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Women in physics: an interview with Urbasi Sinha

Urbasi Sinha is a Professor of Light and Matter Physics at the Raman Research Institute, India. Her research is in the field of quantum technologies, where she uses experimental methods to investigate quantum information processing, precision tests of quantum mechanics, photonic quantum computing as well as quantum communications including quantum key distribution (QKD) in free space, fibre and integrated photonics.

Credit: Urbasi Sinha

Urbasi was named as one of Asia's Top 100 Scientists in 2018, received the ICTP-ICO Gallieno Denardo Award in Optics in 2018, was appointed a Simons Emmy Noether Fellow in 2020, awarded the Chandrasekarendra Saraswathi National Eminence Award in Science and Technology and the Canada Excellence Research Chair in Photonic Quantum Science and Technologies both in 2023.

Why did you choose to be a physicist?

Physics describes the universe, so, in my view, this is the field to pursue if one wants to be a scientist! The choice of pursuing science stems from my very early years as I had a natural inclination towards science and maths-based topics in school, and I was always intrigued by various natural phenomena. I am a logical, curious, and rather direct person and thus the scientific method has been a natural choice of vocation. I must say that the support that I received from my parents (both not scientists) to pursue pure science throughout my formative years has been instrumental in making my choice a reality.

What scientific developments are you most excited about?

The mind-boggling developments in my own field of research, i.e. quantum science and technologies, are of course very exciting to me. Quantum security being used in practical sectors, the advent of the NISQ era for quantum computers already providing exciting results to be improved upon, and commercial quantum sensors are all phenomenal developments that occurred over the last couple of decades. Outside of my research area, I am also excited by the observation of gravitational waves by LIGO interferometers, the James Webb telescope and its fascinating findings, as well as new breakthroughs in cosmology and high energy physics. Instead of naming each and every exciting development, I would simply say that exciting science is happening every day in one or the other corner of the world. The development of sophisticated technological tools has made certain explorations possible, that were earlier more in the realm of science fiction. This is truly a great time to be pursuing science.

In your view, what are the issues women are facing in terms of diversity and inclusion in academia? What has been your experience?

Let me answer this by referring to an interesting situation that was portrayed in the Barbie movie. In Barbie-land, Barbies decide on everything, they manage every sector while the Kens exist simply as an add-on to the Barbies. When Ken and Barbie visit the real world, Ken realises that it is not quite the same as in Barbie-land. Men still seem to be in control of most things and patriarchy is still pretty much the rule of the game. Becoming a promoter of explicit patriarchy, Ken questions the effectiveness of the real world in implementing it, failing at realising that patriarchy in the real world is often disguised.

Indeed, both explicit and implicit patriarchy plagues women in academia. While now there is a lot of discussion on diversity and inclusion and some affirmative action is also being taken to enable the same, recognising the implicit patriarchy is way more subtle. In this sense, we still have a long way to go before we can declare that we indeed have a diverse and inclusive environment in the world of academia.

Regarding my personal experience, as a student and a junior scientist, I did not face a lot of gender-related issues. However, as I started climbing the ladder in more senior faculty roles, I found increasing hostility towards personal successes by several colleagues. I have been advised by a very wise mentor that this feeling will only increase as we achieve more successful academic results. I was hurt for a while but now I say: "bring it on". I will achieve and excel, in spite of my gender. After all, if we give up, then how would we ensure that girls and young women have women role models to look up to?

If you could change one thing (or two)—what would you change to increase the proportion of women studying physics?

At a younger age, I would advocate for more subsidies for girls in schools as well as more scholarships for meritorious girls so that we don't lose them due to economic considerations. In a developing country like India, this is especially a concern as many girls drop out of school as the parents only have the resources to educate one child and the natural choice for the majority is the boy child.

Another major cause for attrition leading women to quit science is motherhood-related breaks, as the lack of institutional and financial support hinders the productivity requested to excel in science. Here, I would encourage more

affirmative action to support families during this phase. More and more easily affordable day-care, some flexibility in working hours, some provisions to support the other parent as well, so that they are also able to help out more. These and other actions to support family life can go a long way in increasing the proportion of women in physics.

Finally, we women also need to acknowledge that no one needs to be perfect in every role at all times. Being able to offer our complete attention to the matter at hand, whether personal or professional at a given time and in isolation, without having to worry about everything else, will result in a better work–life balance, and it will go a long way in ensuring gender balance in physics in general, and society at large.

What directions do you think your research should go in?

I work in the domain of quantum science and technologies, especially using photons. Currently, we are focused on various applications like quantum security, foundational experiments in quantum mechanics as well as quantum information processing in general. Going forward, I would like to further explore possibilities in quantum computing (we have already devised a very nice architecture for this and would like to expand on this in years to come), quantum sensing and imaging as well as light–matter interaction. As an example of the latter, we would look at entanglement distribution networks and quantum repeater technologies. I will also expand on the direction of quantum technologies for societal good by further working on possible solutions towards the sustainable development goals of the United Nations. For instance, this will include explorations in quantum-inspired medical imaging. My aim as a scientist would be to participate in long-lasting research, namely producing useful and relevant works that extend beyond their immediate impact. I will try to explore new avenues for interdisciplinary work to help with such goals.

Has your gender affected your career in physics?

I would say that my gender has not had much of a positive or negative influence during my formative years. However, as I have grown into more senior roles, I find an increasingly small number of colleagues from the same gender in my immediate peer group. This does have an effect as one tends to stand out more (which is not always a good thing!). I also find that there is a conscious and unconscious bias towards women assuming leadership roles in physics. There is an underlying unspoken sentiment that one should be happy with whatever opportunities one has had, and this should be enough. In the current stage of my career, with many scientific accomplishments and several engagements in science and policy-oriented roles in national and international fora, I do believe that I have the right credentials to steer the field in the right direction. My gender sometimes makes it hard for a few patriarchal decision-makers to appreciate this sentiment, however, I carry on with my journey, nonetheless.

Have you engaged in Women in Physics activities yourself, organised or participated in any?

Yes, I have engaged in women+ in Physics activities whenever I have had the opportunity. I was part of the Indian delegation that went to Birmingham, UK, a few years back to participate in the Women in Physics conference organised by the International Union of Pure and Applied Physics. There we worked on the country paper wherein we presented statistics on various aspects of women's participation at different stages of physics education, as well as in professional bodies and events in India. We also deliberated on how to improve such statistics with representatives from several countries worldwide. More recently, I organised the first conference on "Women in optics and photonics in India (WOPI 2022)". This inaugural conference had an all-women participation. Young women pursuing an optics career got to network and learn from more senior women with careers in academia, industry and government institutions. We also organised career enhancement sessions on diverse aspects including building confidence, leadership qualities, and work–life balance. The conference was indeed a huge success and it is being followed up with new editions. I am a regular speaker in conferences and workshops that aim to bring in gender balance as part of International Women's Day and International Day for women and girls in science. I believe that by doing this consistently, I will be able to make a difference to an increasingly larger number of young girls and women who may wish to pursue a science career.

What is a mentor and why do you need one?

A mentor is someone who can inspire, educate, and influence through their vocation, actions and broader views in life and society. I do believe that having a mentor (or many mentors) is especially useful to transmit and root a certain values system and work ethics. Talking to the mentor in general or having him/her as a go-to person when there are doubts in one's mind can definitely help in moving forward. Likewise, the mentor can also provide good advice at different stages of one's career and on what may be the right path forward. However, one should choose their mentor with care. Not all people who have a higher position in their career are necessarily suited for mentorship! My advice would be to select a mentor who is a respected figure in the particular field, has time to listen to one's particular confusions and concerns and also genuinely wishes to see you shine on your own.

This interview was conducted by the editors of Communications Physics.

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