Technology Networks

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Transforming STEMM Through INCLUSION

Allyship – How Do We Strive for a More United World?

Pride in STEMM: Overcoming Challenges and Improving Inclusivity

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FEATURE

Transforming STEMM Through Inclusion

Molly Coddington

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EDITORS' NOTE

Dear Readers,

Welcome to the final issue of *The Scientific Observer*. This issue marks the culmination of an incredible journey spanning 39 issues where we've explored stories, ideas and innovations that are shaping science and the scientific community.

In this final issue, we highlight how diversity and equality can transform science, technology, engineering, mathematics and medicine (STEMM).

In our feature article, *Championing Change and Transforming STEMM Through Inclusion*, we hear the stories of five remarkable individuals leading the charge for a brighter and more united future in STEMM. We also address how science can become a more inclusive environment for women with Mirit Eldor, secretary of Elsevier's Inclusion and Diversity External Advisory Board. Though Elsevier's recent Progress Towards Gender Equality in Research and Innovation Review highlighted 20 years of progress, it also emphasized the extent of work that remains to be done. Our articles on allyship and Pride in STEMM demonstrate the strength of diverse voices in shaping a more equitable scientific landscape.

In this closing chapter, we also take a moment to reflect on our journey, revisiting some of our team's favorite features from *The Scientific Observer* over the years.

On behalf of everyone who has contributed to *The Scientific Observer*, thank you for being part of our story. Your engagement, curiosity and support have made this journey meaningful and inspiring. Although this marks the end of *The Scientific Observer*, you can continue to explore and engage with our content over at the *Technology Networks* website, where we'll continue bringing you the latest in science and innovation.

The *Technology Networks* team

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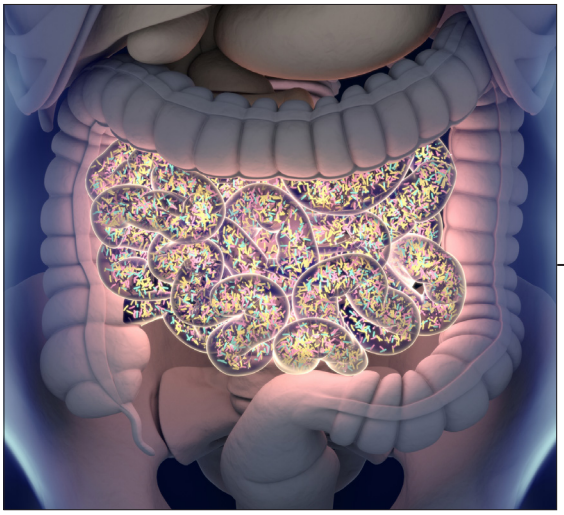
From the Newsroom

Ancient DNA Rewrites the Stories of Buried Pompeii Victims

MOLLY CODDINGTON

A collaborative team of scientists extracted DNA from the famed plaster casts of Pompeii, revealing new insights about the victims of Mount Vesuvius' infamous eruption in 79 AD.

JOURNAL: *Current Biology*.

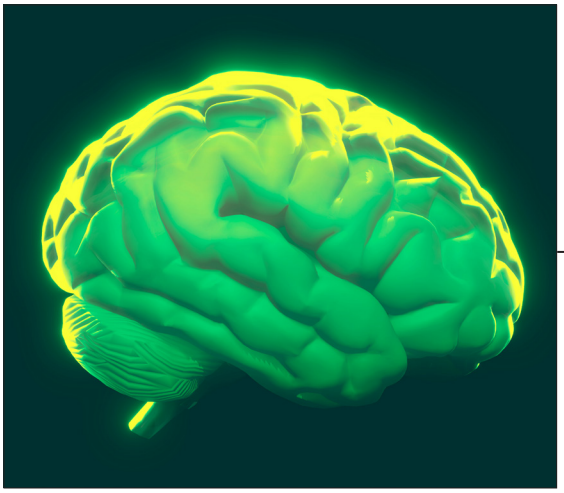


How Opportunistic Bacteria Trigger Neuroinflammation via the Gut-Brain Axis

BLAKE FORMAN

Florida State University researchers have described, in mice, how an opportunistic bacteria can migrate from the gut into the bloodstream and eventually into the brain, resulting in symptoms often observed in Alzheimer's patients.

JOURNAL: *The Journal of Infectious Diseases*.



Glaucoma Drug Reduces Tau Buildup in Neurodegeneration Model

SARAH WHELAN

A common drug used to treat glaucoma has shown promise for neurodegenerative disease, preventing buildup of abnormal tau protein – implicated in dementia and Alzheimer's – in the brains of zebrafish and mice.

JOURNAL: *Nature Chemical Biology*.

From the Newsroom

Nearly 200 Potential Breast Carcinogens Detected in Food Packaging

ALEXANDER BEADLE

New analysis of a major food packaging study database suggests that breast cancer-causing compounds could be migrating out of common packaging materials and into our food.

JOURNAL: *Environmental Health Perspectives*.

Planting Trees in the Arctic Could Make Climate Change Worse, Not Better

LEO BEAR-MCGUINNESS

The normally tree-free tundra already stores a vast resource of carbon within its soil. The researchers say any new forests could disrupt this delicate carbon sink and indirectly release more carbon than they would absorb.

JOURNAL: *Nature Geoscience*.

How Does the Newborn Brain Adapt in the First Days of Life?

RHIANNA-LILY SMITH

Researchers have mapped the rapid reorganization of newborn brain networks, showing global surges in connectivity during birth. Analyzing fMRI scans, they reveal distinct growth in subcortical and sensorimotor regions.

JOURNAL: *PLOS Biology*.

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Addressing Widening Health Disparities With Inclusive Stem Cell Models

OUR UNDERSTANDING OF DISEASE VARIES DRAMATICALLY ACROSS ETHNIC GROUPS, CONTRIBUTING TO WIDENING HEALTH DISPARITIES.

BLAKE FORMAN

Advances in medicine and healthcare have decreased mortality rates for major diseases. However, racial disparities in mortality are increasing, as evidenced by the disproportionate impact of the COVID-19 pandemic on populations of color. This inequality has highlighted the need to understand how diseases and therapeutics affect different races.

To help researchers find new therapies for ethnic communities underrepresented in disease research, the Allen Institute for Cell Science has partnered with the New York Stem Cell Foundation (NYSCF). The partnership will produce DNA-edited ethnically diverse stem cell lines for disease research, to improve global health equity.

"Haplotypes unique to a few regions of the world are dramatically over-represented among donors who have contributed cells for deriving stem cell models," Dr. Brock Roberts, scientist III at the Allen Institute for Cell Science, told *Technology Networks*.

"As stem cell science improves as a field, organ-like tissues derived from stem cells are predicted to be used for many safety studies. But it is not appropriate to test for safety in only one or a few genetic backgrounds."

Human induced pluripotent stem cells (iPSCs) can be derived directly from adult tissue and reprogrammed to differentiate into various cell types.

As human-derived iPSCs possess the donor's genetic information, they provide a more accurate way to evaluate individual responses to treatments.

"Current iPSC repositories/biobanks consist of low diversity iPSC lines, with the vast majority originating from white Europeans," Dr. Josephine Wesely, principal scientist at NYSCF, told *Technology Networks*.

"DNA is broken at specific locations in the cells using CRISPR, and DNA with the same sequence as the broken region plus a tag sequence is added to repair the break, in a process called homology driven repair," explained Roberts.

"These tagging strategies are highly valuable to the scientific community as the cells can be more easily to remove the hurdles of starting from scratch when transitioning to ethnically diverse stem cells.

"While the Allen Institute has put years of work into the generation and characterization of those tags (and therefore ensuring high quality and functionality), NYSCF has developed an automated gene editing pipeline that allows standardized, fully automated and high throughput generation of genetically modified iPSC clones," Wesely commented.

"The two institutions are bringing this expertise together to provide genetically diverse tagged cell lines to the community."

"The lack of diversity of cell lines used in research as well as drug discovery leads to an incomplete understanding of diseases and drug-related pathways and ultimately results in a biased approach to drug development."

CREATING MORE INCLUSIVE CELLULAR MODELS

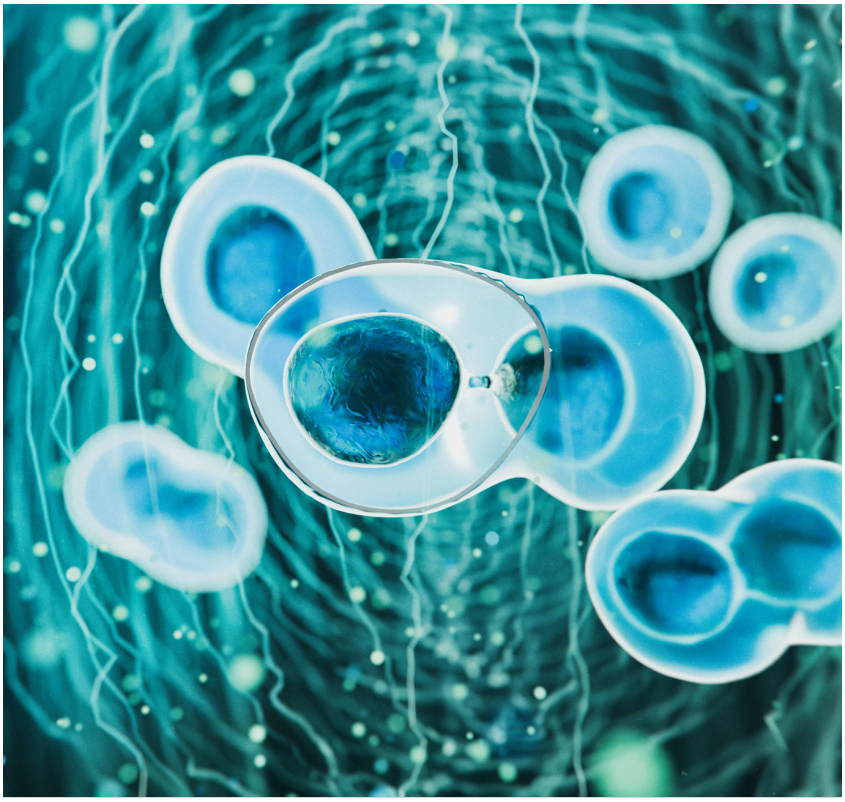
In efforts to create a diverse and accessible stem cell resource, ethnically diverse stem cell lines produced by NYSCF will be gene-edited with structure tags produced by the Allen Institute for Cell Science. They will then convert the tagged stem cells into neurons and astrocytes, two cell types implicated in Alzheimer's and Parkinson's disease.

The initial phase of the collaboration will focus on enhancing 24 iPSC lines from diverse ethnic backgrounds, with less than 25% of the cell donors being of European origin. The cohort includes 12 lines from healthy subjects and 12 with Alzheimer's and Parkinson's relevant genotypes. These iPSCs were created by reprogramming adult skin or blood samples, using an automated platform developed by the NYSCF.

Gene tags will be introduced into the cell lines, allowing scientists to visualize under live imaging conditions two cell components: the nucleus (by tagging LAMININ B1) and lysosomes (by tagging LAMP1).

The tagging strategy will utilize CRISPR/Cas9 technology whereby analyzed, imaged and followed. However, they are laborious to generate and need some specific expertise to ensure high quality," said Wesely.

By combining the Allen Institute for Cell Science's structure tags and NYSCF's stem cell automation technology, the partnership hopes



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Tagged iPSCs allow researchers to look at the cell structure in many disease-relevant cell types, such as neurons and immune cells, at different stages of differentiation, or different time points of drug exposure.

"The tags give us the ability to look non-invasively at living human cells at the subcellular resolution where we believe neurodegenerative diseases start and progress," Wesely said.

"The tags also give us the ability to study the same living cells over time, which is not possible with most approaches, because they require terminating the experiment to visualize cell structures. Thus, having these structure tags on iPSCs allows scientists to accelerate the amount of data they can generate, the number of questions they can ask and address within one or few experiments."

By combining artificial intelligence and machine learning with these structure-tagged cells, Wesely hopes it will be possible to identify and understand phenotypes that we have not been able to by traditional microscopy analysis.

COGNITIVE DISEASES HAVE NO BIAS, BUT RESEARCH OFTEN DOES

Producing diverse cell lines from healthy controls and neurodegenerative disease patients – in particular, patients with Alzheimer's disease and Parkinson's disease – will be the initial focus of the collaboration.

"Importantly these diseases have previously been studied in very non-diverse, mostly Western European patients and cell models. However, we know that there is substantial genetic heterogeneity," explained Wesely. "That means that specific risk variants may either function similarly in patients with different genetic backgrounds or very differently, leading to different phenotypes and reactions to medication."

Research has shown that ethnic minorities are at greater risk of dementia and Alzheimer's disease. Studying the disease among a diverse population is therefore essential to understanding how an individual's genetic background could influence disease progression.

In addition to including ethnically diverse cell lines, phase one of the collaboration includes nine stem cell lines derived from nuns, priests and brothers aged 65 years and older participating in the Religious Orders Study/Memory and Aging Project. This unique cohort adds an additional layer of significance to the resource and could present new insights into aging and cognitive health.

EXPANDING TO ADDITIONAL DISEASES AND ANCESTRAL BACKGROUNDS

Future phases of the collaboration aim to expand the scope of the project to include additional diseases and minority groups. In addition, they hope to develop new tagging technologies and integrate more complex cellular models such as organoids.

"The benefit of understanding the diversity of disease biology will be global since no group is spared these diseases, and what we learn from each gives us a better understanding of, and thus ability to combat, the disease overall," said Wesely.

Wesely concluded, "We would like to be an example of a collaboration where two institutions bring their expertise together to accelerate the scientific field, give to the science community and be an example of how we can overcome the low number of genetically diverse iPSC lines in our laboratories." ●

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Despite Progress, Research and Innovation Still Lack Gender Equality

WOMEN NOW REPRESENT 41% OF RESEARCHERS GLOBALLY, BUT EQUALITY IS STILL UNACCEPTABLY FAR AWAY.

MOLLY CODDINGTON

For many centuries, higher education was a privilege accessible only to men. In the United States, for example, women were not permitted to enter college institutions until the early 19th century, over 200 years after the first colleges were founded for men.

Thankfully, higher education has progressed significantly since those days when women were completely excluded. And yet, despite more women graduating per year than men, our journey towards equality in the research sphere is not over yet.

Significant challenges remain, as highlighted by the global publisher Elsevier's "Progress Towards Gender Equality in Research & Innovation – 2024 Review", which examined inclusion and diversity in career cohorts throughout different parts of the world over the last 20 years.

The report is a comprehensive evidence source for academic leaders, funders and policymakers, which will enable data-led actions to be taken to improve and promote gender equality in research and innovation. To increase the accessibility of the report's findings, Elsevier has created an interactive dashboard displaying key results.

According to the report, as of 2022, women represent 41% of all active researchers globally, an increase from 28% in 2001. This progression in diversity is not equal across all fields, however; in the physical sciences, women represent a mere 33% of researchers. Women's participation in the research workforce is also not equal across all countries and regions. In the USA and UK, women make up approximately 40% of researchers, compared to 33% in India, 30% in Egypt and 22% in Japan. Globally, women are receiving more grants than in previous years: in 2022, 37% of research grants were awarded to women, compared to 29% in 2009. While this 8 percentage point increase is a reason to feel optimistic, 37% is still far below 50%.

The key take-home from the report? Given the current pace of change

in our world and societies, equality remains "unacceptably far away", Elsevier said. So, what can we do to encourage progress?

Technology Networks interviewed Mirit Eldor, managing director of life sciences solutions at Elsevier, and secretary of its Inclusion and Diversity Independent Advisory Board, to further explore the report's key findings, discuss its recommended actions and learn how Elsevier is promoting diversity, equity and inclusion (DEI) as a global publisher.

Molly Coddington (MC): Can you share the history behind Elsevier's Progress Towards Gender Equality in Research & Innovation Report?

Mirit Eldor (ME): Elsevier is a global publisher with a history spanning nearly 150 years. We publish a significant portion of global research – about 20% of all research worldwide is published in Elsevier journals.

Beyond publishing, we are also an information and analytics company. Through this part of our business, we access comprehensive datasets from the research world, primarily through our Scopus database, which includes nearly 100 million records. Given our position in the market, we take our responsibility seriously and consider how we can positively impact our communities and wider society.

We realized that the data we have could help others make similar strides. We published our first gender report in 2015, which was focused on German research. This report analyzed the diversity of the researcher population, comparing participation and impact between men and women, and exploring ways to measure both. Two years later, we released our first global gender report, and we've continued to improve its scope and methodology ever since.

Our most recent report, published a few months ago, is the most comprehensive yet. It not only examines the representation of men and women in research globally but also provides granular insights by discipline, geography and career stage (early career, mid-career and late career).

Additionally, it evaluates the impact of researchers in various ways. For instance, if you're an engineer, you can delve into the data by discipline, country and career stage to better understand the progress being made. This multidimensional approach helps researchers, institutions and policymakers identify gaps and develop targeted strategies for improving gender diversity in research.

MC: How do you interpret the key data points from the report – what do they tell us about the current state of gender equality in research and innovation?

ME: There's definitely some good news – we're making progress. Looking at a 20-year time frame, we've seen substantial improvements. Women now represent over 41% of researchers globally, compared to just 28% 2 decades ago. That's remarkable progress. Similarly, in STEM fields – science, technology, engineering and mathematics – women's representation has increased to nearly 40%.

However, when we look more closely, there are areas where progress is still lagging. For example, fields like mathematics, engineering and computer science still see women's representation hovering in the 20–29% range. Additionally, among senior career cohorts, women only account for about 27%, so there's clearly more work to do.

Another challenge is the publication gap. While women now make up 41% of researchers, they contribute to only 35% of published research. This gap highlights that while representation is improving, disparities in research output remain.

One of the most surprising gaps we identified was in patents. Women are involved in only about a quarter of patent submissions. Even more striking, only three percent of patent submissions come from women-only teams, which is extremely low. This underscores a significant area for improvement in supporting women's contributions to innovation and intellectual property.

MC: Based on the surprising finding on patents, what do you think we can do to encourage women to commercialize their research?

ME: Women are often seen as pragmatic and multidisciplinary in their approach. Women are engaging in interdisciplinary research and influencing policies, so why not patents?

I believe we can support women in multiple ways. First, we need to provide training on the "how" – how to move research into the innovation sphere, how to approach patent submissions and how to navigate the process effectively. Second, financial incentives could encourage more diverse teams to pursue patents.

Inclusion and diversity have been areas of focus for Elsevier over the past decade. We started by examining our own processes – looking at representation within our journals, editors and conference speakers – and identifying opportunities to improve.

For example, providing funding or other resources specifically aimed at supporting women-led or diverse teams in innovation could make a significant difference.

Additionally, we should rethink how research is evaluated. Currently, evaluations are heavily based on bibliometrics, but we could broaden this to consider real-world impact, including patents. Patents are a tangible way to measure innovation and societal contribution, so integrating this into how we reward and recognize research could incentivize women to commercialize their work.

As for the data, it all comes from Scopus, the world's most comprehensive research database. Scopus includes not only journal articles but also other sources, such as policy documents. By analyzing these documents, we can track which research has been cited and contributed to policy development. This gives us a clear picture of the tangible impact women's research is having on driving change in the real world.

In terms of action points, this finding highlights the importance of supporting women in these critical research areas and ensuring their work continues to reach policymakers. Encouraging collaboration across disciplines and investing in initiatives that amplify women's contributions to SDG-related research could further strengthen their impact on policy and societal progress.

Ultimately, we need to combine educational support, financial incentives and a broader evaluation framework to create an environment where women feel empowered to innovate and bring their ideas to market.

MC: One of the 2024 report's key findings was that research by women is more likely to be cited in policy documents. Can you expand on where the data comes from, and whether there are any action points that we can take from it?

ME: Yes, policy is a particularly interesting area where women are outperforming expectations. In addition to policy, women also excel in multidisciplinary research and research related to the Sustainable Development Goals (SDGs).

These areas address some of the world's greatest challenges, such as education, peace and well-being, global health and gender equality. In all these fields, women are making a significant impact, and it's exciting to see their research contributing to societal and policy changes.

MC: Based on the data from the report, what would you say to people who feel unsure about how they can create change as individuals?

ME: Any change starts with one person as a first step – so we should never feel deterred from getting started, even if we are just one person.

For example, the first gender report published by Elsevier was initiated by employees who felt that they wanted to make a difference. These people then started to find other like-minded people within the company who also wanted to create change, and the initiative grew. They identified how they could utilize the data at their disposal. Ultimately the report was created to raise awareness and help academic leaders and policy makers become more aware of the gaps that still exist, and to encourage them to think about what difference they can make – so it was almost a ripple effect from one person's actions.

At an institutional level, there's a lot that we can do. Part of the reason why women don't progress to senior roles as much as men is often due to factors that academic leaders can influence. This might include the culture that

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the leaders create, the incentives they provide and their handling of biases that may exist in their institution.

MC: In your opinion, are some of the barriers that women face in research unique to research settings, or are they issues that are likely seen across wider employment disciplines?

ME: Some challenges are generic, such as work–life balance, managing family life if applicable and encountering bias barriers.

But there are unique paradigms in academia that can affect success for women. A key example being the funding model – researchers need to attract grants to progress in their careers. Grant allocations are another area of academia that the report assessed, and while there is progress for women, it's not quite enough yet.

The second unique challenge to academia is how research is evaluated, which is typically through bibliometric factors such as citations. The report shows that we could better support women's career progression in academia if we evaluated the success of research based on its impact on societal factors such as policies, on wellbeing or SDGs.

MC: Beyond the report, in what other ways is Elsevier promoting DEI?

ME: Elsevier is doing a lot of work to promote and advance DEI throughout the research and publishing process, which is conducted in collaboration with editors, partners, the research communities and other publishers.

One example is by increasing representation among editors and reviewers. We've made huge progress here over the last few years. Ten years ago, only ~15% of editors were women, which is unbelievable. Now, it's approximately 30% – still not where we want it to be, but it's certainly progress. This figure also varies across different types of journals. In our Lancet journals, for example, over 50% of editors and reviewers are women, which is much more representative of the landscape of health research.

Similarly, Elsevier holds many conferences and is actively working to increase equality and diversity across speaking panels. In 2015, 17% of speakers were women. Now, that figure sits at over 40%, which is fantastic.

Elsevier encourages equality and diversity by publishing guidelines and educational resources for researchers to help them ensure their research is representative. DEI is also an important consideration for our educational products. Human anatomy, for example, has been taught using male models historically. Elsevier developed a female model that is anatomically accurate. We've created resources to help clinicians diagnose skin disorders in people with different skin colors. These are just some examples of the major ongoing efforts at Elsevier to promote DEI. ●

It's not always easy to be an equality and diversity activist because we're aiming for systemic change. But systemic change only happens when many people take action to create small changes that eventually lead to larger waves of change.

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Allyship – How Do We Strive for a More United World?

NISHA POKAR, PHD

As we all do, I find myself wandering through life, questioning my direction. Like science, life involves collecting data points every day, which shape our worldview and influence our path. Naturally, everyone's data points are vastly different, and so are our opinions. My goal is to start a conversation on how we can strive to be better allies, particularly in STEMM. The future of STEMM depends on the full inclusion of all perspectives and experiences – because without them, our progress is limited. History has shown us that some of the greatest innovations have come from those who see the world differently. When we inadvertently exclude others, we limit society's ability to advance. So, how do we strive for a more united world that benefits from every perspective?

Even as a minority, I fear saying the wrong thing, unintentionally hurting someone, or leaving a group out. In the age of cancel culture, these worries are very real. But how can we find our voice if we refuse to use it? Being an ally isn't about being perfect – it's about showing up, learning and growing, even when we are scared. I may not be able to give you a three step-guide on how to solve the world's diversity, equity and inclusion problems, but I can help you to see how powerful you are.

EMBRACING GRAY AREAS

The world-famous scene from Matilda comes to mind here: "I'm smart, you're dumb. I'm big, you're little. I'm right, you're wrong!".

Like I said about embracing perfectionism, it's important to allow yourself to make mistakes. Similarly, it's important to be *allowing* of other people to make mistakes too. As humans, it is in our nature to make mistakes. For example, you may hear somebody use outdated terminology – it doesn't make them a bad person, it just means they don't know.

That being said, things aren't black and white. We live in shades of gray, yet we're often polarized to believe there are only two ways to think. We are not a monolith. No one group of people thinks the same. A great illustration of this complexity can be found in Anne Fadiman's book, "The Spirit Catches You and You Fall Down", which recounts the story of Lia Lee, a young Hmong child with

epilepsy. Lee's parents perceived her seizures as a spiritual gift to be developed, while Western physicians approached it strictly through a biomedical lens, seeking to cure her.

The tragic outcome in Lee's case wasn't simply about one side being "right" or "wrong." Instead, it came from a lack of understanding and cultural humility. Lee's doctors needed a collaborative approach – one that prioritized open dialogue and compromise. If we fail to acknowledge the moral hierarchy that places one perspective above another, how can we effectively engage with and understand different cultures? If we don't recognize that our own cultural background shapes our interests, emotions and biases, we risk misunderstanding others.

So how do we go forwards knowing this information? We communicate with each other. Not to be right, or to make others wrong. We communicate to understand each other. We don't play devil's advocate to intellectualize people's feelings, because it's rarely that simple anyway. When we notice ourselves becoming uncomfortable, we take a step back and we consider why we feel uncomfortable. We don't run away. After all, nobody ever grew in their comfort zone. So today I ask you: where can you listen more attentively? Perhaps it's a lab co-worker, your PhD student or even your supervisor. How can you respond with compassion and an openness to truly understand their world?

HAVE THE COURAGE TO TELL YOUR STORIES

Sharing your stories can be scary. What if people criticize my story? What if people make fun of me? What if people don't understand? What if people can't relate? The thoughts go on. But what if people love your story? What if people *embrace* you? What if people do understand? What if people can relate?

Mae Jemison, the first Black woman in space, is a great example of this courage. She famously said, "Never limit yourself because of others' limited imagination." In 1961, becoming a scientist wasn't realistic for the average person, let alone for a young woman of color. As she recounts in her memoir, "Find Where the Wind Goes", when her teacher asked what she wanted to be when she grew up, Jemison eagerly replied, "A scientist." Her teacher responded, "Don't you mean a nurse?". Standing her ground, Jemison replied: "No, I mean a scientist!"

Despite the pushback from others' limitations, Jemison had the courage to pursue her passions and dreams. By sharing her story, she expands the boundaries of what others believe is possible for themselves.

Remind me how your voice isn't important, again? I'm not saying it is easy, and I'm not saying you shouldn't be discerning, but I am saying it will be worth it. When your story reaches the right people, and when you focus on who your story will benefit rather than that small voice in your mind telling you to stop speaking, you'll realise how important you and your voice are.

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READ, READ, READ!

Or listen, listen, listen! Think, think, think! Ok you get the point. Educating yourself is so important. Did you know the idea of two fixed genders is a relatively new construct? For example, the Hijra people in India are a community of queer, trans and or intersex people with a documented history of over 4000 years. Mentioned in texts like the Mahabharata and Ramayana, they were historically acknowledged as a third gender until British colonial laws sought to erase them (Sharan Dhaliwal, 2022). Today the Hijra community continue to face discrimination.

Why am I telling you this? Because reading allows us to unlearn the narratives we were taught, showing us that trans, non-binary and gender-diverse people have always existed. This in turn allows us to be better allies in STEMM. We have a responsibility to educate ourselves about the issues marginalized groups face, and to create a supportive and inclusive environment for everyone. For example, trans people are at greater risk of violence and discrimination, so being aware of this when organizing events and conferences, especially in countries where discrimination may be more pronounced, is important. Holding events in unsafe locations inadvertently suggests that the safety and participation of marginalized groups are not priorities, driving away talented individuals.

If you see something wrong, speak up! Remember, if you aren't part of the solution, you're part of the prob-

lem. When we educate ourselves, we realize that diversity isn't new. It is a part of our human experience. Imagine how beautiful our world could be if we truly understood this and took the time to educate ourselves about people who have been historically silenced. Education leads to compassion, which in turn leads to change. So, let's commit to learning more.

IT'S NOT ABOUT ME VS. YOU

Have you heard of Oak Park pool in Montgomery, Alabama? Don't worry, I hadn't either until I watched Heather McGhee's TED Talk. This swimming pool, built with the tax dollars of both black and white families, was off-limits for black people. In the 1960s when this rule was finally deemed unlawful, the town's reaction was to drain the pool rather than share with black families. The pool was never rebuilt. In response to these desegregation orders, towns across the country followed suit by closing their public parks, schools and pools (Heather McGhee, 2021).

The moral of the story? Racism has a cost for everybody. It's a difficult conversation, I understand. But if scientists decided to ignore a problem in the hope that it would go away, would we have the medical and technological advancements we have today? Would we be able to live as long as we are able to?

EQUITY VS. EQUALITY

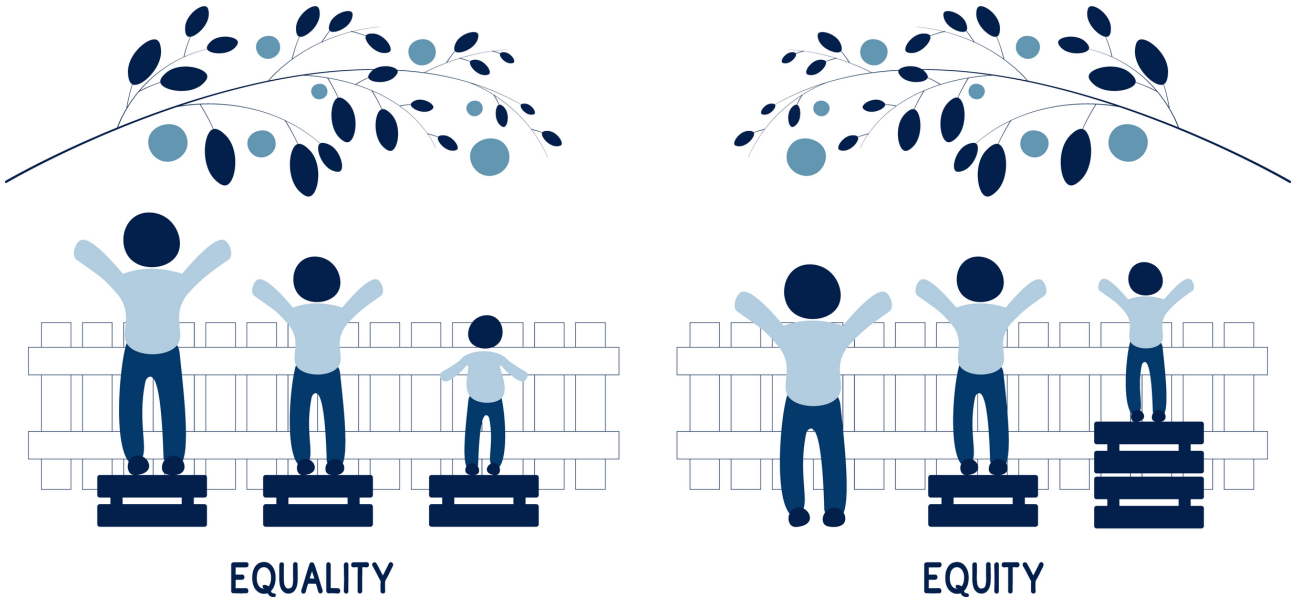
Have you seen that picture where a tall, medium and short person are each given the same sized box so they can look over the fence? The short person still can't see over it! This is *equality*, where everyone is given the same thing. *Equity* is when the short person is given an extra box, because it allows them to look over the fence in the same way as the other two people. It's easy to assume that providing the same resources is fair, but this perspective overlooks our differences.

In STEMM, advocating for equity means recognizing that reasonable adjustments can upset those who feel that providing additional support gives an unfair advantage. However, this discomfort often comes from a misunderstanding of what equity truly means; it's not about making things easier for some, but about ensuring everyone has a fair chance to succeed based on their unique circumstances.

What does fairness look like? It's a hard question. Like in a chemical reaction, where adding excess reagents leads to a change in equilibrium, striving for equity may require us to make adjustments that feel disproportionate at first. Sometimes the pendulum swings too far before finding its balance – but only by embracing these shifts can we ever hope to reach true equality.

MOVING FORWARDS

The journey towards a more inclusive and compassionate world starts with small but measurable steps. Allyship is not about having all of the answers, it's about showing up, ready to listen, learn and grow. It's about showing up even when it's hard and uncomfortable. So today I ask you: where can you listen more carefully? Where can you practice more empathy? Let's be the kind of allies who understand the path to equity is a collaborative effort. As a team, we can build a world where everyone feels seen. So I end with this: what's your next step? ●



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NEED TO DISSEMINATE YOUR RESEARCH? WE CAN HELP!

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We want to help connect scientists with great research and have created an easy-to-complete form and guidance to help distil the essence of your paper into a short, punchy article that will then be shared:

on our site, which receives over

1 million page views every month

with our

4 million + social media followers

in our

18 newsletters

and may be included in our regular

digital magazine

The Scientific Observer

Find out more

Transforming STEMM Through INCLUSION

Molly Coddington

Diversity, equity and inclusion (DEI) are essential to the continued growth and innovation of STEMM (science, technology, engineering, mathematics and medicine) fields.

A diverse workforce not only ensures a broad range of perspectives and ideas, but also fosters an environment where individuals from all backgrounds can thrive and contribute. Despite progress in recent years, significant barriers still prevent equitable access to STEMM careers, particularly for individuals from historically underrepresented groups.

In this article, we celebrate individuals who are working to address these challenges. Each has taken a unique path into STEMM and brings their own experiences and insights to their efforts of creating a more inclusive and equitable future. We explore their personal journeys, motivations and the initiatives they have spearheaded to champion DEI in their respective fields.

By sharing the stories of these champions, we hope to shed light on both the importance of diversity in STEMM and the practical steps being taken to improve representation and inclusion. These conversations highlight how fostering equitable opportunities benefits not only individuals but also the advancement of science and society as a whole. Let's meet our DEI champions.

Cristina Zavaleta, PhD

Dr. Cristina Zavaleta grew up in McAllen, Texas – a border town in the Rio Grande Valley (RGV), just a few minutes from Mexico. The RGV has a rich history with a predominantly Hispanic population and is located over 200 miles south of the closest "big" city, San Antonio.

Zavaleta credits her love of STEMM to her school's local science fair that took place when she was in 7th grade. Her project, "What Affects the Browning of Apples?" was Zavaleta's very first exposure to the scientific method. She formulated a hypothesis and tested how the application of sugar, water and lemon altered the rate at which her apples browned, even including a control group.

After winning first place in the science fair, Zavaleta's confidence in her abilities grew, and she knew that she had to keep pursuing STEMM. Her parents, who stressed the importance and value of education, encouraged her interests and were supportive of her love for science and engineering. Even still, Zavaleta's life lacked a clear mentor or role model – she didn't know anyone with a PhD, and there were limited opportunities to learn about PhD programs or engage in scientific research in the RGV. Sadly, she doubted whether she was "smart" enough to pursue a career in STEMM.

Tell us about your work that champions inclusivity and diversity in STEMM:

"Since receiving my PhD, I have had the opportunity to inspire and mentor students of all ages, including multiple Hispanic undergraduates who are now enrolled in PhD programs. Being able to return to the RGV and spark interest in students about science is very rewarding and has become a personal passion. It's particularly important in isolated communities to give students an idea of what is possible and foster their confidence to pursue a career in science and engineering. Having a role model that they can relate to is key in these communities.

As an associate professor at USC, I play an active role in supporting multiple groups on campus that focus on empowering minority students to pursue STEMM careers. I am involved in the Society for Hispanic Professional Engineers, Center for Engineering Diversity, and Graduate Pathways to STEM. I've given presentations to students from minority-serving schools in our neighboring area and invited them to tour our lab, where we conduct scientific demonstrations of our imaging research.

I also actively participate in local career fairs by running a booth in East Los Angeles, where elementary school students can meet and interact with engineers. Within my own lab, I have mentored several Hispanic graduate, undergraduate and high school trainees who have worked on various imaging projects. The students are paired with PhD graduate students who develop their own mentoring skills while having the trainees assist them in their research projects. The student trainees are responsible for designing experiments, analyzing data, reading journals and preparing a poster for

Zavaleta plays dress up with East LA students at a career fair. This exercise was meant to excite kids about science.

iStock modified, Dr. Cristina Zavaleta

their annual symposium. One of my first Hispanic undergraduate trainees has now transitioned to our graduate program at USC and is currently working in my lab to obtain her PhD.

Our lab also participates in the Gateway Scholars fellowship program at USC, which prepares and supports minority undergraduates to pursue higher education PhD programs.

It's important to expose students at this age to a multitude of career paths, and the "scientist" role is often overlooked due to a lack of awareness. I certainly didn't know anyone with a PhD growing up, and looking back, I wish I had. My plan is to get students excited about how we solve problems in the lab.

Advancing women in science and engineering

I have also been involved in supporting multiple groups within USC that focus on enabling women to pursue STEMM fields, including Women in Science and Engineering (WISE), Women+ in Engineering (W+IE), and the Society of Women Engineers (SWE). In 2021, women made up half of the total population from ages 18 to 74 years, but only a third of those were employed in STEMM-related occupations. My lab is passionate about getting more women involved in the sciences. I've had the opportunity to share my academic journey with several groups of young women and girls to help inspire them to pursue STEMM fields. I've been invited to speak at the Young Women's Career Conference for the Girls Academic Leadership Academy, the only all-girls public STEMM school in California for grades 6–12. Our lab was also chosen to be videotaped and featured in a National Academy of Engineering Outreach Program. We were interviewed by Sophie Poole, a National Academy of Engineering ambassador, to promote Girls in Engineering to middle school students. She featured our lab performing demonstrations and describing our research to inspire young girls to pursue engineering-based fields. Over the course of my career, more than 70% of the students I have mentored have been from groups underrepresented in STEMM fields.

I recently had the privilege of being invited to participate at the White House Initiative Summit to promote higher education for Hispanic students, where I heard U.S. Department of Education Secretary, Miguel Cardona, speak about the importance of advancing educational equity. I also participated in the Department of State's International Visitor Leadership Program, where I toured women leaders in STEMM from across the world in my lab and presented our research interests."

Natalie Kuldell, PhD

Dr. Natalie Kuldell studied chemistry at Cornell University before receiving her PhD in molecular and cellular biology at Harvard University. During her post-doctoral studies, Kuldell became a mother and realized that the demanding hours of an academic career would leave her with less time for her family.

Determined to find alternative ways to share her love for STEMM, she pursued a teaching career, eventually becoming an instructor at the Massachusetts Institute of Technology (MIT)'s Department of Biological Engineering. After teaching at MIT for over 12 years, Kuldell was inspired by her students' abilities to apply their knowledge of life sciences to solve real-world problems. She founded the BioBuilder Educational Foundation in 2011.

Biobuilder is a nonprofit organization that aims to provide opportunities for hands-on, experiential STEMM learning across the United States to better educate a future-ready workforce that will solve some of the world's greatest challenges with science. It was recognized as a 2024 BostInno Fire Awards honoree in the top ecosystem supporter category and was a Best of STEM award winner in the career and technical education in STEMM category.

Tell us about your work that champions inclusivity and diversity in STEMM:

"Through my work with BioBuilder, I hope to make STEMM education accessible to students throughout the country with the hopes of bridging the gap between those who gain a college education and for those who immediately enter the workforce. A recent Boston Globe Magazine-Emerson College Polling survey found that New England adults are not sold on the value of a college degree, with respondents nearly split down the middle. With BioBuilder, I hope to give the next generation of scientists a chance at impactful, wealth-building careers. My goal is to have a BioBuilder program in every high school in America; we are actively expanding into new regions that would benefit from a flourishing

A college education is not the right path for every young learner. Bringing STEMM education to young scientists where they are, into their high school classrooms, can help give them the spark that they need to jump into the world of science. At BioBuilder, we hope that by giving these students more exposure to the sciences, we can change the trajectory of their lives and support the growing biotech workforce.

Dr. Natalie Kuldell

bioeconomy. Since its founding in 2011, BioBuilder has worked with schools in over 66 countries and 49 states, impacting over 63,000 students across 1,179 schools, with the goal of matching the skills of our future workforce to the needs of the biotechnology industry.

Eva Schmid, PhD

Dr. Eva Schmid's journey into STEMM was fueled by a deep curiosity about human nature. With a strong passion for both biology and psychology, she faced a difficult decision when the time came to choose between the two fields.

Schmid ultimately pursued biology, a decision that led her into two decades of active research across diverse environments and countries.

As her career progressed, Schmid realized that what she loved most about science wasn't just the research – it was the people and the ecosystems that drive science forward, from the microcosms of individual labs to the diplomacy of campus-wide decision-making.

Schmid became deeply invested in understanding and shaping the scientific community, ultimately stepping away from the bench to focus on fostering growth in others and contributing to the thriving scientific society that she felt so proud of. She is currently the head of Vienna BioCenter's Scientific Training Unit, which is responsible for coordinating the training, education and professional development of undergraduate students, PhD students, postdocs and staff in leadership roles at member organizations of the Vienna BioCenter. Their activities include the organization of an international summer school, a PhD program and a pioneering leadership program. The interinstitutional setup of the training team has placed it at a vital position for steering a continuous evolution of work culture at the campus and beyond.

Tell us about your work that champions inclusivity and diversity in STEMM:

"During my time in the US, I volunteered on diverse initiatives, from outreach programs to inspire the next generation and engage the public in science, to suicide prevention efforts offering support to those in despair. These experiences shaped my understanding of the power of community and the importance of inclusivity.

At the Vienna BioCenter, I've been privileged to contribute to efforts that make our campus more inclusive and supportive. Small yet impactful initiatives, such as creating a nursing room, a family seminar room, gender-neutral restrooms, mental health support and anti-discrimination reporting structures (where I served as an ombudsperson for years) were achieved by raising awareness and working with dedicated colleagues and supportive management. I was also fortunate to build these initiatives on earlier actions pioneered by our institutes, such as the creation of pregnancy labs that allow pregnant colleagues to continue doing experiments in an environment that is safe for their unborn babies.

The program brings together leaders from across departments, representing different experiences, nationalities, genders and perspectives, to form a year-long cohort. Together, they learn, share challenges and successes and mentor one another. Participants include leaders from both research groups – the principal investigators – as well as heads of services and other departments. This draws on complementary perspectives and bridges all parts of our campus.

This program is now in its second year, and what I find especially rewarding is seeing a community grow that unites leaders as peers across backgrounds, institutes and cohorts. All participants in the program interconnect and remain active in peer groups, creating an ever-growing leadership community that transforms how our campus tackles challenges and fosters a culture that embraces differences rather than resisting them. I think this program is unique in its scope and achievements, and I am happy that we see strong interest from other institutions in adopting it as a model.

I believe that lasting change in academia stems from those who lead – not through authority, but by setting the tone and acting as role models for work culture. This belief inspired me to design and implement a comprehensive leadership program at the Vienna BioCenter.

Eva Schmid, iStock modified

Stephen Hancock

Stephen Hancock's career in STEMM came about serendipitously. Earlier in his career, he worked in public health behavior change communications in East Africa, and spent some time at an Oxford University medical technology spin-out. Throughout these experiences, he saw the STEMM sector's potential to drive innovation. Its ubiquity and intersectionality led to it becoming one of his greatest passions. Hancock pursued a career change and joined In2science UK, an award-winning social mobility charity that supports young people from lower socioeconomic backgrounds and underrepresented groups to unlock their potential in STEMM.

At In2science UK, a common topic of conversation is how the young people supported by the charity rarely have linear career paths. Hancock believes he is a testament to that, and challenges the common misconception that a STEMM professional is someone in a white lab coat. In 2024, he became In2science UK's CEO.

Tell us about your work that champions inclusivity and diversity in STEMM:

I lead In2scienceUK, a social mobility charity established in 2010 which focuses on empowering young people from low socioeconomic backgrounds and underrepresented groups to explore and pursue STEMM education and careers. Our aim is to break down barriers to STEMM by equipping those we support with the knowledge, skills and confidence needed to thrive in these sectors.

We do this by offering three separate programs, all of which are completely free for those participating. In2STEM and In2research both offer funded in-person placements alongside mentorship and employability workshops to Year 12 students and undergraduates respectively, while In2careers is an online platform that provides exclusive access to careers resources, events and other opportunities.

I'm pleased to say that we supported more than 1,000 participants across our programmes last year alone and 95% are working in a STEMM field.

A diverse range of backgrounds and experiences are an integral part of creating transformative solutions to tackle global challenges. We often hear from placement hosts that our participants have offered new perspectives on projects – these valuable insights should be welcomed.

Lisa Mohamet, PhD

Since she can remember, Dr. Lisa Mohamet has had a keen curiosity about biology and the human body – despite considering art college for a brief moment. She credits this natural interest and motivation, coupled with brilliant advocates and mentors, as enabling her to pursue a career that has spanned multiple disciplines and places.

Mohamet worked as an academic researcher at The University of Manchester for over 10 years. She harnessed her experience in human stem cell biology and regenerative medicine to co-fund a spin-out biotech company StrataStem Ltd, which utilizes stem cell technology to identify stratification opportunities for Alzheimer's disease. Mohamet was named as one of BioBeats' "Rising Stars" of the top 50 UK women entrepreneurs and leaders in biobusiness in 2016. In 2017, she joined the pharmaceutical company, GSK, as a scientific leader in preclinical R&D. In 2018, her team moved to the newly formed Functional Genomics department. Mohamet is now head of Translational Cell Science within Target Discovery and leads The

Stephen Hancock, Dr. Lisa Mohamet, iStock

Stem Cell & Complex *In Vitro* Models Centre for Excellence at GSK.

In early 2024, she joined the ELRIG UK Board as the People and Culture Work Group Leader, with the aim of helping to expand representation for scientific innovation and lead ELRIG's diversity and inclusion objectives.

Tell us about your work that champions inclusivity and diversity in STEMM:

There are two things that come to mind that I've had the pleasure of being part of to help drive inclusion and diversity in STEMM. Several years ago, I was working with ELRIG to help set up a new conference series for their organization. As part of the scientific organizing panel, we were tasked with inviting speakers to present at the inaugural meeting to be held in the UK. As the meeting was in full swing, I realized we had only one female presenter in our lineup, and I was horrified that I hadn't noticed it earlier! I brought this to the team's attention, and they immediately took action. Within a few months, they established a DEI group, implemented social mobility policies, and now have one of THE best DEI efforts among any scientific conference partners. Kudos to the ELRIG team that made this happen!

Secondly, as we formed a new large department at GSK, I wanted to ensure we also created a strong ethos of DEI within our growing team (~190 people) spanning the US, UK and Germany. We set out with a couple of focused goals, including increasing our ability to attract and recruit diverse talent by working closely with our recruitment partners to build relationships with institutions and groups with diverse representation, and ensuring the diversity of our interview panels to reflect this. We also embedded key training to increase awareness and active leadership of DEI, including reverse-diverse mentoring and inclusion dialogues. I was particularly inspired to see that over one year, we had significantly increased female representation in leadership roles.

There is an overwhelming body of evidence that shows how science benefits from diversity. What do I mean by that? Improving participation of under-represented groups or cross-sectional participation produces better research and outcomes, linking positive performance to enhanced diversity of women and cultural composition at the leadership level within large companies for example. A diverse team provides mixed perspectives that is associated with increased productivity for all STEMM.

Our champions share their hopes for the future of STEMM

"I am hopeful that the future of STEMM will continue to become more inclusive, where individuals will have equal opportunities to contribute and thrive, regardless of their backgrounds. We are fortunate at In2scienceUK to have built a diverse and inspiring community of volunteers, partners and past participants who are passionate about harnessing their knowledge and experience to give back to our young people, which gives me hope for a fairer future. Ultimately, my vision for STEMM is one that is centred on using innovation and technology to improve the human experience for all," – Hancock.

"I am optimistic, as there are many positive developments happening already. We are starting to rethink how we evaluate success in STEMM – prioritizing collaboration, mental well-being and equity. Change is slow and often challenging, but as we begin to see the results of diverse perspectives and talents, momentum will grow.

I hope the future of STEMM places leadership at its heart – leadership that builds strong and inclusive communities, fosters collaboration and supports individuals. On our campus, we aim to create a community of leaders who learn from one another, inspire and support their teams, and prioritize well-being alongside scientific excellence," – Schmid.

"With states and organizations beginning to remove the college degree requirement from STEMM jobs, I hope to see a future of STEMM where scientists of many different educational backgrounds are given educational opportunities that allow them to step into the workforce immediately after high school, and that these hands-on, experiential learning opportunities become more widespread and available to students all around the world," – Kuldell.

"A future without stereotypes about who should pursue a career in STEMM," – Zavaleta.

"That DEI is inherently part of our everyday in STEMM," – Mohamet.

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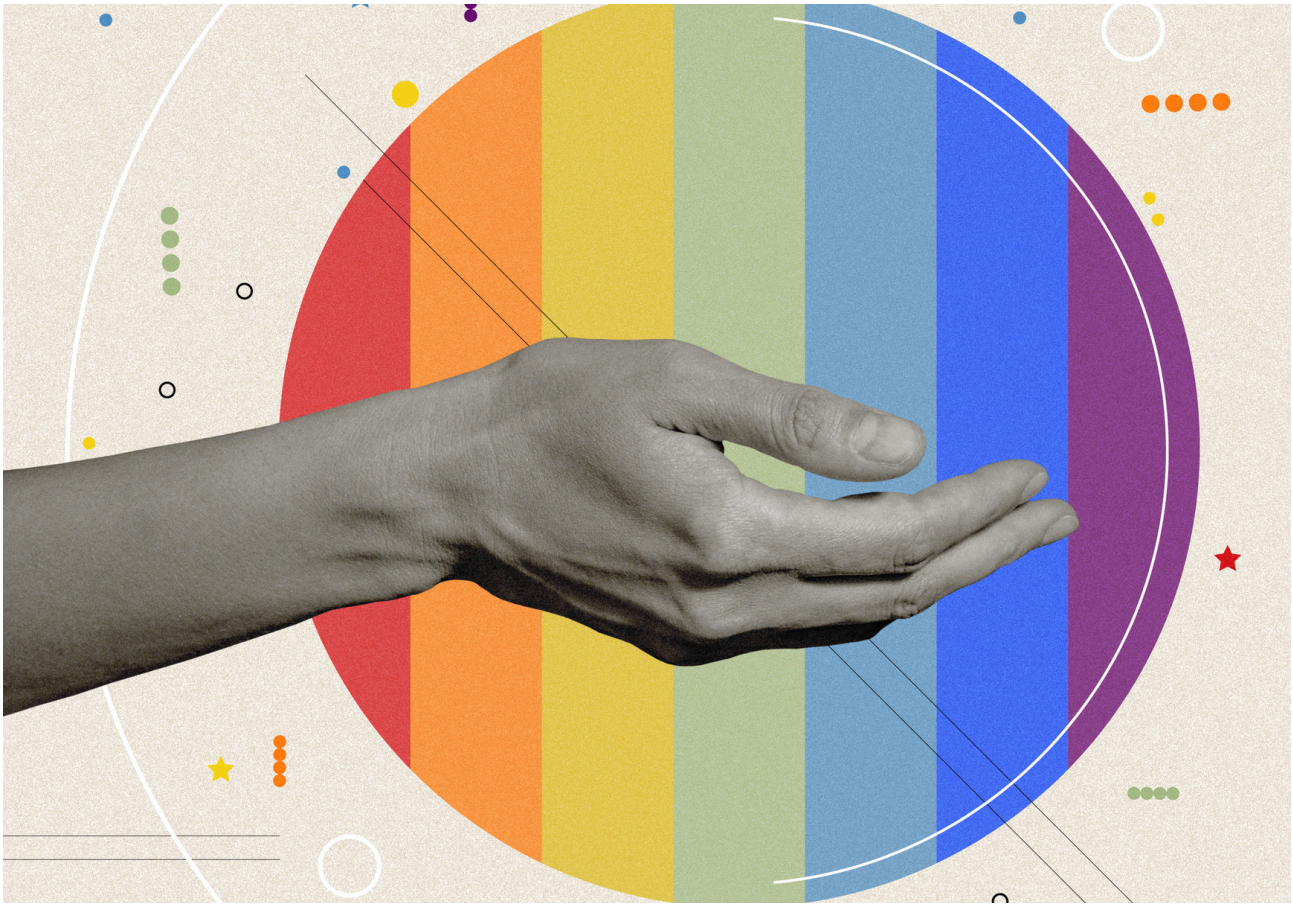

Pride in STEMM: Overcoming Challenges and Improving Inclusivity

KATE ROBINSON

LGBTQIA+ professionals working in science, technology, engineering, mathematics and medicine (STEMM) make incredible contributions to science, however, many face many challenges in the workplace, such as inadequate career resources and opportunities, social marginalization, and difficulties with health and wellbeing.

Here, LGBTQIA+ scientists from diverse fields share what they enjoy most about their work, discuss the primary hurdles LGBTQIA+ individuals encounter in STEMM and offer advice to young professionals entering the field.

Q: What do you enjoy most about working in STEMM?

Ashley Turner (AT): I love working in STEMM as it allows me to combine my two deepest passions of teaching and research into one career. Both areas are challenging yet incredibly rewarding components of STEMM that offer the opportunity to leave a lasting impact on society through two profound facets. The first is through novel discoveries and findings that help shed light on biological processes and the underpinnings of life. The second is by helping train the curious, competent and compassionate scientists and educators of tomorrow.

Avery Cunningham (AC): What I enjoy most about working in STEMM is that I feel it's a place where I get to be a huge nerd and solve problems. There's a sense of fulfilment in knowing that the work I do has the potential to make a positive impact on society. From when I wanted to work in nuclear energy and solve our energy crisis, to now where I support STEMM faculties through EDI, for me it has always been about making the world just a little bit better. I think the best thing we can all hope for is making a positive impact, no matter how big or small, on other people.

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Giles Oldroyd (GO): Even after more than 30 years as an academic, science still excites me. I love those moments of discovery, those moments when you see a result for the first time and suddenly you understand something in a way you didn't previously. I'm especially motivated by the prospect of my research having a tangible impact on the betterment of society and the planet. I really enjoy working with people, helping them as much as I can to advance their own thinking and move forward in following their passions. I really enjoy watching someone develop as a scientist and I am particularly appreciative when I can help women and minorities in science.

Raquel Cuella Martin (RCM): One of the things I like most about my job is that we are always surprised by how nature works. You often have an idea and a model at the start of a piece of research, a lot of the time what you are investigating doesn't work how you think it did. I really like that – I like to be challenged. I like that you have to be critical of your results, and sometimes you have to understand that the way you thought something would work is not how it works. I think there is something beautiful in understanding even if it's just the truth of how two proteins come together or how a process works.

Q: What are the main barriers for LGBTQIA+ people entering and progressing in STEMM, and what could be done to support them?

Ashley Turner (AT): Some workplaces have hostile or unwelcoming environments for LGBTQIA+ individuals, where they may feel pressured to conceal their identities or experiences to avoid discrimination or harassment. The lack of inclusion ignores the importance of LGBTQIA+ identities, discriminations of the queer community and the intersectionality of diverse identities and experiences. To support queer people in STEMM, it is crucial to take proactive steps to create inclusive and supportive environments. First and foremost, be an ally and an advocate. By addressing these barriers and implementing supportive measures, we can create more inclusive and welcoming environments, ultimately fostering greater diversity, innovation and excellence in STEMM fields.

AC: While the discrimination and biases faced by LGBTQIA+ individuals are prevalent across many sectors, the impact within STEMM is particularly pronounced. This is due to the traditionally male-dominated nature of these fields and a lack of diverse role models. Considering this lens is crucial, as it highlights the broader cultural challenges that need to be addressed alongside those unique to STEMM. Recognizing this overlap emphasizes the importance of our collective responsibility in fostering inclusive environments, not just within our professional domains, but in society at large. By leveraging the influence we hold in STEMM, we can spearhead initiatives that challenge these societal norms, promote diversity and create a ripple effect that encourages acceptance and equality beyond our immediate spheres.

GO: Diversity among leadership is lacking, and this reinforces the perception that success is only for a narrow sector of society. Greater representation at the higher levels of academia is not only good for diversity but it's good for innovation and for science. Mentoring LGBTQIA+ scientists and, indeed, all minorities, requires a sensitivity of understanding, which is often lacking in academic institutions dominated by scientists who have benefitted from their majority status. Peer support groups and sensitive mentors are really important to build the confidence of minority scientists and to help them thrive.

Jay Mandula (JM): Refusing to speak out about overtly discriminatory legislation is one of the most counterproductive approaches institutions can take. Visibly and vocally communicating to students and faculty that they will be supported and protected is essential. In instances where access to medical treatment or similar rights are being infringed upon, institutional provisioning of alternative services or care options can be lifesaving.

RCM: Employers sometimes fail to understand the realities LGBTQIA+ people face. Even in my workplace, I have had to explain to senior colleagues a couple of times what they/them means. Those senior colleagues might be unconsciously or consciously mis-assigning pronouns to nonbinary people who could be working for them. You could be in a workplace where people don't understand that if you have a same-sex partner, relationship dynamics might be different. It's very easy to make those realities invisible, to not be able to acknowledge or understand them or understand the challenges they could face.

Q: If you could give one piece of advice to young LGBTQIA+ researchers beginning their career, what would it be?

AT: Be unapologetically you and find your community. I am a proud member of the LGBTQIA+ community, and identify as queer, lesbian and a cis-gender woman. It is important for queer-identifying scientists and trainees, allies and really everyone to know, see, communicate and collaborate with other queer individuals and professionals in STEMM. Your unique perspective and experience as an LGBTQIA+ individual bring valuable insights to your work and contribute to the diversity and richness of your chosen field.

AC: Find your community. I wouldn't have finished my degree without the community I found. It's where I found role models to look up to across the UK and beyond, and where I found friends that kept me going through all that.

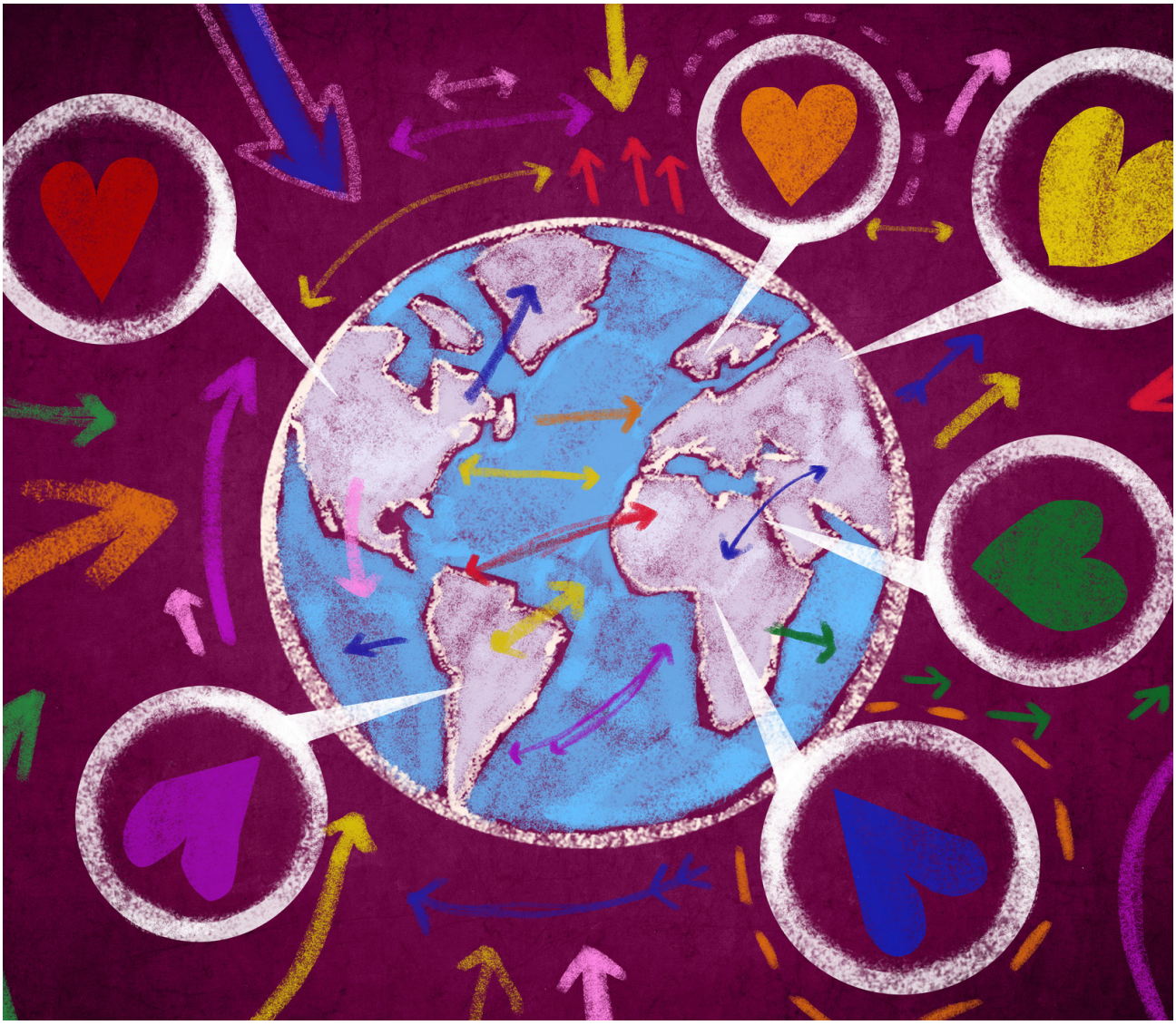
Daniel Bending (DB): You're going to be happiest in the lab where you feel most comfortable. When

looking at joining a lab, ask yourself if you will enjoy the research, if you are going to get good mentorship and if the environment is inclusive and supportive. I would encourage anyone interested in going to work or study in a lab to meet with the principal investigator or other researchers in the lab to gauge the work culture. I think feeling comfortable in your work environment is so important and that will be what keeps you engaged in the research.

GO: See your uniqueness as your strength. Try to not be afraid to turn up authentically as yourself at work. You have a gift to offer organizations: by presenting your unique take on sexuality or gender identity, you allow others at that organization to feel more comfortable in their own differences. It takes bravery to be openly queer. But I have learned that years of compromising your queer identity undermines your self-worth and ultimately is a path to poor mental health. Thriving as a scientist means thriving as a person. Be brave and show who you truly are – you may be surprised how positive the reaction could be.

JM: First and foremost, my advice would be: "You belong here, and don't let anyone tell you that you don't". I want young LGBTQIA+ researchers to know that they are not alone and that they have substantial value in contributing to the field of research. I would strongly suggest that younger LGBTQIA+ researchers seek out established LGBTQIA+ mentors in their research field of interest, as they play an essential role in offering advice on how to navigate any professional and interpersonal hurdles that may arise.

RCM: Your ability to change the environment that you are in is beyond what you can imagine. We always tend to gravitate towards safe places, but STEMM is not going to be a safe place in many institutions, and we need to work to create those safe places. So go for it, don't get discouraged, support yourself and people who have had the same experiences and educate yourself and the people around you. It's an uphill battle, and sometimes not one that you want to fight. But your place is here, in this field, in this job – so fight to create those safe environments for yourself and everybody else. ●



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Our Favorite Issues of *The Scientific Observer*

As we say farewell to *The Scientific Observer*, our editorial team felt drawn to highlight some of our favorite feature articles from the last 3 years and 39 issues.

From de-extinction research to emerging gene therapies, our magazine has covered some of the most topical issues in science and society. As promised in our very first issue, "whatever your preferred way of digesting science, we believe that there is a little something here for everyone".

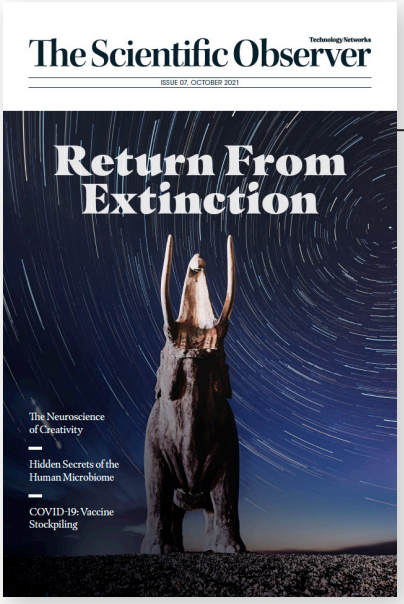
The *Technology Networks* team

All Cancers, Great and Small

ISSUE 5

In issue five, Dr. Kat Arney explored the prevalence of cancer across the animal kingdom, from simple organisms like Hydra to complex mammals. She discussed how cancer manifests differently across the animal kingdom and examined evolutionary trade-offs between growth, longevity and reproduction that influence cancer susceptibility.

"We are much less likely to get cancer in our lifetime than mice, but more susceptible than the giants of the mammalian world such as elephants and whales. Something doesn't add up here. If cancer is an inevitable consequence of multicellular life, then it should follow that the more cells in an animal, the more likely it is to get cancer."

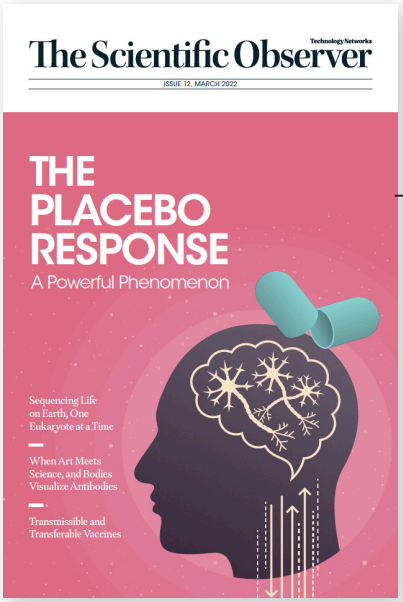


Return From Extinction

ISSUE 7

Extinction cannot be undone. But genetic engineering techniques are making de-extinction – the creation of a genetic hybrid version of an extinct creature – a possibility. In issue seven, we interviewed genetics giant Professor George Church. At the time of the interview, his company Colossal's journey to resurrect the woolly mammoth was just beginning.

"This project has really been in the making since 2006/2007, when two journalists asked me about the movement to read the Mammoth genome," Church explained. The journalists asked him whether it would be possible to use synthetic biology approaches to read and then re-build the Mammoth genome. "Their enquiries made me start to think seriously about it. When I came to the answer that, hypothetically, we could do it, I then thought well – should we do it?"

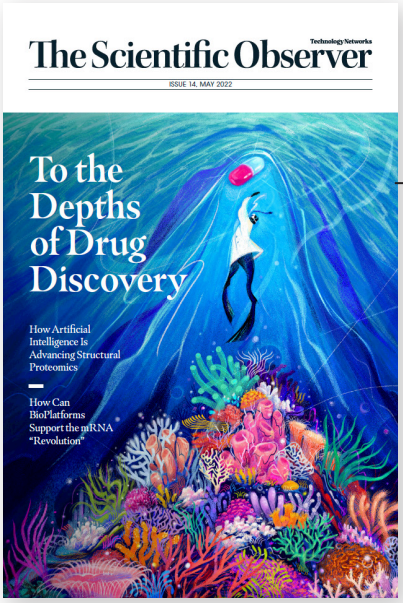


The Placebo Response - A Powerful Phenomenon

ISSUE 12

In issue 12, Laura Lansdowne interviewed Professor Ted Kaptchuk, a leading figure in placebo studies and a scholar of East Asian medicine. Lansdowne and Kaptchuk discussed the importance of humanistic dimensions of care, what is currently known about the neurobiology and genetics of placebo effects, open-label placebo studies and ethical use of placebos in clinical practice.

"They [patients] would walk out of my office with the prescription that I'd written. But they already looked like they were getting better as they walked out, their gait was upbeat and they looked more spirited," said Kaptchuk.



To the Depths of Drug Discovery

ISSUE 14

Issue 14's feature article explored the ocean's vast potential as a natural source of life-saving drugs. Molly Coddington highlighted the unique adaptions of different marine organisms that produce bioactive compounds, which can be used in drug development. The article also investigated the integration of cutting-edge technologies in marine natural product research and the importance of preserving biodiversity.

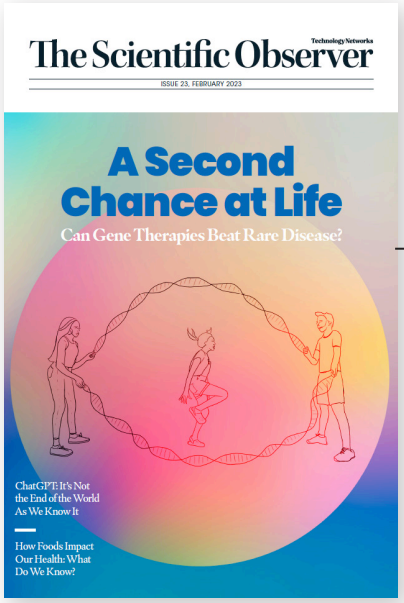
"The growing preclinical and clinical pipeline of marine-derived drugs points to a bright future for this fascinating field of research, and we're likely only just scratching the surface."

From Culture Plate to Dinner Plate - The Lingering "Promise" of Lab-Based Meat

ISSUE 16

In issue 16, Tanaaz Khan tucked into the field of cultured meat and its potential to revolutionize the food industry, addressing critical issues like sustainability, ethical concerns and climate change. The feature examined the technological advancements, challenges and societal implications of lab-grown meat and provided a look at its promise to reshape global meat consumption.

"Cellular agriculture might soon replace a portion of livestock agriculture, and there might be positive and negative repercussions."

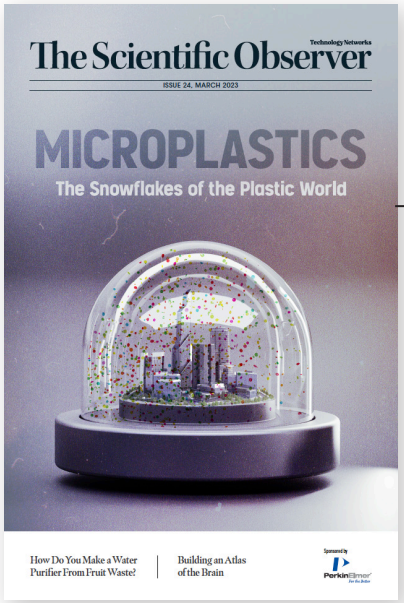


A Second Chance at Life - Can Gene Therapies Beat Rare Disease?

ISSUE 23

Issue 23 highlighted the devastation faced by families afflicted by rare, inherited disorders and considered how life-changing gene therapies could offer these patients a second chance at life.

"The battle against rare diseases is ongoing. Developing a successful treatment and screening program is an endeavor that can take decades. But the rewards for children like Joe are boundless and the price of failure is too great."



Microplastics - The Snowflakes of the Plastic World

ISSUE 24

In issue 24, Kerry Taylor-Smith confronted the pervasive environmental threat of microplastics, utilizing expert perspectives to explore this growing problem and highlighting technological innovations and global cleanup initiatives.

"Although we've known about the potential dangers of plastic pollution since the 1960s and 70s, early research consisted of one-off papers, meaning there was not enough understanding of the distribution and behavior of microplastics in the environment."

The Little Things - An Inspired Scientist's Pursuit for a Cancer Cure

ISSUE 31

Issue 31's feature article, written by Anthony King, follows Dr. Darrell Green's journey to developing a transformative bone cancer treatment. The article highlighted the dedication and ingenuity driving advancements in a field that has seen little progress for decades, offering hope for children afflicted by this aggressive disease.

"I want to see a new treatment that is available to kids with bone cancer, because the treatments that my friend Ben received 21 years ago are the same treatments that are still being used today. This just isn't good enough," said Green.

Meet the Interviewees

Meet the interviewees whose insights featured in issue 39 of *The Scientific Observer*:

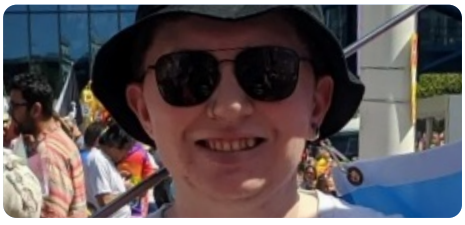
Dr. Ashley Turner is an assistant professor of biology at Jacksonville State University in Jacksonville, Alabama. Turner completed a BS and MS in biology at the University of West Georgia and a PhD in genetics, genomics and bioinformatics at the University of Alabama at Birmingham (UAB), where she studied neurofibromin function and human neurofibromatosis type 1 mutations.

Dr. Eva Schmid is head of scientific training at the Vienna BioCenter Scientific Training Unit, where she is responsible for coordinating the training, education, and professional development of undergraduate students, PhD students, Postdocs and staff in leadership roles at member organisations. Schmid completed her PhD at the University of Cambridge.

Dr. Brock Roberts is a scientist at the Allen Institute for Cell Science. Roberts earned a PhD in molecular and cellular biology from the University of California, Berkeley in 2015. He is a member of the International Society of Stem Cell Research and the American Society for Cell Biology. Roberts' specialisms include genetics, genome engineering and early human development.

Dr. Cristina Zavaleta was born and raised in McAllen, Texas, a small town on the border with Mexico. She received her bachelor's degree in Nuclear Medicine at the University of Incarnate Word, a small private university in San Antonio. After graduating, she started in the Medical Physics graduate program at the University of Texas Health Science Center in San Antonio where she focused on utilizing radioactive nanoparticles for the treatment of ovarian cancer. After receiving her PhD, she began a postdoctoral fellowship at Stanford University where she dedicated the majority of her time developing a new Raman imaging strategy for cancer detection. She is currently an associate professor at the University of Southern California in the department of Biomedical Engineering. Her lab focuses on providing physicians with better molecular imaging tools to improve cancer detection.

Avery Cunningham is the EDI business partner at Birmingham City University, vice president of international affairs at oSTEM and founder of STEM, LGBTQ & You. After completing a BSc in nuclear science and materials in 2020 from the University of Birmingham, Avery began working on widening participation in STEMM.

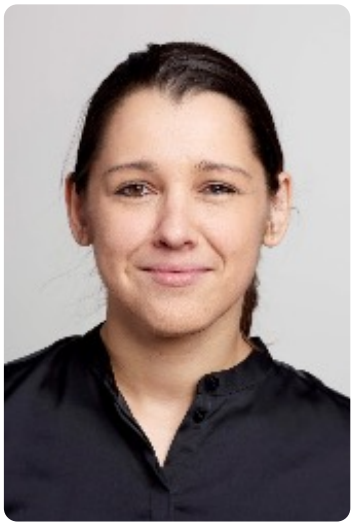


Jo Turner, Brock Roberts, Cristina Zavaleta, Avery Cunningham,

Prof. Giles Oldroyd is the director of the Crop Science Centre at the University of Cambridge, and leader of the global research consortium Enabling Nutrient Symbioses in Agriculture (ENSA). He is a leading expert on plant biology and one of the few openly queer scientists who have been inducted into both the prestigious Royal Society (UK) and the National Academy of Sciences (USA).

Dr. Jay Mandula is a postdoctoral researcher at the Pelotonia Institute for Immuno-Oncology and The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute. He completed his PhD in cancer immunology and immunotherapy at the University of South Florida.

Dr. Josephine Wesely is principal scientist at the New York Stem Cell Foundation (NYSCF). Wesely holds a PhD in biosciences from Goethe University Frankfurt. In her work at NYSCF, she applies CRISPR gene editing techniques to patient-derived cells to investigate drivers of various common and rare diseases, as well as develop better cell therapies.



Dr. Natalie Kuldell is a longtime leader in the STEM educational landscape, having been recognized in 2020 as a STEM Trailblazer by the Million Women Mentors and in 2022 with the HA Rey Curiosity Award. She taught for more than a dozen years in the Department of Biological Engineering at the Massachusetts Institute of Technology (MIT), where she saw how the application of life science to solving real-world problems fueled her students' interest and curiosity in science. In 2011, Dr. Kuldell founded the BioBuilder Educational Foundation as a nonprofit that works to bring hands-on STEM learning to high schools around the country to better educate a future-ready workforce that will solve some of the world's greatest challenges with science. BioBuilder was also recognized as a 2024 BostInno Fire Awards honoree in the top ecosystem supporter category and a Best of STEM award winner in the career and technical education in STEM category.

Dr. Lisa Mohamet joined the ELRIG UK Board earlier this year as people and culture work group Leader to help expand representation for scientific innovation and lead ELRIG's diversity and inclusion objectives. In 2017, Lisa joined GSK preclinical R&D as a scientific leader to head up the advanced cellular model platform group to support lead drug discovery programs. She is now Head of Translational Cell Science within Target Discovery and leads The Stem Cell and Complex In Vitro Models Centre for Excellence at GSK.

Giles Oldroyd, Jay Mandula, Josephine Wesely, Lisa Mohamet, Natalie Kuldell

Dr. Raquel Cuella Martin

is an assistant professor in the department of human genetics at McGill University. She earned her PhD from the Wellcome Center for Human Genetics at the University of Oxford, where she described the role of a DNA repair protein in response to "The Guardian of the Genome" – the tumor suppressor p53.

Stephen Hancock

For the last six years, Stephen Hancock has held a senior role at in2scienceUK, before stepping up as CEO in 2024. In2scienceUK is an award-winning social mobility charity that supports young people from lower socioeconomic backgrounds and underrepresented groups to unlock their potential in STEMM. Prior to this, Stephen has worked within education and technology, including public health behaviour change communications in East Africa and with an Oxford University medical technology spin-out.

Mirit Eldor

is managing director of Life Sciences Solutions at Elsevier. In her role, she supports pharmaceutical, biotech and life sciences companies around the world with trusted, data-led analytical insights that help research and development teams innovate effectively and efficiently using curated and validated scientific information. In addition to her role, Mirit serves as secretary of Elsevier's Inclusion and Diversity External Advisory Board, which aims to improve gender balance in academic research globally.

Raquel Cuella Martin, Stephen Hancock, Mirit Eldor