

Navigating STEM with Bittu K. Rajaraman: A journey of inclusion and inquiry

A genderqueer biologist's motivations, experiences, and insights into the challenges and triumphs of being a queer and trans scientist in India.

By **Dhruvi Nirmal** and **Bittu K Rajaraman** | Published on Nov 1, 2024

Bittu K. Rajaraman (he/they) is an associate professor of biology and psychology, and a genderqueer trans man who believes that the annihilation of caste, class, ableism and gender are necessary for queer and trans liberation. A distinguished figure in the Indian STEM community, they are known for their pioneering work in neurocognition and insect communication. Their journey in science, coupled with their advocacy for diversity, equity, and inclusion, offers a unique perspective on the intersection of identity and academia. In this interview, Bittu shares their motivations, experiences, and insights into the challenges and triumphs of being a queer and trans scientist in India.

To begin with, can you share something from your background, your motivations, and milestones in entering the path of science? What initially drew you to this field?

Thank you for having me. I've been fascinated by science since I was very young, around five or six years old. My parents are in academia, which definitely influenced me. However, I believe all children are natural scientists, curious about the world around them. Unfortunately, schools often discourage this innate curiosity. My journey into science was more about maintaining this natural curiosity rather than being specifically encouraged towards a scientific career. It's been a long journey of following my interests and passions, and fortunately, I've been able to turn that into a career.

It sounds like your family's academic background played a significant role. Was there a specific moment or event that solidified your decision to pursue a career in science, or was it a more gradual realisation?

It was definitely more gradual. While my family's academic background provided a rich environment for intellectual curiosity, there wasn't a single moment that solidified my decision. I was always deeply interested in understanding how things work, whether it was nature, animals, or the fundamental principles of the universe. Over time, this interest just grew stronger, and I found myself drawn to research and experimentation. It was less about deciding to become a scientist and more about never losing that childhood wonder and curiosity. As I progressed through my education, the path naturally led me to where I am today.

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Can you tell us more about your current work and the specific field of research you are involved in? What excites you most about your research?

Sure – I work on communication in insects and quantitative cognition in zebrafish. My research explores the neural basis of communication and numeracy. For example, in language, we abstract patterns in sound to derive meaning, while in numeracy, we abstract quantitative patterns. Understanding these processes in model organisms like zebrafish allows us to investigate these cognitive functions with large-scale neural imaging. My work also delves into economic cognition, social choices, and the neural underpinnings of these behaviours.

The most exciting part of my research is uncovering the similarities and differences between these two forms of cognition. Communication and numerical cognition are foundational skills we learn early in life, yet they involve complex neural processes. By studying these processes in simpler organisms, we can gain insights that might be applicable to understanding human cognition. There's something incredibly fascinating about seeing how these fundamental aspects of cognition are both shared and distinct across different species. It's like piecing together a complex puzzle.

Moving on to another aspect of your experience, how has your sexual orientation or gender identity shaped your approach to STEM research and your professional journey?

I've always been out ever since I recognized myself as a queer and trans person, which was sometime during my school years. Being openly queer and trans means I don't have an understanding of what my career trajectory would look like without these identities because I've never lived a closeted life. This has profoundly influenced my journey in science and academia.

One significant impact is how quickly we, as trans individuals, learn that the canonical literature often simplifies or misrepresents the consensus in various fields. The discourse within the trans community can be decades ahead of medical and scientific consensus, which teaches us an important lesson: textbooks are not immutable truths. They reflect the current consensus in the field, which is continually evolving based on new research.

Just because something is in a textbook doesn't mean it's unquestionably true. For instance, in school textbooks, information is rarely cited or referenced properly, which can mislead students into thinking that what they read is definitive. In reality, all scientific information should be critically examined, and students should be taught to question and verify the sources.

In psychology, for example, the field evolves so rapidly that today's textbooks can quickly become outdated and even problematic. We need to instil in students from an early age that critical thinking is essential. They should be encouraged to question and scrutinise their textbooks rather than accepting them as gospel truth.

As trans people, we often find ourselves ahead of the scientific literature, which forces us to be sceptical and critical thinkers. I remember my professors at Harvard University who taught developmental biology had no understanding of trans animals or what it meant to be intersex. These topics were not part of the curriculum, so unless one specifically researched intersex variations, one could remain entirely ignorant of them.

For example, as a non-binary trans person, I face the challenge of finding relevant information on non-standard, sub-clinical doses of hormone replacement therapy that aren't part of standardised medical procedures and therefore not covered in scientific research papers. This sometimes means I have to generate my own data to inform my decisions. This experience has reinforced the

importance of scepticism towards the current scientific consensus and has highlighted the need for continuous questioning and updating of knowledge based on lived experiences and emerging research.

This is the second time I'm hearing someone say that science is not concrete. It changes constantly, and it's not as objective as many assume it to be.

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Exactly. The objectivity of science increases with the inclusion of multiple subjective perspectives. For example, we use light metres to measure light intensity objectively because we recognise our own subjectivity in assessing absolute light intensity. Similarly, in neuroscience and behaviour, the research is influenced by both the subjects' and researchers' perspectives, which are each subjective.

Any research in these fields involves specific subjects whose experiences and social contexts influence the outcomes. As society evolves, what we consider factual about human beings will also change. Most researchers in neuroscience and behaviour understand this, but it's crucial to integrate this understanding into our teaching from the start.

Critical thinking should be a fundamental part of education from an early age. If we wait until advanced education stages, which are often inaccessible to many due to privatisation, we miss out on nurturing potential scientists. We need to rethink our education system to foster a scientific society where critical thinking is encouraged from the very beginning, ensuring that science is inclusive and accessible to all. I have to say, politically speaking, what also shapes my anti-caste and anti-class perspectives is my understanding that all of these structures are terrible for science.

Coming to my next question, what challenges have you faced as a non-binary trans person in STEM, and how did you navigate them?

In my field, and in most academic contexts I've been in, I've often been the only trans person. While there are now many younger trans researchers and we have developed a mentoring network to support more individuals entering the field, the representation is still quite limited, especially among my age group. I know only one other trans academic older than myself in the country.

The discourse around gender in science typically focuses on women in science. However, in India, due to the historical visibility created by the struggles of traditional trans-feminine cultures, Indian feminists are generally more receptive to trans representation compared to other parts of the world. Nevertheless, it will take time for the conversation to evolve into one that fully includes trans men, non-binary individuals, and intersex persons in the broader discourse on gender in science.

Did you find any organisations or support groups on campus that were helpful when you were starting out? You mentioned being one of the first transgender persons in your field. Now that you are mentoring others, what kind of support groups or organisations did you have, and what are you providing now? What differences have you seen?

At Harvard, I was part of an existing trans organisation, which was a great support. When I returned to India, there was a pre-existing queer group at the Indian Institute of Science (IISc), but it wasn't very active. A few of us restarted it, and I was the first openly trans person in its history. This group, now called QUASI, still exists today.

At the University of Hyderabad, I was again the first openly trans person on campus, but as a faculty fellow, and I helped form a student cell for future trans students. Now that trans students have joined the University, they have been working on improving its structure and taking it forward. At Ashoka University, I was the first trans person I knew of on campus, but now there are around 70 trans persons on campus, creating a large and thriving community.

Science should be accessible to everyone, and we need to dismantle the barriers that restrict who can participate. The concept of a scientific society won't become a reality if we keep enforcing these artificial ranks.

How do you think your identity has impacted your professional, academic, or social experiences? You seem very comfortable with who you are, and it doesn't seem like you were ever afraid to come out about your trans identity.

I'm sure my identity has had an impact, but as you mentioned, I don't spend much time thinking about it. I prefer not to deal with people who might have an issue with it, so I simply don't focus on them. Some people might wonder where they'd be if they weren't out, but that's not something that interests me. I'm not driven by ambition in a conventional, ableist sense, and I don't care much for status or prestige in the scientific world, which I find quite flawed.

Science should be accessible to everyone, and we need to dismantle the barriers that restrict who can participate. The concept of a scientific society won't become a reality if we keep enforcing these artificial ranks.

Yes, I've faced microaggressions, rudeness, and hostility. Sometimes there's a lack of infrastructure, like bathrooms for someone like me, or people who are simply scared of what they don't understand. But I tend to set the expectation for respectful behaviour, and most people rise to it. For those who don't, I don't waste time on them.

I've been openly trans from a young age, so I haven't spent much time weighing the pros and cons. The simplicity of just being myself without worrying about others' opinions is a huge relief.

Did you find any role models or mentors when you entered the field of STEM?

Yes, absolutely. Understanding what it meant to be trans and finding others like me was incredibly helpful. Growing up, I assumed there weren't many people like me, and that was fine. However, when I realised there were other trans people in STEM, it gave me a sense of belonging and purpose.

For example, during grad school at Stanford University, I became aware of trans faculty members like Ben Barres, a neuroscientist and passionate advocate for gender equality in STEM. He was a strong ally to cis women in STEM as well. Then there was Joan Roughgarden, an evolutionary biologist who wrote *Evolution's Rainbow*, a fantastic book that explores the biological and societal

aspects of sex and gender across various species. It's an eye-opening read, and I highly recommend it to everyone.

Meeting Joan during my Stanford interview was significant, although she might not remember it since I was one of many PhD candidates. Unfortunately, I never met Ben Barres, which is one of my regrets. Nonetheless, knowing that trans scientists like Ben and Joan existed was immensely encouraging. It showed me that there was a place for trans individuals in science, which made a big difference in my journey.

When you meet a trans colleague, don't whisper or speculate about their identity. Just introduce yourself, ask for their chosen name and pronouns, and use them. Respecting their self-identified name and pronouns is the first step in being an ally.

What would be your advice to cisgender professionals on campus to help them become better allies to the LGBTQIA+ community?

My first piece of advice is simple: when you meet a trans colleague, don't whisper or speculate about their identity. Just introduce yourself, ask for their chosen name and pronouns, and use them. Respecting their self-identified name and pronouns is the first step in being an ally.

Some people might struggle with this because it requires a cognitive shift. However, as academics, we need to be adaptable and comfortable with quick changes in thinking. We are constantly encountering new information, so applying this flexibility to understanding and respecting gender identity should be part of our professional behaviour.

Another crucial aspect is ensuring that trans people have basic infrastructure to support their needs. This includes having gender-neutral bathrooms or single-stall bathrooms that anyone can use. This simple change can make a significant difference in making spaces accessible to all genders.

Additionally, when reviewing applications for jobs or admissions, be aware that trans applicants might have different names and genders on their documents. Understand that these discrepancies are not fraudulent but part of their identity. Ensure that such applications are not automatically disqualified during clerical checks.

Overall, respect, adaptability, and inclusive infrastructure are key. By incorporating these practices, we can create a more welcoming and supportive environment for the LGBTQIA+ community on campus.

Most support schemes for parenting, especially in science, are designed with cisgender women in mind and don't include transgender parents.

Would you like to share your experience as a working transgender parent?

Being a trans working parent involves a large amount of work because we don't have the same support structures as cis-gender parents. Teachers and other parents at my child's school often don't know what to make of us as parents, which leads to us being misgendered frequently.

Additionally, very few workplaces offer gender-neutral parental leave. For example, while my workplace does provide this, many do not, and even fewer allow time off for queer partners to help with childcare, that's the case for my partner.

Most support schemes for parenting, especially in science, are designed with cisgender women in mind and don't include transgender parents. These programs should be redefined as gender-inclusive rather than exclusively for women, recognising that the term "women" often implies cisgender and binary identities. By highlighting these issues, we can hopefully shift the discourse and bring about necessary changes.

What are your long-term goals in your scientific career? How do you see your work contributing to the advancement of your field?

I don't tend to have long-term goals in a scientific career. I am lucky to work on science and to work on questions that interest me. One hopes that in the medium to long run, we'll be able to do work that helps us understand, very basically, how brains produce communication and quantitative and mathematical cognition. This has specific applications for the ways in which we do interventions around education and health, as well as in how we deal with climate change, because some of the communication work that we have has applications in monitoring biodiversity.

Bittu's wishlist for diversity, equity, inclusion and accessibility in science in India

Basic Setup Protocols:

- Ensure job application portals do not assume that all names and gender markers on submitted certificates are mutually consistent.
- Screening committees should not expect consistent names and gender markers due to possible changes along a trans person's trajectory.

Entry Criteria:

- Adjust criteria for entry into institutions to accommodate trans persons' varying documentation.

Infrastructure Requirements:

- Provide gender-neutral washrooms in every building on campus.
- Alternatively, implement single-stall bathrooms that anyone can use, as they are less complicated infrastructurally.
- Ensure trans-affirmative housing is available.

Operational Inclusivity:

- Allow individuals to operate within the institution using their chosen name and gender, regardless of what is on their official documentation.

- Enable the selection of institutional email IDs that reflect chosen names rather than assigned names.
- Ensure course administration and attendance sheets align with individuals' preferred names and genders.

Support Measures:

- Implement sensitisation programs and establish anti-discrimination cells.
- Recognize and include queer relationships, partnerships, and parenting within institutional policies.

Addressing Broader Issues:

- Combat the ongoing scourge of casteism in India, which intersects with class and language issues, particularly given that English is the primary language of scientific instruction.
- Change the way science is taught and practised to move away from a Brahminical approach. Instead of viewing science as a set of recipes to learn, promote critical thinking, troubleshooting, and understanding the rationale behind scientific processes.

Notes:

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