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**INTERNATIONAL
WOMEN'S DAY
SPECIAL**

OF EXPERIENCE AND LEARNINGS

CHARTING MY PATH AS PHYSICIAN, WOMAN AND MOTHER IN SCIENCE

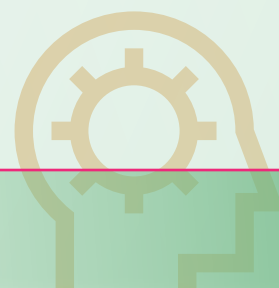


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➤ Dr Karishma S. Kaushik is a physician-scientist at the Savitribai Phule Pune University. After her MBBS from Maharashtra University of Health Sciences and MD in Clinical Microbiology from Armed Forces Medical College, Pune, she earned a PhD in Molecular Genetics and Microbiology from the University of Texas at Austin. After a stint as an Assistant Professor of Instruction in Biology at the University of Texas, she returned to India

as a Ramalingaswami Fellow in 2018 and established her research group at the University of Pune. She employs laboratory and clinical approaches towards the study of wound infections. This ranges from developing a human-relevant wound infection model system to the long-term characterisation of microbial populations from patients with chronic wound infections.



WITH an education and career that has spanned two decades across medicine and science, in India and the United States, and a research focus that has included interdisciplinary domains across microbiology, biological physics and bioengineering, the charting of a unique career path has been a major feature in my life.

I was born in Mumbai, to a lawyer-businessman father and physician-mother, and the pursuit of formal education has always had an important place in our family. I am one of two sisters; my younger sister is a corporate lawyer, and while there was no pressure, it is special that we happened to choose the professional paths of our parents!

Soon after graduating from medical college, I decided to move away from the practice of medicine and chose laboratory medicine as a career path. I did my MD in Clinical Microbiology at the Armed Forces Medical College, Pune. During this time, I had the opportunity to lead a nationwide project to genotype clinical varicella-zoster strains in India.

To learn molecular biology tools related to the work, I visited a research laboratory in the vicinity. It was there that I was first exposed to basic science and 'bench research'. From the PhD students in these laboratories, I learnt how to cast gels, design primers, and select restriction enzymes. It was a steep learning curve for a medical doctor, but I could see I was enjoying the excitement of conducting science and building a research project. The project led to the first large-scale characterization of varicella-zoster strains in India and was the turning point in my professional path.

Deciding to formally train as a physician-scientist, I moved to the United States after marriage. I did my PhD in Molecular Genetics and Microbiology at the University of Texas at Austin. I worked in an interdisciplinary biological physics laboratory, with crosstalk across engineers, chemists, mathematicians, and physicists; I was the only medical doctor in the programme.

In the first few years, I grappled with quantitative data analysis and physics-based models. Here I was a medical doctor trying to make sense of diffusion coefficients and constants, and learn optical trapping and interpolated surface methodologies. I also worked as a teaching assistant for several semester-long courses and laboratory sessions.

Around this time, my husband and I decided to have a child, and our son was born in the second year of my PhD. Since the PhD programme did not have stipulations for maternity leave for international students, I returned to the laboratory and doctoral coursework within three weeks of our baby being born; a colleague covered my teaching commitments during this time. On both the scientific and personal front, this phase in my life demanded the next level of time and task management, drive and commitment. Looking back, this was my training ground for both a scientific career and life; these skills have been invaluable in navigating the return to India, and early-career investigator track.

After my PhD, I decided against the traditional post-doctoral route and instead took up a teaching professorship at the University of Texas at Austin. In addition to the fact that I enjoyed teaching and curriculum development, there were two major reasons for this. Firstly, I was confident in developing and executing my own research ideas, and secondly, I wanted time to plan my return to India. During this phase, I wrote

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grants to support my re-entry into the Indian system, as well as visited India several times to better understand the ecosystem. In 2018, after a decade in the United States, I returned to India as an early-career investigator leading my own research group in human-relevant infection biology. I often say, 'I left India as a physician, and returned as a scientist!'

My independent research group is based at Savitribai Phule Pune University — a large, state-funded university in India. Our research focuses on biofilms relevant to wound infections and the oral microbiome, developing pre-clinical infection models for antibiotic development, and discovering novel anti-biofilm approaches, for which we use a combination of bioengineering, bioinformatics and cell biology, in addition to classical microbiology. In addition, my role involves teaching a vast pool of undergraduates, and our group contributes to science in several ways across policy, education, communication, and outreach. A far cry from being 'holed up in the academic ivory tower', we are a dynamic and vibrant group that is deeply committed to the larger science ecosystem in India, which is reflected in the numerous community and nation-building initiatives we lend ourselves to.

Taken together, I started my independent research career with substantial research and teaching experience, along with a solid understanding of microbiology and medicine. Nevertheless, at an individual level, nothing can quite prepare you for the depth and breadth of skills needed to run one's own research group. I have transitioned from medicine to science, done a PhD in a biophysics group, and had a baby during a PhD, and yet those challenges paled in comparison to the rugged climb in the early years as an independent investigator.

Beyond leading and envisioning the science, I found myself needing to rapidly learn many new things at once, including building a research team, grant and project management, procurement and purchases, and collaborative networking. The sheer unfamiliarity of it all, and the lack of peer support, often made me feel like an 'outsider' to Indian science. At a personal level, I drew on all the experience I had with handling unprecedented personal and professional change.

At a professional level, I reached out to colleagues and mentors across the research enterprise in India. Beyond the inputs and advice, they, most importantly, provided a listening ear. Reaching out to colleagues also enabled the research in my group; we built valuable academic and industry collaborations, as well as community initiatives such as a national group of biofilm researchers in India. A few years on, it gives me immense satisfaction to say that our group has made several research contributions, including human-relevant approaches to understand biofilms, a large



Science education, doctoral programmes, and independent research not only constitute a tough path, but can also bring with it a daunting sense of isolation. This is particularly relevant in the context of women scientists who often face family resistance to advanced education, challenges related to marriage and relocation, and motherhood and time away from work.

repository of antimicrobial peptides for biofilm studies, and the early evaluation of certain novel anti-biofilm approaches.

As evident through my career journey and the stories of other scientists, science education, doctoral programmes, and independent research, is not only a tough path, but can also bring with it a daunting sense of isolation. This is particularly relevant in the context of women scientists who often face family resistance to advanced education, challenges related to marriage and relocation, and motherhood and time away from work.

Further, professional ‘gatekeeping’ in science, in the form of glass ceilings, inner circles and cliques and hierarchical structures, often leaves women out of positions and promotions, committees and decision-making, and leadership roles. Taken together, the challenges for women in STEM are manifold, and can be traced to girls’ education, science as a profession, as well as societal views.

However, at the level of the scientific research ecosystem, there are certain relatively simple measures to build conducive professional environments for women. These points arise not only from the experience of my own professional journey but also from learnings from conversations with fellow women scientists. These aspects have been discussed at various committees, conferences, and seminars in India, including the more recent re-drafting of our national science policy. It is imperative that we see a uniform policy covering these aspects that can be applied to universities, central institutions, and institutes of eminence, and across both government and private establishments.

Removal of age-related cut-offs for positions, awards and recognitions: Women in science do spend substantial years, often immediately after their education and in the prime of their careers, related with ‘child bear, child care, and child rear.’ Prestigious awards with strict age cut-offs do a disservice to women who have survived decades that have demanded attention on the personal front. The award lists are, therefore, not surprisingly, overrepresented with men in science. Instead of age cut-offs, years since the start of one’s independent research career, with relaxations for women and underrepresented groups would herald the change.

Parental leave that can be availed of by both partners: This is important, particularly in a society where the women bear the larger chunk of childcare responsibilities. For women in science, their male partners are often scientists themselves,

Building Conducive Professional Environments for Women

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- Breast pumping room and child care facilities
- Flexibility for dual career and relocation situations
- Positions for women with non-traditional career paths in academic science

and they most certainly work outside the house. Parental leave for both partners means that childcare responsibilities can be shared, and further, it sends a strong message in terms of inclusion for mothers in science.

Breast pumping room and child care facilities: This is a simple fix, and yet several establishments have either no mothers’ room at all or run-down rooms doubling up as bathrooms. A breast pumping room needs a chair, a table, an electrical point and a small fridge, apart from a clean and well-kept space. Similarly, part of building science clusters in our cities should be building faculties such as childcare that can be shared among scientists in the vicinity.

Flexibility for dual career and relocation situations: While select institutes do hire couples, it is important that this provision moves beyond only scientist couples. For women, the challenges of building two careers exist even if one’s partner is not a scientist. Flexible and rolling lateral-entry positions in institutes would allow partners to work in the same city, and importantly it would mean that the woman partner does not have to give up or dampen her professional pursuits.

Positions for women with non-traditional career paths in academic science: Along with the removal of age cutoffs, these changes will foster interdisciplinary experts and diverse skill sets, which most often require longer durations of study and experience; for example, proactive hiring of quantitative biologists or physician-scientists in research institutes.

These points are certainly not all-inclusive, and there are several unaddressed aspects, particularly those related to women with added caste and socioeconomic discrimination, and the LGBTQIA+ community. So far scientists from these underrepresented groups, including women, have relied on drive and commitment, along with personal privilege, if any, to survive and possibly thrive, in academic science. To bring about a comprehensive change towards inclusion, academic agencies, policy groups and ministry-level decision-makers, will need to streamline suggestions from stakeholders into ground-level realities.

