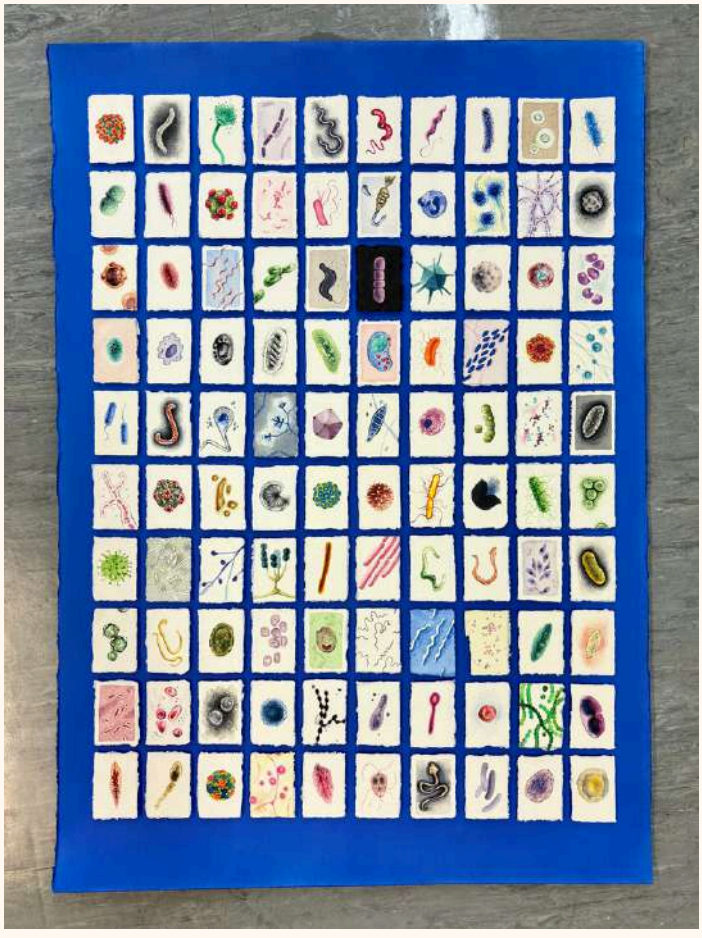


MILLY GREER

Milly is an illustrator and artist from London. After her undergraduate in Chemistry, she looked for avenues to combine these two things she was good at: science and art. That is how she ended up in her second year studying MA Art and Science at Central Saint Martins. The art in this feature is all work she has created in 2025 on the course, inspired by the microuniverse. The starting point of a lot of her work is the increasing knowledge gap between scientists and the public which has become a breeding ground for science conspiracy and distrust.

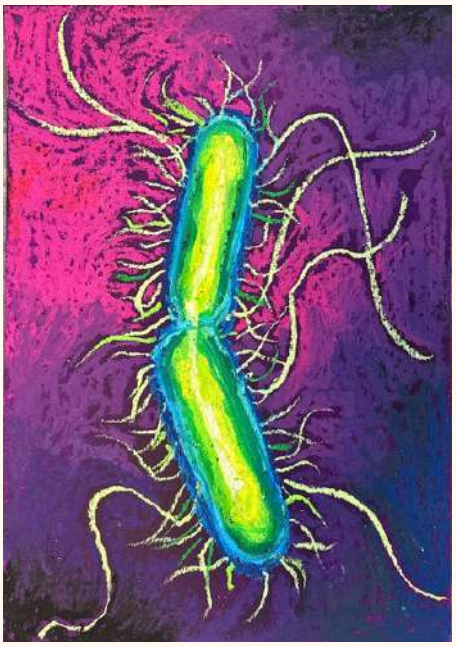
"*We have seen a rise in skepticism towards knowledge claims of the scientific community, notably the rejection of vaccination under guises of misinformation and pseudoscience. This is not just a matter of free speech but can have real world consequences. As a person with scientific training but an aptitude and inclination towards visual communication, I feel responsible to make a contribution to improving scientific literacy. How can I distribute scientific knowledge in a more accessible and inclusive way, and create a safe environment to ask questions and challenge misconceptions? This is the mission of my current illustration work: to show people the beautiful side of science and invite them to be curious.*"

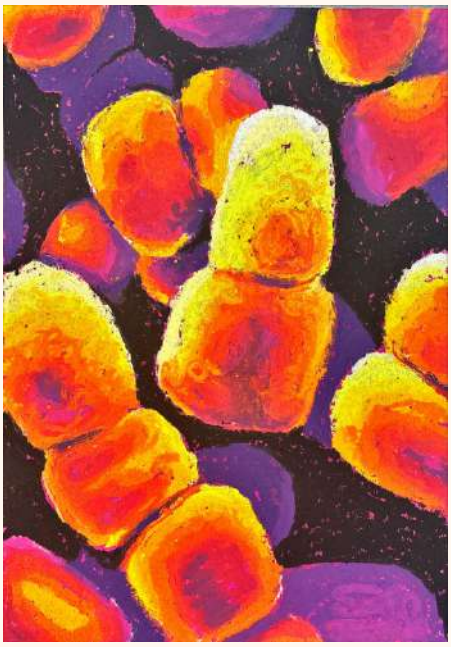
100 PATHOGENS *(2025, 100 5x8cm, watercolour, ink, and pencil on paper)*



100 paintings of the most prevalent pathogens in the UK. A compilation of the viruses, bacteria, parasites and fungi that are responsible for illness, arranged in an aesthetically pleasing way. The juxtaposition of the pretty presentation and deadly context, evokes a sense of conflict within the viewer, being both attracted and repulsed by the piece. She plays on this confusion, encouraging a blurred sense of right and wrong to challenge the preconceptions of the viewer, encouraging them to find more information to help them decipher how they feel about the work. In doing so they may find themselves better informed about the mechanisms that the cells operate, and how we have developed ways to intercept these mechanisms and improve healthcare. The more we know, the more informed decisions we are able to make.

CELL DRAWINGS *(2025, A4, oil pastel)*





Interested in how some of the shapes from '*100 Pathogens*' would appear on a large scale as opposed to small, she did some A4 illustrations with oil pastels. In '*100 Pathogens*' she had to isolate the cells from the environment they were pictured in, but the dark backgrounds in these larger, more fleshed out drawings add a sense of depth and space compared to the watercolours. On a larger scale the impact of the colour is much greater, and paired with the texture, they make for stand alone pieces from another world. Even though we are surrounded by bacteria, and depend on them for our existence, we are hardly aware of their abundance. When we observe them under a microscope, we can see this microuniverse of perverse shapes and colours, a microuniverse that looks totally science fiction. She is enjoying exploring this alien world that exists prolifically but unnoticed among us.

RISO PRINT *(2025, A3, risograph)*

Once she creates a traditional piece of art, she loves to turn to printmaking to see what reproducible adaptations of the work she can make. This risoprint takes some of the pathogens from '*100 Pathogens*' and has them arranged at different scales and fit together in a puzzle of disease. The bright colours of the risograph reflect the artificial colouring of electron microscopy images and digital renditions of cells. The colours of these pictures are chosen by scientists or computer programs if the cells are smaller than wavelengths of light (ie. they do not have any colour properties). Risoprinting is a technique where you print many many copies, allowing for distribution of pamphlets, newspapers and posters on a large scale. This is something she's going on to explore in 2026, creating visually interesting physical media around scientific concepts.

BACILLUS CERUS *(2025, 40x50cm, acrylic on canvas)*

Her ongoing work involves the stylisation of pathogenesis, turning cell imagery into design. This painting is a simplification of gram stained bacillus cerus cell cultures, a type of bacteria. She can imagine these rod-shaped clusters printed on fabric or wallpaper and made into commercialised products like clothes as the Festival Pattern Group once did. The Festival Pattern Group celebrated the scientific innovation happening in Britain in the 1950s. X-ray crystallographers, designers and manufacturers came together to put observed patterns under the microscope onto wallpapers, carpets, fabrics, ceramics and clothing. She is drawn to this commercialisation of the scientific image, and how atomic structures are brought into the macro world, becoming observable and tangible in the everyday.

Would you like to see more of her works? Go follow her!
IG: @millydoesgood
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ANNE-CATHERINE BEDARD

Anne-Catherine Bedard is a French-Canadian abstract artist and PhD chemist whose work invites you to reclaim your wholeness. Born and raised in Quebec City and now based in Midland, Michigan, she bridges two worlds that rarely meet: Science and Art. Her career as a research scientist informs her artistic practice, allowing her to blend analytical curiosity with intuitive emotional expression.

Anne-Catherine began painting during her recovery from surgery, a moment that opened an unexpected pathway back to herself. What started as a personal outlet quickly became a transformative practice that helped her process emotions that language could not reach. This experience shaped her belief that art has the power to regulate the nervous system and reconnect people with the parts of themselves they often silence. Her work is known for its bright and often fluorescent palettes, fluid movement, and layered textures that recall both molecular structures and playful improvisation.

Through her brand ***Labcoat & Leggings***, she creates work that merges scientific themes with bold creative freedom. The name reflects her dual identity, honoring both the structured world of chemistry and the expressive world of art. Her process often incorporates reclaimed materials and organic textures, mirroring her belief that nothing is wasted and everything can evolve.

Across all media, Anne-Catherine's mission remains constant. She wants her work to help people feel strong, capable, whole, and free.

SCALE UP YOUR DREAMS

(2025, 36x36x1.75, Mixed Medium on Canvas)

This piece is a call to reject the notion that we must choose only one path. It celebrates the possibility — and power — of living a life with multiple passions. You can be analytical and artistic, methodical and expressive. You can explore molecules and make magic.

On one side, cool tones and subtle scientific notations evoke precision, knowledge, and logic. On the other, vibrant colors and flowing textures speak to creativity, intuition, and emotion.

This work invites you to expand, to grow, to scale up not just in ambition, but in authenticity — to give space to every part of who you are.

F.L.Y.: First Love Yourself (2025, 40x30x1.75, Mixed Medium on Canvas)

This piece is about becoming — about choosing freedom, choosing yourself, and letting love grow from within.
F.L.Y. is the first act of courage: giving yourself permission to rise, to move beyond what holds you back, similar to a butterfly emerging from its cocoon, and loving yourself deeply, truly, and unapologetically.
Across the canvas, a vibrant fusion of color, science, symbols, and texture unfolds — like a mind opening, a spirit lifting.

Molecular shapes, mathematical equations, galaxies, and sacred patterns all coexist, telling the story of a self that is both complex and whole.

This is a reminder that transformation doesn't happen all at once. It begins with one decision: to choose you, and it involves rest!

Want to know more? You can find her in Instagram as *@labcoat_and_leggings*

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