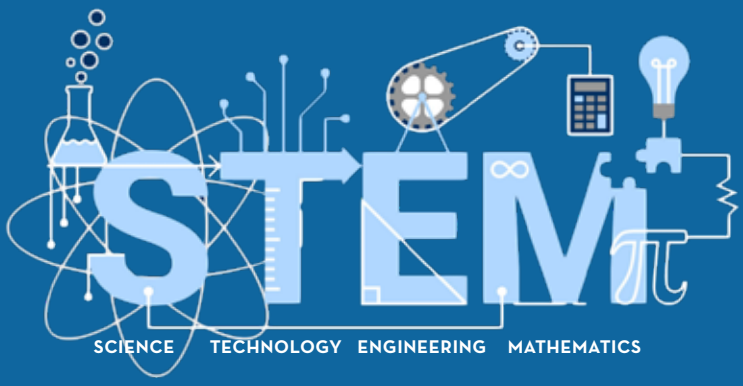
INDIA @ 75 MISSION 2022
a CII initiative

Confederation of Indian Industry

WOMEN in STEM:
Vanguards of India@75



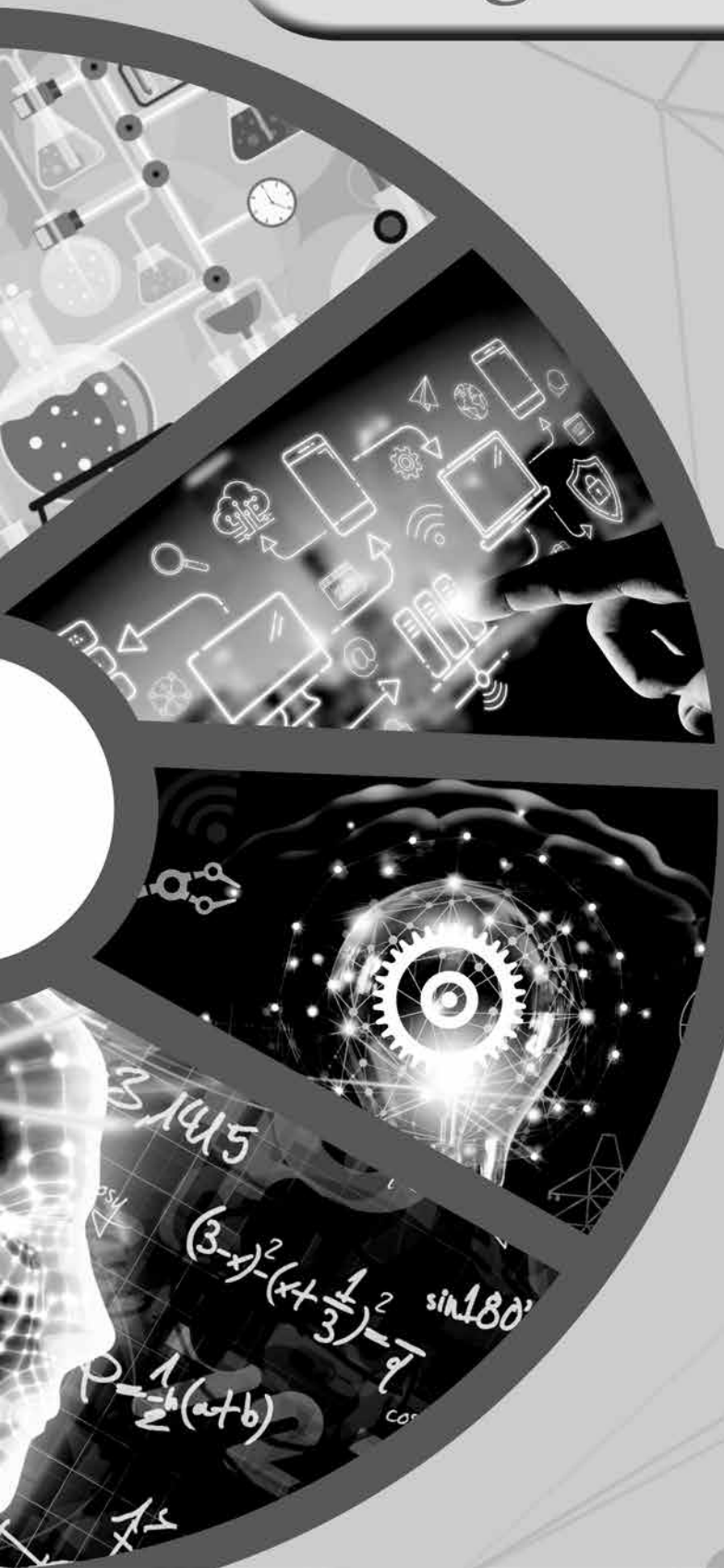
JULY 2022

Published by Confederation of Indian Industry (CII),
The Mantosh Sondhi Centre;
23, Institutional Area, Lodi Road,
New Delhi 110003, India,
Tel: +91-11-24629994-7,
Fax: +91-11-24626149;
Email: info@cii.in;
Web: www.cii.in

INDIA @ 75™
MISSION 2022
a CII initiative

CII
Confederation of Indian Industry

WOMEN in STEM:
Vanguards of India@75



JULY 2022

Dedicated to

All Women Pioneers leading the way across Science, Technology, Engineering & Mathematics (STEM) – Vanguards of India@75

MESSAGE

Chandrajit Banerjee

Director General, CII

In a global marketplace that is increasingly driven by science, technology and innovation (STI), the role of women in Science, Technology, Engineering and Mathematics (STEM) is essential for boosting countries' competitiveness. This diversity will expand the pool of talented researchers, bringing in fresh perspectives, talent and creativity.

A diverse workforce is, therefore, critical for enhancing innovative capacity, sustainability and global competitiveness. Careers in Science, Technology, Engineering and Mathematics are often referred to as the jobs of the future; jobs that will foster sustainable development and that will drive innovation, social well-being and inclusive growth. However, despite all the progress, women are vastly underrepresented in STEM jobs and among STEM degree holders.

This leaves an untapped opportunity to expand diversity in education and employment. Therefore, the Technology Mission initiated by CII identifies encouraging women in STEM as one of the key goals. It is essential to promote participation of women in education and career at all levels. In fact, the growth journey of New India will be driven by the success of women scientists in the country.

The present compendium, ***Women in STEM: Vanguards of India@75,*** serves as the starting point by capturing some of the successful case studies that would inspire and advance the agenda of encouraging women participation in STEM.

FOREWORD

Vipin Sondhi

Chairman, CII National Mission on Technology, Innovation and Research

Science, Technology, Engineering and Mathematics (STEM) are critical to the national economy and future development. The higher presence of women in STEM offers a significant opportunity to further boost innovation and better represent the needs of all in society for more inclusive growth and relevant developmental solutions.

As India celebrates 'Azadi ka Amrit Mahotsav' at India@75, it is important to recognize women achievers so as to encourage more women to engage in STEM. These successful women include educators, tech leaders, innovators and pioneers with technological skills necessary for a better future.

With this in view, CII is working on a mission to launch technology, innovation and research across the nation. The purpose of the mission is to make India a technology leader driven by a focus on innovation and research. The mission has five key goals including, enhancing national investment in R&D with a specific focus on encouraging industry contribution; nurturing Innovation competitiveness; fostering collaboration among industry-academia-research labs-start-ups and finally enhancing gender equality in STEM workforce to a minimum of 50 percent by 2047, with an interim milestone of 35 percent by 2030.

Taking forward the goal of enhancing gender equality in the STEM workforce, CII is bringing out this compendium ***Women in STEM: Vanguards of India@75*** to highlight and recognize the women achievers leading the way across STEM. The compendium brings out the rich talent and passion of India's women scientists as well as draws on the captivating stories of women in STEM education and careers.

FOREWORD

Alok Nanda

Co-Chair, CII National Mission on Technology, Innovation & Research

Science, Technology, Engineering and Mathematics (STEM) is a booming field and the number of women in STEM is not nearly balanced in the workforce today. Women's underrepresentation in STEM and STEM careers has been well documented and there is a need for the industry to scale up its commitment and efforts to build a more diverse workforce. It is recognised and proven that diverse teams bring forth diverse ideas and perspectives that enrich and expand knowledge and science in all its facets. While there has been progress in the number of women in STEM, a lot more can be done to truly unlock the potential in innovation and problem solving to build the future of science and technology.

To encourage women in STEM, the entire ecosystem comprising the government, industry and academia will have to make collective efforts to encourage and enable women to choose STEM in their education and as a career. Robust programmes, schemes and policies would be important to support in this advancement. As work-life challenges become more normalised across genders, work-life balance coupled with policies like flexible or remote work set-ups, childcare facilities at work, etc. will not just help redefine the culture and provide the needed support and encouragement for women, but build an ecosystem where everyone can be successful. As more women scientists grow at their workplace and become role models, young girls will be able to envision themselves in these roles as future leaders in the field of STEM.

Taking forward the agenda of encouraging Women in STEM, CII is working on this as a mission to enhance gender equality in STEM workforce to a minimum of 50 per cent by 2047, with an interim milestone of 35 per cent by 2030. With this, CII has launched the present compendium on Women in STEM. This compendium, which highlights the role of Women in STEM, is not just about celebrating their contribution, but also to inspire our young generation of women scientists on their role as potential and equal contributors for the sustainable growth of the society.

TABLE OF CONTENTS

ADMINISTRATORS AND POLICYMAKERS

ACADEMICIANS & RESEARCHERS

BUSINESS INNOVATION STRATEGISTS

INNOVATION ENTREPRENEURS

CONTENT & MARKETING PARTNER

ACKNOWLEDGEMENTS

The CII compendium on Women in STEM is an acknowledgement, in itself, of the great contribution which the fraternity of women scientists and professionals are making towards the understanding, development of expertise and growth of the subjects of Science, Technology, Engineering and Mathematics. This compendium is a part of various initiatives taken by the Confederation of Indian Industry to enable and enhance participation of women in these areas. In this section, the CII would like to enlist and acknowledge its patrons, guides and other key partners, who played an instrumental role and helped in making of this compendium. It is indeed through the guidance and support of these patrons and guides that this work of compendium has taken its final shape.

CII is grateful to the various ministries and departments of the Government of India for their constant support and guidance. We would like to specifically thank the Department of Science and Technology, Government of India, and the Office of the Principal Scientific Adviser to the Government of India for their vision, consistent guidance and encouraging support. We would also like to thank the Technology Information Forecasting and Assessment Council; the Department of Biotechnology; the Science and Engineering Research Board (SERB) and likewise many other departments and ministerial offices for their guidance towards this initiative.

CII is also grateful for the support of several technology experts from academic and research institutions across India for their immense contribution. The prompt responses and detailed inputs from them have greatly enriched the contents of the compendium.

CII would also like to thank its member organisations and establishments, start-up founders and institutions that have provided relevant insights and details without which this compendium wouldn't have been possible.

Women in STEM is one of the key goals of the CII National Mission on Technology, Innovation and Research. The mission envisages to enable India take strategic initiatives towards technology leadership. We would also like to acknowledge and thank the guidance and support of Mr Vipin Sondhi, Chairman, CII National Mission on Technology, Innovation and Research and Mr Alok Nanda, Co-Chairman, CII Mission on Technology, Innovation and Research, for their persistent leadership and guidance on this initiative. Valuable inputs were provided by the members of that Mission throughout the process. We acknowledge the global industry leaders and members of the CII National Committee on Technology, R&D and Innovation for having shared their thoughts and providing their viewpoints.

We would like to thank our Content & Marketing partner, Vivify Media Pvt. Ltd., for its resolute efforts in research, content development and marketing support. The company is led by Mr Vivek Verma, Founder-Director, and his team, including Editor Mr Dipesh Kumar Satapathy; Issue Editor Ms Adita Joshi, PhD; Research and Content Executive Ms Kavya Noble; Designer Mr Surendra Gupta and the Book Logo Designer Ms Palak Agarwal.

The CII compendium has taken its final shape, also because a very strong synergy among various departments and CoEs within CII. Thus, a very insightful and detailed database was created by the CII Technology team through interactions with the CII Foundation, India@75 and the CII Indian Women Network (IWN). The task of synthesising the information, scientific research, data analytics and inter departmental efforts for knowledge generation were led by the CII Technology in synergy with CII IWN. These efforts, combined with the vision of the leadership of CII National Mission on Technology, Innovation and Research, were instrumental in bringing out this CII compendium acknowledging women scientists, professionals and experts in the field of Science, Technology, Engineering and Mathematics.

Indeed, this Women in STEM compendium requires a special mention to all the women in STEM pioneers who are the key pillars in building and shaping up the technology leadership of the nation and humanity at large.

EXECUTIVE SUMMARY

Azadi Ka Amrit Mahotsav is a celebration of India's socio-cultural, political and economic success. It aims to recognise the people of India who have been instrumental in India's growth and have the power and potential of taking it to newer heights. On the same lines, we see that India's Science, Technology, Engineering, Mathematics (STEM) scenario has hugely transformed after independence. Both men and women S&T professionals have contributed to the making of the self-reliant India. However, the socio-cultural set up, gender bias and related stereotypes have restrained gender equality in STEM. India has 43 per cent women STEM graduates, but only 14 per cent are recruited in the workforce. Although considerable efforts have been made to increase the visibility of women in STEM, we are still lagging behind in embracing the tenets of inclusion and diversity.

As we stand to open the celebration gates for the 75th year of our independence, we realise there are a few doors still waiting to be unlocked, such as bringing equal representation of women in STEM workforce. Towards this cause, CII pledges to launch 'Women in STEM' as a movement across the nation and the globe, as one of the key goals of the CII National Mission on Technology, Innovation and Research. This compendium, *Women in STEM: Vanguards of India@75,* is a symbolic representation of CII's vision for gender equality.

The compendium seeks to compile a representative list of 125 successful women, including academicians and researchers, administrators and policymakers, business innovation strategists and innovation entrepreneurs. The compendium tries to cover representation from diverse disciplines like physics, chemistry, biology, earth sciences, interdisciplinary sciences, mathematics, engineering, information technology and medicine amongst others.

The compendium has four sections. The first section features some women administrators and policymakers in the higher echelons of decision-making, policy and implementation. The second section features women in academia and research institutions. The third section covers women from industry at various levels, from leadership to mid-career accolades. The fourth section features innovation entrepreneurs. The success stories that have emerged as role models have broken the myths that certain careers are not meant for women.

The understanding and reflections that have emerged out of this compendium have highlighted a few important action points needed to achieve gender balance and equality in STEM, such as creating a strong mentoring ecosystem for young girls in school and young women researchers in academia and industry; ensuring childcare facilities, flexible working hours and pay parity for making workspaces more enabling; and age relaxation in hiring and consideration for awards and recognition.

While some women have admitted not encountering any gender-related obstacles, others mentioned about the gender barriers that they faced and propose a change in the mindset towards how society perceives the worth of women in terms of what they must do in their personal and professional lives.

The efforts of organisations and the government in promoting 'Women in STEM' with diversity and inclusion were acknowledged by many women. However, we need to keep progressing and making concerted efforts towards achieving gender equality, doing away with the concept of 'gendered science'.

This compendium is the first edition, and henceforth, will be an annual feature going forward. CII wishes to keep the momentum going and celebrating the spirit of women achievers as they continue to emerge strong and contribute in the S&T domain.

Administrators and Policymakers

Anasuya Lahiry Bhadalkar, PhD

Joint Director, Human Resource Development
Gujarat State Biotechnology Mission (GSBTM), DST, Govt. of Gujarat

Anasuya Lahiri Bhadalkar is a science administrator contributing to human resource development for the biotechnology sector with the aim to benefit teachers and students of different strata of Gujarat.

I belong to a Hindu Bengali family residing in Vadodara, Gujarat. My father shifted his base to Gujarat from West Bengal. The mix of culture from Bengal and Gujarat offered me the opportunity to think differently and make the best of my abilities. I grew up with an inherent interest in biological sciences.

The world of medicines and disease treatment was something that interested me in a deep way. Microbiology and biotechnology seemed like an exact fit for this interest. The college where I pursued my graduation kindled my interests and made it clear to me that this field of study will indeed take me to the point where it would be easier to see the other side of medical treatments, i.e., the discovery of new molecules and healthcare. Going further, my association with the Marine Bioresource Centre showed me the bounty of nature and the diversity of new molecules that can be studied for different purposes. So in a nutshell, I believe that nature has always inspired and led me to study this area.

- Always wisely choose your career. Your career choice might need you to develop new skillsets.
- At times, sleeping over your biggest issues helps in better resolution and effective output.
- Giving opportunities to your younger colleagues always leads to harmony and higher work efficiency.

My decision to join government service was the biggest step toward professional growth. Having completed my academic career in the state, I felt that there are certain points in a student's career where training and orientation play an important role in molding their future. This thought lay dormant for many years, till GSBTM happened to me. The professional system where I have worked has been very supportive and warm in accepting a female employee. Whether juniors or seniors, the barriers were not felt, or better so, were never there.

Every work has a time, and the time comes, it happens. Just continue to focus your efforts towards the goal.

I lead the work under human resource development for the biotechnology sector. The schemes that are designed for this sector are to benefit the teachers and students of different strata, of the state. Leadership roles are indeed a challenge. Having a group of young minds, younger than you, working under you, with their ambitions, it is always challenging to bridge their ambition to the needs of the sector. However, in the course of this journey, I have realised that giving opportunities to your younger colleagues, and working with consensus always leads to harmony and higher work efficiency. To ensure this harmony, it is always important to disconnect yourself from your work, for a bit. At times, sleeping over your biggest issues helps in better resolution and effective output. Every work has a time, and as the time comes, it happens. Just continue to focus your efforts towards the goal.

I am also the coordinator for the PG Diploma in Biotechnology, Law and Public Policy course in collaboration with the Gujarat National Law University.

Always wisely choose your career. Your career choice might need you to develop new skillsets. If you are a person who is ready to learn for the rest of your life and wishes to contribute to the betterment of the stakeholders of any sector, only then, you are fit for science administration. The vision of 'Women having Careers" is also evolving, very much like human evolution. It will certainly take time.

The government has always done a lot of work towards this, by emphasising maintaining the boy:girl ratio in childbirths, girl-child health, girl-child education and reserving seats for women for employment. In the private sector, the reflection of society continues, where discrimination in the workplace is felt at times. The change for supporting women in professional, domestic and social spheres has to start at a personal level and reflect collectively as a society. ■

Academic Profile

- BSc, NV Patel Science College, Vallabh Vidyanagar
- MSc, M S University, Vadodara
- PhD, Marine Bioresource Centre, Jamnagar & Hemchandracharya North Gujarat University, Patan

Jancy Ayyaswamy

Scientist-F, Technology Information Forecasting and Assessment Council (TIFAC)

Jancy Ayyaswamy is a scientist with extensive experience in technology foresight in materials, technology needs assessment in climate change and forecasting of advanced technologies. She has worked on key projects dealing in translation of technologies for real-life applications.

I was born in Vellore and did my schooling from Don Bosco Matriculation School, Chennai. S&T has always been my passion since childhood. My parents were my moral support, especially my late father. They sacrificed a lot without bothering about financial difficulties and that inspired me to focus on my studies.

One of my best friends in college instilled strength in me to take life head-on and not be swayed by gender bias at any point in my life. My uncle inspired me to select metallurgy as a career option.

The founding and executive director of TIFAC, YS Rajan, PhD, and senior colleague D Bhatnagar mentored me when I joined the organisation in 1997. The projects on international cooperation with ASEAN at TIFAC exposed me to international trends and technology forecasting. Prof. Anand Patwardhan and Prof. Prabhat Ranjan, both former TIFAC executive directors (EDs), encouraged me to focus on innovation policy, support mechanisms and technology foresight initiatives in materials and manufacturing.

Current ED Prof. Pradeep Srivastava has offered me an excellent platform to work and study emerging technologies of interdisciplinary nature. My senior colleague G Goswami, PhD, always encouraged me while working on the 'Technology Vision 2035' document, technology roadmaps, climate change projects and training programmes. In addition, I owe my professional success to my spouse and kids.

- The sky is the limit once you decide to take life head-on.
- Timely intervention, at the school level can mitigate gender imbalance.

Born with infinite strength compared to men, women should stay strong and forthright.

I have worked on foresight reports on emerging technologies in new materials and advanced manufacturing technologies. I am an active member of the Global Technology Watch Group, targeted in collating green technologies in key sectors, especially in manufacturing. I am also a member of the core team for drafting the 'Policy on Scientific Social Responsibility', a novel policy to augment the science-society connect.

Initially, I experienced a couple of uncomfortable situations due to individuals from other organisations during travel that I managed to avoid tactfully. My advice is to ensure that your workplace is a peaceful one, and transform it into your learning platform. At the same time, you need to know when and where to discreetly draw the line.

I am now working on advanced technology interventions in agriculture, especially for apple growers and saffron farmers, semiconductors and energy storage. I have worked on key projects dealing with the translation of technologies for real-life applications and on a mission mode programme for industry-academia collaboration. I played a key role in setting up centres of relevance and excellence across India for higher technical education.

Born with infinite strength compared to men, women should stay strong and forthright. The sky is the limit once you decide to take life head-on.

Trained researchers in the field of new material design are always in constant demand in several industries. Both soft skills and hard skills are required in future industry domains. Knowledge of modeling and upcoming trends like miniaturisation, resource use optimisation, recycling, etc. would increase the scope of placements in my field.

Graduate students of STEM do not acquire the necessary skills, such as fluency in cognitive skills, critical thinking, resolution of complex and creative problems, and quick adaptability, which future jobs will demand. These aspects have to be built into the courses. The issue of disproportionate participation in STEM jobs based on gender, race and low-income population also needs to be tackled.

Timely intervention at the school level can lead to the mitigation of gender imbalance. More girls should be encouraged to participate in competitions and Olympiads. National R&D institutions and science academies should mentor and showcase work done by women scientists to encourage others. Improved work culture needs to be ensured to have gender sensitivity and effective addressing of harassment issues. ■

Academic Profile

- BE Metallurgy, PSG College of Technology, Coimbatore

Membership

- Expert Assessment Committee, AICTE

Pranati Das, PhD

Programme Lead, TB Programme Team
Clinton Health Access Initiative (CHAI)

Pranati Das has over 15 years of experience in the development sector in the health and disease field. She is currently leading her team across 11 states in India, implementing a project on the roll-out of preventive treatment for tuberculosis (TB).

I was born and brought up in Patna. My biggest source of inspiration has been my mother. She is the pillar of my strength, who always insisted on self-belief, hard work and perseverance. I also draw energy and inspiration from my colleagues and seniors. Right from my school days, I had been interested and intrigued by science and took up biology and biotechnology in pursuit of contributing to the healthcare sector. Throughout these years, I have had two major forces helping to keep my back straight and head up, even in challenging times-the beneficiaries that our projects support (meeting patients who are healing, who have benefitted in some way and meet us with gratitude) and the teammates and juniors who acknowledge enhancement in their professional skills and capacities while working in my team. I read somewhere that a true measure of success is the number of faces that smile at the mention of your name; I strive to achieve success that way.

My work includes ideation, conceptualisation, planning, implementation, management, monitoring and quality control of public health projects.

- Always believe in yourself and your aspirations, even in the face of complex situations.
- Maintain good public relations and professional networks.
- Be well-read and maintain sincerity and integrity in work.
- Strive conscientiously towards a good work-life balance.

My major contributions include the work towards registration and mainstreaming of a new drug for kala azar, demonstrating models for engagement of the private healthcare sector under the national TB elimination programme and supporting sustainable integration of the same with the health system.

A true measure of success is the number of faces that smile at the mention of your name.

I have demonstrated viable models for strengthening communication and implementation of adolescent health and hygiene and family planning programmes. Over the last 15 years of work in the development sector, I have had the opportunity of working with multiple organisations in various mid-to-senior management positions, contributing to varied healthcare programmes (TB, kala azar, diarrhoea, maternal, adolescent and child health) across Southeast Asia (India, Bangladesh, Nepal). I have had the opportunity of working on some pioneering projects, results and learnings that helped shape national guidelines and policies.

Being a married woman and a mother, balancing work and family life (especially when work demands travel) was something that required constant thinking, planning and prioritisation. I feel it is still a wee bit more difficult for women in our society to keep up with the demands of post-office-hours and informal gatherings that often have an implicit work-related agenda.

So be well prepared for the stream you aspire to take up. Maintain good public relations and professional networks. Being well-read and maintaining sincerity and integrity in work would certainly take you places. Always believe in yourself and your aspirations, even in the face of complex situations. Know your worth. Strive conscientiously towards a good work-life balance.

I feel teaching STEM should be more practical rather than theoretical right from the middle school level. There has been a good change over the last couple of decades, but there is still a lot of room for the incorporation of teaching based on activities, demonstration, application, troubleshooting and problemsolving-of the underlying theoretical details. Young students should also get visibility and access to details about the multitude of career options in STEM. Promotion of work-family balance, equal sharing of care responsibilities and achievement of pay parity (equal pay for work of equal value) are some of the things to be done at the policy level by the government to attract more women into STEM careers. ■

Academic Profile

- MSc & PhD Biotechnology, University of Allahabad
- PG Diploma in Business Administration, Symbiosis, Pune

Fellowships

- CSIR-JRF/SRF scholarship, University of Allahabad

Pratibha Jolly, PhD

Academic Consultant, National Assessment and Accreditation Council
Principal Investigator, DST-Gender Advancement for Transforming Institutions (GATI)
Former Principal, Miranda House, University of Delhi

Pratibha Jolly is an internationally-renowned pioneer in physics education. She is leading Gender Advancement for Transforming Institutions (GATI), a project of the Department of Science and Technology (DST) aimed at advancing gender equity in STEM disciplines in institutes of higher education and research.

From an early age, I had wide-ranging interests. I played basketball (state level) in school, loved to paint, enjoyed discovering interesting books on the library shelves and spending endless hours reading or writing. My science teachers saw my potential and began setting academic challenges that were far beyond the curriculum. Lady Irwin School in Delhi held special summer camps to hone talent in science. The annual science fairs gave an opportunity to showcase our projects and interact with scientists. That experience set the path for my career in science. My teachers and family inculcated a strong sense of self belief in me and the capacity to pursue interests with great passion.

When I began teaching physics at Miranda House, I disliked the cookbook approach to the laboratory work that taught students neither the skill of experimentation nor the science behind it. This is when I said to myself: if you don't like something, you have got to do something about it. With financial support from DST, I launched a unique program called 'Learning Through Investigative Projects' to offer undergraduate students a flavour of collaborative research, access to resources and a lab of their own where they could innovate and experiment. This experience gave me a mission in life.

- The new age women are aspirational and have the skills needed to succeed in their unique careers.
- We need to weave in enterprise education.
- Faculty members have to become lifelong learners. They need to reskill, upskill and develop new competencies.

Women have to be ready to pursue non-linear paths when new opportunities beckon.

My interests veered towards research on physics education and several pioneering research projects led to pedagogical innovation, development of educational resource materials, integrating computer-based technologies much before these became ubiquitous. Ultimately, the multifaceted work led to establishment of the D S Kothari Centre for Research and Innovation in Science Education at Miranda House.

I took the path less taken when I quit my permanent faculty position at the college to take on a contractual position as research scientist at the university, as the position came with grants that helped me to scale-up my research. At that time, I was laser focused and never stopped to ponder if the resistance I faced had anything to do with gender. In hind sight, I think differently. I see clearly what needs to be done is to provide women in science a level-playing field. This insight has helped me develop the gender equity framework for GATI.

Women in particular have to be ready to pursue non-linear paths when new opportunities beckon. I was initially hesitant when I was nudged to apply for the post of principal, but took the plunge.

New-age women are aspirational and have the skills needed to succeed. They are willing to challenge the status quo. Leadership is not just about stepping up the ladder, but building communities ground upwards and empowering others to shatter the ceiling.

Despite myriad schemes launched to facilitate women in science, the needle has not moved. GATI shifts the focus to the institution as a community and a self-learning organisation, nudging it towards supporting diversity, inclusion and gather the full spectrum of talent for success and progression of all.

The science classroom has not kept pace with the rapid changes in the discipline. Students are fascinated by the technological innovations and want to participate in solving real-world problems. Teaching-learning of science has to be hands-on and minds on. This entails integrating problem solving and project-based teaching-learning. We need to weave in enterprise education. Faculty members have to become life-long learners. They need to reskill, upskill and develop new competencies. ■

Academic Profile

- BSc & MSc Physics, Miranda House, University of Delhi (DU)
- PhD in Theoretical Chemical Physics, DU

Awards & Fellowships

- IUPAP-ICPE Medal, 2019, for contribution to physics education
- Australian Leadership Award Fellow, 2013
- Fulbright New Century Scholar Award, 2009-2010
- American Physical Society Kilambi Ramavataram Fellowship, 1994-95
- Commonwealth Academic Staff Fellowship 1986-87

Dr Priya Abraham

Director, ICMR-National Institute of Virology (NIV), Pune
Former Professor, Christian Medical College (CMC), Vellore
Former HoD & Deputy Director, CMC Hospital

Dr Priya Abraham is a famed virologist who was at the helm of activities pertaining to SARS-CoV-2 research, diagnostics development and variant identification.

I was born in Pallom in Kerala's Kottayam district, was brought up and schooled in Visakhapatnam. I spent several years of my professional life in Vellore, where I worked at CMC in both academic and administrative capacities.

I was inspired the most to choose this as a career option by my teachers in the medical school. The combination of clinical training along with training in laboratory medicine that I received has proved quite useful in the last two-and-a-half years during the COVID-19 pandemic. The training in CMC was so well-rounded that I discovered that I could gain recognition for my work even abroad.

I have contributed to the use of hepatitis vaccines in high-risk and special patient groups and the molecular epidemiology of hepatitis B, hepatitis C viruses and human papillomavirus virus in India. I have also helped establish sound screening and monitoring tools for patients infected with these viruses. I had steered the clinical virology department to becoming the first virology laboratory in India accredited by the National Accreditation Board for Testing and Calibration Laboratories.

- Every woman should strive for excellence in her professional sphere.
- Be a good team player and be ready to give others credit when due.
- Young minds need to be inspired to see the translational impact of STEM.

Soon after taking over as NIV Director, I had to lead the institute on several fronts during the pandemic. We were able to report many 'firsts' in the country–the first cases of SARS-Cov-2 in India; the first electron micrograph; the first whole genome sequences; the first virus isolation; the first indigenous ELISA; and the first indigenous vaccine in partnership with Bharat Biotech International Limited. We also submitted two patents for SARS-CoV-2 detection assays and identified several variants of concern in India. Towards outreach, I delivered a TEDx talk and I spoke on the 'Infodemic within the Pandemic'. I have been nominated for Indian National Science Academy and the National Academy of Sciences. Vogue India, Forbes India W-Power List and UNESCO's publication A Braided River—The Universe of Indian Women in Science, 2022, featured me for my work in virology.

Sometimes, women are labeled aggressive if they are focused on their professional work.

All this good work and its recognition would not have been possible if I was not so serious or 'aggressive' regarding my work. Women have to face tough experiences, barriers or gender biases in different forms that are at times obvious or otherwise subtle gestures and remarks that can be easily overlooked or are often normalised. I find that sometimes, women are labeled aggressive if they are focused on their professional work.

However, every woman should strive for excellence in her professional sphere—we should not be distracted by our detractors. Yet, we should be good team players and be ready to give others credit when due.

Choose good mentors to discuss science, take their guidance for making professional decisions.

The government and private sector should offer more Early Career Women fellowships. Research institutes must support young women scientists who are delicately balancing their work and family life.

STEM careers are connected to STEM education. In a country like India, the choice to pursue STEM is made in the high school. Hence, young minds need to be inspired to see the translational impact of STEM even as early as middle school. Field visits and interacting with inspirational teachers will certainly draw them to STEM. Small group discussions and having dedicated mentors are ways in which students stay focussed and inspired to give their best in the field. Interactive rather than didactic teaching is a must. ■

Academic Profile

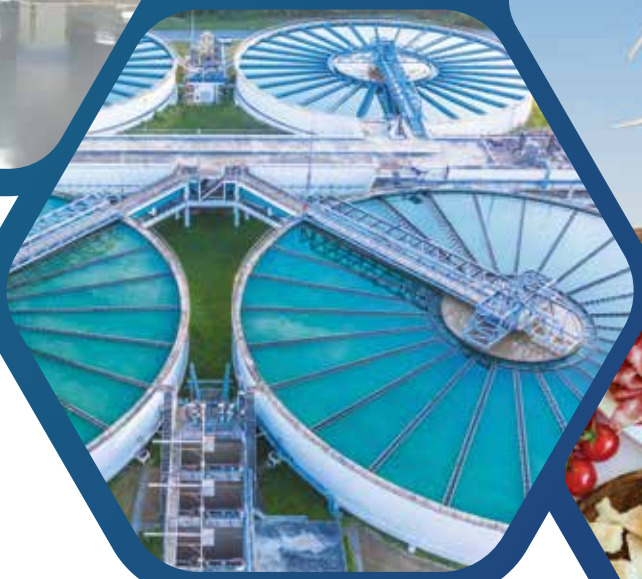
- MBBS, CMC Vellore & Madras University, Chennai
- MD, & PhD, CMC Vellore & Dr MGR Medical University, Chennai

Awards & Fellowships

- Fellow of Royal College of Pathologists & Royal College of Physicians, London
- JC Bose Award by Indian Science Monitor
- Public Relations Society of India National Award, 2021, Pride of India Award for Brave Corona Fight
- Business Today's Most Powerful Women Award

ADITYA BIRLA
CHEMICALS

Creating bonds that **touch millions of lives**



A global chemicals player, Aditya Birla Chemicals has leadership positions across product lines with a diversified portfolio of over 1000 products. We partner with our customers to provide path breaking solutions to more than 15 industries. Serving customers across 80 countries, our products are trusted in every segment and touch millions of lives around the world.

For further details, please contact:
Aditya Birla Chemicals
Aditya Birla Centre, A Wing, 4th Floor,
S.K. Ahire Marg, Worli, Mumbai – 400030
Tel: +91 22 66525000 / 2499 5000
Email: abgchemicals.cfi@adityabirla.com
Website: www.adityabirlachemicals.com

/aditya-birla-chemicals
/AdityaBirlaChemicals
/adityabirlachemicals
/adityabirlachemicals

- ADVANCED MATERIALS
- CHLOR-ALKALI
- PEROXIDES
- PHOSPHATES
- SULPHITES

Scan to visit our website

Renu Swarup, PhD

Former Secretary, Department of Biotechnology
Former Chairperson, Biotechnology Industry Research Assistance Council (BIRAC)

Renu Swarup is a science administration and policy expert and has actively engaged in the formulation of India's National Biotechnology Vision and Strategy. More recently, she led the COVID Vaccine, Diagnostic and Genome sequencing Mission.

I believe though everyone opts for a specific discipline to pursue as formal education, the important part is how one resolves to use her education, interest and skills, and decides her profession.

Like most people in research, I joined the Forest Research Institute (FRI), Dehradun, for PhD and later did my post-doctoral research at The John Innes Centre, Norwich, UK, as a Commonwealth Fellow.

I had a crystal-clear resolve to come back to my country after completing my research abroad. Upon my return, I had considered two options—either to pursue academics, i.e., scientific research, or take up science administration.

- 'Women in science' is both a cause and a need that should be institutionalised and sustained.
- I faced challenges while working, but never looked at myself as a woman facing those trials. The very nature of these challenges is professional and is equal for both men and women.
- Challenges for professional women are more because of societal and cultural issues.
- I got opportunities to take up decent work not based on gender, but rather my merit.
- Research administration must not be treated as a career different from research.

I chose the second option thinking that it would give me an opportunity to view S&T on a wider landscape. I understood that crafting my career in science management will allow me to contribute and use my scientific skills towards a larger planning process and strategise newer activities for science.

Never look for short-cuts just because you are a woman. Continue to work hard, harder and the hardest.

My parents played an important role in shaping my personality, thought process and individuality. We were three sisters and my parents gave us freedom to be able to take forward our interests and academic pursuits. They did not condition us by the rules of the society, but rather nurtured us to develop a holistic personality—unrestricted, original and free for thought and action.

If I have to talk about my mentors, as a student I was fascinated with Prof. AK Sharma's work in genetics. Another iconic geneticist whose work inspired me was Prof. MS Swaminathan. That is how my interest in genetics developed, and I chose to pursue my PhD in genetics and plant breeding.

Getting into the right position at the right time is crucial. After that, as soon as your seniors and colleagues' spot your keen desire to bring a positive change to the work that you do, the mentoring and support comes automatically.

I was fortunate enough to be selected as one the first science managers at DBT and joined the same in 1989. I learned the nuances of science administration under the mentorship of S Ramachandran, PhD, former DBT Secretary and later with Manju Sharma, PhD, the first woman secretary of DBT.

While mentors and seniors played an anchoring role, the most important was my desire to become a part of larger planning and policy that always made me push my boundaries. There are many anecdotal experiences that prompted me to take interesting decisions.

I met TN Khushu, PhD, Director of the National Botanical Research Institute (NBRI) in Lucknow with a question on whether to join a PhD course at NBRI and stay in Lucknow or move to Dehradun, the new place of my father's posting. Khoshu, a champion for forestry, suggested that I join FRI and his argument was that forestry needs good students as well.

Ironically, when I joined DBT, Khoshoo had become Secretary in the Department of Environment and also the chairman of DBT Task Force on Forestry and Biomass, of which I was the member secretary and we worked together. Thus, certain fortunate decisions can sometimes take people forward in a long way.

Another incident pertains to VL Chopra, PhD, another famed geneticist who was the jury of the selection committee for the Commonwealth

Fellowship. During my interview, he made a quick comment saying if I got the fellowship, he might never see me again in the country.

When I was at DBT, Prof. Chopra was Director General, Indian Council of Agricultural Research (ICAR), and we worked closely to create the agriculture research ecosystem that he had envisioned. I reminded him of my promise of coming back to serve the country.

So it was always encouragement of the seniors that helped me decide upon crucial questions or guided me towards doing good work for the country.

As a member of the Task Force on Women in Science constituted by the Scientific Advisory Committee to the Prime Minister, I could contribute to some important programmes for women in science research.

As the Secretary, I led a network of 16 autonomous research institutes, two public sector undertakings and a R&D network of more than 5,000 projects across over 100 research institutes, universities and laboratories.

The most exciting was setting up a new organisation, Biotechnology Industry Research Assistance Council (BIRAC), for fostering entrepreneurship that has supported more than 5,000 start-ups and over 75 incubators.

Being in science administration, therefore, allowed me to overcome the restrictions of being in domain-centric applications. It gave me such a wide coverage—starting off with agriculture and forestry to being at the helm of the fight against COVID-19 and steering the pharma sector, I have seen and done it all in my career spanning 33 years.

I have also held additional charge of Secretary in the Department of Science and Technology (DST).

I faced a lot of challenges while working, but never looked at myself as a woman facing those trials. The very nature of these challenges is professional and is equal for both men and women. Challenges for professional women are more because of societal and cultural issues.

As a professional, I always felt at par with my male colleagues and got opportunities to take up decent work not based on gender, but rather my merit. I have always taken any difficulty as learning to figure out how to rectify or manage, and then move forward with greater speed and vigour.

I credit this to my father, a defence officer, who instilled this conviction in us that nothing is impossible, everything can be figured out; the only solution is hard work. I followed this mantra throughout my career and still continue to do so.

I would advise women to have a lot of confidence and recognise their inherent strengths and abilities. Never look for short-cuts just because you are a woman. Continue to work hard, harder and the hardest, as this is what will pay you in the long run. Women who wish to be in research administration must not treat it as a career different from research.

To be a successful research administrator, one must have an in-depth understanding of science, research and its applications. If you have it, you can play an important role in becoming an enabler and facilitator in shaping programmes and activities nationally and internationally.

For promoting women in STEM, I think the programmes and initiatives started by the government are largely in place. What we need to do is increase the number of women in STEM and steer leadership development.

It is with larger numbers that we can push women into leadership roles and increase their participation and visibility across key decision-making bodies at multiple levels.

'Women in science' is both a cause and a need that should be institutionalised and sustained.

Let's not put gender to career, and allow our young girls the choice to choose a discipline that they will truly thrive upon. It is high time that we cease celebrating this as a one-day women's event. ■

Academic Profile

- BSc, IT College, Lucknow
- MSc Botany, Lucknow University
- PhD in Genetics & Plant Breeding, Forest Research Institute, Dehradun

Awards

- Smt. Chandaben Mohanbhai Patel VASVIK Award for Women Scientific & Chemical Science & Technology, 2020-21
- Life Time Achievement Award for Biotech Policy maker, 2021 by Golden Jubilee Women Biotech Park
- TWAS Regional Office Prize on Science Diplomacy, 2018
- TiE Women Enabler Award, 2018
- National Entrepreneurship Award, 2017
- BioSpectrum Person of the Year Award, 2012

Fellowship & Memberships

- National Academy of Sciences
- Life Member of Trust for Advancement of Agricultural Sciences
- Member of Organisation for Women in Science for the Developing World

Savita Ayyar, PhD

Founder, Jaquaranda Tree
Lead, India Research Management Initiative, DBT/Wellcome Trust India Alliance

Savita Ayyar is an independent consultant and provides services for supporting organisations with their research management needs. Her aim is to raise awareness, build capacity and nurture a community for research management in India.

I was born in Mumbai and spent my childhood in different parts of India, including New Delhi, Bihar, Gujarat and Assam. I was drawn to science from my school days and had exceptional teachers at school and undergraduate levels who motivated me to pursue scientific research as a career. My family has been my constant support and has consistently encouraged me to follow my dreams, relish adventure, rise above constraints and work hard to realise my ideas.

Robert White, PhD, my doctoral research supervisor at Cambridge, shaped my ability to ask the right questions, plan and perform experiments, analyse results and draw conclusions –skills that are a must in a researcher. During later years of my PhD, I learnt about the other major aspect of building successful research programmes—research management. Research managers run and ensure success of quality research.

Thus in 2007, I decided to join the Wellcome Trust, UK, as a Grants Advisor, facilitating funding for research programmes in the United Kingdom and globally. My mentors there in London taught me about research management, team work and process development for the benefit of the scientific community. Lorraine Monteiro, PhD, was an exceptional line manager to me.

In 2010, I relocated to India to build the activities of a new Research Development Office (RDO) at the National Centre for Biological Sciences (NCBS), Bengaluru. RDO was created for fundraising and award management. It was the first of its kind in India. Former NCBS director K Vijayraghavan, PhD, and NCBS director Satyajit Mayor, PhD, played an important role in shaping my career. I applied all lessons on research funding learnt at the Wellcome Trust to support NCBS researchers seeking funding.

- Find your own style of leadership, one that works for you.
- Women need enabling environments both at home and workplace.
- Be inclusive of stakeholders' views and focus on co-creation.

In 2017, I moved on from NCBS and set up Jaquaranda Tree. Kannan Viswanathan, a close friend, mentored me during the early stages. Shahid Jameel, PhD, former CEO of the DBT/Wellcome Trust India Alliance, motivated me to contribute my bit towards developing research management in India.

Talking to practitioners in different STEM fields will help you assess whether you might be a good fit for certain jobs.

I now work as an independent consultant on behalf of academic institutions, funders and other stakeholders on research management challenges. I work on behalf of the DBT/WT India Alliance to lead the India Research Management Initiative, aimed at building capacity for research management and creating a community of practice of research managers.

I did not face any exceptional challenges owing to my gender. As women traditionally share the most burden of family care, they need enabling environments on the home as well as work fronts to build successful careers. Families and institutions can help by changing mindsets and putting processes in place to ensure women participate fully in the workforce.

Women who aspire to be leaders must learn to genuinely care for all your stakeholders. Be inclusive of their views and focus on co-creation as that brings in lasting value. Dare to be original in your thinking. As a leader, allow yourself to be as ambitious and creative as it takes. Be a constant learner and be open to new ways of thinking. Network and interact with a wide range of professionals. Finally, find your own style of leadership, one that works for you.

There are several new kinds of research-related roles emerging in India. It is worthwhile to consider your unique strengths and interests and identify areas that you might wish to contribute towards in a professional capacity. Talking to practitioners in different STEM fields will help you assess whether you might be a good fit for certain jobs. Seeking internships with organisations undertaking research-related services may help you explore this field and make informed decisions.

The government and institutions can work together to make the work environment safe and ensure a level-playing field where merit shines. For STEM education, we need more initiatives to instill the joy of doing science and of research as a career among students. Implementation of the New Education Policy 2020 offers an excellent framework for making STEM education inclusive of other fields like the arts and humanities, and encourages creativity. ■

Academic Profile

- BSc Biochemistry, University of Delhi
- MSc Biotechnology, All India Institute of Medical Sciences, New Delhi
- PhD, University of Cambridge, UK
- Post-doctoral research in Neurobiology, Cambridge

Shanta Thoutam, PhD

Chief Innovation Officer, Government of Telangana

Shanta Thoutam is an expert in innovation and entrepreneurship and is Telangana state's first woman chief innovation officer.

Self-motivation is one of the virtues I have always believed in. While working on my PhD dissertation as an engineer, I aspired to become an all-round professional and picked myself up to volunteer at the Arrowhead Center, the primary economic development arm of New Mexico State University (NMSU), in various capacities, including technology commercialisation associate, commercialisation analyst and director of launch competition. I played a key role in bridging the gap between NMSU and the market by advancing technologies emerging from campus to business development settings. For the summers of 2015 and 2016, as the Programme Director of StartFast Venture Accelerator, upstate New York's top accelerator programme, I helped ten start-ups raise more than $2 million.

This is when I found my calling in innovation and entrepreneurship to further explore career opportunities. For inspiration, I certainly look up to Indra Nooyi as a tall leader who carved a niche for herself in the global setting.

When I started volunteering at the Arrowhead Center, my supervisors assessed my professional demeanour coupled with structured thinking and gave me enough leeway to spearhead multiple initiatives and prove myself. In 2016, I was inspired to hear the vision of Telangana minister KT Rama Rao to build the state as a start-up state and Hyderabad as the start-up destination of the world. I took the job of vice president, corporate innovation & business development, with his brainchild T-Hub and relocated to serve in various capacities under his leadership. Within 2.5 years at T-Hub, I spearheaded over 25 open innovation programmes that had more than 170 start-ups graduate with nearly $130 million worth funds raised cumulatively. Seven of those stert-ups got acquired.

- Trust your inner voice to defeat barriers.
- Ensure you are recognised as a value-adding knowledge worker.
- Do take calculated risks rather than living in complacency where nothing grows.
- Whatever the work is, pay attention to details and do a world-class job.

I prefer not to give myself 'I am a woman' reservation while I sit at the table as a contributor and raise my hand ensuring my voice is heard.

As an officer on special duty, textiles and handicrafts, government of Telangana, I played a key role in helping Kerala-based Kitex Group, the world's second largest manufacturer of kid apparel, invest ₹3,200 crore in the state. As a woman thought leader, I preside over several advisory committees and panels that deal with innovation and entrepreneurship.

For scaling heights in professional life, women have to overcome not only institutional but also internal barriers. Sure, I did encounter some barriers that I turned into opportunities to assess my strength and grow stronger. Looking back, I don't find them as tough experiences to mention. As a person with integrity, I prefer not to give myself "I am a woman' reservation while I sit at the table as a contributor (not a spectator) and raise my hand ensuring my voice is heard. Do take calculated risks rather than living in complacency where nothing grows. Become a subject matter expert rather than a generalist and hold onto an anchor to coast through the challenges. Trust your inner voice to defeat barriers and ensure you are recognised as a value-adding knowledge worker. Whatever the work is, pay attention to details and do a world-class job. Carry yourself well, displaying accountability to be considered an approachable and go-to-person in the ecosystem.

The need of the hour is to catch girls from school age for encouraging STEM learning, launch initiatives focusing on providing special fellowships for post-graduate and advanced degree holder women to continue in STEM, include subject matter expert women in the academy and government decision-making bodies, and promote late-career lateral entries.

STEM learning is the most effective when students think outside the box and become problem solvers. We need STEM learning to begin with identifying grassroots challenges, proposing viable solutions, building prototypes and piloting them in rural settings. Furthermore, we have to empower both teachers and students to develop analytical and critical thinking, peer-to-peer learning, creativity and collaboration. ■

Academic Profile

- BTech Electronics & Instrumentation Engineering, Kakatiya Institute of Technology & Science
- MS & PhD in Electrical Engineering, New Mexico State University, US

Awards & Fellowships

- Graduate Senator of Associated Students of New Mexico State University
- Stanford Epicenter's University Innovation Fellow

SECTION SPONSOR

SHIV NADAR UNIVERSITY

DELHI NCR

Academicians & Researchers

Abha Misra, PhD

Professor, Department of Instrumentation & Applied Physics
Indian Institute of Science (IISc), Bengaluru

Abha Misra is a nanotechnologist and her research focus is technology development for monitoring environment pollutants with a fast communication system. She is developing self-powered devices like sensors and supercapacitors.

My father is a retired scientist who worked in a defence laboratory. As a first teacher, he introduced scientific concepts to me. This was when my journey began toward finding a career in S&T. My mother's contribution as a mentor is incredible in supporting me throughout my career. She has supported all my decisions that help me develop enormous confidence to pursue a career in science.

I learned novel scientific concepts from Prof. Chiara Daraio, my post-doctoral adviser at the California Institute of Technology, and her approach to unconventional ideas and presenting them simply was a good learning experience that I used in my teaching. The support from my husband towards my professional career has been incredible.

I am now working to develop technology for monitoring the environment (air and water pollutants) with a fast communication system, which must reach every home. My research extends to develop sensors and detectors for defense applications. We are focusing on utilising the cheap carbon source, also known as a blackbody, but their intrinsic properties have to be engineered to enhance the light-matter interaction. Our research has demonstrated the proof-of-concept for self-powering in photodetector as well as supercapacitor applications. A country like ours has plenty of sunlight to be harvested and we should succeed in developing the technology for everyone. Although there are developments in interdisciplinary fields in nanotechnology, still more research needs to be focused on understanding the interfaces between various boundaries for the transformation from science to engineering.

- Persistent hard work with a clear aim in mind is the key to reaching the goal.
- Without support from the government, the success of women in STEM cannot reach an optimum mark.

One educated woman can bring a breakthrough in society by supporting several other girls and women.

Fortunately, the people around me were always very encouraging and supportive. I never faced any exclusive challenge as a woman. However, I am aware of the fact that most women have a tough journey reaching the same level as mine. I have great regard for them, and these are the real role models for women in our country.

I see every successful woman as a role model to several lakhs of young girls who are starting their careers. One educated woman can bring a breakthrough in society by supporting several other girls and women. This is possible only when all of us work together and develop a gender-neutral society.

Persistent hard work with a clear aim in mind is the key to reaching the goal. It is important to get support from your parents as they are the true mentors, do not hesitate to reach out to women scientists who have already crossed hurdles so that they can speak to your parents. No doubt, women students face a lot of responsibilities along with their studies and work but a sincere effort always paves a path to success. In the process, something succeeds and something gets missed. But we will always have our opportunity to attain excellence—the journey is ours and does not depend on any one. Have a roaring journey.

Nanotechnology is interdisciplinary; more research needs to focus on understanding the interfaces between science and engineering. More women researchers must take up research in this direction. Science is gender neutral and it gives everyone freedom without any boundaries being imposed.

Without support from the government, the success of women in STEM cannot reach an optimum mark. The government needs to make sure that all deserving talents can pursue a career in STEM. The flow of support should not be limited to the school level. Government policies should help establish women role models in every school and college by facilitating them in the environment that they require to outgrow in society.

We need to relook at the decades-old syllabus and initiate a good STEM-specific teaching programme by revamping such older programmes. The same style of teaching and teachers will not help improve this area in the country. ■

Academic Profile

- BSc & MSc Physics, Kanpur University
- PhD in Physics, IIT Bombay

Awards & Fellowships

- Gordon and Betty Moore Foundation Post-doctoral Fellowship, Caltech, US
- Top Cited Author Award, IOP Publishing
- SERB Women Excellence Award
- DST Young Scientist Research Award
- INSA Medal for Young Scientists

Anindita Bhadra, PhD

Associate Professor, Department of Biological Sciences
Associate Dean of International Relations and Outreach
Indian Institute of Science Education and Research (IISER), Kolkata

Anindita Bhadra is an ecologist and the master of the 'The Dog Lab' at IISER, Kolkata. She works on the behavioural ecology of free-ranging dogs in India.

I was born and brought up in Kolkata, and studied at the G D Birla Girls' High School. I fell in love with biology in class III, totally smitten by my science teacher Mandira Basu, who would demonstrate science concepts in class. Prof. Aniruddha Mukherjee, my high school mentor, inspired me to dream of pursuing a PhD. During my undergraduate days at the Vivekananda College, a field trip to IISc Bengaluru and the Western Ghats changed my life forever. The trip was organised by Prof. Silanjan Bhattacharyya, who instilled my interest in the field of ecology and evolution.

I fell in love with IISc and its intellectual ambience at the first sight. I was highly inspired by the research work of Prof. Raghavendra Gadagkar whose lecture on social wasps mesmerised me. Even before returning from the trip, I had decided to come back to IISc to pursue research. Prof. Gadagkar has been my mentor since my PhD days. My experiences at the Centre for Contemporary Studies, started by Prof. Gadagkar during my stay at IISc, boosted my intellectual growth.

Since 2009, I have been working on the behavioural ecology of free-ranging dogs in India. Until then, most of the research on dogs was focused on pet dogs. My research has influenced researchers at well-known dog research labs from the global north to start travelling to the global south to study free-ranging dogs.

- If you want to embrace ecology, read a lot, look at nature and ask questions.
- Women researchers from the country should be highlighted as role models for young girls.
- We need more discourse on pedagogy and make teaching a lucrative career option.

Ecology is a field that has many women researchers. Field work is often considered difficult for women, but that is completely wrong. One of the pioneers in this field was Jane Goodall. Thus, if you want to embrace ecology, read a lot, look at nature and ask questions.

Believe in yourself. Follow your dreams, and don't pay heed to what the world says. If you believe you can; you can.

I do wish to share the flip side of being a woman researcher. The first time I faced hurdles as a woman was at IISER Kolkata. From receiving flirtatious remarks and comments on my dressing sense to being subjected to vindictive behaviour of senior administration, I saw it all. The contracts of four women fellows, including myself who protested against these practices, were terminated. Though the contracts were reinstated, yet the original promise of regularising us seemed to be distant from reality. I was told to look after my family and be happy with the permanent post of a scientific officer rather than trying to craft a career as a scientific group leader. While I was fighting my due for a regular position, my students too struggled with certain kinds of biased behaviour from their peers and my colleagues. The time was tough, but I went on with resilience and grit and never learnt to keep my mouth shut on issues that were righteous and just. My career path at the institute started as an IISER fellow, took a bend as a contractual assistant professor, and almost met a dead end until the selection committee decided to uplift me and put me on a safe track. Those years of abeyance and denial for what I deserved made me who I am today. Thus, believe in yourself. Follow your dreams, and don't pay heed to what the world says. If you believe you can; you can.

We need more awareness among youth about STEM careers, irrespective of gender. To attract young girls and women to STEM, we need to ensure safe workplaces and have more stringent action in cases of sexual abuse, discrimination and harassment. Women researchers from the country should be highlighted as role models for young girls to look up to. STEM education is plagued with the lack of hands-on teaching. Students are not motivated to conduct experiments; they are not encouraged to ask questions. We need more discourse on pedagogy and make teaching a lucrative career option. ■

Academic Profile

- BSc (Hons) & MSc Zoology, University of Calcutta
- PhD from IISc Bengaluru

Awards & Memberships

- INSA Young Scientist Award, 2009
- SERB Women Excellence Award, 2013
- Janaki Ammal National Woman Bioscientist Award (Young), 2021
- Founding Member & Chair (2015-18), Indian National Young Academy of Sciences
- Member, Royal Society of Biology, UK
- Member, Animal Behavior Society, US
- Member, European Society of Evolutionary Biology

Dr Bhavana Prasher

Senior Principal Scientist, AYUSH Centre of Excellence at CSIR-IGIB, Delhi
Professor, Biological Sciences, Academy of Scientific and Innovative Research
Adjunct Faculty, School of Sanskrit & Indic Studies, JNU, Delhi

Dr Bhavana Prasher pioneered the development of the new field of research called Ayurgenomics at CSIR-IGIB. Her research integrates disciplines of Ayurveda, modern biology, computational methods and genomics for developing a framework for precision and predictive medicine approaches.

I was born and brought up in Mumbai in a Gujarati family. My elder brother inspired me to pursue medicine and become a doctor. Although my joining a BAMS course was a sheer chance, the moment I entered this stream, I felt this is where I belong to. Access to Sanskrit teachings and literature and proximity to the British Council Library enriched my learning experience manifold. My exposure to integrative medicine got impetus in the second year when I attended a summer course organised by the National Integrated Medical Association. Passionate teachers, mentors and peer groups all have contributed to and inspired me.

My admission into MD course strengthened my exposure to a combination of modern research methods and pure classical Ayurveda-based clinical activities. I visited a CSIR lab to access modern scientific literature available on herbal formulations that I was using for my MD research work as a probe for exploring fundamental concept of Ayurveda, *Ojas* through reverse biology approach. This was my first project work towards exploring Indian traditional knowledge and bridging it with modern scientific methods, which encouraged me to take it up as a career. I joined the same CSIR lab as an Ayurveda expert in Traditional Knowledge Digital Library project in 2001.

In 2002, I joined CSIR-IGIB and established the new field of Ayurgenomics.

- Tough experiences prove to be good opportunities rather than barriers.
- Age relaxation in reward systems would encourage women to pursue science careers post 35 or 40.

Ayurveda says that the ultimate test of maturity of any discipline is that its subject matter appeals to and engages anyone irrespective of the level of intelligence. STEM education must incorporate this tenet.

I initiated systematic exploration of Ayurveda's framework and building of conceptual concordance between its fundamental methods and principles with basic science. Scientific development of methods for cross-validation for this concordance not only led to identification of molecular and genomic corelates of *dosha* and *prakriti* theory but also lead to novel discoveries of predictive markers.

In my journey of developing Ayurgenomics, tough experiences proved to be good opportunities rather than barriers. Proving the relevance of *prakriti*, a fundamental principle of personalised medicine in Ayurveda, in the modern context of genomics-based predictive medicine was one such tough task. Thus, I faced barriers not as a woman, but due to my different educational and training background, non-native peer group and environment. We were on an adventurous journey towards creating a completely new disciplineWe wanted to open it for people to travel seamlessly across disciplines.

My research experience has taught me that domain expertise and vision for the core area of work is a must for earning respect as a leader. A leader's role in team is to select the right person for the right task and to recognise the potential, groom and push the teammates to the next level and create leaders for tomorrow.

For women, though age relaxation in recruitments exists, similar relaxation in reward systems would encourage them to pursue science careers even after 35 or 40. Mentorship programmes to hand-hold and support women after maternity break would be immensely beneficial.

There is a great potential in Ayurgenomics, both from basic research and its translation in preventive and clinical medicine. Programmes for supporting more inter-disciplinary approaches in science, leveraging the indigenous knowledge systems as well as cutting-edge scientific developments, may also attract women and provide them edge over others due to their natural ability to multitask and integrate.

Ayurveda texts describe learning in three steps: *Adhyayan* (studying), *Adhyapana* (teaching) and *tadvid sambhasha* (discussion with domain experts). Ayurveda says that the ultimate test of maturity of any discipline is that its subject matter appeals to and engages anyone irrespective of the level of intelligence. STEM education must incorporate these tenets. ■

Academic Profile

- BAMS, Smt. KG Mittal Punarvasu Ayurveda Mahavidyalaya, University of Mumbai
- MD, Gujarat Ayurveda University, Jamnagar

Awards

- Keertan Sanjeevani Smt. Pushpalata Ranade National Research Award for Women

SHIV NADAR UNIVERSITY
DELHI NCR

RECOGNIZED AS INSTITUTION OF EMINENCE BY GOVT. OF INDIA

Let me begin by congratulating the CII for publishing this volume on women achievers in STEM. The contribution of India's women to the world of scientific research is a matter of such great pride. Where would we be today without the pioneering work of Janaki Ammal or Asima Chatterjee or Kadambini Ganguly and so many others, many of whom to this date remain unsung?

Research in its broadest sense, is the fundamental pillar of the academic mission of Shiv Nadar University. We believe strongly that the university must be a center for the discovery and creation of new forms of knowledge and expression, going beyond the dissemination of existing knowledge.

Within just ten years, Shiv Nadar University has defined a new trajectory for higher education in India. The recognition as the youngest Institution of Eminence by the Government of India is a testament to this trajectory. As we look forward to the next decade, we are determined to continue to drive foundational thinking within, across and beyond disciplines. Our focus will remain steadfast on the fundamental pillars of what makes a great university: a holistic, multidisciplinary education, research, innovation, and a commitment to the betterment of society.

However, we wish to be defined not only by the outcomes we achieve: our aspirations are more audacious. Our agenda is to transform the very ways in we learn, discover, teach, analyze, act, live and come together to create an institution of higher learning. Needless to say, women are, as they must be, central to such an agenda.

In the words of our former Vice-Chancellor Dr. Rupamanjari Ghosh, a recipient of the Stree Shakti Samman award for her contribution to science: 'it is not just about treating men and women equally -- it is about understanding the differences rationally and making the best of everyone's abilities and choices. A career in science often demands long hours at work, there are issues that affect women more adversely than men in this society. We paid active attention to these preventable problems. The overall culture I wanted to create at the University was 'gender-enriched', and not just 'gender-neutral'."

This work of enriching knowledge through the full participation of women needs many champions, advocates and foot soldiers. It is not a task that should fall on women alone. Neither is this a problem limited to India only. There is a large body of literature which shows the global trends and suggests many strategies we could mobilize for achieving greater inclusivity. My fervent hope is that India will lead this global quest for inclusive science.

It is important therefore that our message to our women scientists is not that they must continue despite all adversity. Instead, our message should be that all of us commit to work together to reduce those adversities, to remove those barriers and make their paths less difficult than it is today.

At Shiv Nadar University, we are committed to the mission of fostering an inclusive climate for such research excellence. The research success of our faculty, including women faculty in STEM disciplines, and our students, is making an increasing impact every day. But there is much more to do.

As a research university, our foremost task is to foster the love for research and curiosity itself. This is the main impetus behind our 4-year research degree programs. Their objective is to nurture young talent of the country by developing their capability for methodologically rigorous research, right from the undergraduate level.

Acknowledging the critical importance of supporting PhD students, we have established a doctoral award program, guaranteed for 5 years. It consists of a stipend (for 5 years), an academic fee waiver, highly subsidized accommodation on our beautiful 286-acre campus and support for dissemination of research through conferences and publications. Our investment in research facilities remains a topmost priority. The state-of-the-art, 63000 square feet Research Block houses major equipment and facilities for experimental research. The university is the first in the country to establish a Center for Genomics and Spatial transcriptomics (STOMICS). A Center for Integrative and Translational Research is in progress, while the Center for Excellence in Epigenetics was inaugurated in May 2022.

We are developing several new areas for cutting-edge transdisciplinary research. One such area is Cognition, where our vision is to bring together the STEM, the humanities and social sciences and creative fields to produce high-impact research.

Let me conclude by noting that I am very heartened by the increasing number of male colleagues who are proud to support their spouses and daughters in their aspirations and often ready to make serious compromises with their own careers. In an ideal world, academic institutions would be able to support both careers, and families, irrespective of gender.

Let us come together to create that world.

DR. ANANYA MUKHERJEE
VICE-CHANCELLOR

Chirashree Roy Chaudhuri, PhD

Associate Professor, Department of Electronics & Telecommunication Engineering
Indian Institute of Engineering Science and Technology, Shibpur, West Bengal

Chirashree Roy Chaudhuri's research pertains to electrical biosensors for affordable and sensitive diagnostics and food quality monitoring

My high school and under graduate teachers motivated me for developing the basic scientific reasoning and introduced me to the world of hands-on experiments. I am ever grateful to my PhD supervisor who taught me to think out of the box and execute any research idea with the simplest resources available.

A major turning point was not being able to pursue a master's degree at IISc Bengaluru despite securing a high rank in GATE examination due to family issues. So I had to steer my research domain with limited experimental resources at Jadavpur University in microelectronics. Soon after completing my PhD, I had to shoulder the responsibility of establishing a laboratory in the department and create a research group of my own. I wrote and secured research grants from various funding agencies, thereby accelerating my professional growth from an early stage. Further, it was my husband, a medical professional, who motivated me to pursue research in the area of rapid, low-cost disease diagnostics.

I joined as a lecturer at the Bengal Engineering and Science University at Shibpur while writing my thesis; I was also married by then. It was indeed tough to strike a balance between family, PhD and a new job. Further, due to domestic responsibilities, I gave up the idea of pursuing post-doctoral studies in any international laboratory or institute and had to ignore many options. However, I decided to do the best possible in India in my field and continued securing research grants and expanding my lab.

- Nurture a curious mind and be prepared for accepting changes.
- Focus on a key goal that is inspiring and challenging.
- Be surrounded by people of interest and intellect.

Success is not final, failure is not fatal; it is the courage to continue that counts.

My research group is working on developing ultrasensitive, specific and affordable biosensors for early detection of cancer and discovery of new biomarkers for treatment of complex diseases. As existing commercial technologies seldom reach the required detection limits in femtomolar, we have developed a suite of technologies with translational potential for cancer biomarker detection in femtomolar regime in serum. We further developed ultrasensitive field effect transistor-based devices with detection limits in sub-femtomolar range in serum. Our research has several Indian patents to its credit.

I am not in a leadership role in a traditional sense, but I have led myself on every occasion. Every successful woman leader benefits from guidance, advice or mentorship. To reach the top, one should always nurture a curious mind and be prepared for accepting changes as technology evolves on a daily basis. One should not be afraid to learn from others, including juniors, and learn new ways of solving old problems. It is necessary to focus on a key goal that is inspiring and challenging.

The road may not be smooth. One must remember that success is not final, failure is not fatal; it is the courage to continue that counts. Be surrounded by people of interest and intellect and continuously exchange ideas through discussions.

Administrators and educators must strive to create an environment in school that motivates parents to encourage their girl child to pursue science as a career. Workshops must be organised to create social awareness that science & technology is not a male-dominated field. Attractive fellowship schemes for women may be introduced to boost to their career even after a professional setback for raising a family.

Science teaching in school is syllabus-centric and is detached from correlating the content with everyday life. At the college level, experiment design should be emphasised in STEM subjects rather than just performing standard sets of experiments. Project-centric study modules in technological courses with practical relevance are needed. ■

Academic Profile

- BE Electronics & Instrumentation, ME Electronics & Communication Engineering, PhD, Jadavpur University, West Bengal

Awards & Memberships

- Gandhian Young Technological Innovation Appreciation Award, SHRISTI, 2021
- Visvesvaraya Young Faculty Research Award, MeITY, 2017
- Young Scientist Award, Institute of Smart Structures and Systems, 2015
- Young Scientist Platinum Jubilee Award, National Academy of Science, 2014
- Women Excellence Award, DST-SERB, 2013
- Young Engineer Award, Indian National Academy of Engineering, 2011
- Member of National Academy of Science, INYAS, INSA

Devinder Kaur, PhD

Assistant Professor, Central University of Punjab, Bathinda

Devinder Kaur's research work comprises scanning the whole genome sequence of the pathogenic protozoan parasite E. histolytica to discover its features that confer pathogenicity.

As a master's student, pursing a PhD was never my choice. My master's dissertation, however, turned out to be a game-changer when I got the opportunity to work with Prof. Sudha Bhattacharya at the Jawaharlal Nehru University (JNU). For the first time, I realised that research was fun. While presenting my work for the viva voice, my external examiner told me: "Good, Go back, complete it and get it published." These remarks had a huge impact on my life. After a year, it did get published. This served as the spark that ignited my PhD pursuit.

All of my teachers, right from school time in Una, Himachal Pradesh, inspired me to pursue science. All the engaging, hands-on activities piqued my interest in biology. In this learning, my friends played an equally significant role. Support from my parents and siblings fostered my inner strengths. When I was struggling with my PhD experiments, my sister inspired me and my brother encouraged me to set high goals and take pride in my publications.

- Women researchers must master time management skills to have work-life balance.
- 'Train your brain' all the time with updated data and new skills.
- Research is a field of endless learning.
- The government must alter employment policies to restore faith in STEM careers.

My father, initially hesitant about my decision to pursue a PhD, later supported all of my endeavours. My mother has been a mentor who taught me to learn basic principles in science and not run after marks. Everyone in my life—instructors, mentors, siblings, friends, husband and mother-in-law, encouraged me to move ahead in professional life.

Conducting research and defending your work using the strongest arguments and evidence are completely different games.

The organism I chose for my research work was Entamoeba histolytica. It causes amoebiasis and according to WHO, it is responsible for 10,000 deaths annually worldwide. I have explored this organism at the molecular level using both molecular and computational techniques. I studied the highly crucial process of rRNA maturation required for the growth and viability of the cells.

I used a computational approach to decipher the mechanistic details of this process, which revealed some peculiar features, unique to E. histolytica. I carried out studies that would help in finding the target genes for drug design. My PhD experience made me realise that Conducting research and defending your work using the strongest arguments and evidence are completely different games.

I would say hard work is the key but nowadays hard work along with smart work is the super-key to success. Research is a field of endless learning. You need to 'train your brain' all the time with updated data and new skills. As a woman reseracher, you must master time management skills to ensure work-life balance.

One should enter this field voluntarily and out of interest. As a PhD degree is compulsory for applying for an assistant professor's job, we are simply asking everyone to do PhD, irrespective of their interest. Without interest, it is simply going to be the wastage of lab resources, expensive chemicals and fellowship funds. One needs to think about it.

In my opinion, the lack of a secure job is one of the weakest points of this field. People put in a lot of hard work as this field necessitates a lot of effort, attention and time. After all this, one should be rewarded with secure jobs. Limited-time fellowships are not enough for a life-long career journey. Due to the lack of regular employment and reduction in the number of fellowships, the only remaining alternative left is to take on contractual positions, which primarily involves teaching with little to no research. What needs to be done is the alteration of government employment policies to restore faith in STEM careers. ■

Academic Profile

- PhD, Jawaharlal Nehru University

Fellowship

- UGC-BSR Meritorious JRF-SRF Fellowship

Debashree Ghosh, PhD

Professor, School of Chemical Sciences
Indian Association for the Cultivation of Science (IACS), Kolkata
Former Senior Scientist, National Chemical Laboratory, Pune

Debashree Ghosh's research interest is to explore the mechanism of melanin-related photo-processes using machine learning and quantum chemistry-based software packages.

I was born in Kolkata and brought up in the suburbs of Serampore. Early on, my grandfather encouraged me to read. Our home was full of books, and I took to them quite naturally and enthusiastically. My interest was in science and mathematics, I was an introvert and not particularly sure about my career prospects then, but I found a comfortable refuge in studies and school work.

I participated in a summer school organised by IACS for school-leaving children. At that time I did not know that IACS would later become my workplace. I met some amazing professors there who opened up the world of academics and research to me. It was mainly this influence that offered the initial impetus to me to pursue science. My teachers at the Presidency College not only inspired me to pursue research, but mentored me as well on how to make it possible. They offered me the confidence to dream and the ability to realise my goals.

My postdoctoral advisor, Prof. Anna Krylov, played a crucial part in my professional growth. She has always been extremely balanced, understanding and encouraging.

Sometimes, a single incidence may leave a long-lasting influence. In my qualifier for PhD, I was required to defend the work's progress and show a path forward. I had in my committee Nobel laureate Prof. Roald Hoffmann, a tough examiner. I remember being extremely terrified. But somehow, this exam went spectacularly well for me. The ownership and confidence I felt after that incident made me finish my PhD in a smooth manner.

- Organising summer schools and science camps with participation of a large number of women professionals may help.
- Social consciousness about STEM careers should also be cultivated.
- Be part of professional circles of women scientists and develop a culture of helping each other.

It is necessary for women to identify a few mentors who can motivate and support them when the calling gets tough.

My research aims at understanding the interaction of light on biological systems from a molecular perspective using theoretical and computational tools. I do not think I have faced too many barriers as a woman. However, it was a difficult experience hunting for a job when both my husband and I were looking for academic positions at the same time. I was always apprehensive whether my candidacy would be viewed less seriously. I was never quite sure whether to be assertive as I normally am or be more soft-spoken as I might be expected to be. It was a difficult balance and I never quite knew what worked or did not. But I am ultimately thankful that there were many people who believed in me.

It is necessary for women to identify a few mentors who can motivate and support them when the calling gets tough. Women must learn to strike work-life balance and take some time away from work to do things that bring joy. This helps prevent burnouts and ensures a positive spirit. For me, it is a diverse group of friends that keeps me more outward-looking and balanced.

My field, chemical sciences in particular, is extremely male-dominated where women research group leaders make up for less than 15 per cent of the total in the field. I wish this percentage shoots up. Therefore, I would advice women researchers to be persevering and strong-willed. I would suggest they form and be part of professional circles of women scientists and develop a culture of helping each other in such networks.

Despite favourable policies to attract more women into STEM careers, lacunae still exist in efforts to attract more women at a younger age and to retain them later. Organising summer schools and science camps with participation of a large number of women professionals may help. 'Vigyan Jyoti' camps are a good example. Social consciousness about STEM careers should also be cultivated.

The main shortcoming in how STEM is being taught is that we are discouraged to ask questions and not taught to solve problems. While bookish knowledge and reading up on existing theoretical aspects is done quite effectively, students are not encouraged to think about how to apply it to solve a real-life problem. ■

Academic Profile

- BSc Chemistry (Hons), Presidency College, Kolkata
- MS Chemical Sciences, IISc, Bengaluru
- PhD, Cornell University, US
- Postdoctoral research, University of Southern California

Awards & Fellowships

- POWER Fellowship, DST-SERB, 2022
- Annual Medal of the International Academy of Quantum Molecular Sciences, 2021
- Fulbright-Nehru Fellowship, 2020
- Experienced Researcher Fellowship of Humboldt Foundation, 2017

Debrupa Lahiri, PhD

Associate Professor, Biomaterials and Multiscale Mechanics Laboratory
Department of Metallurgical and Materials Engineering, IIT Roorkee
Ex-Scientific Officer-D, Nuclear Fuel Complex, Hyderabad

Material scientist Debrupa Lahiri's research and expertise are focused on composites, nano-mechanical properties and biomaterials.

I was born in Liluah, a small town in the Howrah district of West Bengal. I am thankful to my parents and teachers for giving me a wonderful schooling experience, which inspired me to perform the best in whatever I did. As such, no specific person inspired me to opt for engineering; it was mostly my own interest and pursuit. The beauty of my stream, metallurgical and materials engineering, is the perfect combination of science, engineering and technology.

After pursuing MTech, I settled down in Hyderabad—got married, joined a government job in the Department of Atomic Energy and became a mother. One day, a casual conversation with my mother changed everything. I and my husband decided to go further in our careers. We left everything behind and went to the United States for pursuing PhD. It was a big, but calculated risk, which paid off finally, when we returned to join IIT Roorkee as assistant professors.

I had a tough experience when I became a mother. Being a premature baby, my son needed special care and attention. At that point, I was in a dilemma about whether to continue in my career. Anyway, with strong support from my husband and parents, I was able to go through that tough phase of my life, keeping my career intact.

I received an international award, the Zwick Science Award and Paul Roell Medal, for a specific study on nano-mechanical properties. Recently, we are being approached by companies for practical problems related to composites.

- The government and the private sector should recruit more women.
- Success stories of women in STEM need to be highlighted frequently in the media.

Women are natural leaders. They can take care of the family, nurture children for proper education and training, and can concentrate on their official responsibilities as well, keeping all aspects in perfect equilibrium.

Women are natural leaders. They can take care of the family, nurture children for proper education and training, and can concentrate on their official responsibilities as well, keeping all aspects in perfect equilibrium. Once they are in the leading position, they will be able to manage all other aspects of their life with similar efficiency and in perfect balance.

The field of engineering, specifically metallurgical and materials engineering, is highly suitable for women. Development of materials in a broad range–from as small as in a transistor going into a mobile phone to as big as needed in a ship or an airplane—is challenging, exciting and enjoyable.

The government has already increased seats for women at the entry-level of engineering education in some reputed engineering institutions. The government and private sectors should move ahead to recruit more and more women. GATI by DST is one such effort. Women should also be encouraged to become entrepreneurs and the government should extend the required support. Success stories of women in STEM need to be highlighted frequently in the media. Once the general awareness increases about the expanding scope of women in STEM, more women will automatically get attracted to this field.

Since engineering is directly related to practical application, I feel the studies also need to be more practical-oriented. Problems from practical life, issues faced by industries and success stories of engineering marvels must be included wherever possible, to attract students to this vast field. Once we make STEM education attractive and challenging, STEM careers will turn more popular. Recent government initiatives like Atmanirbhar Bharat and Make in India have the potential to make this journey more interesting, challenging and fruitful. I am quite sure these would be an integral part of education and research in STEM and act as the driving force towards incorporating a practical approach in the field. ■

Academic Profile

- BE Metallurgical Engineering, Bengal Engineering College, Shibpur
- MTech Materials & Metallurgical Engineering, IIT Kanpur
- PhD in Materials Science & Engineering, *Post-doc Research*, Florida International University, Miami

Awards & Fellowships

- Zwick Science Award and Paul Roell Medal, 2013
- Dissertation Year Fellowship & Dissertation Evidence Acquisition Fellowship from University Graduate School, FIU

Memberships

- American Ceramic Society
- Minerals, Metals & Materials Society
- Materials Research Society India
- Indian Institute of Metals

Dr Dhanya Lakshmi N

Associate Professor
Kasturba Medical College, Manipal

Dr Dhanya Lakshmi is a clinical geneticist who works on autoinflammatory diseases to understand their genetic basis by using genomic techniques.

I have been fortunate enough to have supportive parents who encouraged scientific inquiry from a young age. In my opinion, teaching or learning any subject, should not be done for the sake of getting a job or for earning money. Inculcating scientific inquiry is needed from the beginning. My parents never hesitated to spend money on books for me and my brother. My brother, who is also a scientist, has been a motivation for me to pursue rational thinking.

I was lucky to have mentors who were extraordinarily brilliant and at the same time amazing human beings. I got the chance to work with Dr Sheela Nampoothiri as soon as I finished my MD in pediatrics. Her commitment and perseverance inspired me a lot to study medical genetics.

Another key person who inspired me was Dr Shubha Phadke, my department head at the Sanjay Gandhi Post-Graduate Institute of Medical Sciences (SGPGIMS), Lucknow. She has always encouraged and supported me to pursue research in medical genetics. Recently, I had the opportunity to meet Dr Dan Kastner, the father of autoinflammatory diseases. It was the conversation that we had that changed my perspective on research in that field.

- Inculcating scientific inquiry is needed from the beginning.
- Decide the field of work based on your interest, not those of your partner or family.
- Teaching or learning any subject should not be done for the sake of getting a job or for earning money.
- It is important to choose a wise, kind and considerate mentor.

The portrayal of women as shakti (power) with multi-tasking abilities and ten different hands should end. Women need not be put on a pedestal as every pedestal is a prison as well.

I did not face the regular barriers women have to face due to gender-bias. However, as soon as I finished my MD, a personal tragedy struck me. And it was an experience that enabled my growth as a human being. All that I achieved afterwards would not have been possible without the support of my friends, family and wonderful colleagues.

Being a clinical geneticist, I see families with rare diseases. We help them get an answer by performing genetic testing. We also aid in their management and provide genetic counselling for the families. I am currently trying to focus on autoinflammatory diseases, which are a rare group of diseases that cause uncontrolled inflammation in the body. I am also researching their genetic basis by using genomic techniques that will enable treatment with drugs.

Through my experience, I believe that, when you get into the field, it is important to choose wise mentors, but ensure that you choose them not based on the number of publications or grants, but based on how kind and considerate they are. If possible, always spend time with the person before choosing him or her as your mentor.

Women should be able to decide the field of work based on their interests, and not of their partners or family. To attract more women into STEM careers, there should be policies to enable women in the workforce irrespective of their marital status.

Many institutes in India have extremely biased housing arrangements for single women. They are not given preference when it comes to housing inside the campus. The portrayal of women as shakti (power) with multi-tasking abilities and ten different hands should end. Women need not be put on a pedestal as every pedestal is a prison as well.

There should be a regular feedback mechanism in workplaces. And finally, all workplaces should have a dedicated centre to address the concerns of women. Women need a lot of support when they need to voice their opinion that differs from their superior male officers. ■

Academic Profile

- MBBS, Kerala University
- DCH, MD Pediatrics, Calicut University, Kerala
- DM Medical Genetics, SGPGIMS, Lucknow
- DNB Pediatrics

Fellowship & Memberships

- DBT/Wellcome Trust India Alliance Early Career Fellow (clinical and public health research)
- Member of INYAS, Society of Indian Academy of Medical Genetics, Indian Association of Pediatrics

Dr Gagandeep Kang

Professor, Department of Gastrointestinal Sciences
Christian Medical College, Vellore
Former Director, Translational Health Science and Technology Institute, Faridabad

Dr Gagandeep Kang is a physician-scientist, specialising in microbiology and public health. She has more than 30 years of experience in leading and coordinating health research.

I was born in Shimla, and was schooled in many towns owing to the transferable government job of my father. My family encouraged me to become a doctor, but the focus on research came largely from my own curiosity. My supportive parents and colleagues with whom I had collaborations for over 20 years inspired me in different ways.

I built an internationally-recognised, globally-competitive research programme focused on enteric infectious diseases and interventions ranging from water and sanitation to vaccines. I have conducted hospital- and community-based randomised controlled trials, initiated and followed cohorts and multiple case control studies. I have collaborated with over 70 institutions in India to establish multi-site and multi-tier surveillance systems to define the burden of several enteric infections and evaluate the safety and effectiveness of vaccines introduced into the national immunization programme. My research group has supported the development of three indigenously-manufactured rotavirus vaccines, one of which failed while the other two are now WHO pre-qualified.

For the past 15 years, I have been deeply engaged with the global vaccine research community. In the past two years, I have continued to serve on multiple advisory committees, nationally and internationally, most notably as part of the WHO SAGE Working Group on COVID-19 vaccines and as vice-chair of the Board of the Coalition for Epidemic Preparedness Innovation, where I also chair the Equitable Access Committee.

- I have never thought India has a special problem with women in STEM. I think India has a problem with professional women.
- Be sure that you have a passion for change and are willing to be rigorous with your efforts.

Aspiring women leaders must stretch themselves early in their career to get a sense of what they are capable of, and then network and project their achievements.

However, for my professional journey to become so satisfying and successful, I had to go through the lens of scrutiny. Recognitions that I could perform at a very high level helped me accomplish my best whenever I met new challenges.

Barriers and roadblocks are commonplace for women in STEM fields, largely dominated by men. From a head of department who constantly told me that I was doing badly and had no potential to another who said he did not like the look on my face, the systemic denigration, as happens particularly in medical research in India, led me to believe that I was incapable of doing anything well. I found working in other countries much easier, with much more overt support to grow. It takes a long time to rebuild your belief in yourself. I was over 40 when I finally decided to do the best I could to pursue my interest, and not let the demeaning and ignoring get me down.

Aspiring women leaders must stretch themselves early in their career to get a sense of what they are capable of, and then network and project their achievements. In Indian society, women are insensibly conditioned to not put themselves forward and thus often do not get selected for roles where they would be more than suitable. For those who wish to become a clinician scientist, be sure that you have a passion for change and are willing to be rigorous with your efforts. You must be ready to devote the time needed to execute on the challenges of research in hospitals and laboratories and with the community.

I have never thought India has a special problem with women in STEM. I think India has a problem with professional women. Indians respect STEM careers, but the real need is to respect and facilitate working women. Most STEM teaching in India lacks building professional readiness in students. At the school level, particularly in rural areas, experiential learning and critical thinking are not widely used, and require a level of teaching skills that few of our teachers have, even at the university level. Improvements are feasible: smaller class sizes, better teaching, and opportunities for exposure through workshops and summer programmes. Many of these exist for the elite, but just as with the potential for women to expand the STEM workforce, all Indian students should be supported to explore and pursue their interests. ■

Academic Profile

- MBBS, MD, PhD, Christian Medical College, Vellore
- Post-doctoral training in UK, US

Awards & Fellowships

- Infosys Prize in Life Sciences, 2016
- Fellow of the Royal Society, UK, 2019
- Fellow of the Faculty of Public Health, UK, by publication, 2016
- Fellow of American Academy of Microbiology, 2010
- Fellow of Indian National Science Academy, Indian Academy of Sciences, National Academy of Sciences

Gaiti Hasan, PhD

SERB-Distinguished Fellow & Former Senior Professor
National Centre for Biological Sciences (NCBS)
Tata Institute of Fundamental Research (TIFR), Bengaluru

Gaiti Hasan is a neuroscientist who leads fundamental research in neurodegeneration, molecular genetics and cell signaling in neuronal function.

My childhood was spent in the campus of Aligarh Muslim University, where both my parents were professors. Academia was all around me; and so academic research as a career option was obvious. My progressive family valued and supported women's education.

During college at Delhi's Miranda House, where teachers made us experience science hands on in an experiential manner, my interaction with students from non-science streams helped me view science in a broader perspective rather than confining it to discipline-specific definitions..

The strong social science backbone of the Jawaharlal Nehru University fostered empathetic thinking in me. Then for my PhD, I left for Cambridge University, where I learned to practice utmost discipline—the only trait that helps you tread the long and testing road in research with ease.

I started my career at TIFR, Mumbai, and later moved to NCBS, Bengaluru. I Pdeveloped an interest in how one cell sends signals to the other and how these communications culminate into diverse cell functions. Cellular events are often mediated by spikes of cytoplasmic calcium. My group studied how cells release Ca^{2+} in response to the second messenger Inositol 1, 4, 5-triphosphate ($InsP_3R$) to regulate neuronal physiology in model organisms like fruit flies and mice as well as in human stem cell-derived neurons. Our recent findings demonstrated a role for intracellular Ca^{2+} signaling in regulating neurotransmitter release and neuronal gene expression. These findings are significant in suggesting possible means of therapeutic intervention for human neurodegenerative diseases like spino-cerebellar ataxias and Parkinson's syndrome, where the $InsP_3R$ plays a causative role.

- As a research scientist, you must enjoy your work and the process of scientific research.
- Research institutions must strive to become more equitable for women scientists and researchers from diverse backgrounds.
- Experimental research often requires long work hours and a supportive family is essential.

Science is all about learning from one's failures; so learn to handle failure positively as early as possible.

In their early years, both TIFR and NCBS recruited competent women, but sparingly. That was probably due the fact that there were less women in STEM. Research institutions in our country must strive to become more equitable not just for women scientists, but for researchers from diverse backgrounds to retain talent in its most inclusive form and number. Small changes like having good redressal mechanisms for work place harassment, more opportunities and institutional facilities for married students and a mentoring system for women researchers can go a long way in improving the representation of women in STEM.

Young women looking to go into scientific research must be quite certain that their family will agree to support their passion. Experimental research often requires long work hours and a supportive family is essential. As a researcher, I have witnessed and have been a part of four decades of change in the S&T landscape in India. Sometimes, I wonder at the diversity of career choice in STEM today; If I had grown up in current times, I would have chosen a different career path, but in STEM only. There are multiple career options that women can take up other than bench research. Those include teaching, opportunities in industry, patent law and as science administrators and communicators.

Since schools are the feeding units for higher education ecosystem in STEM, we need to have long-term investments in school and college education. We need to have better trained teachers and a dynamic STEM curriculum that can risk logic, creativity and problem-solving as metrics of learning rather than the standardised tests.

Equitable school education accessible to all economic classes and better scientific research infrastructure in colleges and universities with greater exposure of students and teachers to rigorous scientific thinking can help improve our scientific ecosystem.

Finally, as a research scientist you must enjoy your work and the process of scientific research. Science is all about learning from one's failures; so learn to handle failure in a positive way as early as possible. ■

Academic Profile

- BSc Zoology, Miranda House, University of Delhi
- MSc & MPhil Life Sciences, JNU
- PhD, University of Cambridge

Awards & Fellowships

- Sri M Viseswaraya Senior Scientist State Award, 2019, 2022
- Chaire Gutenberg, by Strasbourg Communities, Strasbourg, France, 2020

Hemant Sood, PhD

Associate Professor, Department of Biotechnology & Bioinformatics
Jaypee University of Information Technology, Solan, Himachal Pradesh

Hemant Sood is a plant biotechnologist developing technologies for conserving endangered medicinal herbs of North-Western Himalayas.

My professional mentor Prof. RS Chauhan inspired me to pursue a career in biotechnology that involved S&T interventions in Himalayan medicinal plants. During my PhD, I realised that high-value medicinal herbs endemic to North-Western Himalayas are given the least importance by advanced countries. Therefore, I decided to pursue my research in this field. I started developing cell and tissue culture technologies for endangered medicinal plants and the production of medicinal compounds so that these traditional herbs could be commercialised, utilised and acknowledged globally.

I realised that there is still a biased approach towards women scientists, particularly among S&T leaders who feel insecure due to forward-looking women. Moreover, opportunities are still not enough to accommodate the growing number of women scientists having robust potential. I would advise to take up a career in S&T, particularly in biotechnology, as India is facing serious challenges in health and malnutrition among women and children in rural areas, and hence the necessity of creating women S&T leaders.

- Young women must pursue their education with great enthusiasm and passion.
- There is an urgent need to recruit more women as STEM teachers.
- We need a defined policy in recruitment with a quota for women trained in STEM.

My research has also contributed to creating avenues for rural entrepreneurship through local societies and NGOs. I have submitted in vitro grown medicinal plants at the National Bureau of Plant Genetic Resources, Delhi, and shared my scientific findings in more than 100 publications in journals and international and national conferences. I have three patents granted and one published.

I would advise to take up a career in S&T, particularly in biotechnology, as India is facing serious challenges in health, malnutrition among women and children in rural areas.

I am also actively involved as convenor or member of university and department level committees like anti-ragging, sexual harassment, New Education Policy, board of studies, bio -clubs and student mentoring and counseling.

My advice to young women is to pursue your education with great enthusiasm and passion by taking up local problems in health, food, nutrition and environment so that not only national issues are addressed, but avenues for entrepreneurship are created by budding women scientists.

There is an urgent need to recruit more women as STEM teachers, right from school to college and university level, so that they become role models. This can only be achieved if the government or private sector comes up with a defined policy in recruitment with a quota for women trained in STEM. The major shortcoming in how STEM is being taught is that there has been a very low percentage of women as teachers and faculty trained in STEM subjects. Even in my current department of 20 faculties, we are only three women whereas all others are men, whereas the proportion of female students is 80-90 per cent. Moreover, new S&T programmes exclusively for women should be proposed with potential avenues for entrepreneurship. ■

Academic Profile

- BSc Biotechnology, HP University, Shimla
- MSc Biotechnology, University of Horticulture & Forestry, Nauni, Solan
- PhD in Biotechnology, Jaypee University of Information Technology, Solan
- PG Diploma in IPR, IGNOU, Delhi and WIPO, Geneva

Awards

- Indian Science Congress Association Young Scientist Award
- International Scholarship, Israel's Agency for International Development Cooperation (MASHAV)

Memberships

- Indian Science Congress Association
- Biotech Research Society of India
- Association of Bio-Pharma Professionals
- Orchid Society of India
- IEEE

Jyoti Sharma, PhD

Professor, Cluster Innovation Centre
University of Delhi

Jyoti Sharma is a mathematics educator who specialises in developing creative methods for identifying gifted STEM students and works for promoting innovative pedagogies in STEM education.

My inclination towards mathematics was natural and I built a strong foundation in the subject right from my school days. My maternal grandfather was a mathematician, but it was my grandmother who nurtured my interest in the subject. As a mathematics enthusiast, I was keen to help students with high potential in the discipline. Hence, I decided to pursue a career in math education and learned nuances of cognitive and other factors that influence math learning in students.

I was fortunate to have a very encouraging ecosystem, including professional colleagues, mentors, friends and family, that was always quite supportive and trusted me in all my professional adventures. I remember an incident where a school principal introduced me to a little girl of grade five, a talented child who had won many laurels in several inter-school competitions. But when I asked the principal about how the school can further help foster her talent as she progresses to higher grades, she acknowledged the gap in teaching expertise and lack of relevant resources. I realised that many talented and gifted students in STEM don't receive the required stimulus or challenging environment, and we lose out on their real talent. This incident inspired me to work closely with high potential students and to equip teachers in STEM-based pedagogy for nurturing high-ability learners.

- Develop passion, commitment and a futurist vision.
- Building teachers' capacity in STEM-based pedagogy is important.
- STEM learning experiences should be realistic and localised.
- We must merge disciplinary boundaries in education.

I worked continuously towards creating new platforms for changing math education. I am one of the founder faculties who started the meta university concept-based programme aligned with STEM and technology-based innovative pedagogy. I conceptualised a project on developing methods to identify and mentor gifted students in math and science in Indian classrooms and am the principal investigator of this pioneering national-level work. I have contributed extensively while working with NCERT and CBSE and other national and international groups on promoting mathematical abilities among learners.

Women must not be guided by the myths generated by social systems and gender stereotypes.

As a math educator, I have discovered the fascination of working with little geniuses who could be the Einstein or Ramanujan of tomorrow. I feel satisfied that my work is actually bringing my expertise to the levels of young gifted minds. It is challenging, yet very rewarding to the soul.

I advise all young women pursuing careers in STEM to always believe in your potential and identify your inherent talent. Women must not be guided by the myths generated by social systems and gender stereotypes. Always pursue your passion and invest quality time on self-reflection, bringing clarity in your ideas and setting up your priorities. Women can effectively balance their roles as professionals and as a family anchor with better planning and perseverance. Women in STEM careers must develop passion, commitment and a futurist vision.

We must encourage girls at the school level to pursue careers in STEM. Policymakers must construct and create multiple routes for young women to pursue STEM careers, including multiple entry and exit options. Options for part-time, weekends and evening research programmes must be made available so that women can save their career while meeting important family commitments and duties.

STEM should be encouraged at all levels of education. Curriculum should be more hands-on and research-oriented. Students should be encouraged to engage in small-scale research and innovation activities. Building teachers' capacity in STEM-based pedagogy is important and must be a continuous endeavour. We must merge disciplinary boundaries in education and promote multidisciplinary and interdisciplinary approach in teaching and assessment. Finally, STEM learning experiences should be realistic and localised. ■

Academic Profile

- BA (Hons) & MA in mathematics, University of Delhi (DU)
- BEd, MEd and PhD in education, DU

Awards

- Teaching Excellence Award for Innovation (DU)

Memberships

- Consultation Group, Science, Technology, Innovation Policy (STIP) 2020
- The Association of Mathematics Teachers of India

Krishna Ray, PhD

Assistant Professor, Botany, West Bengal State University, Kolkata

Krishna Ray is credited for her commendable work on ecological restoration of degraded mangrove ecosystem in Indian Sundarbans, in collaboration with the West Bengal department of forests.

My late parents and my late elder brother had been my best teachers, inspirational sources and motivators since childhood. My husband has been my whole-hearted supporter and a major collaborator in all my research and other academic activities. My school, college and university teachers and my late PhD supervisor have all supported and made my journey fruitful.

However, some key advisors whose contributions in building my research career is quite instrumental and undeniable are Prof. Sampa Das and Prof. Arunendra Nath Lahiri Majumder of Bose Institute, Kolkata; Prof. Deepak Pental and Prof. PK Burma of the University of Delhi South Campus; Prof. S. K. Barik, Director, CSIR-National Botanical Research Institute, Lucknow; and finally Prof. CR Babu from the Centre for Environmental Management of Degraded Ecosystems (CEMDE), University of Delhi. Prof. Babu was the key motivator in my research journey towards taking care of nature and environment.

My research career took a significant turn when I was selected to attend the 'Mahabaleshwar Conference on Functional Genomics' organised by TIFR Mumbai in 2000 as a DBT post-doctoral representative from Bose Institute. I got a chance to interact beyond my lab with researchers and scientists from across the country working in a similar arena. I happened to meet Prof. Deepak Pental and got mesmerised by his ideologies. Subsequently, my eight-year tenure as a research associate and post-doctoral scientist at the Department of Genetics, University of Delhi South Campus under the supervision of Prof. Pental and Prof. Burma turned out to be instrumental in shaping my research concepts. In addition, I was introduced to the field of ecological restoration and other ecological concepts of Prof. Babu's team at CEMDE indirectly through my husband who happened to be there as a scientist in that team on deputation.

- Stick to your aims and aim still higher by fulfilling them.
- For a successful research career, you have to be patient and persevering.
- Interdisciplinary studies are the need of the hour.
- Field studies should be made mandatory in each subject.

You have to be focused and do not succumb to any hindrances obstructing your academic career.

I and my collaborators have worked towards restoring 3.16 hectares of degraded mangroves located at Ramganga village of Patharpratima block at the confluence of rivers Mridangabhanga and Barchara and showed evidence of eco-resilience during super cyclones Amphan and Yaas. Since 2020, another 60 hectares of degraded mangroves have been targeted and their ecological restoration is being executed.

I faced the toughest phase in my research career when I was expecting my son.

This is a common phase of all women researchers' lives to delicately balance between the family and research at some point in time. Once sustained, you may get success, but if you fail, you are excluded from your research or academic career.

Come what may, you should stick to your aims and aim still higher by fulfilling them. If I can trail myself amid all the hurdles, you too can. For a successful research career, you have to be patient and persevering. You have to be focused and do not succumb to any hindrances obstructing your academic career.

Although not specific for women in STEM, overseas post-doc experience is still preferred over Indian post-doc experience for recruitment in India. This must change and researchers who chose to stay in India must get a level-playing field.

The government and the private sector have long patronised the advocacy of women's rights on the ground of the equality of the sexes and several policies are already in vogue. Yet mental harassment of women in academics and STEM fields by their colleagues, supervisors and lab mates is being continued at several levels and I do not know which policy could abate it completely.

Field studies should be made mandatory in each subject to correlate the subject with nature, environment and industry. Present credit-based choice systems of syllabi are just namesake only at most institutions as they lack relevant facilities and resource persons. Interdisciplinary studies are the need of the hour. ■

Academic Profile

- BSc (Hons), MSc & PhD in Botany, University of Calcutta

Kusum Deep, PhD

Professor, Mathematics; Joint Faculty, Mehta Family School of Data Science and Artificial Intelligence, IIT Roorkee
Visiting Professor, Liverpool Hope University, UK

Kusum Deep is a renowned mathematician who leads her research to design efficient and reliable nature-inspired optimisation techniques to solve real-life optimisation problems.

I was inspired by my parents, late Kailash Kambo and late Prof. Kuldip Chand

Kambo. During schooling, I was inspired by J N Sharma, my mathematics teacher. Prof. Chander Mohan, my PhD supervisor at the University of Roorkee/IIT Roorkee was another inspiration.

I have taught subjects like mathematics, operations research, numerical and analytical optimisation, parallel computing, computer programming and numerical methods. My research interests are nature-inspired optimisation techniques, particularly evolutionary algorithms, and swarm intelligence techniques and their applications to solve real-life problems.

I have a breakthrough publication in 2009 to my credit. It talks about real coded genetic algorithms for integer and mixed integer optimisation problems and continues to be the most downloadable paper of the Elsevier Journal of Applied Mathematics and Computation.

I have designed and applied new particle swarm optimisation (PSO): e.g. shrinking hypersphere PSO, co-swarm PSO, novel Inertia weight strategies in PSO; binary PSO for knapsack problems, hybrid discrete PSO for trim loss, earthquake engineering, stereo camera calibration, parameter pptimisation of multi-pass turning, extraction process of bioactive compounds from gardenia, a genus of flowering plants in the coffee family Rubiaceae; cell-like P-systems based on rules of PSO, artificial bee colony for avalanche forecasting; harmony search for Sudoku; harmony search for maximum clique; and antlion optimiser for data clustering.

- Be confident, bold and outspoken.
- Women in STEM should not think themselves to be less than men.
- For better representation of women in STEM fields, the government and the private sector should reserve a certain number of positions for women.

Next-generation women who wish to be leaders need to put extra efforts to keep a proper balance between academic and administrative areas.

It is a great honour that my recent papers on grey wolf optimiser, Hariss' hawk algorithm, sine cosine algorithm have received large citations. Recently, my publications in classifications problems of breast cancer data set using artificial intelligence and non-deterministic polynomial-time hard problems like 'travelling the salesman' problem has received noteworthy attention.

I have authored two books, *Optimization Techniques* and *Nature Inspired Optimization Techniques—An Introduction;* supervised 20 PhD scholars; and published over 130 research papers. I am the executive editor of *International Journal of Swarm Intelligence,* published by Geneva-based Inderscience Publishers, associate editor of *Swarm and Evolutionary Algorithms* (Elsevier) and associate editor of *Engineering Applications of Artificial Intelligence.* I am the general chair of a series of International Conference on Soft Computing for Problems Solving.

I have made an international presence in my field. However, there have been occasions when I was not assigned any administrative or leadership position despite my managerial skills, just because men do not prefer to work under a woman.

In my opinion, next-generation women who wish to be involved in a leadership role along with academic excellence need to put extra efforts to keep a proper balance between academic and administrative areas by being confident, bold and outspoken.

Women who wish to join faculty in any university should not think themselves to be less than men in any way whatsoever. For better representation of women in STEM fields, the government and the private sector should reservea certain number of positions for women. Announcing best women teacher awards at the university level, best researcher award, etc. can attract more women into STEM careers. ■

Academic Profile

- MPhil & PhD, Mathematics, University of Roorkee

Awards & Fellowships

- DST-SERB POWER Grant, 2021
- Association of Inventory Academicians and Practitioners Excellence Award, 2018
- Khosla Award, University of Roorkee
- Post-Doctoral Bursary, Commission of European Communities, Brussels
- Career Research Award, UGC

WINNING WITH THE POWER OF DIFFERENCE

40%+
women representation in India Leadership team

34%+
women representation across engineering roles.

42%
women representation in Cummins Global Services and Analytics team.



DIVERSITY EQUITY & INCLUSION



Cummins

Lolitika Mandal, PhD

Associate Professor, Indian Institute of Science Education and Research (IISER), Mohali

Lolitika Mandal is a developmental biologist who uses the fruit-fly model to unravel several cross-talks between different blood stem cell compartments. She aims at understanding the role of stem cells in development and disease.

I was born and brought up in Asansol, West Bengal. My interest in science dates back to my childhood, when my father, a physician, kindled my sense of curiosity, a knack for observation and a thirst to explore the world around me. Growing up in remote coal belts and a small city like Asansol, I could not have reached where I am today if not for him, my first mentor. My family supported me through all ebbs and tides. My perpetual addiction to diving into the realms of developmental and stem cell biology owes its sustenance to the support of my mother, brother, husband and two daughters. Their encouragement and support have helped me achieve work-life balance.

After a long post-doc at the University of California at Los Angeles, the reason to come back to India was to create a vibrant and strong lineage of students in developmental biology. In addition, I wanted to reach out to kids with limited resources to help them get inducted into science. At the same time, I tried my level best to provide fundamental insights into the research problem that I'm pursuing at IISER Mohali. The fruit-fly model has helped me unravel the several cross-talks between different blood stem cell compartments, providing fundamental insights into developmental and disease scenarios.

- Passion is the only fuel to drive you to be a successful individual.
- Maternity break or childcare leave should not be taken as a break.
- Your kids should find a role model in you rather than focusing elsewhere.

Women need to act as individuals and be courageous enough to take essential and crucial steps for their professional growth

Like many women, the age criteria have bothered me also as an individual principal investigator in applications requiring a so-called age limit. Achieving a balance between motherhood and scientific commitments has been a huge challenge for most women and I was certainly not the odd one out. However, with my husband's help, I could tide over them to a large extent, especially during the growing phase of my kids.

Women need to act as individuals and be courageous enough to take essential and crucial steps for their professional growth. We must appreciate and strengthen the bonds of sisterhood, and reach out to every woman who is worth giving a push, and nudge to reach the next level. Passion is the only fuel to drive you to be a successful individual. We need a lot of patience and an artistic soul that is more stoical than one involved in the rat race for awards and recognitions. Your kids should find a role model in you rather than focusing elsewhere.

I am deeply interested in contributing my bit to STEM education. In my opinion, teachers have to be the bridge between textbooks and students. To instill interest in the topic, we have to be the proactive link that infuses life and our excitement into the textbook content. Instead of telling students facts straight from a book, teachers may need to involve students in the process of discovering science through experiments or engaging with a movie or a story about a discovery or the discoverer.

To promote women in STEM disciplines, relaxing the age barrier women face in awards, fellowship applications or jobs can bring more people to the field. Motherhood and family responsibility weighs one down, and most of the time, we cannot satisfy the age requirements. Maternity break or childcare leave should not be taken as a break; it is a learning experience that teaches us time management, multitasking and patience, and infuses us with happiness that strengthens our inner soul. I firmly believe that it should be classified under job experience. This single bottleneck in our careers results in the absence of a good representation of females in higher positions. ■

Academic Profile

- PhD in Cytogenetics, Banaras Hindu University
- Post-doctoral studies, University of California, Los Angeles

Fellowships

- DBT/Wellcome Trust India Alliance Intermediate & Senior Fellowships
- Fellow of National Academy of Sciences

Dr M V Padma Srivastava

Professor & Head, Department of Neurology
Chief, Neurosciences Centre, AIIMS, New Delhi
Honorary Professor, University of Central Lancashire, UK

Dr M V Padma Srivastava is a Padma Shri awardee and is recognised for her work in acute stroke care, its treatment, management and rehabilitation in India.

My life has been hugely influenced by my doctor mother, who sailed through innumerable setbacks and with impunity, fortitude, grit and resolve. I guess she has been my living God!

I have pioneered the work on thrombolysis programme in acute ischemic stroke in India. I initiated and implemented the country's first public sector acute stroke thrombolysis programme (Code-Red) in AIIMS, New Delhi, in 2002. The international guidelines for stroke management then had mandatory requirement of obtaining blood platelet count, prothrombin time (PT) and international normalised ratio prior to administering intravenous recombinant tissue plasminogen activator (alteplase). This was impossible for any patient managing to arrive at the emergency triage within three hours of stroke onset as obtaining results of these investigations within the extremely narrow therapeutic time window was not possible. I redefined the relevance of these pre- thrombolysis investigations that further delayed and increased cost of treatment. Due to my work, it is no longer mandatory to perform these tests if patients could be identified with appropriate clinical and radiological criteria. In 2018, the international guidelines, including those by the American Stroke Association and the American Heart Association, also adopted these modifications.

- Every win can empower; every step forward can be a huge leap of faith.
- There will always be roadblocks and a glass ceiling to break.
- Work-life balance is more of a tight rope walk for a woman.
- Gender should not define 'choice' or preference. It should be based on merit and calibre.

If a girl believes in her capabilities, strength and merit, no power in the world can change her conviction to forge ahead and pursue her goal.

I was instrumental in formulating the India Stroke Guidelines, which are now endorsed by the Indian Stroke Association. I am involved in work on stem cells therapy in chronic stroke and multiple sclerosis. I am an active member of the National Stroke Surveillance Programme in India, the National Stroke Registry and the National Prevention Programmes for Non-communicable Diseases of India.

I have closely observed gender biases in medical profession. Junior women physicians were more vulnerable to gender discrimination, pressure to excel at work, struggle of work-family balance and experienced identity crises as competent doctors and mothers. They felt themselves to be isolated in multiple cultural contexts, including school ties, rankism and a culture of after-work gatherings.

As a woman, we often talk about breaking the barriers that can be there irrespective of gender, age, colour, race and geographical existence. There will always be roadblocks and a glass ceiling to break. Work-life balance is more of a tight rope walk for a woman than a man—a girl should choose her life partner well. However, tackling issues as challenges and not as impediments can help shift our attitude from nihilism and depression to vigour, enthusiasm and hope. I believe challenges make life exciting. Every win can empower; every step forward can be a huge leap of faith.

I would recommend not requesting a privilege as a woman but working harder than male physicians to succeed. We do see Amazonian advances in career graphs of a number of women now. We do now have role models we can look up to. But every woman is an epitome of immense patience, strength and love—there lies the power.

Be it government or private sectors, gender should not define 'choice' or preference. It should be based on merit and calibre. Only six countries in the world give women the same legal work rights as men. Studies show that if employment became a more even-playing field, it has a positive domino effect on other areas prone to gender inequality. Gender equality in work is not possible without gender equality in society.

We need to empower our generations to believe in oneself. If a girl believes in her capabilities, strength and merit, no power in the world can change her conviction to forge ahead and pursue her goal. No power should. We need families and societies to change accordingly. Otherwise it is a glass half full. ■

Academic Profile

- MBBS, Osmania Medical College
- MD Neurology & DM, AIIMS, Delhi

Awards

- Padma Shri, 2016
- National Award for Science and Technology Communication, DST, 2017
- METRODORA Awards for Women in Science Excellence, International Alliance of Patients Organisations, 2022

Madhuri Dutta, PhD

Head, Centre for Operational and Research Excellence,
George Institute for Global Health India
Assistant Professor, Prasanna School of Public Health,
Manipal Academy of Higher Education
DBT/Wellcome Trust India Alliance IRMI Research Management Fellow

Madhuri Dutta is a research management professional. Her expertise is in grants and research administration and resource mobilisation in the S&T and healthcare space.

I stumbled into research management by chance. After my post-doctoral research in the United States, my family relocated to India and I wanted to explore options in alternate careers in science. With my husband's encouragement, I joined the Hyderabad office of the DBT/Wellcome Trust India Alliance as a grants adviser, attracted by the opportunity to read cutting-edge research proposals and be part of a vibrant research ecosystem in India. The passion and out-of-the-box thinking of the early, mid-career and senior researchers I witnessed at interview meetings amazed me. This job helped me organise myself to meet tight deadlines, be professional in my bearings and empathic to my surroundings. Best of all, it helped me realise my skills and interest in research facilitation.

My work at the India Alliance made me realise the huge efforts required in developing and submitting high-quality research applications for funding. The success rates are low and can get anyone disheartened. A large part of my job is to help researchers tide over periods of disappointment, till they can take their learnings forward and develop great applications again.

I am involved now in streamlining processes and resources so that research runs smoothly at my institute. This requires bringing together researchers and other supporting divisions and understanding what each stakeholder finds challenging, and co-creating workable solutions. I am also part of strategic research development. While institutional standing is the final word for me, I value individuals who sincerely work towards institutional growth as well. Hence, I aim to serve both. Research management has made me more confident and resilient as a person. Also, being part of the India Research Management Initiative (IRMI) network has opened professional doors.

- Without changing societal thinking as a whole, we cannot uplift only a single gender.
- Be a part of strategic and resource networks and reach out to people for inspiration and collaboration.

I have taken breaks in my career, I have had periods of self- doubt, taken risks, made a fool of myself, laughed it off, fallen down and gotten up.

The right contribution of research managers lies in increasing human capacity. Their value is in working with researchers and supporting division colleagues at a one-to-one level and helping them realise their true potential. My greatest satisfaction also has been to support and work with early and mid-career researchers and help them succeed in their career path.

I have faced 'interesting' experiences as a research manager; however, these are perhaps faced by all genders in this profession. There have been times where my scientific inputs have been dismissed simply because I am an administrator. Over the years I have built my strength in not letting others define who I am. I am completely cognizant of my strengths and my weaknesses and hence I have voiced my inputs, opinions, suggestions as necessary irrespective of what others think. It is important not to give up on oneself. Let nothing stop you, including yourself. Research management has fulfilled me as a person and is a gender agnostic profession, which requires one to be a part of strategic and resource networks and reach out to different people for inspiration and collaboration. Connect with mentors and enjoy the journey of a research manager.

I have taken breaks in my career, I have had periods of self- doubt, taken risks, made a fool of myself, laughed it off, fallen down and gotten up. These have enriched my life and made it more livable.

Most research institutions I have worked in have more women in the early to mid-career workforce but not in leadership positions. STEM policies need to create mentorship opportunities and avenues for women to be in leadership positions. Mentors can be established professionals, both women and men, who can guide youngsters in STEM. I think that men need to be part of all these initiatives, right from school too. Without changing societal thinking as a whole, we cannot uplift only a single gender. ■

Academic Profile

- BSc, MES College of Arts, Science and Commerce, Bengaluru
- MSc, St. John's Post-Graduate College, Bangalore University
- PhD in Biochemistry & Molecular Biology, Indian Institute of Chemical Biology, Kolkata

Fellowship

- IRMI Fellow, 2020-2023

Mahua Mukherjee, PhD

Professor, Department of Architecture and Planning
Joint Faculty, Centre of Excellence in Disaster Mitigation and Management
Chair, Diversity and Inclusion Committee, IIT Roorkee

Mahua Mukherjee is involved in building capacity in architecture and disaster management. She is the secretary general of the South Asia Alliance for Disaster Resilience Institutes (SAADRI).

My family instilled the importance of education in us right when we were young kids. My mother taught me simple lifestyle and value system that helped in professional life as well. My primary school teachers taught us with care, sensitivity and fostered understanding of fundamental concepts in science. Arun K Roy Sir can be singled out in his effort to bring the best out of me.

I was addicted to story books, history and travelogues, which generated a lot of fascinating mental images about building spaces and structures. My secondary school premises and its buildings imprinted an impression on me to acknowledge activity-spaces, interplay of pond, playfields, trees and buildings, materials. My neighbourhood provided perspectives about settlement problems and liveability.

It took months for me to internalise the ambience of Jadavpur University (JU), its main building and history, layout, departments, classes, workshops, sports facilities and amenities. Faculty and seniors alike helped to grasp the fundamentals and nuances of architecture. Samaresh Mukherjee, Ramen Dutta and Chandrashekhar Bhattacharyya were my mentors who taught me the meaning and scope of architecture. Construction site visits and training at M/s Ghosh, Bose and Associates made me understand architecture in real time.

- Consider your talent and aptitude with your inner quality of compassion and sensitivity.
- Resolve to shine at your best in all endeavours.
- Inter- and multi-discipline exposure of students is necessary to be successful professionals.

Women in architecture must learn to equally enjoy the comfort of an outdoor construction site and an indoor office space.

Interest in 'building physics' brought me to IIT Roorkee that turned out to be a holistic experience. Later, I joined JU as a research fellow where association with Prof. Santosh K Ghosh of Centre for Built Environment, Kolkata, influenced me to look at research questions differently. My supervisors—Prof. Monideep Chatterjee and Prof. S R Bhattacharyya, Biman Chakroborty and D N Guha Majumder, PhD—have their share in promoting my research endeavours. During my PhD, interactions with Ranajit Gupta and Prof. Santosh Ghosh exposed me to professional ethics and nurtured my passion for architecture pedagogy.

As a faculty at IIT Roorkee, interactions with students on subjects like climatology, construction and structure opened new vistas for me. Seismic safety became a new learning from giants like A S Arya, D K Paul, S K Jain, C V R Murthy. Professors from WindLab, Prem Krishna, Krishan Kumar and A K Gairola, accommodated me in their research team. I continue to be involved in multi- and inter-disciplinary knowledge building and dissemination, capacity building through workshops and research seminars. I spent three months with the Disaster Prevention Research Institute in Kyoto University in 2016 as a visiting associate professor. Each such project or stint helped me grow in my craft. SAADRI started in 2020 on IIT Roorkee platform.

I feel inter- and multi-discipline exposure of students is necessary for successful professionals. Aptitude evaluation should be given due priority during STEM admission process. In architecture and disaster risk management education, hand-holding from industries can change the professional capacity spectrum. Sectors like construction, architecture –structure-MEP consulting services, municipal departments and government disaster management—can work closer with architecture professionals and academia to bring improved sustainability.

My inner challenges have troubled me more than challenges imposed by others; and this journey continues. For women I have a simple advice: do consider your talent and aptitude with your inner quality of compassion and sensitivity and resolve to shine at your best in whichever endeavour you plunge into.

For those interested in architecture, I would advise to start preparing yourself to render a professional service. Women in architecture must learn to equally enjoy the comfort of an outdoor construction site and an indoor office space. ■

Academic Profile

- BArch & PhD, Jadavpur University
- ME Building Science & Technology, IIT Roorkee

Fellowships & Memberships

- Fulbright Fellowship
- SIDA Fellowship, Lund University, Sweden
- Member of Global Alliance of Disaster Research Institutes; Indian Society of Earthquake Technology, IIT Roorkee; Council of Architecture, New Delhi; Indian Roads Congress

Megha, PhD

Associate Professor, Centre for Ayurveda Biology and Holistic Nutrition
Trans-Disciplinary University (TDU), Bengaluru
Former Grants & Programme Manager, Wellcome Trust/DBT India Alliance

Megha is trying to establish innovative courses in the area of public health and nutrition. She is trying to merge Ayurveda and nutritional biochemistry in the area of food and diet and is spearheading a new Ayurveda Biology PG programme at TDU.

I was lucky to have Prof. Erwin London as my PhD supervisor. The training in his lab set me up for a lifetime of experimentation and taught me the value of kindness. Later, I was mentored by Prof. Anuradha Lohia, who gave me the confidence to recognise my talents as well as introduced me to science administration and policy. Prof. Gaiti Hasan provided me the space to explore bench science after I had a break in my career. While finishing up my postdoc in her lab, I had the chance to develop my interest in combining lab science and public health.

At a Young Investigator's Meeting in 2018, Dr Gagandeep Kang spoke to me for a few hours on projects that can have an impact on public health nutrition. This gave me the impetus to start on something that could be translational. I also got a waiver from Purnima Menon, PhD, at the International Food Policy Research Institute to attend a policy workshop on nutrition. This opened my eyes to how biology and policy need to intersect for laboratory-based discovery to help communities.

- We need to remove age brackets in all science related matters–hiring, grants, prizes.
- Claim your space, believe in yourself and look for ways to make circumstances work for you.
- Indigenous training in Indian academia should be considered a plus, but unfortunately, it's actively discriminated against.
- Ageism is a major problem in Indian science, especially academia.

My training is in laboratory science, but I am deeply fascinated by nutrition. Hence, to straddle two areas, I first obtained a degree in Public Health Nutrition and at TDU, and got involved in a community health project. My role was in communications, yet it taught me a lot about working with people and how to do translational work. Here, I am most proud of the things we designed to help people adopt long-term health practices.

Build a network of friends who celebrate your achievements, hold your hand when things fail and give you critical feedback.

Since 2019, I have been working at TDU, where over the last two years, I have run a collaborative programme with Ayurveda physicians called the 'Ayurveda Dietetics Programme'. This academic programme provides knowledge seekers a way to understand dietetic advice in Ayurveda, and importantly, how it can be imagined in terms of modern biochemistry, food systems and nutrition. Although still in its infancy, the programme seeks to create a scientific workforce that will understand both the sciences—a need of the hour in India.

The greatest threats to STEM education are competitive exams and coaching classes. Together, these drive school students to only prepare for multiple choice questions and facts. That is a pity! STEM fields, above all, recognise that humankind is innately curious. The biggest disservice we are doing as educators is to somehow suppress this fundamental feeling. This must change.

Though I have never faced any strong gender bias in my career, yet I feel ageism is a major problem in Indian science, especially academia. While I was looking for a place to start as an independent principal investigator, it was implicit that age was an issue. My administrative experience was not considered a plus. Further, Indian academia is besotted with foreign-trained scientists. Indigenous training should be considered a plus, but unfortunately, it's actively discriminated against.

We need to remove age brackets in all science related matters–hiring, grants, prizes. This is hampering the growth of women or anyone who decides to take a different path. Ageism punishes creative people, who choose to make family commitments a priority. There is no scope for lateral entry in Indian academia; and as a result, the ecosystem loses out.

Thus for women in research, the road is long. Build a network of friends who celebrate your achievements, hold your hand when things fail and give you critical feedback. You have to carve your own path. The advice people offer is based on personal experiences and, sometimes, prejudice. Claim your space, believe in yourself and look for ways to make circumstances work for you. If one tries, there are always solutions. ■

Academic Profile

- MSc, IIT Bombay
- PhD, Stony Brook University, New York
- ePostgraduate Diploma in Public Health Nutrition, PHFI
- Senior Fellow, University of Washington, USA

Awards

- Early Career Award from DBT/ Wellcome Trust India Alliance

Millie Pant, PhD

Professor & Head, Department of Applied Mathematics & Scientific Computing, IIT Roorkee

Millie Pant is a mathematician who leads her research in numerical optimisation, evolutionary algorithms, swarm intelligence, nature inspired algorithms and supply chain management.

I was born in Lucknow and completed my schooling and university studies from Meerut. My parents have been my biggest source of inspiration. They wholeheartedly supported all my decisions and offered suggestions and advice whenever needed. They guided all crucial steps of my life, but at the same time, taught me to take my own decisions, to have confidence in my decisions and to work on those.

I was fortunate enough to be surrounded by supportive siblings, friends and colleagues who encouraged me at every step in all possible ways that helped me turn a successful career woman. Never in my life have I ever faced a problem being a woman.

In my family from both sides, the number of females exceeds the number of male members. All the females of my family, including my grandmothers from both sides, were well educated and independent. They participated in taking decisions at home and their opinions were given due importance.

- Women must be passionate about their work and keep reinventing themselves.
- Sincerity, hard work and dedication are the keys to success in any field.
- STEM should be taught by taking into consideration the real-life scenarios.
- Webinars should be held on sensitive issues like gender ethics in the workplace.

Young women should not hesitate in expressing their views and actively participate in every decision-making process of their organisation.

Though the words like female empowerment were never a topic of discussion in the family, it was always visible, whether it was my maternal grandmother, who single-handedly raised her daughters after the death of my grandfather, or an aunt of mine, who cracked the University of Roorkee entrance exam and went to the North East for a government job.

I have published more than 200 papers in journals and conferences. I have guided 14 PhD students and more than 6,000 citations have been noted. I have been featured as one of the most cited researchers. I have completed three projects at the national level and four research projects at international level.

I would advise next-gen women to be self-assured. They should not hesitate in expressing their views and actively participate in every decision-making process of their organisation. Sincerity, hard work and dedication ensure success in any field. One needs to inculcate these traits and follow them religiously to be successful in a particular field. I would advise women to be passionate about their work and they should keep reinventing themselves to match up with the dynamics of the field they are in.

Being a STEM educator, my observations will not be very different from others in the field. The focus now most of the time is on theory while teaching STEM subjects, sufficient importance should be given to the practical aspects of STEM subjects. STEM should be taught by considering real-life scenarios where STEM technologies will be useful.

The syllabus should contain case studies and projects to help appreciate and learn the subjects. To promote women in STEM, the government must launch more schemes, keeping in mind the needs and requirements of women that include dignity, safety and security at the workplace. Webinars and lectures should be held from time to time on sensitive issues like gender ethics in the workplace. ■

Academic Profile

- BSc, MSc Mathematics, CCS University, Meerut
- PhD in Mathematics, IIT Roorkee

Awards

- Best Paper Premium Award, Smart Media and Applications (SMA) 2020, Jeju, South Korea

Mira Mitra, PhD

Associate Professor, Department of Aerospace Engineering, IIT Kharagpur
Former Associate Professor, IIT Bombay

Mira Mitra is an aerospace researcher who works on structural health monitoring of aircrafts and other aerospace vehicles to ensure safer flights.

I was born in Kharagpur, where I spent my childhood and school days in the railway colony of South Eastern Railways. I did my schooling from Hijli High School. I have grown up watching my grandparents spending most of their time reading books. My grandfather used to read to me works of great poets and writers and that inspired me strongly. I developed a keen interest in reading and expand my knowledge.

Since my childhood, I have read a lot of biographies of influential leaders, scientists, social and business icons, and have been left awestruck by them. These stories of people who did things differently and sought excellence in everything they had done kept me motivated to pursue excellence and contribute in however small capacity to the society.

My mother was extremely particular that I took my studies seriously and always told me how important it is for a girl to be independent financially and emotionally. I did my bachelor's degree in civil engineering from Jadavpur University, Kolkata, in 2001.

- Read biographies of influential leaders, scientists, social and business icons.
- A woman can excel in STEM as anyone else.
- Stay motivated and never lose focus.

Gender has nothing to do about whether a person likes mathematics, humanities, sports or music.

I joined the department of aerospace engineering at the Indian Institute of Science, Bengaluru, in the same year for my master's degree course and completed my PhD in 2007 from there. I then joined a faculty position at IIT Bombay.

My stint with teaching has allowed me to experience that STEM curricula are a bit heavier on theory. I feel there should be more practical aspects to it and hands-on and project components should be included.

I enjoy my career, a blend of teaching and research. I work on structural health monitoring of aircraft and other aerospace vehicles. It is a technology for online monitoring of the integrity of aerospace vehicles for safer flights.

I have known people being surprised at me being an aerospace scientist, mostly because they think it is not what bright women students would do. I have always disliked this type casting of women in the professional world. Gender has nothing to do about whether a person likes mathematics, humanities, sports or music. Every person has her very own aptitude and should have the support and encouragement to pursue it.

As I said earlier, science and technology know no gender. Irrespective of certain beliefs, a woman can excel in STEM as anyone else. There are umpteen number of illustrious example of women in STEM, and fortunately, the number is increasing. My advice to next-gen women who wish to be in leadership roles is to just stay motivated and never lose focus.

To attract more women into STEM careers, government and private sector policies must focus on increasing the number of women in leadership roles. Younger girl students should meet more women leaders to stay motivated and not feel out of place. ■

Academic Profile

- BE Civil Engineering, Jadavpur University, Kolkata
- MSc, PhD in Aerospace Engineering, Indian Institute of Science, Bengaluru

Awards & Fellowship

- DST-SERB Women Excellence Award
- Young Engineer Awards from Indian National Academy of Engineering (INAE) & Institution of Engineers (India).
- INAE Fellow, 2021

Mitali Mukerji, PhD

Professor & Head, Department of Bioscience & Bioengineering
Faculty, School of Artificial Intelligence and Data Science (AIDE), IIT Jodhpur
Adjunct Professor, Academy of Scientific and Innovative Research, Ghaziabad

Mitali Mukerji spearheaded genomics research in India with the Indian Genome Variation Consortium and is known for her pathbreaking work in hereditary ataxia and Ayurgenomics, a new field combining Ayurveda and genomics.

My initial inspiration to take up science as a profession came from my master's thesis supervisor Dr Srinivasan at the Indian Agricultural Research Institute. I developed my scientific temper during my PhD under mentorship of Prof. S Mahadevan in IISc Bengaluru. Several teachers, family members, friends, colleagues and PhD students also influenced me.

Unlike my peers, I wanted to start my career in India working on a problem that is relevant to the country. A chance meeting with Prof. Samir K Brahmachari, who was moving to Delhi to initiate genomics in the country, sealed my fate. Indian scientists were hesitant to take up genomics then. Under his mentorship, I have been part of different initiatives to transform India into a self-reliant nation in genomics and enabling diagnostics and precision medicine.

My research interest is in the broad area of genome variations and their effect on human genome organisation and function. I have been the convener of the Indian Genome Variation Consortium project, which provided the first comprehensive genetic landscape of Indian populations. My lab has identified informative markers that link to health and disease states. We also initiated a new and challenging area, Ayurgenomics, which was perceived with much scepticism and posed a problem in attracting students, peer participation and growth in its early years.

- Women who wish to lead must start with identifying the right role models and mentors.
- The major mistake we often make is becoming influenced by peer pressure and societal pressures.

A major talent pool exists that can be tapped to full potential if alternative solutions are created for women participation and engagement in STEM.

In my collaborative research spanning over 20 years with AIIMS New Delhi and NIMHANS Bengaluru in clinically and genetically heterogeneous hereditary ataxias, our group has been able to develop an algorithm for genetic diagnostic for rare diseases in Indian population based on our experience in spinocerebellar ataxias. Ataxia is a group of disorders that affect coordination, balance and speech. For the first time, we carried out exome sequencing in uncharacterised cases and identified novel mutations in reported as well as novel genes associated with ataxia. This has led to development of targeted panel of ataxia. AIIMS has an ataxia clinic and the diagnostic algorithm developed through our initiative has been useful in classifying over 5,000 families that have been referred to AIIMS from different parts of the country.

My professional journey as a woman has been rather smooth after joining Institute of Genomics and Integrative Biology..

Women who wish to lead must start with identifying the right role models and mentors as the first prerequisite. Second is a continuous upgrading of skills and competence. Third is time management in terms of when to do what and how to prioritise things in life.

My first advice is to identify what is your calling and what you like to do most effortlessly. For instance, there are different career planning needs if one wants to take up a pure academic route, industry job, entrepreneurship or science education and communication. Planning needs to be done keeping family decisions in picture.

We need to plan novel and innovative work spaces for women to be able to address two-body relocation challenges in a more comprehensive manner. A major talent pool exists that can be tapped to full potential if alternative solutions are created for women participation and engagement in STEM. These would be long-term and sustainable.

In STEM education, we did not have so much digitised information and teaching aids available earlier. So accesing information and knowledge were treated equally. Now the challenge is how to synthesise the information and build knowledge. There has to be more emphasis on getting the teachers trained in novel and innovative pedagogical methods. Curiosity-driven. ■

Academic Profile

- Bsc Zoology, Botany, Chemistry, University of Allahabad
- Msc Molecular Biology & Biotechnology, IARI, New Delhi
- PhD in Developmental Biology & Genetics Laboratory, IISc, Bengaluru

Awards

- Shanti Swarup Bhatnagar Award in Medical Sciences, 2010
- Kirtan Sanjeevani Pushpalata Ranade National Award for Women in Research, 2017
- VASVIK Award for Woman Scientist, 2016
- Pandit Shiv Nath Sharma Shodh Puruskar for Research in Ayurveda, 2012

Munia Ganguli, PhD

Senior Principal Scientist
CSIR-Institute of Genomics and Integrative Biology, New Delhi

Munia Ganguli is a nano-biotechnologist. Her research focus is designing and developing new nanomaterials with potential biomedical applications.

I was born and brought up in Kolkata and have been working and staying in the Delhi-NCR region for the past 20 years. My father, who worked as a scientist in Kolkata, has been my prime inspiration and propelled me towards pursuing research. My mother, who continues to work as a teacher, has always encouraged me to dream big and take up a challenging career. While growing up, I would often meet my extended family, many of them being researchers across diverse disciplines. Engaging in conversations with such intellectuals at a young age provided me with valuable exposure and instilled the excitement in me to consider a career in scientific research. Some of my teachers who taught me during my masters and PhD days have been a big influence as well.

Research may be compared with a roller -coaster ride with high points and low spots, but each situation is either driven or followed by the thrill of discovery and anticipation of new knowledge. Every experience–be it a failed experiment, an intense scientific discussion with a colleague or a wonderful talk that I heard from the best in the field—has shaped my professional growth. In the early days, when we were low on resources but high on enthusiasm, my first PhD student and I would travel to various labs in Delhi both for discussions on our work plan and for access to whatever facility we did not possess then. Those journeys, literally and figuratively, have been very instrumental in shaping the growth of my lab.

In the beginning, setting up a new research lab and building a new family in parallel was a big challenge. However, I have been lucky to have had understanding co-workers and supportive family members. It is crucial for women to establish domestic support systems so that house-work does not become their sole responsibility and they can ensure work-life balance as well as excel at work. With time, as more administrative responsibilities came my way, the challenge has been to ensure that my voice is heard and my opinion is counted.

It is crucial for women to establish domestic support systems so that house-work does not become their sole responsibility and they can ensure work-life balance as well as excel at work.

Being a woman leader is a big opportunity to make changes in both policies and mindsets, and create more gender-balanced workspaces. Changing mindset is a harder task and it is important to have frequent formal and informal conversations around the role of women at the workplace.

It is important to believe in yourself and not get too influenced by multiple opinions.It is important to stay on course; every year may not be extremely productive in terms of securing grants or getting new insights. But it is imperative to not give up and not only seize every opportunity that comes your way, but also create new ones for yourself.

Policies aimed at encouraging women in STEM careers have to start with removing obvious and hidden bias and working on the premise of equal opportunity. This should start with hiring of more women scientists and promoting them in due course so that there are adequate women at senior positions of decision-making. Inclusive policies aimed at wider presence of women in scientific conferences or a re-look at eligibility criteria for grants and fellowships to ensure higher participation from women are necessary. It is also important to take special care that apparently encouraging measures for women should not end up being exclusionary for them.

In addition, I strongly feel that STEM courses need to be designed in a more imaginative manner than they currently are. The focus on rote learning needs to be reduced. A large component of hands-on research, more of presentation and discussion on ideas, encouraging critical thinking and learning how to frame research questions need to start early on. Visits to research labs and interaction with researchers need to be amped up for school and college students. These might ignite interest in the young minds and hopefully attract more students towards STEM. ■

- It is important to believe in yourself and not get too influenced by multiple opinions.
- Encouraging measures for women in workplaces should not end up being exclusionary for them.
- Visits to research labs and interaction with researchers need to be amped up for school and college students.

Academic Profile

- BSc & MSc Chemistry, Jadavpur University, Kolkata
- PhD in Solid state Chemistry, Indian Institute of Science, Bengaluru

Awards

- SERB-POWER Fellowship, 2021, Department of Science and Technology
- National Bioscience Award for Career Development, 2012, Department of Biotechnology

Nabamita Banerjee, PhD

Associate Professor, Department of Physics, Indian Institutes of Science Education and Research (IISER), Bhopal
Ex-Assistant professor at Indian Association for the Cultivation of Science (IACS), Kolkata, and IISER Pune

Nabamita Banerjee is a theoretical high energy physicist. Her primary research interests are study of black holes, symmetry, gravity in lower dimensions and fluid dynamics.

I was born and brought up in Siliguri in northern West Bengal. I completed my education up to the post-graduate level from the same city. My parents and my teachers have always been my support. For this particular field, I have to take the name of Prof. Nikhelesh Kar, without whom this journey would have never been possible. Later, mentors like Prof. Ashoke Sen, Prof. Dillep Jatkar, Prof. Debashis Ghosal, Prof. Biswarup Mukherjee, Prof. Rajesh Gopakumar, Prof. Sumathi Rao and Prof. Srubabati Goswami inspired me. My students, colleagues and family are my strength now and support me in moving forward to make new strides in my research life.

It was one of my teachers at school who influenced me and helped in taking a decision to study physics in an honours degree course, instead of choosing a technical or engineering field. Prof. Kar inspired me to take up fundamental research and pursue a PhD. My physicist husband Suvankar Dutta, PhD, encouraged me to take up String Theory for studying black holes as my research topic.

- The road to STEM careers is not smooth, but it is certainly not impossible to walk on it.
- Myths like "STEM is too hard for women" are false.
- Successful women researchers should do as much outreach as possible to encourage young girls in STEM.

With such positive support and my interest in physics, I have more than 40 research articles published in peer-reviewed journals. I have mentored five PhD students and many master's degree students. In addition, I have mentored four post-doctoral fellows.

I have always tried to be honest with my profession and have given my cent per cent to every job assigned to me.

I have not faced many barriers. Only a couple of times, I was denoted as someone's wife, but that phase passed soon. Of course, being a mother brings new challenges in life, but I do not think of it as a barrier; it is rather a phase of life where one needs a lot of balance between work and life. I have been fortunate to get support from my parents and family to deal with personal issues and to get support from all my colleagues and students to deal with professional issues. From my side, I have always tried to be honest with my profession and have given my cent per cent to every job assigned to me.

Women researchers need to be always ready to deliver, irrespective of the difficulty of the situation. With strong determination, nothing is impossible. Sometimes, life tests you with varied situations and challenges., Do not give up. The road to STEM careers is not smooth, but it is certainly not impossible to walk on it.

I do not think that there are any shortcomings in how STEM is being taught. The problem lies afterwards, where the job market is not that open for women. Of course some myths like "STEM is too hard for women" are false and successful women from the field should do as much outreach as possible to change this perception. The government and the private sector must have policies to provide some relaxation in age limit for all possible funding schemes, awards and fellowships to attract and retain more women into STEM careers. National-level PhD and post-doctoral fellowships for women will be helpful. I am also in support of reservation in job positions to stop women from leaving STEM. ■

Academic Profile

- BSc & MSc, North Bengal University
- PhD, Homi Bhabha National Institute, Mumbai, & Harish Chandra Research Institute, Prayagraj
- Post-doctoral Studies, ITP Utrecht and Nikhef, Amsterdam

Fellowships

- FOM fellowship, Institute for Theoretical Physics, Utrecht, The Netherlands
- Veni Grant, Dutch Research Council
- Ramanujan Fellowship, Science and Engineering Research Board, India
- ICTP Associateship, Abdus Salam International Centre for Theoretical Physics, Italy

Nandita Narayanasamy, PhD

Associate Professor, Sri Venkateswara College, University of Delhi

Nandita Narayanasamy is an educator who uses research as a pedagogical tool for enhancing teaching and make learning an experiential, fun and holistic experience.

I was born in Bengaluru, Karnataka, but spent most of my formative student life in Vadodara, Gujarat. I loved science, particularly chemistry, right from my school days and wanted to take up an honours course in my undergraduate studies. This dream of mine was shattered when I did not get the required percentage in my Std. XII examination to qualify for the chemistry course. I had no choice but to take admission in BSc (Hons) in home science, graduating in food and nutrition. My parents offered solid support to me and always bolstered my spirit that had been shattered by my poor result. My father, Prof A.R.Krishnamurthy, was the first person who told me that marks and position don't define your knowledge and conceptual understanding, and I carry his philosophy to date.

In hindsight, I feel blessed that this life-event happened as I got some stellar teachers who ignited my interest in biochemistry and encouraged me to apply for the much-famed MSc programme in biochemistry at the Maharaja Sayajirao University (MSU), Baroda. It was during my post-graduation years that my passion for biochemistry,particularly nutrition and immunology, was strengthened.

- Marks and position don't define your knowledge and conceptual understanding.
- Teach from the heart and make learning holistic, fun and experiential.
- Teaching-learning process should be more experiential, discussion-based and interactive.

During my PhD, I worked on the role of dietary lipids on immune responses using mice as a model system. My guide and role model, Prof. Tara Mehta, gave me absolute freedom to explore and design my experiments. She taught me that we learn best from failure, and that I think is so true. I received constant support and encouragement from my husband during my PhD and he urged me to take up a job as a lecturer.

Apart from education, women need emotional and social support as well to be empowered.

I still remember the fear and nervousness for my first class for teaching postgraduate biochemistry students at MSU in 1989. I am still surprised how the whole feeling vanished completely when I started teaching. I knew I had found my place and have never regretted taking up teaching as a profession. I moved to Delhi's Sri Venkateswara College in 1995 where I transformed and grew as a teacher.

I feel that education is all-encompassing and cannot be bound by the barrier of a single discipline. Thus, I endeavour to make my classes an experience in which the students are also exposed to the nuances of science, society, culture and creativity. I believe STEM education should be an amalgamation of a variety of enjoyable experiences that challenge the student to become a skilled, informed, creative and sensitive human capable of independent thought and action. On the other hand, I use research as a pedagogical tool that improves the conceptual understanding of science for a student.

We need to make the teaching and learning process more experiential, discussion-based and interactive. Students have information overload and that has led to a lack of imagination, innovation and creativity. Students can't think; if they have a doubt, they need to be encouraged to process the concepts and arrive at a logical answer rather than accessing the internet for the answer. Teachers now have to guide students on how to use technology fruitfully and judiciously. We need to shift our teaching to be more problem-solving, analytical based and multidisciplinary.

The position of women in STEM is a sensitive and long -standing issue. Indian girls are at times in a difficult position as their social and emotional mentoring is grossly overlooked. On one hand, education has broadened their views, but they are not able to reconcile with societal expectations and feel pressured and stressed. Education is just one support. To be empowered, women need social and emotional support as well. We need to have more women as mentors to ensure that young women in STEM and women researchers have a smoother professional journey as they meet success. ■

Academic Profile

- BSc (Hons) Home Science
- MSc & PhD in Biochemistry, MS University, Vadodara

Awards & Fellowships

- Best Teacher Award from Indian National Science Academy
- CSIR-UGC Fellowship

Neeldhara Misra, PhD

Associate Professor, Smt. Amba and Sri V S Sastry Chair
Associate Dean for External Communications, IIT Gandhinagar

Neeldhara Misra explores the interplay of structural graph theory and graph algorithms; tools and techniques in parameterized complexity and computational perspectives on combinatorial games.

Reading the biography of Paul Erdös, *The Man Who Loved Only Numbers* written by Paul Hoffman, was an influential chapter in my life as a college student. It got me interested in combinatorics, and I was also drawn towards research as described in the book. A textbook called Concrete Mathematics reaffirmed this preliminary interest, and I started seriously thinking about higher studies after encountering these two books.

I received amazing mentorship from my PhD advisors, Prof. Venkatesh Raman and Prof. Saket Saurabh. The overall environment at the Institute for Mathematical Sciences (IMSc), Chennai, was quite conducive to free-wheeling discussion. The initial feeling of vulnerability wore off rather quickly, with all the encouragement that I experienced. There were also plenty of opportunities to collaborate both within IMSc and beyond, which was not only valuable in terms of technical learning, but also in building perspective and boosting intellect. During my post-doctoral years at IISc, I was mentored by Prof. Narahari, and his constant guidance and insights have been valuable ever since.

- Your resources are valuable, and you should pick your battles carefully.
- Ignore the typical stereotypes that hold women back and just get started.
- Policy must aim at reducing the disparities by creating opportunities specific to women.

I have actually been rather lucky in not facing any discrimination in my career; everyone has been extremely supportive. Something I chose to do a little less than many of my peers was traveling to conferences and workshops and I don't think my choices in this context have limited my access to opportunities in any way.

If you face unfair scenarios, stand up for what is right.

Much of my research focuses on identifying if we can identify some useful workarounds in this backdrop. In particular, my work focuses on the design of algorithms for hard problems that work well in practice, in spite of the theoretical verdict of intractability. I work on abstractions of questions that come up in various application scenarios, including computational biology, preference aggregation and VLSI layouts.

I am a part of the ACM-W India Council, and we run an annual event called the 'Grad Cohort' to help women computer science scholars) in graduate schools discuss their issues and connect with mentors beyond their immediate circles. I've also been involved in organising several workshops to help students get exposure to research in computer science while they are in college.

If you are a woman researcher, don't let anyone tell you what you can or cannot do. I cannot speak for every enterprise, but I do believe that anyone can be a computer scientist armed with her curiosity and willingness to put in the rigour. Ignoring the typical stereotypes that hold women back—for example 'girls don't code', or 'it takes a genius to be a researcher'—just get started. If you have strong instincts or a natural talent for the subject, that's great, and if not, you'll learn anyway. All it takes is time, patience and some guidance at appropriate stages.

Policy must aim at reducing the disparities by creating opportunities specific to women

in ways that encourage them to come into the STEM fields. While awards and recognitions at the higher level are helpful to create women role models, I think doing more at the earlier stages of the pipeline would be helpful as well.

Women pursuing leadership roles have to devote time, energy and overall mind space. You must be clear about what a specific role entails and whether that's aligned with your temperament and motivation. Once you're convinced of the fit, give the pursuit and the execution your cent per cent effort. If you face unfair scenarios, stand up for what is right. Recognise that your resources. ■

Academic Profile

- BSc Computer Science, Mathematics and Statistics, Mount Carmel College, Bengaluru
- MSc, PhD, Institute for Mathematical Sciences, Chennai
- Research Fellow, Department of Computer Science & Automation, IISc, Bengaluru

Awards & Fellowship

- INAE Young Engineer Award
- DST-Inspire Faculty Fellowship

Neha Sardana, PhD

Assistant Professor, IIT Ropar & Former Assistant Professor, IIT Jodhpur
Former Scientist, Institute of Nano Science & Technology (INST), Mohali

Neha Sardana is a material science researcher who creates new devices and develops metamaterials for antenna applications and high temperature materials.

I have been brought up all over India and have changed several schools as my father was in a transferrable job. Inspiration came as encouragement by my mathematics teachers at school. The person who inspired me to stay in materials and metallurgy was late Prof. Vijaya Aggarwal. She encouraged me to opt for a six- month semester exchange programme at KTH-Sweden (Bergs) during my BTech and also pushed me to apply abroad for masters and PhD. She also instilled in me the desire to come back to India and work in the materials domain.

Daily motivation from my father was a major source of inspiration. My father always encouraged me to observe my surroundings and made physics and mathematics fun. My mother, a teacher, persuaded me to be fully independent and take up a career in education. She has been my role model for being a life-long learner. When I enrolled in BTech, she enrolled in LLB, which set an example by showcasing thirst to gain knowledge. Inspiration still comes by daily, from the inquisitiveness and questions of my kid and students.

I believe that one can't connect the dots looking forward; you can only connect them looking backwards. My first job in India encouraged me to write projects and I carried out tasks like compeering at conferences and events that nobody else took, but it really helped me develop a rapport with my peers, meet new people and build research collaborations and permanent scientific friends. My husband, in-laws and parents supported and encouraged me to join IIT Jodhpur after leaving INST even though I would be far from home.

- One can't connect the dots looking forward; you can only connect them looking backwards
- STEM needs more role models and needs positive publicity
- Educational day care facilities in proximity to workplace can be a great enabler for women professionals.

I always wanted to return to India after completing my studies. However, when I started applying for jobs, I was neither shortlisted in any engineering college due to my PhD in science, nor in universities or IISERs due to my BTech degree. I realised I did not fall in the single degree line science or engineering. Thus, job hunting was a test of time for me. It was the strong alumni affiliations, flexibility of the IIT system and interdisciplinary institutes that helped me grab a job.

If you love creating materials, metallurgical and materials engineering is a wonderful field, so just dive in and you will fall in love with it.

At work, I have been developing metamaterials for antenna applications and high temperature materials, and device development. I have made an air-purification device for volatile organic compounds sequestration and patent filing is under way. Since March 2020, our group has been working on the combat against COVID-19. We worked on an indigenous BiPAP machine as a substitute of ventilators for non-serious patients that can be made by anyone in remote and rural areas.

I would advice next-gen women who wish to be in leadership roles to be persistent, brave, stand tall and speak up. If you love creating materials, metallurgical and materials engineering is a wonderful field; so just dive in and you will fall in love with it.

India's paradigm has shifted to nuclear families and working parents, and so for the first few years after childbirth, women and men should be given an option for more flexible working hours or work from home options, making it more inclusive for new parents. Educational day care facilities in proximity to the workplace can be a great enabler for women professionals.

STEM needs more role models and needs positive publicity. At schools and universities, it needs to be more engaging and encouraged by hands-on learning, both for experimentation and computation than only teaching theory. Students should be allowed to come up with their own ideas to experiment with. Outreach activities for integrating schools with university and college labs may work wonders for promoting interest in STEM disciplines. ■

Academic Profile

- BTech Metallurgical & Materials Engineering, IIT Roorkee
- MTech Materials & Manufacturing Engineering, Technical University of Denmark
- PhD in Plasmonics, International Max Planck Research Schools for S&T of Nanostructures-MLU, Germany

Awards & Membership

- IEI Young Engineers Award 2021-22, Institution of Engineers, India.
- Member of Indian National Young Academy of Sciences

N Nishad Fathima, PhD

Senior Principal Scientist
CSIR-Central Leather Research Institute (CLRI), Chennai

Nishad Fathima is a leather technologist working on the fascinating structure of skin and collagen. She loves to inspire school and college students through popular lectures.

I was born in Salem, Tamil Nadu, and attended school and university in Chennai. My parents have always been a pillar of support for me. They never stopped me from pursuing my dreams. They valued the concept of women's education in practice. My mother had only a BSc degree when she married my father. My father, a true role model, supported her in pursuing MSc, BEd, MEd and MPhil after marriage.

Someone who continues to always inspire me is T Ramasami, PhD, my teacher, mentor and supervisor. It was his teaching on the introductory course in leather technology that cultivated my fascination for leather. He gifted me a book for securing highest marks in his subject with a note "I have higher expectations of you".

It is said we don't choose our destiny; our destiny chooses us. I wanted to be a doctor and selected math, physics, chemistry and biology in Std. XI. However, destiny had other plans for me. I shifted to computer science after dropping biology in my intermediate course. I chose leather technology in BTech as I did not want to leave my home in Chennai. Little did I know then that it would become my passion and future profession.

- A 'never ever give up' attitude will help you sail through the testing times that life throws at us.
- A positive attitude and support from family help women balance childbearing responsibilities and profession.
- We must educate our society to overcome inherent prejudices against women to seal the leaky pipeline.
- STEM education must focus on efforts to bust the myth that biology or certain disciplines are more suited for girls.

As part of my research, I developed value-added products from proteinaceous solid waste through the principal understanding of protein assemblies. My research group's work on the use of designer and greener solvent 'ionic liquids' for leather processing is the first of its kind in the world.

Being a researcher has taught me to embrace failures as scientific experiments do fail a number of times before one tastes success. Repeated efforts and a 'never ever give up' attitude will help you sail through the testing times that life throws at us. Keep pushing yourself and you will succeed.

Being treated a little differently as a woman hurts, but that should amplify your strength and push you harder to prove yourself.

On occasions, I have been made to remember that I am a woman. Nevertheless, I have taken such remarks or situations in my stride, didn't complain and have always moved forward. Having a child is a major event for any woman. It definitely holds you back as priorities change. A positive attitude and support from family help women balance childbearing responsibilities and profession during the crucial phase of embracing maternity. I have had my own share of sacrifices, but I know they were worth it.

Being treated a little differently as a woman hurts, but that should amplify your strength and push you harder to prove yourself. I have always turned my challenges into opportunities. I would recommend next-generation women to know about women achievers in STEM, their career paths and their journeys to understand how to overcome hurdles or handle a particular situation or maintain work-life balance.

The government should undertake more efforts to generate awareness on women-centric schemes, especially to those who took a break due to marriage and child birth. We need to have more 'role models' speaking about their success stories to school and college girls to encourage them to take up science. We must educate our society to overcome inherent prejudices against women to seal the leaky pipeline.

Everything in our daily life involves science. If it is taught with this perspective in mind then young students will study science with enthusiasm and excitement. There are more women scientists in biological sciences than other areas. STEM education must focus on efforts to bust the myth that biology or certain disciplines are more suited for girls. This way more girls can be inspired not only to join other STEM fields, but also be leaders in other areas. ■

Academic Profile

- BTech (gold medalist), MTech (gold medalist), PhD in Leather Technology, Anna University, Chennai

Awards & Fellowships

- Tamil Nadu State Young Scientist Award, 2017
- SERB Woman Excellence Award, 2013
- INSA Young Scientist Medal (Engineering Sciences), 2011
- INAE and IEI Young Engineer Award
- INSA-DFG Visiting Scientist Fellowship
- Fellow of Madras Science Foundation

Nishima Wangoo, PhD

Assistant Professor, Department of Applied Chemistry
University Institute of Engineering and Technology (UIET),
Panjab University, Chandigarh
Former Project Scientist at National Agri-Food Biotechnology Institute (NABI), Mohali

Nishima Wangoo is a nanotechnologist who designs nanoparticles for multiple applications and sensors for detection of heavy metals and other compounds.

My father has been and will be my life-long inspiration. I have imbibed strength and persistence from him, both of which are essential traits in my field. My mother made me an independent woman, and I cannot thank her enough for that. My other key inspiration is late Prof. DVS Jain, who never actually guided me or helped me directly, but listening to his life's stories was a great source of motivation. Interestingly, I was also inspired by those who created problems in my life as they gave me an opportunity to discover my hidden strengths to face challenges.

Struggle has been my long-lasting friend as I never achieved anything in an easy manner. When I returned to India after completing my post-doctoral studies, I could clearly see the subtle gender bias and conspicuous nepotism in faculty selections. As I was naïve, more often than not, I became a soft target of both. But my hard work could not be sidelined that easily. I was selected for the prestigious DST-INSPIRE faculty position-cum-grant in 2012 that boosted my confidence for going on in STEM. I was able to start my own research group and engage in meaningful and applied research.

- Credit and encouragement should be irrespective of gender.
- Sensitise both men and women to take STEM as a gender-neutral field.
- Age relaxation for women candidates should be seriously considered.
- Promote more women in decision-making committees at apex positions and in governing bodies.

A woman's journey is relatively filled with exponentially higher barriers than her male counterparts. I had to surpass the difficulties thrown to me by others in higher positions who could not avail a grant at a young age like me. I endured and ignored a lot, focusing on my only aim of doing quality research. When I got a permanent position in an institute where research was not the thrust area, I was told that it would be the dead end of my career. I actually proved it to be a 'stepping stone' instead.

It is improper to give credit for your hard work and talent to people who are your well-wishers and not a direct contributor to your academic work.

I was the first woman faculty from Panjab University to be selected for the membership of Indian National Young Academy of Sciences (INYAS) in 2021. In a span of 10 years of starting my career, I have completed 10 research projects and have two patents along with 57 high-impact research papers in international journals of repute. I was also listed among the top 75 women in India in STEAM (STEM plus Arts) in March 2022 by the British High Commission-Red Dot Foundation and the Office of the Principal Scientific Advisor to the Government of India.

As is quite common in our society, the credit of my success was often given to my husband who is a supportive life partner. As a professional, it is improper to give credit for your hard work or talent to people who are your well-wishers and not a direct contributor to your academic work. Credit and encouragement should be irrespective of gender.

Challenges also soared high when I entered motherhood, especially after my second child. It is a herculean task to balance work and life, but it brings out abilities in you which even you yourself were never aware of.

Traditional methods of teaching STEM must be augmented with newer methodologies. Use of technology should be exploited. As science progress, policies must keep changing to stay in line with new advancements.

I believe that we, as women, need to give credit to other women. Mentoring girls is a starting point and I am doing all I can to make a difference in the life of all the girl students who work with me. Quality creches and daycare facilities should be there in every sector to support women in their careers. I have also started a forum called Women in Science (WISe) in collaboration with Panjab University and INYAS. It is dedicated to encouraging women to take up STEM as a career and go forward with their dreams. ■

Academic Profile

- MSc Chemistry, Panjab University, Chandigarh
- PhD, Institute of Microbial Technology, CSIR-IMTECH, Chandigarh
- Post-doctoral Fellow, Nanyang Technological University, Singapore & Northwestern University, US

Awards & Memberships

- Smt. Prem Lata Jain Best Researcher Award, 2019
- Best Researcher Award in Engineering Sciences under PURSE Grant, 2018
- Prof. UC Pant Memorial Award in Chemistry, 2013
- Member of INYAS, INSA

Niti Kumar, PhD

Senior Scientist, CSIR-Central Drug Research Institute, Lucknow

Niti Kumar studies the genome and proteome signatures in malaria parasite and her research explores the lead compounds against drug-resistant malaria.

I was born and brought up in Delhi and completed my schooling and university education in the city. My science teachers in school played an important role in igniting curiosity about scientific discoveries and their applications in our day-to-day life. My interest in biology and chemistry attracted me to pursue studies in life sciences. During my summer training and dissertation work, Souvik Maiti, PhD, from the Institute of Genomics and Integrative Biology (IGIB), who later became my PhD supervisor, played an instrumental role in my scientific training. I also met wonderful people during this journey who motivated me to take up a career in STEM.

My PhD mentor used to say: "Diamond is a carbon crystal which forms under high pressure and temperature, and it sparkles when it is properly cut." This is the basis of my training, which helped me evolve as a mature and competent researcher. Probably, this pushed me to overcome professional failures and consistently make efforts towards scientific endeavours.

The journey of any researcher is arduous, yet exciting, as you uncover what is unknown in the realms of science.

- Choose your battles cautiously and invest your energy and time carefully.
- Upskill yourself continually.
- Be ready to try new ideas and adapt to new settings.
- Network with people and be aware of emerging trends in the field.

My lab is investigating critical parasite genome (telomere homeostasis) and proteome (proteostasis) maintenance pathways, and trying to understand how they give competitive edge to the malaria parasite. My lab is also involved in exploration of novel hits and lead compounds against drug-resistant malaria and their probable mode of action.

A researcher needs to be consistent, confident and keep looking for avenues and opportunities.

I have not encountered any challenges of gendered science; my challenge is associated with my personality, as I am usually trapped in a vicious cycle of 'self-doubt'. My suggestion would be not to let yourself carried away by such feelings as it results in waste of time and mental energy and dilutes the motivation towards your work. Further, I am unable to say no to academic housekeeping and institutional work, which results in too many responsibilities and tasks in my to-do list that causes fatigue and burnout. Thus, be cautious that you are able to say no in certain circumstances and don't end up biting what you cannot chew. For women in science, I have one simple suggestion: Don't be deterred by challenges.

A researcher needs to be consistent, confident and keep looking for avenues and opportunities. Be ready to try new ideas and adapt to new settings. Choose your battles cautiously and invest your energy and time carefully. Any journey begins with small steps; thus being overambitious may be counter-productive at times. Network with people and be aware of emerging trends in the field and upskill yourself continually.

For STEM researchers, policy should focus on creating more avenues of employment in mainstream research and alternative science careers for both genders. This will help couples to take up careers within the same city and help in maintaining the work-family balance. Many a times, women have to compromise on the kind of job they choose in STEM owing to family reasons and geographical constraints. Regarding STEM education, both at the school and the university level, vast courses and diverse subjects are covered without building proper concepts and practical knowledge. The evaluation process is marks-oriented that has resulted in erosion of concept-based fundamental knowledge. More practical teaching will help understand the concepts and connect different fields. ■

Academic Profile

- BSc Microbiology, MSc Biomedical Sciences, University of Delhi
- PhD, CSIR-Institute of Genomics and Integrative Biology, New Delhi

Awards & Fellowships

- Swarnajayanti Fellowship, DST
- SERB Women Excellence Award, DST
- Marie Curie Fellowship
- EMBO Post-Doctoral Fellowship
- Innovative Young Biotechnologist Award, DBT
- Young Scientist Award, INSA

Nitin Shukla Tiwari, PhD

Principal Scientist & Head, Intellectual Property Group
CSIR-National Chemical Laboratory
NCL Innovations Advisor, Venture Centre, NCL's tech business incubator

Nitin Shukla Tiwari is a registered Indian patent agent with 12 years of experience in advising on intellectual property (IP) protection, IP portfolio planning, management and value addition.

My journey from being a biomedical researcher to an IP expert has been inspired by a crucial event. My doctoral research focused on assessing prevalence of Taenia solium (tapeworm) infections in northern India. I realised that this problem was huge, but there were no sensitive and cost-effective diagnostic tools to detect such infections. So I decided to work on developing a diagnostic kit for tapeworm infection and apply for its patent. However, during the process, I discovered that as I had published part of my work on the antigen of the kit, it barred patenting the same. This was an unexpected setback. Without a patent, commercial production was not possible. This mistake prompted me to dig deeper into learning the nuances of intellectual property rights.

Prompted by the newly developed interest in IPR, I appeared for a competitive call for Department of Science and Technology's women scientist-C scheme, which trains females with a science background in IPR via an on-job training for 12 months. I joined the training programme. During the training, I spent some time in an IP consultancy firm, which exposed me to practical aspects of IP and substantiated the feeling of sticking to the field. The choice between a wet lab with PhD students, research publications and sort of a predictable career and IPR was quite tough. After all IPR was a new, uncertain arena in India.

Finally, I decided to choose IPR and be at the helm of updates in cutting-edge science of several domains rather than focusing on one research theme. I further realised that IPR needs development of the ecosystem and workforce training. Soon I started designing events and training courses that fulfilled the desires of my inner academician as well. IPR is a very fast-moving, but welcoming-all field; so do take a plunge, but with full might.

Being treated a little differently as a woman hurts, but that should amplify your strength and push you harder to prove yourself.

I have been contributing towards expanding the IP and patent filing foothold of NCL Pune and the Venture Centre. I have trained in IPR around 500 researchers, academicians, engineers, students, start-up owners and managers. I have also trained aspiring patent agents to help them qualify the patent agent examination organised by the Indian Patent Office.

My co-workers always understood my needs as a primary caregiver to my family and gave me flexibility in work schedule. Hence, I did not face any tough experiences in my professional journey. I, of course, had to limit my travels, do day trips, and take offs when kids needed while working until late nights.

I strongly feel that women must not be hesitant when they get a chance to be a leader in action; rather they must grab every opportunity. Females generally feel undeserving or reluctant for leadership roles as also observed by Sheryl Sandberg, in her book Lean in. This book is a must read for all females so that they can identify, understand and manage the most common feeling of guilt. Our society must learn not to turn females into guilty villains for being ambitious while managing all aspects of life.

Women have more commitments than men in terms of child bearing and family care. Females are oriented to be the focal point of their families which leaves lesser time for their professional focus compared to their male colleagues. Thus, females must be given flexibility of office hours, work from home options when needed. Daycare facilities near or within offices can help women cope up with the demands of both office and family with least resistance.

STEM teaching should be more practical right at the school level and should be coupled with life and management skills at all levels. Further, students should regularly undergo industrial training to make them understand requirements of the industry and skillsets needed. ■

- Women must not be hesitant when they get a chance to be a leader in action— grab every opportunity
- Do not turn females into guilty villains for being ambitious while managing all aspects of life.
- STEM teaching should be coupled with life and management skills at all levels.

Academic Profile

- BSc Zoology & Chemistry, MSc Zoology, University of Lucknow
- PhD in Biomedical Research, King George's Medical University, Lucknow
- Diploma in IPR, NALSAR University of Law, Hyderabad

Fellowships

- CRISP-Chevening Fellow, University of Oxford
- DST-IUSSTF Khorana Tech Transfer Fellow

TATA STEEL
#WeAlsoMakeTomorrow

TATA

EMPOWERING PEOPLE TO WRITE THE FUTURE | THEN AND NOW

Women in all shifts at mines 2019

Maternity benefit scheme for workers, 1928

Azadi Ka Amrit Mahotsav

Equal opportunity for all defines our employee-friendly ethos. Whether it's gender diversity, support to people with disabilities, LGBTQ+-friendly policies and forward-looking welfare measures for our people, it's our way of strengthening India.

P Hemalatha Reddy, PhD

Advisory Member, Delhi Effective Education & Pedagogy Cluster (DEEP-C) under the Delhi Science and Technology Cluster
Executive Council Member, Federation of Asian Biotech Association
Former Principal, Sri Venkateswara College, University of Delhi

P Hemalatha Reddy is an expert in science education, administration and science policy. Based in Hyderabad, she is involved in activities pertaining to the start-up ecosystem in the pharma sector.

I was born and brought up in Chittoor district of Andhra Pradesh. I was passionate about science right from my early student years. One of my teachers during my undergraduate days saw the spark in me and identi-fied my passion towards science. Though I studied zoology, botany and chemistry during my BSc, it was she who guided me to choose biochemistry for my master's degree. I started my career as an undergraduate faculty and spent 22 years teaching biochemistry at Sri Venkateswara College. I moved to administration later, and served as the principal of the same college from March 2009 to May 2020.

In the beginning, I met some wonderful people, such as Anil Kumar Tyagi, PhD, who mentored me for un-dergraduate teaching and research. Towards the last few years of my service, I got associated with L S Shashidara, PhD, and contributed to science teaching at the national and international levels.

My determination, hard work and perseverance have made me follow my heart's calling. It was difficult at each step; right from pursuing PhD after marriage to being the first-generation working woman in my family. My dream was to provide good training to students in life sciences. My enthusiasm for biochemistry made me excel in teaching, and eventually led the way to secure well-funded R&D projects for my college. These projects allowed my college faculty to get trained in conducting research and writing projects.

- Perception and apprehension are two key barriers for women leaders.
- Motherhood and other social constraints can temporarily delay career advancement and productivity, but cannot stop women from growing as leaders.

I faced many challenges, and learnt from each step. I was the first woman principal of Sri Venkateswara College. Being an academician, it was an unfamiliar experience to adapt to the role of administrator initially. I learnt that as a team leader, I had to win the confidence of all stakeholders to achieve targets for develop-ment and growth of my college. I introduced research in the undergraduate course for the first time in my department to promote scientific curiosity and enquiry-based learning. The decision was not appreciated by many and was scrutinised through filtered glasses. However, I survived these hiccups, and eventually achieved my goals for student and staff training in science. As a task force member of STAR college pro-gramme of the Department of Biotechnology, I contributed for a decade to the assessment of colleges across India for financial support to set up science laboratories and to strengthen them.

Women are better managers, experts in multitasking and sharp at time management.

I designed various workshops and faculty development programmes on life sciences and developing peda-gogical tools to improve science education. I participated in designing such programmes on life skills and universal human values for Heartfulness Education Trust, Hyderabad, in collaboration with the All India Council for Technical Education. At present, I am engaged in training undergraduate faculty in life sciences through the Delhi Science and Technology Cluster, and across Asia through the Federation of ASEAN Biotech Association, Hyderabad.

At present, I am drawn to STEM education based on enquiry-based learning, and believe that the system of teaching through rote learning should be discouraged. STEM teachers are instrumental for molding future generations, and as all teachers are not trained in this aspect, there is a huge scope of empowering faculty with new-age pedagogical tools. Our main aim should be to train them first to bring a paradigm shift in teaching in tune with the New Education Policy 2020.

For women in leadership, two significant barriers are perception and apprehension. Barring those, I don't think anything else will affect. I have always believed women are better managers, experts in multitasking and sharp at time management. Motherhood and other social constraints can delay career advancement and productivity for a few years, but cannot stop women from growing as leaders, if they have the will, convic-tion and determination.

This is a golden age for women in science. Women of today come from the second generation of working women in their families. They are bolder, confident and open to new ideas and opportunities. And there are ample opportunities. Therefore, young women should never lose hope, and wisely and constructively utilise their time. ■

Academic Profile

- BSc, Sri Satya Sai Women's College, Anantpur
- MSc Biochemistry, Andhra University
- PhD Medical Biochemistry, Delhi University

P S Lakshmi Priya, PhD

Assistant Professor, Structural Engineering Laboratory
Department of Civil Engineering, IIT Madras

Lakshmi Priya worked as a bridge design engineer at Walter P Moore & Associates in Houston, Texas. Her research at IITM revolves around pushing the boundaries of structural design using steel.

I was born in Chennai and brought up in Hyderabad where I spent most of my childhood. I chose civil engineering simply out of my love for mechanics. I seriously started considering it as a career option after attending a summer camp at IIT Kanpur for civil engineering students. My parents and elder brother inspired me to think independently and persuaded me to do better at every stage. My family members stood their ground in supporting all my career decisions, sometimes having to answer to the society on why their daughter was in a profession 'unsuitable' for women, and why I was pursuing a PhD at such a late age. My husband, through his infinite patience and emotional support, helped me finish my PhD while we were residing in different continents.

My guides, both during my masters and PhD work, were not only excellent humans, who supported my emotional and physical struggles, but ensured I took the best professional decisions.

My research revolves around pushing the boundaries of structural design using steel. The work shall enable longer, slender and lighter-weight steel structures, which are more beautiful and economical. I worked in a structural design firm where I learned that engineers had to constantly push past what design specifications allowed us to do. I also realised that a deeper, more fundamental understanding of design provisions in codes is required. The desire of enabling engineers to make more 'impossible' structures and to make more students envision the same pulled me into research and academia from the industry.

- It is fine to breathe when things are too hectic both on the professional and personal fronts.
- Things will always fall in place as long as our drive and passion to excel does not dwindle.
- Don't try to be like men to compete with them. Own your femininity.

The desire of enabling engineers to make more 'impossible' structures and to make more students envision the same pulled me into research and academia from the industry.

I conduct courses periodically for faculty members of AICTE-approved colleges to disseminate knowledge to the next generation of civil engineering students who do not have direct access to IIT. I find that we are still teaching STEM in a largely traditional manner, with chalk and board. STEM teaching must involve hands-on projects giving a real-world picture, rather than isolated problems that do not help connect the dots. Students should be allowed flexibility and choice to take fewer or more credits per semester, based on individual needs, and established proficiency.

Workplaces are getting used to seeing women in non-traditional set-ups and roles. Times have changed, and civil engineering is no longer an unsuitable profession for women. Of course, there are additional challenges to be met if you have to travel for site visits in remote areas. But every perceived challenge can usually be solved. What has still not changed for women is the social and domestic set-up. Marriage during my PhD and having my child at the start of my career were easily the most challenging phases of my professional journey. Even when one resumes work after maternity leave, a child expects undivided attention from the mother once she is home. It is more likely than not that these events slow down your professional growth. Work-from-home support for young mothers will go a long way in encouraging women into STEM careers. Private organisations can be advised to provide extended maternity leave up to a year (even if it is without pay) as an option for those women who are unable to find reliable and affordable child support, and are forced to quit their jobs. Subsidised state-of-the-art day care facilities could be provided in every government and private organisation.

It is fine to breathe when things are too hectic both on the professional and personal fronts. But get ready to tackle professional assignments head on as soon as the time demands get manageable. Things will always fall in place as long as our drive and passion to excel does not dwindle. It is also important to not compare yourselves with other successful women around. Let them inspire, not demotivate. Every woman's situation is different, and everyone thrives in different environments. Let us not try to be like men to compete with them. Own your femininity. If you shy away from an important part of your identity, it is difficult to find long-lasting success or peace. ■

Academic Profile

- BTech, Visvesvaraya National Institute of Technology, Nagpur
- MS, University of Texas at Austin, US
- PhD & Post-doctoral Fellow, Georgia Institute of Technology, Atlanta, US

Award & Memberships

- Vinnakota Award (runner-up) for the best student paper, Structural Stability Research Council (SSRC), US, 2015 & 2016
- Member of Indian Institute of Bridge Engineers & SSRC

Padmshree Mudgal, PhD

Professor, Biochemistry, Daulat Ram College, University of Delhi (DU)

Padmshree Mudgal has over 32 years of undergraduate (UG) teaching experience. She established the zebrafish lab facility at the Daulat Ram College and popularised the zebrafish model system as a teaching and research tool. Her research interest lies in evaluating the therapeutic potential of traditional Indian medicines using zebrafish model system.

I was born in Karnal, Haryana, and brought up in the campus of the National Dairy Research Institute (NDRI) there. My father, late Dr VD Mudgal, worked in the area of animal nutrition at the institute. Later, he became director of the Buffalo Research Institute, Hissar. He was my biggest inspiration and instilled in me scientific temper as well as leadership qualities. I would always listen to his radio and television talks for farmers regarding nutrition requirements of farm animals.

Being at NDRI campus, I got to know about new developing technologies like embryo transfer and animal cloning that offered me the excitement to pursue science and I made up my mind early in life that this was the career path for me. Listening to luminaries like Verghese Kurien and MS Swaminathan, PhD, made me realise how their pioneering work had changed and impacted the lifes of millions. Another person who shaped my future was my PhD guide, SR Anand, PhD, who instilled in me the art and skill of scientific design and exploration.

After my PhD, I joined Daulat Ram College, DU, as an assistant professor. While I enjoyed teaching to its core, I always craved for establishing a research lab of my own. In 2014, DU announced funding opportunities and encouraged faculty members to take up projects and set up research labs at the undergraduate level. While I was thinking of research themes to apply, I discovered that a zebrafish facility could be established with minimum means and it provided an alternative in vivo non-invasive model system for science education, teaching and research. I applied for the grant and after that there was no looking back.

- Don't be daunted by roadblocks or failures.
- Women who wish to be in leadership roles must learn to inspire by example.
- More scholarships and sponsorships are required to girls encourage to take up STEM careers.

STEM teaching at UG is a great career to pursue; one can influence and be part of shaping scientific temper in young minds.

Establishing a zebrafish lab facility in college was the turning point of my professional growth. I could start some zebrafish-based projects at my college and also initiated collaborations with a few other colleges. The facility is running for the past seven years and has trained 150 faculty members and more than 800 masters' and undergraduate students from different Delhi NCR universities.

I have not faced any challenges due to gender bias. However, initiating and setting up the zebrafish lab facility was the biggest challenge that I faced. The overall coordination, setting up the basic infrastructure and training of staff for its round-the-clock maintenance was a challenge.

My advice to next-gen women who wish to be in leadership roles is inspire by example. Set high goals, motivate your team to achieve those. Encourage and celebrate every small achievement. STEM teaching at UG is a great career to pursue; one can influence and be part of shaping scientific temper in young minds. As mine is an all women college, so I waste not even a single opportunity to inspire and motivate young girls to develop an interest in science, skilling, mentoring and supporting them for taking informed choices for pursuing a career in science. Don't be daunted by roadblocks or failures. Relentless and persistent efforts are the key to success.

Query-based teaching should be encouraged at all levels. Lab practicals should encourage critical thinking and instead of structured and planned lab practicals, students should be encouraged to explore and design their own experiments and learn from them. More funding and encouragement at the UG level is required to tap the enthusiastic potential of young girl students. Being a faculty at an all-girls' college, I have seen many girls dropping of after graduation due to lack of family support or early job opportunities. More scholarships and sponsorships are required to encourage girls to take up STEM careers. ■

Academic Profile

- BSc (Hons) Chemistry, Miranda House, University of Delhi
- MSc Biochemistry, Post Graduate Institute of Medical Sciences, Chandigarh
- PhD in Animal Biochemistry, National Dairy Research Institute, Karnal

Awards

- Best Innovative Idea, Teaching Excellence Award for Innovation, DU
- Dr Sarvepalli Radhakrishnan Best Teacher Award, Centre for Professional Advancement, DU

Paramjit Khurana, PhD

Professor, Department of Plant Molecular Biology and JC Bose National Fellow
University of Delhi South Campus

Paramjit Khurana is known for her accomplishments and expertise in plant biotechnology. Her research focus has largely been around wheat biotechnology, seri-biotechnology, plant genomics, bioinformatics and genetic transformation of legumes and cereals.

Several people inspired and motivated me to excel in life and career. My father Mohan Singh Gharyal, teacher Prof. SC Maheshwari, husband Prof. JP Khurana, and former DBT Secretary Manju Sharma, PhD, are some of them.

My father, while working for the Indian Army, devised an engineers' stethoscope for locating faults in heavy machinery, which he patented after retirement and won the President's Award conferred by the Invention Promotion Board of India. This was a major event that encouraged me to pursue research in my field of interest and soar high in my profession.

There were times I faced challenges. To be specific, not being taken seriously for your ideas or work was the major one. Socially as well, science was considered a male domain.

However, my hard work and dedication has paid off well and my research has been acknowledged and appreciated at the national and global levels. My advice to the next generation of women researchers is: Believe in yourselves and be at your work till your work starts speaking for itself.

My team has worked on sequencing the complete chloroplast sequence of Indian mulberry, *Morus indica*. I was associated with the sequencing of the rice genome as part of the international rice genomics effort. At present, I am associated with the sequencing of the tomato genome as part of the international genome effort.

Believe in yourselves and be at your work till your work starts speaking for itself.

Other major research contributions of my group include the development of a systems biology approach to decipher the molecular mechanisms associated with somatic embryogenesis in plants, transcriptome profiling for studying heat stress tolerance in wheat and drought stress in mulberry, development of genetic transformation system by agrobacterium methods in wheat species and varieties, development of a novel technique of direct gene transfer in plants via cellular permeabilization, and the development of a non-invasive method for the introduction of impermeant macromolecules into living plant cells.

All these involved non-stop labour, patience and perseverance. Therefore, women researchers who wish to make a mark must be prepared for a 24x7 job with no official timings and no holidays.

I think the attitude of the masses towards women who are serious about their careers should change. Well-educated teachers are a need of the hour. Teachers' training is crucial for creating interest in students and young girls in science. And finally, science needs to be more paying as compared to other professional courses. ■

- Women researchers should be prepared for a 24x7 job with no official timings and no holidays.
- Well-educated teachers are a need of the hour.
- Science needs to be more paying as compared to other professional courses.

Academic Profile

- BSc, MSc, Mphil & PhD in Botany, University of Delhi

Fellow

- National Academy of Sciences (NASI), Allahabad
- Indian Academy of Sciences (IASc), Bengaluru
- Indian National Science Academy (INSA)
- National Academy of Agricultural Sciences (NAAS)
- The World Academy of Sciences, Trieste, Italy

Awards

- Prof. J.C. Bose National Fellowship
- Shri Ranjan Memorial Lecture Award, NASI
- Bharat Ratna Rajiv Gandhi Mahila Shakti National Award
- Birbal Sahni Award Medal, Indian Botanical Society
- Professor Har Swarup Memorial Medal, INSA
- Prof. Archana Sharma Memorial Lecture Award, 2019, NASI

Membership

- Third World Organization for Women in Science, Italy
- International Sericulture Commission, France.
- Society of Plant Biochemistry and Biotechnology
- Indian Society of Developmental Biologists
- Indian Cell Biology Society
- Indian Science Congress Association
- Association of Plant Tissue Culture (India)
- National Academy of Sericultural Sciences India, Bangalore

Pinky Agarwal, PhD

Scientist V, National Institute of Plant Genome Research, New Delhi

Pinky Agarwal's research aims to elucidate the molecular networks controlling various aspects of the rice grain during its development to improve rice crop.

My parents have always encouraged me to pursue an independent career in my field of interest. Being a doctor's daughter, biology always fascinated me. My teachers at Gargi College introduced me to biotechnology and my teachers at the Department of Plant Molecular Biology, University of Delhi South Campus ensured that I got fascinated by the subject. My spouse Rachin and my brother Gautam have always supported me and celebrated my success and stood by me in times of need.

A research paper of one of my first PhD students came in for review when I was expecting and in my third trimester. I put in all my time and effort to the same and submitted the review just a week before my delivery. The paper, however, was sent to a different set of reviewers by the editor, who did not seem to be experts in the field and had a completely different perspective. This did not discourage me and I submitted the same paper to a better journal, where it got accepted with minimal changes by reviewers. The icing on the cake was that the paper was much lauded by the scientific community. I also have some very encouraging colleagues who are always ready for scientific discussions and suggestions.

- Stay persistent even when it gets tough.
- Flexible timings, work-from-home options and part-time jobs to attract more women into STEM careers.
- Exhibit a balance of authority and friendliness as a leader.

A leader is respected only when one can step up and become a role model and display skills that they expect to see in others.

My research work is on rice improvement. Rice is a staple food crop and grain size is the most important parameter contributing to its yield. The rice grain is carbohydrate-rich, and has a few micronutrients, but is also a source of dietary protein.

The research in my laboratory aims to elucidate the molecular networks controlling these aspects of rice grain during its development to improve rice crop. Recent work done in my laboratory has led to the identification of a seed-specific transcription factor controlling multiple aspects of rice grain development, including amylopectin and seed storage protein biosynthesis. We have also identified an E3 ubiquitin ligase involved in increasing grain size in indica rice.

It is a blessing to work at an Institute where both genders get equal opportunities. Yet, the glass ceiling does exist in the minds of people and is difficult to break. Trends are changing with an increased focus on working women from various decision-making bodies and that is heartening to see.

A leader is respected only when one can step up and become a role model and display skills that they expect to see in others. A leader has to not only be sincere and hardworking but also empathetic towards her co-workers and subordinates. She has to exhibit a balance of authority and friendliness as required. Stay persistent even when it gets tough, because the satisfaction obtained from being able to complete experiments, publish papers and guide others to build a career is unmatched.

I would recommend flexible timings, work-from-home options and part-time jobs to attract more women into STEM careers. STEM can be made interesting with hands-on experience rather than rote learning. An actual lab exposure to students through a short training can help them visualise concepts better. ■

Academic Profile

- BSc (Hons) Botany, Gargi College, University of Delhi (DU)
- MSc & PhD in Plant Molecular Biology, DU

Awards & Fellowships

- INSA Young Scientist's Award
- Women Excellence Award, Science and Research Engineering Board
- EMBO Research Leadership Course Selection, DBT India Alliance.
- Memberships
- Organisation for Women in Science for the Developing World
- Indian Science Congress Association
- American Society of Plant Biologists

Pooja Devi, PhD

Principal Scientist
CSIR-Central Scientific Instruments Organisation, Chandigarh.

Pooja Devi is a material scientist who develops and studies new materials to address their techno-commercial aspects for sensors and energy catalysis.

I was born in Birbangra, a small village in Haryana's Kaithal district, and brought up in the small town of Dhandh. Later, my family moved to Kurukshetra for my education. My father Shivdutt Sharma couldn't complete his education and studied up to matriculation due to financial constraints. He gave us the best opportunities and environment to study, which pushed my interest in education. I was much influenced by TV programmes (Turning Point and Nano Ki Duniya) and science columns by Prof. Yash Pal in newspapers. My two siblings helped me overcome the English language barrier. My husband has been a strong support system and has taught me patience and perseverance.

I have been guided and influenced by many faculty members. They include Prof. P Jeevanandam, Vijaya Aggarwala, PhD, and Anil Srivastava from IIT Roorkee; Prof. R K Sinha, former director of Central Scientific Instruments Organisation (CSIO); Prof. Ashutosh Sharma from IIT Kanpur; and Prof. S Anantha Ramakrishna, CSIO director now.

I have contributed to developing functional materials for detecting pollutants in water. Many of these materials are integrated with field-deployable test kits and devices. I have also contributed to catalytic materials, especially the design of oxide- and 2D materials-based heterostructures for green hydrogen generation through electrochemical route and air purification by photocatalytic oxidation, and to developing a wearable breathing device V-Treat for clinicians to provide SARS-CoV-2-free breathing air while discharging their clinical duties.

- If you have zeal, creativity, enthusiasm and curiosity, then R&D is the career choice for you.
- Women often set boundaries for themselves due to their socio-cultural upbringing.
- Women must build a proper support system, which could be in the form of family, friends and colleagues.

I try to become the best version of myself and follow the quote, 'I didn't come this far to only come this far'.

My journey from a small town till here itself is a driving factor for me. I try to become the best version of myself and follow the quote, 'I didn't come this far to only come this far'. Recently, I received recognition from the Haryana government. I hope this encourages my community girls to take up STEM as a career.

As a working woman, I have faced a major challenge in balancing motherhood and professional life. I am also going through a two-body problem, wherein my husband is working in Kolkata while I am working in Chandigarh. Thus, at times STEM careers can be indeed quite challenging on the personal front.

Women often set boundaries for themselves due to their socio-cultural upbringing. To become leaders, we need to break a few of these boundaries, and come out of our comfort zone. Women must build a proper support system—family, friends or colleagues. If you have zeal, creativity, enthusiasm and curiosity, then R&D is the career choice for you. It is also equally important to have knowledge, patience and resilience to sustain and grow further.

STEM fields are very demanding and competitive and thus we need more policies to enable women to manage their professional and personal lives. Introducing flexibility in working hours or work from home, especially for young mothers, hiring couples in the same city (if not institute), introducing the provision of child care leave for fathers and age relaxation for recruitment may enable women in STEM in a great manner. Women-friendly policies in institutes and mentorship programmes must be rolled on soon. Campus crèche and playschools can also help attract and retain women in STEM.

I am an avid science communicator working on girls' STEM participation. It is important to create an ecosystem of curiosity-driven teaching at schools by engaging students in activity-based learning. Undergraduate students should be engaged in mini-projects to address real-time problems for experiential learning. More competitive job opportunities in academic and industrial sectors are also required to attract a talented pool in STEM. The culture and positive environment for start-ups should be promoted amongst youngsters while creating an ecosystem for their hand-holding and sustainability. ■

Academic Profile

- BTech Biotechnology, University Institute of Engineering and Technology, Kurukshetra
- MTech Nanotechnology, IIT Roorkee
- PhD in Engineering (materials), Academy of Scientific and Industrial Research, New Delhi

Awards

- NASI Young Scientist Platinum Jubilee Award, 2021
- IEI Young Engineer Award, 2021
- INAE Young Engineer Award, 2020
- SERB Women Excellence Award, 2020

Dr Pranita P Sarangi

Associate Professor, Department of Biosciences & Bioengineering
IIT Roorkee

Pranita P Sarangi is a veterinarian and researcher who explores the immunological mechanisms associated with the development of herpetic stromal keratitis, an infectious blinding disease caused by Herpes simplex virus-1.

I was born and brought up in Bhubaneswar, Odisha. My father was a mathematics teacher in Sainik School and mother, a teacher in a government high school. From childhood, my father motivated us to become good human beings and imbibed in us the essence of Indian tradition, including yoga, spiritualism, Vedic traditions and classical art forms. My mother has been a classic symbol of a strong woman who would always excel at home and at work. In addition to my parents, I have acquired certain traits, such as stretching myself a bit more even when I am going to give up, taking risks and venturing into new areas of research, from my doctoral and postdoctoral mentors.

I was always interested in pursuing something that would offer some challenge to me. After completing my schooling at the Sainik School, Bhubaneswar, I decided to pursue veterinary science, which was dominated by men in those days. After working as a field veterinarian, I went for my higher studies in the United States—a key factor in choosing a career in academia later.

At work, I have contributed to the understanding of various immunological mechanisms associated with the development of herpetic stromal keratitis, an infectious blinding disease caused by Herpes simplex virus-1. My work has improved our understanding of the trafficking and activation pattern of innate immune cells such as neutrophils and macrophages under septic conditions. My work is the first report on the immunomodulatory and therapeutic potentials of fibulin7 in inflammation and cancer conditions.

- Network with senior women leaders in STEM and take their advice
- Understand the social and biological needs of women and create gender-supportive policies.
- Emphasise paternal leave and promote sharing of family responsibilities by both parents.

Setting higher goals, persistence, sincere efforts, constant self-analysis and a strong desire to become a leader is what is needed from the next-gen woman.

When I look back, one of the factors that pushed me to my test limits and strengthened my abilities as a career woman was the challenges post marriage and the desire to stay close to family and become a mother. I chose to accept the change in research areas, and career breaks and give my best in every sphere no matter whatever came to my share.

My advice to the next-gen women is that each woman has an inherent ability to take on any challenge and it is possible to become a mother, wife and successful career woman in STEM. Setting higher goals, persistence, sincere efforts, constant self-analysis and a strong desire to become a leader is what is needed from the next-gen woman. I believe, regardless of the domain, one of the things that could help women, especially those who are family-oriented is to learn to share their responsibilities with their partners. Secondly, networking with senior women leaders in STEM and taking their advice could help a lot in their journey towards success.

While the world is prioritising gender equality, diversity and inclusion in all disciplines and careers, it is highly essential to understand the social and biological needs of women and create gender-supportive policies. There is a need to emphasise paternal leave and promote sharing of family responsibilities by both men and women could help in bringing women and retaining them in STEM careers. Vigyan Jyoti and the Gender Advancement for Transforming Institutions (GATI) are two commendable schemes from the WISE-KIRAN division of the Department of Science and Technology and similar programmes ought to be facilitated.

At the high school level, students need to understand various career opportunities that could exist in STEM disciplines irrespective of gender bias. The addition of demonstration and practical-based school curriculum from the primary level could increase interest of students in science. From the school level, more efforts should be made to inculcate creativity and an innovative mindset, rather than forcing kids to memorise vast syllabi. ■

Academic Profile

- BVSc & AH, Orissa University of Agriculture and Technology
- PhD, College of Veterinary Medicine, University of Tennessee, US

Awards & Fellowships

- Travel for Technique Award, American Association of Immunologists, US
- Innovative Young Biotechnologist Award, DBT
- University Merit Scholarship for undergraduate education, Govt. of India

Priyanka Bajaj, PhD

Assistant Professor, National Institute of Pharmaceutical Education and Research (NIPER), Hyderabad

Priyanka Bajaj is a green chemistry researcher who is working towards making pharmaceuticals and other industrial products environmentally friendly. She is developing biocatalytic processes and enzymes with potential applications in green chemistry.

I was born and brought up in the Karnal district of Haryana. Being from a rural area, it was challenging to take science and pursue it up to this point. I give the whole credit to my parents for keeping me persistent and supporting me in every possible way. I especially owe it to my mother, who has been quite progressive in her thoughts and always wanted me to be an independent woman.

As the saying goes,, challenges are opportunities in disguise. I always find my path and vision among challenges I face day to day. My biggest professional challenge has been limited Indian scientists working in the field of 'enzyme evolution and engineering' for catalysing chemical reactions. This work involves both biology and chemistry and requires understanding of both the subjects. So it becomes difficult to get students for PhD and post-doctoral positions who have knowledge of both the subjects.

To tackle this challenge, beginning this year, we have made students of biology and pharmaceutical sciences eligible for admission to the PhD programme in chemical sciences at NIPER. I am thankful to my director and colleagues for their constant support and encouragement for establishing this interdisciplinary field of research at NIPER, Hyderabad. There is a dire need to introduce upcoming and interdisciplinary research areas in school and college STEM education. Here I would like to mention that through Indian National Young Academy of Sciences (INYAS), we are working on multiple projects to impart practical, hands-on training to school students and teachers.

- Break free of stereotypes and perceptions of society.
- Have faith in yourself and develop a healthy sense of confidence.
- Let go all fears, judgements and limited beliefs, and make a place for yourself.
- Take calculated risks, adjust and align yourself with your goal.

Challenges are opportunities in disguise. I always find my path and vision in challenges.

As far as my research is concerned, for the past 12 years, I have been working on developing new proteins and biocatalysts to solve pharmaceutical and environmental challenges. During my PhD with Prof. Abhay H Pande at NIPER, Mohali, I worked on developing enzymes for degradation of organophosphates, components of nerve gas agents and toxic pesticides. These enzymes have been engineered and evolved and depending on the utility (prophylactic/outside environment); they have been stabilised with different formulations and nano-carriers.

I have published multiple international research articles on the above work and patents have been granted for the same. During my post-doctoral training with Prof. Rudi Fasan, who trained with Nobel Laureate Prof. Frances Arnold at Caltech, I worked on engineering and evolving enzymes for synthesis of active pharmaceutical ingredients (APIs). My current focus is developing multiple important enzymes for catalysing the synthesis of chiral APIs. Here, we are working on multiple projects funded by the government, collaborating with industry partners and trying to tailor the enzymes as per industrial applications and demand.

It is difficult to be a woman researcher. Facilitating the emotional and physical safety of women, reducing stereotypes, equal opportunities and pay scales at the level of educational institutes and workplaces are highly required for the change to come.

The most challenging experience as women in the professional world is to break free of stereotypes and perceptions of society. I think times are changing for the better and we are progressing towards a gender neutral society in a positive way. Have faith in yourself and develop a healthy sense of confidence. It can do wonders. Let go all fears, judgements and limited beliefs, and make a place for yourself. Take calculated risks, adjust and align yourself with your goal, and the most important, don't give up. Keep patience, as anything good for you takes time. ■

Academic Profile

- MSc, Kurukshetra University
- PhD, NIPER, Mohali
- Post-doctoral Fellow, Pharmaceutical Biotechnology, University of Rochester, New York
- Post-doctoral Fellow, University of Michigan, Ann Arbor

Awards & Fellowships

- DST-INSPIRE Faculty Award
- CSIR-Shyama Prasad Mukherjee Fellowship
- Haryana State Prathibha Samman, 2009
- INSA-INYAS Fellow, 2020

Rakhi Chaturvedi, PhD

Professor & Head at Department of Biosciences & Bioengineering, Indian Institute of Technology Guwahati, Assam
Visiting Professor, Gifu University, Japan

Rakhi Chaturvedi is a plant and agri biotechnologist specialising in *in vitro* plant tissue culture and secondary metabolite production.

I was born in Prayagraj. My father would devote time to teach me and deconstructed difficult concepts to help me develop fundamental understanding of several topics. I was quite focused on academics and had little time for extracurricular activities. My strict father insisted all his children must excel in academics. My stern mother taught me cooking and other domestic chores without hand-holding. I always wanted to control my destiny, be financially independent, and not get married off at an early age. I realised education was my path to independence.

I experienced a few rough patches. During my PhD days, my father suffered a stroke and had no one to look after him. I had to move to Prayagraj to supervise his recovery, which was very slow. Upon his partial recovery, he was adamant that I return to Delhi. He had been paying for my fees out of his paltry retirement pension and was keen that I finish my doctorate. I returned reluctantly and immersed myself in studies with new vigour. This is how I channelised my emotions.

My major research contributions include developing *in vitro* triploids of neem (seedless), and haploids and doubled-haploid lines of neem and tea, making them amenable for generating superior plants; developing a process for the production of commercial compounds of medicinal value by employing in vitro plant cell culture technology; and creating sizeable cultivation of top-quality banana, giloy and stevia plants using *in vitro* micropropagation methods. I have filed patents for *in vitro* methods in neem and tea.

- I realised education was my path to independence.
- Respect work—small or big.
- No one can stop you until and unless you yourself allow.
- Don't mix-up emotions while taking crucial professional decisions.

As a woman researcher, I faced a few barriers. My main opponents were mostly women or some of my relatives who never understood my inclination towards professional goals. While women of my age were busy finding their life partners to settle down, my parents decided to free me to pursue academics. My siblings also supported me to realise my dreams. I worked on the principle that 'If you want to fly high, must dare to leave the earth'.

I feel that the concept of women in STEM must be introduced to girls in schools.

Whenever I got a chance to excel, I used it to my advantage. I have contributed extensively to IIT Guwahati in various administrative positions for more than ten years. As Dean at the office of alumni and external relations, I was actively involved in promoting partnerships and collaborations with national and international institutions, leading to starting an international joint degree programme. I took up national-level administrative duties, like chairperson or organising chairperson of GATE-JAM examinations, conducted on behalf of the Ministry of Education. With that opportunity, I could introduce several reforms and conducted the examinations online, thus enabling a larger number of youths from India and abroad to participate. It raised the visibility of IITs around the world. I hold memberships of the Plant Tissue Culture Association, India; the International Plant Propagators Society, USA; and the Society for *In Vitro* Biology, USA.

Women who wish to fly high should not compare and regret who they are. No one can stop you until and unless you yourself allow. Take a challenge, handle it professionally, and do not mix-up emotions while taking crucial professional decisions. Do not inculcate insecurities within and develop a positive aura around yourself. Own your research work, enjoy it, give your best and that is the only way to maintain high standards. I believe in 'work is worship'; respect work—small or big; perform tasks with utmost sincerity and dedication without bothering much about the outcome.

I feel that the concept of women in STEM must be introduced to girls in schools. I do not see any shortcomings in the way STEM is being taught in India. ■

Academic Profile

- BSc Ewing Christian College, Prayagraj
- MSc, University of Allahabad, Uttar Pradesh
- MPhil & PhD, University of Delhi

Awards & Fellowships

- Elected Fellow, National Academy of Sciences, India
- Newton-Bhabha Leading Women Scientist Award 2016
- Prof Y S Murty Gold Medal 2011 by Indian Botanical Society

Rama Govindarajan, PhD

Senior Professor & Dean-Academic
International Centre for Theoretical Sciences, Bengaluru
Tata Institute of Fundamental Research

Rama Govindarajan is a theoretical physicist specialising in fluid dynamics. Her current work is on cloud fluid dynamics and mixing in the Bay of Bengal, where she is trying to begin modeling the Indian monsoon.

I came into this field by compulsion, not choice. After my IIT years, I wished to work in the industry. But as my spouse had a job in Bengaluru, I came here to support him. And in those days, there were not many options for chemical engineers in the industry in Bengaluru. So I decided to venture into aerospace, which had huge scope in that city, and thereafter decided to pursue research in that field.

In the late 1980s, I attended some captivating lectures on non-linear dynamics and chaos at the Indian Institute of Science (IISc). Two lectures I can still repeat on the blackboard were those by Prof. Ramakrishna Ramaswamy and Prof. KR Sreenivasan. In 1992, I went to a winter school on 'turbulence' in Les Houches, France, during which I learned a lot. These incidents brought in me a desire to work in fluid dynamics.

I discovered a new flow instability caused by viscosity variation and showed theoretically how these variations can be exploited to achieve better mixing at low Reynolds numbers. This instability has now been seen in a microchannel experiment in France. My work has examined standard dogmas in fluid flow and shown limits to their validity. For example, the Orr-Sommerfeld equation, widely used for boundary layer stability, is not the correct equation in any formal order of accuracy and the Boussinesq approximation, widely used, is not correct near a powerful vortex (common in turbulence). Recently, I have made contributions to cloud and ocean flows as well.

- Women who wish to take up a career in this field, go for it; you can do great.
- If you witness unfairness, either towards you or towards someone else, speak out.

Belief in yourself, aim high. Be enterprising and creative.

My former students and post-doctoral mentees have set extremely high standards for themselves and their groups. I am most proud of this.

I describe two experiences that I had as a woman in STEM; there were others as well. I was invited (by letter) for an interview in the late 1980s by a pharmaceutical company in Bengaluru. When I walked in, the team leader told me that from my name they had assumed I was a man, and now that they saw I was not, they would not interview me. In 1998, I gave a plenary talk at the International Conference on Numerical Methods in Fluid Mechanics in Arcachon, France. The chairman of the session was a famous scientist from India. While introducing me, he announced to the large global audience that I had left a sick child in India. My son was running a mild temperature, that's all. In the end, he described my talk as consisting of 'pretty pictures' and asked the audience to clap hard because I had left behind a 'very sick child just to show some pretty pictures'. Later, several top scientists told me my work was deep and insightful.

Therefore, despite every barrier, believe in yourself and aim high. Be enterprising and creative. Work hard on all aspects relevant to your field. If you witness unfairness, either towards you or towards someone else, speak out. Women who wish to take up a career in this field, go for it; you can do great. This career keeps you young because you are always connecting to sharp, young and enthusiastic people. The fraction of women in leadership roles should be monitored and efforts made to increase that.

To become deep thinkers, STEM students need to know a bit about other subjects like history, geography, fine arts, performing arts, world affairs, and economics as well. Students should be given harder and more creative problems to solve, and should be judged on the creativity and scientific soundness of their approach, and not always on whether they reached the final answer. ■

Academic Profile

- BTech Chemical Engineering, IIT Delhi
- MS Chemical Engineering, Drexel University, Philadelphia, US
- PhD in Aerospace Engineering, IISc, Bengaluru
- Post-doctoral Fellow, California Institute of Technology, US

Awards & Fellowships

- Kirk Distinguished Visiting Fellow, Isaac Newton Institute, Cambridge, 2022
- Platinum Jubilee Prize, Aerospace Engineering Department, IISc, 2017
- Shanti Swarup Bhatnagar Prize in Engineering Sciences, 2007
- Young Scientist of the Year 1997, National Aerospace Laboratories, Bengaluru

Remya Parameswar Iyer

PGT Biotechnology, Kendriya Vidyalaya, IIT Guwahati

Remya P Iyer teaches biotechnology and science to higher secondary students. She is a resource person for teacher training programmes of Kendriya Vidyalaya Sangathan (KVS) and a coordinator for the Programme for International Student Assessment (PISA) of the Organisation for Economic Cooperation and Development.

I was born and brought up in Thrissur, Kerala, in a Tamil family where education was given paramount importance. I was given freedom to make my own choices. I was deeply inspired by my grade IX science teacher, Ms Pearl, of Sacred Heart Convent Girls High School to take up science. During my bachelor's degree programme, I chose biotechnology as an elective, and opted for the same subject for my master's degree as well.

After that, I worked under the mentorship of Karuppanan Veluthambi, PhD, at the department of biotechnology in Madurai Kamaraj University in plant molecular biology as a CSIR Junior Research Fellow for about a year. During that period, I developed an inclination towards research. Later, I worked at the National Centre of Biological Sciences under K Vijayaraghavan, PhD, who changed my mindset and motivated me to apply for higher education in the United States. I got into the MS programme in biochemical research at the Case Western Reserve University School of Medicine with a fellowship and worked on understanding neurotransmitter metabolism during sleep apnea. I participated in the US government's Fulbright Programme in 2014.

My toughest barrier was trying to balance home and work front. I had to leave my PhD programme in the United States to accompany my husband to India who joined as assistant professor in IIT Guwahati. This was the first turning point in my career. From scientific research, I was challenged to choose a professional path available at that point that aligned with my heart and soul and could give me immense satisfaction.

- Funding schemes for women researchers must be broadened.
- Students should be motivated to take up small research projects right from young age.

My professional life as a teacher is full of many accomplishments that I did not foresee coming when I started. As the head of biotechnology department in Kendriya Vidyalaya Khanapara, I played a pivotal role in building a well-equipped biotechnology lab and infrastructure as the BLiSS and Foldscope (both DBT grants) coordinator. In addition, I won the IREX International Fulbright Alumni Grant in 2015 and the USIEF Alumni Grant in 2021.

Steps must be undertaken by policymakers to assure more flexibility at every level so that more women can complete their doctorate degrees.

My personality transformed as an educator when I mentored students in various scientific projects that they undertook as part of Innovation in Science Pursuit for Inspired Research (INSPIRE), National Children Science Congress, Jawaharlal Nehru National Science, Mathematics and Environment Exhibition (JNNSMEE) and INTEL Science Fair. I am working on developing scientific communication and temperament in young minds, motivating them to take up science as a career, and conducting workshops and building awareness on mindfulness practice to bring in more resilience and intuitive thinking in students.

I feel one should choose a STEM career if she is willing to give time, energy and resources towards work and research. It demands rigorous effort, intensity and passion, and demands curiosity and genuine interest. One cannot lead others without loving, respecting and being her best version every day.

To allow women to flourish in STEM careers, steps must be undertaken by policymakers to assure more flexibility at every level so that more women can complete their doctorate degrees. The spectrum of funding schemes for women researchers must be broadened so that more women may enter and continue in STEM fields. The industry may think of generating novel opportunities to open up new avenues, and encouragement of entrepreneurship and partnerships at individual and community levels. Many science subjects are taught theoretically, and not via learning by doing.

However, collaborations between institutions, colleges and schools can bring about a change. An Edu Talk series with STEM resources, Nature Club, Eco Club and Science Club activities must be encouraged and students should be motivated to take up small research projects right from young age. Visits to labs and industries and interaction with scientists and entrepreneurs can spark a genuine interest in STEM. ■

Academic Profile

- MS Biochemical Research, Case Western Reserve University, Ohio, US
- MSc Biotechnology, Cochin University of Science and Technology, Kochi
- BSc, Sri Sathya Sai Institute of Higher Learning, Anantpur, Andhra Pradesh
- BEd, Guwahati University, Assam

Awards

- National Award to Teachers, 2019
- KVS National Incentive Award, 2018
- Fulbright Distinguished Academic Teaching Award, 2014
- Dr CV Raman Science Teacher Award by DST, 2013

Rituparna Sinha Roy, PhD

Associate Professor, Department of Biological Sciences
Indian Institutes of Science Education and Research (IISER), Kolkata

Rituparna Sinha Roy works in the area of peptide-based therapeutics. She engineers nature-inspired peptide-based stabilised putative molecular medicines having better stability and superior activity.

I was born in Kolkata. However, I was brought up in a remote village named Bishnubati in the Burdwan district until I finished high school. After my class X exams, we had to relocate to Kolkata as higher studies were difficult and safety for women was a big concern in my village. My parents and teachers at Bishnubati were my first mentors who inspired me to do well in my studies and science.

During my younger days, I used to read science articles in Bengal's popular Desh magazine. Owing to my reading habit, I gathered knowledge on the work of some eminent scientists across the world and in India. Besides, the work of Madame Curie, Prof. Dorothy Hodgkin, Rosalind Franklin, Prof. GN Ramachandran, Subhash Mukhopadhyay, Acharya Jagadish Chandra Bose, Sambhu Nath De and several other scientists' work encouraged and inspired me to keep honing my scientific skills and continue to grow in a STEM career.

I am a physical chemist who works on the interface of chemistry and biology to develop peptide-based therapeutics. My research group is interested in the therapeutics of bleeding disorder, diabetic wound healing and siRNA-based combination therapy against triple-negative breast cancer (TNBC). We aim to engineer peptide-based therapeutics for healthcare, especially in the area of regenerative nanomedicine and cancer nanomedicine. My research excites me while I continue to put interesting ideas to work, thus steering my professional growth as a researcher.

- Be patient, grab opportunity, and be focussed and perseverant.
- Interdisciplinary approach is the need of the hour in teaching.
- Philanthropic and industrial grants to support woman researchers in facility-deficient institutes will be encouraging.

Women STEM researchers need to have a lot of courage, a risk-taking attitude and emotional resilience.

However, my professional growth is a mixed bag of roses and thorns. Even in the 21st century, people underestimate the credentials of a woman faculty. Yet, there were rays of hope in science, and somehow, I persisted. Women STEM researchers need to have a lot of courage, a risk-taking attitude and emotional resilience.

My first and foremost suggestion for women scientists is to choose a field where you have good opportunities to excel without too much physical exhaustion. Working in interdisciplinary science is indeed challenging and hugely dependent on facilities.. In interdisciplinary fields like biological chemistry, the experimental work needs dedicated long lab hours. Training students in interdisciplinary areas is quite challenging for a PhD supervisor. So while choosing future research goals, one needs to be careful about the available resources and facilities present at her institute. I suggest next-generation women scientists to be patient, grab opportunity, and be focussed and perseverant.

I support and participate in interdisciplinary STEM research at IISER Kolkata. Interdisciplinary approach is the need of the hour in teaching. For example, biology should be taught by giving detailed molecular level information. Chemistry needs to be made mandatory for learning biology and medicine. To integrate medicine and engineering students into research, appropriate PhD entrance exams must be planned and conducted. Further, rolling PhD interviews will be helpful for researchers working in interdisciplinary sciences as they require students having different academic backgrounds.

For faculty members, five-year grants are desirable, instead of three-year ones, for promoting high-quality research and also to help early-career woman researchers perform better while balancing work and life. Flexibility in fund usage must be built in the grants for the ease of conducting research in newer or facility-deficient institutes.

Women researchers whose works are dependent on instruments and equipment are facing a huge problem in facility-deficient institutes. SERB-POWER grant is a huge enabler for women researchers. In addition, philanthropic and industrial grants to support women researchers in facility-deficient institutes will be encouraging. ■

Academic Profile

- BSc Chemistry (Hons), MSc Physical Chemistry, Jadavpur University
- PhD, IISc, Bengaluru
- Post-doctoral Fellow, Harvard Medical School, US
- Post-doctoral research assistant, The Scripps Research Institute, US

Awards & Fellowships

- SERB-POWER Fellowship, 2021
- Women Scientist Award, 2020, Organisation of Pharmaceutical Producers of India
- DST-Ramalingaswami Fellowship, 2011
- Shamrao Kaikini Medal for best PhD thesis at IISc

Rohini Garg, PhD

Associate Professor, Department of Life Sciences,
School of Life Sciences, Shiv Nadar University, Greater Noida, UP

Rohini Garg studies epigenomics and gene regulatory mechanisms of abiotic stress responses towards creating climate resilient plants.

I always enjoyed science in school, especially biology experiments to understand concepts and finding answers to biological phenomena happening around me. STEM became a natural career option as it encourages critical thinking and collaboration. It also gave me an opportunity to encourage young minds. I was lucky to have excellent mentors who encouraged me to take up a career in scientific research. They encouraged me to apply for various grants and positions, supported my applications and offered me guidance on grant management. I was encouraged by their time management and work perfection. Mentors are a must in a researcher's life. I also looked up to many women scientists for scientific and leadership skills that inspired me in multiple ways.

I was an independent learner from a young age and was not shy in asking my doubts to my teachers. It was one of my best friends who convinced my parents to allow me to study in Delhi University. My family members, including my parents, brother and husband, have supported me in completing my studies. I lost my father while I was in the first year of my undergraduate studies and it was difficult financially to manage, so both my brother and I had to take up tuitions to fund my education. When I applied for the master's degree course in University of Delhi South Campus (UDSC), there were only six seats in that stream, but I was confident of getting through. Always believe in yourself with unflinching confidence; be a go-getter.

- Mentors are a must in a researcher's life.
- Be honest with your work; focus on giving your best, and results will follow.
- Women can fulfil professional responsibilities along with personal ones.

Always believe in yourself with unflinching confidence; be a go-getter.

Receiving INSPIRE Faculty Award and IYBA Young Scientist Award proved instrumental for me to choose research as a long-term career. My key contributions are in genomics and transcriptomics for chickpea. I have studied how epigenomic changes across different plant genotypes influence the regulation of and response to abiotic stress. Such information has helped us understand how epigenomic changes may dictate adaptation to stress in plants. I have also used a transcriptomic approach to decipher genotype specific gene regulatory networks in the context of stress and adaptation apart from unraveling the epigenome regulation during abiotic stress and seed development. This information has application in crop improvement towards creating climate resilient crops.

Despite decent recognition, there were instances when I faced problems in convincing people that I can fulfill my professional responsibilities along with personal ones, which I can't ignore. Other than this I have not faced any gender bias.

My advice to young researchers is if you wish to pursue research, always be honest with your work and focus on giving your best; and results will follow. Perseverance and a support system of close friends are important.

As our society is changing with both men and women working as professionals—and in many cases both partners are researchers, I feel the faculty and scientist recruitment process should not shy away from hiring both as faculty to sustain most women in active research careers.

Otherwise, women researchers end up joining administrative posts and leave active research. There should also be more funding schemes for women researchers for travel support for international collaborations. ■

Academic Profile

- BSc, Institute of Home Economics; MSc Plant Molecular Biology, UDSC, New Delhi
- PhD, National Institute of Immunology, New Delhi

Awards & Fellowships

- SERB Women Excellence Award, DST, 2017
- Young Scientist Platinum Jubilee Award, National Academy of Sciences, 2014
- Indian National Science Academy Medal for Young Scientist, 2014
- Innovative Young Biotechnologist Award, DBT, 2012
- INSPIRE Faculty Fellowship, DST, 2011

Rumi De, PhD

Associate Professor, Indian Institute of Science Education and Research, Kolkata

Rumi De's research focuses on the interdisciplinary areas of physics and biology. She explores the emergent dynamics of living systems from a physicist's perspective.

I was born and brought up in Serampore in West Bengal. I was drawn to science from my school days. My school and college teachers motivated me to take up higher studies. However, I did not know what research was until my MSc. While pursuing my master's degree, I developed interest in pursuing research.

I joined the PhD programme of the Indian Institute of Science (IISc) in Bengaluru, and was exposed to the area of non-linear dynamics and chaotic systems. IISc played a significant role in shaping my career as a researcher. Moreover, for my post-doctoral studies, I worked at the Weizmann Institute of Science in Israel with Prof. Samuel Safran, one of the pioneers in the interdisciplinary areas of physics and biology. Working with his group was a stimulating and rewarding experience. I was intrigued by the challenging problems in living matter systems and continue to explore the complex dynamics of living organisms.

After completing my post-doctoral studies, I returned to India and was eager to set up my research group from the day I joined IISER Kolkata. However, it was a new institute in 2010, and a few students who joined the department had many options in choosing a research lab. It was quite disheartening year after year not to be able to build my research group. I wonder whether my gender—being the only woman scientist in the department—or my interdisciplinary research area had any deterrent role to play. However, instead of losing hope, I tried more and wrote an external research project to take PhD students. Finally, after a few years, I now have a lively research group with enthusiastic students.

- Do what you like to do, do what makes you happy, and enjoy.
- It is now a great time to pursue interdisciplinary research.
- You need to work hard, have patience, and also persevere in pursuing your goal.

Stand up for the cause you believe in. Also, be ready to take up challenges and break free from stereotypical norms, if required.

My research focuses on understanding the dynamics of living systems at various length scales, starting from cellular processes to collective organisations of species. We develop theoretical and computational models to address emergent problems like how do cells sense the forces. Understanding mechanisms, such as how cells respond to mechanical forces, how tissues or organs develop and how cells alternately stick and slip while moving from one place to another, is crucial in designing therapeutic approaches for several diseases, cancer metastasis and diverse areas in developmental biology. Our group's other interest is in the collective dynamics of various species, such as flocking of birds, cooperative hunting, or the formation of bacterial colonies.

Young leaders must have a strong motivation and conviction before they take up a leadership role. Stand up for the cause you believe in. Also, be ready to take up challenges and break free from stereotypical norms, if required. There is immense joy in pursuing science. Also, it is now a great time to pursue interdisciplinary research. The new state-of-the-art experiments and computational tools have opened up quantitative studies on diverse systems ranging from unicellular bacteria to multicellular complex living organisms. But you need to work hard, have patience and also persevere in pursuing your goal. So do what you like to do, do what makes you happy, and enjoy.

To attract more women into STEM careers, parents need to encourage daughters to pursue higher studies and the family needs to be supportive of young women to take up STEM careers. If there are more women teachers, they will serve as role models for young girls to get inspired in this field.

Generally, getting a job in academia after completing higher studies takes much longer time compared to other fields. Hence, it becomes challenging for women to balance family with a career. It is particularly difficult to get an opportunity after a break in a career. In such cases, long-term fellowship schemes for women by the government and the private sector would be helpful for gradual re-entry into academia. ■

Academic Profile

- BSc Physics (Hons), Serampore College
- MSc, Rajabazar Science College, University of Calcutta
- PhD, IISc Bengaluru
- Post-doctoral studies, Weizmann Institute of Science, Israel & Brown University, US

Shalini S Arya, PhD

Associate Professor, Institute of Chemical Technology (ICT), Mumbai

Shalini S Arya is a food technologist who leads research in improvement of Indian traditional foods, product development and processing, and developing newer food preservation technologies.

I was born and brought up in Nanded located in Maharashtra's Marathwada region. My father encouraged me to take up food technology, as one of his known friends was a professor of food technology. As per his friend's suggestion, my father motivated me to apply for and pursue this course.

My parents had limited means; therefore, both of them worked hard to support and educate their kids. W children had to share household responsibilities. I had to cook meals every day in my childhood; I hated it the most. I was not interested in food technology, assuming it was something related to cooking.

But when I started the course, I realised it involved a lot of chemistry, mathematics and engineering. Soon I started enjoying the course and it was fun learning food science. Coming from a financially weak background, education was the only key to solving all problems of poverty and hunger. That inspired me to study and perform the best in whatever I did. I won awards, fellowships and grants during this journey.

I feel very satisfied with my career as a food technologist. Food technology has a great scope and opportunity nationally as well as internationally. The important UN Sustainable Development Goals of no hunger, good health and well-being can be achieved through food science, and thus one can easily get involved in contributing to society. It is a decent career option for those who have inclination.

- The situation might be bad or worse, but changing the situation is completely in your hands.
- One should never quit. Keep yourself motivated; barriers are part of life.
- Learn to dream, keep working for your dream, keep your aspirations high.
- You are the boss of your life. Encourage yourself.

The important UN Sustainable Development Goals of no hunger, good health and well-being can be achieved through food science

Witnessing an increasing number of malnourished children, diabetic and cardiovascular disease-affected people in India, I wonder if food technology can minimise these problems. Developing diabetic and heart-friendly food using locally-available resources and food staples that are regularly consumed by the locals is my area of research. India is unfortunately becoming the capital for diabetes and cardiovascular diseases and thus developing cost-effective products and technologies is necessary. I am striving to work on this.

However, I had my own share of challenges. The ones in my professional field, I could solve using my skills, knowledge and wisdom. But the biggest challenge was the stereotypical behaviour that I received being a woman. This challenge cannot be overcome as an individual, but we need to seek a solution as a society. Till today, people think that women cannot achieve or perform leadership roles due to their responsibilities of household duties and motherhood.

My advice to young women in research would be this: -One should never quit. Keep yourself motivated; barriers are part of life. You must present yourself in the best possible way. It is possible to make the barriers the reason for your success. Always remember that the situation might be bad or worse. But changing the situation is completely in your hands. You are the boss of your life. Encourage yourself. Learn to dream, keep working for your dream, keep your aspirations high.

More fellowships, more funds to provide higher education and more opportunities for girls and women can increase their participation in STEM. At the same time, better workplaces, daycare centres, more maternity leaves and flexible work hours can help retain more women in STEM careers.

STEM education has a direct impact on society as it is a key driver of the economy. The reason for lesser representations of women in STEM is gender stereotypes. Parents, teachers and mentors, government and policymakers can help in changing this situation. ■

Academic Profile

- BTech Food Sciences, College of Food Technology, Marathwada Agriculture University, Parbhani, Maharashtra
- MTech Food Technology, PhD in Food Engineering & Technology, ICT, Mumbai
- CNPq-TWAS Postdoctoral Fellow, Engineering School of Lorena, Brazil, 2019-20

Memberships

- Executive Committee Member, Global Young Academy INSA-INYAS

Shubha Tole, PhD

Professor, Department of Biological Sciences
Tata Institute of Fundamental Research, Mumbai

Shubha Tole is a neuroscience researcher engaged in discovering how our brain is assembled and how the circuitry is created.

My fascination with the brain came from within; rather my brain inspired me to be a neuroscientist. I was fortunate to have a father who believed I could do anything I wanted to do, and a mother, an occupational therapist working with cancer patients, who showed me by her example that one shouldn't let one's job definition limit what one does in life.

I realised early on that women don't get the freedom to just be themselves. We are stared at, questioned, and brought up to avoid even some simple pleasures. Giving up these small bits of freedom is part of a silent conditioning that insidiously spills into every aspect of our lives. Women limit themselves in areas like honing their intellect, making life choices of marriage, having kids and choosing a career. In my journey, I did not give up on any of these freedoms, I suspect, because I didn't even realise I was supposed to.

Professionally, I was once perceived as someone who won't rock the boat, likeability being more important than 'ability' for women. Within our traditional old-boys club type of institution, my problem-solving approach and assertive attitude was perceived as 'pushy and aggressive', when the same traits in men would be appreciated as 'leadership'. Because of this, I was left out of committees early in my career at TIFR, each committee being chaired by an 'old boy' who preferred not to work with me. The international community was more progressive and I received recognition both for my work and for my leadership skills early on. Eventually, leadership roles did come my way at TIFR and I worked to making workplaces better and strengthening the place of women in academia and research as chair of the Women in Science panel of the Indian Academy of Sciences. My work led me to fascinating discoveries about how the brain is built in the embryo.

- Society needs to cease telling young girls that career may come at the cost of family.
- You have ONE life; you owe it to yourself to find a way to express your voice.
- Don't let your job description limit what you do in life. Don't let your syllabus limit what you learn.

Ignore opposition from people who think they know you better than you know yourself.

My advice to young women professionals is: 'You have ONE life; find a way to express your voice'. If you enjoy a particular field, throw yourself into it with abandon and free yourself to explore it fully. Develop an inner voice that will help counter the many objections you will hear; you will develop the thick skin required to push through the daily barriers of life. Learn to ignore opposition from people who think they know you better than you know yourself.

A transformative social change is essential for any policy-level change to promote women in STEM to be effective. Society needs to cease telling young girls that career may come at the cost of family, thus indirectly conditioning them to be ready to give up or undermine their aspirations and independence. The end result is that even women who enter PhD programmes may not have the same long-term ambitions as men do. We as a society need to foster that marriage is not an ultimate desirable state for a woman, rather it is life-choice.

Science must be taught in schools as a process of discovery, and not as a product to be taken from the shelf and digested, or else students may get turned off and abandon STEM subjects later. The syllabus defines the lower limit to what we can learn, not the upper. Everyone has unique inclinations and talents. Therefore, lesson plans should introduce why the subjects studied are important to cultivate interest in students. ■

Academic Profile

- BSc Life Sciences & Biochemistry, St. Xavier's College, Mumbai
- MSc & PhD, Caltech, US
- Post-doctoral fellow, University of Chicago

Awards & Fellowships

- Infosys Science Foundation Award for Life Sciences, 2014
- Shanti Swarup Bhatnagar Award, 2010
- Research Award for Innovation in Neurosciences, Society for Neuroscience, US, 2008
- National Woman Bioscientist Award, DBT, 2008 Swarnajayanti Fellowship, DST, 2005
- Wellcome Trust Senior International Fellowship, 1999

Smita Chaturvedi, PhD

Assistant Professor, Interdisciplinary School of Science
Savitribai Phule Pune University

Smita Chaturvedi is a condensed matter physicist who is striving to produce multi-functional nanomaterials, which may have potential use in low-energy nanoscale devices for Internet of Things (IoT) applications.

I was born and brought up in Jabalpur. Staring from school to completing my PhD, family friends and extraordinary teachers in the city helped shape my personality as a science student. One of my elder cousins joined DRDO as a scientist when I was in middle school. That was the first spark in my mind toward a career in science.

Pursuing PhD at an university in a smaller city has its own challenges. As a young PhD student, I often felt disheartened as I faced lack of research facilities and cooperation. During a scientific conference, I met a researcher from Bhabha Atomic Research Centre (BARC) and requested him to allow me to work in BARC for conducting few experiments of my PhD work, to which he very generously agreed. I learned many things in his lab in BARC and also got to visit IIT Bombay. This was a turning point in my career. Later, during my research tenure as a post-doc scholar at IIT Bombay, I was blessed to have great mentors like Prof. Avinash Mahajan and Prof. Satish Vitta. Prof. Sulabha Kulkarni, and Prof. Satishchandra Ogale, directly contributed to my growth and success while working as a DST women scientist at IISER Pune. Fortunately, a positive atmosphere and great mentors were always around me at every stage of my research life.

- Empathy and passion are key to leadership in any field.
- The government and the private sector need to address the issue of career breaks for women due to family reasons.
- Teachers have a great role in instilling confidence and helping young girls pursue science careers.

My journey into science has been a roller-coaster ride since I finished my master's degree—from my decision not to join the Officers Training Academy in Chennai, and instead opt to pursue a PhD to facing and sustaining uncertain situations. Enduring a career break of about seven years has been the biggest setback in my professional journey. Coming back to the mainstream was tough as opportunities were fewer and the beginning was hard.

However, this journey has transformed me from being a science enthusiast to an experimental condensed matter physicist. The quest for multifunctional materials motivates me. The approach of my work is mainly to obtain multi-functionality of ferroic and multiferroic by tuning size, shape and structure.

The ups and downs of personal life will impact and at times pull you back; just keep going and cherish every small achievement.

I have met some great scientific leaders in my life. I feel empathy and passion are key to leadership in any field. Women must learn when and what to speak and do not hesitate to share their opinion where it is important. Presenting your opinion without hesitation is a skill that needs to be honed. Resilience in the face of criticism and failures is another quality that takes any leader a long way.

I would encourage women to take up a career in STEM research. My advice is to never give up, stay focused and be patient. The ups and downs of personal life will impact, and at times pull you back; just keep going and cherish every small achievement. The government and the private sector need to address the issue of career breaks for women due to family reasons. They need more consideration and flexibility only in the initial stages while restarting their career. With support, women returning to work after maternity breaks can be at par with their peers soon enough in terms of knowledge and performance.

We need to change the classical approach to teaching STEM. Allowing learners to explore and experiment will add value to the learning outcomes. The main challenge in imparting knowledge in STEM subjects is maintaining the motivation level of middle and high school students. Learning by doing and connecting the concept with day-to-day examples will help. The other challenge is males outnumber females in the STEM-educated population. Girls in developing countries grow up with prejudice and face gender bias. Thus, teachers have a great role in instilling confidence and helping young girls pursue science careers. ■

Academic Profile

- BSc, MSc Solid State Physics, PhD in Condensed Matter Physics, Rani Durgawati University, Jabalpur

Fellowships & Memberships

- Fulbright Nehru Academic & Professional Excellence Fellowship, 2018
- DST WOS-A Fellowship, 2013, 2016, 2019
- Member of Organisation for Women in Science for the Developing World
- Member of Society for Material Chemistry, India

Somdutta Sen, PhD

Vice President, R&D, Sphaera Pharma Pvt. Ltd.
Manesar, Haryana

Somdutta Sen has 23 years of R&D experience in life sciences. which includes drug discovery and proteomics-based biomarker discovery for different diseases.

I was born in Kolkata and brought up in Delhi. Inspiration for taking up science came from my siblings, who all had pursued science stream. As kids, we had set up a makeshift lab in our house to conduct small experiments mentioned in our science textbooks during our summer vacation. These activities probably sowed the seed for taking up science later.

For STEM education, teachers must have an innovative style of teaching and they must be capable of instilling collaborative problem-solving in their students. I had decent teachers and was always encouraged by my parents for these kinds of activities. I got tremendous encouragement and support later from my PhD guide Prof. GBV Subramanian. Post marriage, I got all necessary support from my husband, especially during my PhD days.

- Never ever take up science as a subject under pressure; you won't enjoy it for long.
- Once you have a family, try to maintain balance between profession and career.
- When you see other women succeeding, cheer for them as they are paving the way for other women to succeed.
- Parents must support their daughters if they are passionate about STEM subjects.

Though trained as an organic chemist, I slowly drifted to the field of biology starting with structural biology, moving to biomarker discovery and finally to drug discovery. Since childhood, medicine has always intrigued me. I would often read drug compositions on medicine strips and bottles. My fascination for drug discovery leapt after joining Sphaera. I learned how to think innovatively and how to conceptualise a project and take it forward from Sundeep Dugar, PhD, founder-director of Sphaera Pharma.

Be ready to take risks, be innovative, maintain integrity and never opt for a short-cut approach.

I have significantly contributed to the development, implementation and control of pre-clinical studies of pharmacological compounds, validating outcomes for oncology programmes, tuberculosis and metabolic disorders. I am a co-inventor in multiple patents applied by Sphaera Pharma.

During my career, I didn't face any opposition from my family and always got tremendous support. However, I had to go through the struggle of maintaining a balance between my career and aspirations and managing my home and kids.

My first advice to next-gen women is whatever be the situation, never give up and be extremely focused towards achieving your goal. Try to be financially independent and never get bogged down by criticism. Once you have a family, try to maintain a balance between profession and career. As a woman leader, when you see other women succeeding, cheer for them as they are paving the way for other women to succeed.

Women should never ever take up science as a subject under pressure; you won't enjoy it for long. To achieve success in the field of science, be ready to take risks, be innovative, maintain integrity and never opt for a short-cut approach.

At the school level, young girls should be told about global and national women STEM icons. Teachers should convince parents to support their daughters if they are passionate about STEM subjects. The government should also proactively support mothers to join back after childbirth. It should open more creches at or close to the workplace so that women can focus on their research and spend enough time at the workplace. ■

Academic Profile

- BSc (Hons) & MSc Chemistry, St. Stephen's College, University of Delhi
- PhD in Synthetic Organic Chemistry, University of Delhi

Awards

- Young Investigators Award, Gordon Research Conference on CAG repeat disorders, Italy

Sonika Bhatnagar, PhD

Professor & Head, Department of Biological Sciences & Engineering
Netaji Subhas University of Technology (NSUT), Delhi

Sonika Bhatnagar is a structural biologist who studies drug targets for infectious diseases using machine learning models with high accuracy. She is busy probing molecular and structural basis for heart disease in COVID-19 patients.

I was brought up by a working mother who struggled to make ends meet while bringing up three children single-handedly. I had lost my father at a very early age. I had a natural bent for language, mathematics and science. HG Wells, Peter Benchley and Stephen Hawking fascinated me. Encouraged by my physics teacher, Sonam Sir, I started haunting the physics lab at school, meticulously taking readings and painstakingly performing experiments. Thus started my love for physics and biology, which I would combine in later years of study at AIIMS.

Stepping from school into the world of AIIMS was a dream come true. Working with Prof. TP Singh, my PhD mentor, I built up my knowledge of protein structures and drug design. Moving into a faculty position at NSUT isolated me professionally. I was the only biologist in an organisation full of engineers. Soon I realised my thirst for knowledge was unquenched and there was something more that I needed to seek.

Soon I came across a challenge posted by Innocentive, a worldwide crowd-sourcing website, for solving industrial problems. A pharmaceutical company wanted to find the best therapeutic drug targets for the treatment of obesity, a growing problem in America. Looking at the problem with years of training behind me, I found it easy to pose a solution, and soon received an email from Innocentive that I would be awarded for my solution. My interest and future work in drug targets started from there, and I chose cardiovascular disease to work on.

- Women have a natural flair for solving complex problems, for leadership, and for leading by example.
- A career in science is demanding. It requires discipline and devotion beyond the ordinary.

Women must be vocal about their research and must not shy away from showcasing the same at scientific platforms.

For research, I have established a Computational and Structural Biology Laboratory at NSIT. I am responsible for the overall execution of teaching and research in the department. This includes policy decisions, financial planning, infrastructuredevelopment, course conduction, coordinating and aligning with university authorities, forging collaboration within and outside the university.

While I struggled with the challenges of building a new department while carrying out my teaching and research, none of it was because of any unfair treatment as a woman. In fact, many of my male and female colleagues were extremely supportive—freely sharing their advice and experience. I found that if you do your work with sincerity, very few of these things impinge on your world.

Listen to and trust your gut instinct. Women have a natural flair for solving complex problems, for leadership, and for leading by example. Very often, women in science tend to sit back and not talk about their work. Women must be vocal about their research and must not shy away from showcasing the same at scientific platforms.

A career in science is demanding. It requires discipline and devotion beyond the ordinary. Setbacks and failures will occur. There will be marriage and motherhood, illness and heartbreak, but your work will always strengthen you again and again. In your younger years, you will receive time, mentoring and advice from your mentors. Be sure to give back, pass it on to students and younger colleagues.

There need to be more girl students in STEM careers at the undergraduate level. Financial support for taking up STEM in schools, opportunities in undergraduate education, involving girls in novel problem-solving projects, and helping them hone their skills will be good measures. Women leaders in STEM must receive recognition without any prejudice.

Despite having good STEM infrastructure and very sharp minds, students often do not see how their work translates in the real world and lose interest. We need to engage students not only in the labs and classrooms but in the real world—make it mandatory for industries to offer training opportunities to STEM students. Problem-solving should be made lucrative and open to all inventors, instead of being offered to a select few elite scientists. Crowd-sourcing is the right step in this direction. ■

Academic Profile

- BSc (Hons) Human Biology; MSc, PhD & Post-doc Research in Biophysics, AIIMS, New Delhi

Awards

- Commendable Research Award, NSUT
- Dr S Radhakrishnan Distinguished Professor of Biotechnology Award, International Multidisciplinary Research Foundation, Vijayawada
- Kalpana Chawla Memorial Excellence Award for Woman Achiever in Higher Education, Guru Kashi University, Bathinda

Sonu Gandhi, PhD

Scientist D, National Institute of Animal Biotechnology (NIAB), Hyderabad
Visiting Faculty, Lomonosov Moscow State University, Russia

Sonu Gandhi leads research in developing biosensing probes for clinical and nutritional applications and novel nanomaterials for targeted drug delivery and therapeutics.

I was born and brought up in Aligarh, admiring ideologies and not ideals. I firmly believe anyone excelling or striving for excellence can inspire us, which is exactly what happened in my life. I was inspired by former President APJ Abdul Kalam. Apart from parents and mentors, success stories of women like Kiran Majumdar Shaw and Kalpana Chawla motivated me to work towards achieving my goals.

Curiosity led me to excel in my career in science. Interest and aptitude in science is the first major step. A career in STEM needs patience and consistent hard work, but is quite satisfying. The key research undertaken by our lab was in developing bio-sensing probes for clinical and nutritional applications, chemical modification of biomolecules for the generation of specific antibodies against antibiotics, pesticides, toxins or clinically important diseases. We also steered the discovery of novel biomarkers for the design of efficient, affordable and cost-effective lab-on-a-chip.

Everywhere around me, I've always seen women juggling between so many roles and still giving their best. I found this trait of women exceptionally motivating. There are various turning points in a woman's life. And being a person who has closely witnessed influential and strong women,I was encouraged at every phase of my life to move ahead in my work and stay focused while confronting obstacles with optimism.

- If you have an aptitude for science and you enjoy it, just step in.
- Roadblocks are meant to test your courage and willingness to change.
- A career in STEM needs patience and consistent hard work.

Do not let anyone tell you: "You can't do what you aspire for." If anyone does, ignore, smile and carry on.

I always believe that obstacles—big or small—are faced at almost every stage. Those may be personal or professional. But both affect our work and life. Life is never going to be easy for anyone and challenges are what make it interesting. I believe it is never always a smooth journey for anyone, and my case is no different. The skills I inculcated to come out of my hard times were a positive attitude and a habit to make continual efforts.

If you have an aptitude for science and you enjoy it, just step in. Never be afraid of the troubles that come your way; roadblocks are meant to test your courage and willingness to change. They will only increase your endurance and bring out the best in you. And this is what makes life meaningful. If I can, then you can as well. Be strong and strive to achieve your dreams. Do not let anyone tell you: "You can't do what you aspire for." If anyone does, ignore, smile and carry on.

Women in STEM is a matter of emphasis. When we look at leadership positions in India, high ones are occupied mostly by men. Therefore, gender balance is required in all fields. To attract more women to STEM careers, the involvement of women scientists should be ensured in committees on various national and international platforms. Allowances may be made for career breaks and more schemes may be incorporated for facilitating acceleration after rejoining. The service period for women can be increased to five years to make up for the time lost due to maternity and family reasons. And once all these are accomplished, there will be no further need to emphasise this matter again. ■

Academic Profile

- BSc (Hons) Botany, Aligarh Muslim University
- MSc Microbiology, Jiwaji University, Gwalior
- PhD Biotechnology, CSIR-Institute of Microbial Technology, Chandigarh

Awards, Fellowships & Memberships

- Alexander Fleming Excellence Award, AIIMS, Delhi
- SERB Women Excellence Award
- Best Young Scientist Award, IIT-BHU, Varanasi
- DBT-BioCare Women Scientist Award
- Postdoc Scholarship, Marie Curie COFUND
- Senior Research Fellowship, CSIR
- Member of NASI, INYAS, Australian Academy of Sciences, American Chemical Society,
- Royal Society of Chemistry, UK

Sreelaja Nair, PhD

Associate Professor, Biosciences & Bioengineering, IIT Bombay
Former Assistant Professor, TIFR, Mumbai

Sreelaja Nair is a developmental biologist who studies the non-genetic mechanisms of cell movement and cell size in contributing to the shape of an embryo during its development.

I was born and brought up in Mumbai. I was unaware of research as a career; no one inspired me for research. I was also unaware that I could enjoy research until after completing my master's degree in microbiology when I joined the lab of Prof. Veronica Rodrigues in TIFR for a junior research fellow (JRF) position. Eventually, I decided to pursue a PhD and perhaps somewhere in that pursuit, and research consolidated as a career choice. My husband's support for my career enabled me to unapologetically focus on what I wanted without compromise. There is a moment while doing research where you are the only one in the world to have a particular knowledge. That feeling is indescribable. I still do benchwork in the lab and have my own lab bench, which my students are not allowed to take over.

My research group addresses the significance of molecular contributions from the egg and sperm for development of the zygote. We use the zebrafish embryo as our model system and some of our work has revealed that in addition to molecular pathways, physical components like cell size affect how embryos develop. With cells of the wrong sizes, zebrafish embryos develop abnormally. I have always been interested in how cells move to shape embryos in 3D. We have optimised strategies that allow us to take a non-genetic approach towards understanding how cells move in embryos to shape the front-back and top-bottom axis of an embryo during development. It allows us to focus on physical parameters, rather than genetics, during embryonic development. Our long-term interest is to try and understand how embryo and organ shapes emerge during development.

- If you are in a leadership position, reinforce a balanced gender representation.
- There are so few narratives of successful women in STEM.
- Set the boundaries that no one but you can opine about your career.

I doubt if policy changes for promoting women in STEM will make a huge difference; it might just make men think that women made it because of special treatment.

I never faced any barriers owing to my gender. I have an extremely supportive personal environment, where my career is valued at par with anyone else's. My mother had her career at a time when daycare was non-existent and everyone pitched in at home. So for a woman to have a career was not a negotiation point at all while growing up. A few years back though, I encountered situations where senior academicians in positions of authority have been unkind and unprofessional in their conduct. That is a story for another time.

We must remember that just being in a leadership role does not fix a gender-imbalanced ecosystem. If you are in a leadership position, reinforce a balanced gender representation. If you set the boundaries that no one but you can opine about your career, you will have fewer regrets later.

A major shortcoming in promoting women in STEM is that the discoveries being taught are mostly narratives of men by men. Women are unlikely to view a career in STEM because there are so few narratives of successful women in STEM. We must highlight ALL women in STEM, who prevailed against odds. This must be made mandatory in all curricula, especially at the school level.

Personally, I doubt if policy changes for promoting women in STEM will make a huge difference; it might just make men think that women made it because of special treatment. Affirmative action does not work; rather it makes policymakers think they did something concrete to fix the problem. In reality, such policies highlight the marginalised status and sour the ecosystem. My view is that the corrective action needs to start early for girls that a career is not something one does because one wants to keep busy; it is a means of financial sustenance for oneself. ■

Academic Profile

- MSc Microbiology, University of Bombay
- PhD & Post-doc Fellow, University of California, Irvine
- Post-doc Fellow, University of Wisconsin-Madison

Fellowship

- DBT/Wellcome Trust India Alliance Intermediate Fellowship

Sudeshna Sinha, PhD

Deputy Director & Professor, Department of Physical Sciences
Indian Institute of Science Education and Research (IISER), Mohali
Ex-Faculty, Indian Institute of Astrophysics, Bangalore
Ex-Faculty, Institute of Mathematical Sciences, Chennai

Sudeshna Sinha's work in the field of non-linear physics spans over a hundred papers and several patents. Her work has been highlighted in *Nature News & Views*, *Scientific American* and *MIT Technology Review*.

My father was a chemical engineer and my mother was the founder-principal of a school. My parents have had a lasting influence on me. They impressed upon me at a very early stage that a profession is not just a job; rather, one's involvement with it defines one's life. They were open and without a shred of prejudice. My research mentors in TIFR offered me wide a range of ideas to work with. Their vision and taste for what constitutes good science still motivates me. My post-doc mentor, a woman, taught me what it really takes to succeed as a woman scientist in a predominantly man's world.

I work in the field of non-linear science, chaos and complex networks. In particular, I worked on controlling chaotic systems, and our results on adaptive control were among the earliest in the field of chaos control. Another important thread in my research is the development of the novel concept of 'chaos computing', a new computing technique that uses networks of chaotic elements to implement logic operations. This development, which straddles both basic science and technology, can significantly impact integrated chip design and performance.

- A profession is not just a job, rather one's involvement with it defines one's life.
- Negotiating choices and balancing the pressures of professional and personal expectations are more difficult for women.
- Teaching must find a way to combine the rigours of problem-solving with glimpses of unknown frontiers to trigger curiosity.

Losing sight of the basic motivation underlying one's choice of profession in the face of negative feedback, self-pity and self-doubt is one of the biggest dangers of being a minority in any profession.

The biggest challenge in my career was returning to academia after childbirth. One must accept that the break enforces some drop in productivity, and that is absolutely okay. One just has to muster the will and strength to get back to research, and maintain a balance between work and motherhood. The rigours of IIT Kanpur and TIFR had made me extremely resilient and helped me not give up after the professionally lean period that naturally follows child-bearings.

It is also important to note that the main points of 'leak' in the professional pipeline are marriage and childbirth. Negotiating choices, balancing pressure and competing demands of professional and personal expectations are more difficult for women than men. Also in practical terms, as this is a competitive field, it is often difficult to get back to the career track after taking a break. So once you lose women mid-career (or they are slowed down), there are not enough at the next level. The problem is there are significantly less women in the higher rungs of academia and so the pool from which leaders are chosen is much smaller for women.

Gender bias is pervasive. I dealt with it by simply recalling the primary reason why I am in this profession. I always told myself that I had to 'own my choice' of doing science, and that I loved the process of being engaged in research. Losing sight of the basic motivation underlying one's choice of profession in the face of negative feedback, self-pity and self-doubt is one of the biggest dangers of being a minority in any profession.

Over the years, the real change has been the acceptance that women are as capable as men of engaging in quality science. Of course, affirmative action at various levels, especially at the school level, provides opportunities and somewhat levels the playing field. This has definitely widened the net of women moving towards careers in science. But flourishing beyond the initial entry point has been enabled due to a slow and subtle acceptance of women as peers. This breaking of stereotypes has to be sustained and further strengthened.

I do think the manner in which STEM is being taught in premier Institutes in India is actually excellent and on par with what is on offer in leading international universities. In general, I believe teaching must find a way to combine the rigours of problem-solving with glimpses of unknown frontiers to trigger curiosity and the potential for growth beyond the curriculum. ■

Academic Profile

- BSc & MSc Physics, IIT Kanpur
- PhD, TIFR, Mumbai
- Post-doctoral studies, International Centre for Theoretical Physics, Trieste, Italy

Awards & Fellowships

- Birla Award for Physics
- J C Bose National Fellowship

Sudipta Sengupta, PhD

Retd. Professor and Emeritus Scientist, Jadavpur University, Kolkata

Sudipta Sengupta has acclaimed international fame by becoming the first Indian woman geologist to have worked in Antarctica. She is the only woman recipient of the coveted Shanti Swaroop Bhatnagar Prize in the field of earth sciences.

My meteorologist father always encouraged me to study science. My parents were progressive and always wanted their kids to be independent and self-supporting. My choice to study geology was not guided by long-drawn thoughts at all. After higher secondary, I decided to study physics. However, at the interview at Jadavpur University, my candid confession of being an avid traveler led me to choose geology. A professor suggested that a geologist's life involved travel to remote places for field work. It was an impetuous decision, but it gave me my mission and thrill in life .

Calcutta then had a strong base for geology owing to the presence of the Geological Survey of India (GSI). Soon I discovered two things. First, geology was a decent choice for me as I loved science, travel and adventure. Second, it was a male-dominated field. Also, only a few universities permitted girls to study geology as it involved rigorous fieldwork.

Family support always was the backbone of my progress. During my PhD, my mother would accompany me to field trips that lasted for a few months at times. My supervisor, Prof. Subir Ghosh, honed me as a fine structural geologist.

- It is hard for a woman geologist to balance domestic issues, the laboratory and outdoor fieldwork.
- We need more women to take up science as a profession.
- The funding for research in science needs to be increased to bring and keep more women in the fold.

I worked at GSI for a few years and later moved to Sweden and the United Kingdom for my post-doctoral research. At the Imperial College London, I did my research with renowned Prof. Janet Watson. I also interacted with Prof. John Ramsay, an authority on structural geology. I joined Jadavpur University in 1982 as a faculty and very soon got a chance to be a team member of the Third Indian Scientific Expedition to Antarctica. We prepared a geological map of the Schirmacher Hills, a small rocky range, about 70 km inland from the coast. It was the first geological map of the area.

I discovered that girls usually did not choose geology because it involves rigorous fieldwork. I followed my dream and chose my destiny.

I am curious about structures and how they are formed or destroyed over millions of years. The major part of my research in structural geology involved combining geological field studies with laboratory experiments using analogue models and theoretical analyses and projections. Most of my research deals with the evolution of structures through multiple deformation conditions.

Being a woman geologist, I faced several challenges. Fifty years ago, the luxury of decent accommodation or communication was not available to a young woman to work in remote villages in India. It was physically exhausting and mentally strenuous for me to walk miles and miles to locate rocks that would interest me. Walking with a rucksack full of rocks was tiresome and back-breaking. But for me, it was not rocks or stones that I carried; rather it was new knowledge that I would create by studying them. I feel proud to be one of the first Indian women to set foot in Antarctica. All this happened because I followed my dream and chose my destiny.

I also took up mountaineering as a hobby and was a member of the first all-women's expeditions to Ronti in 1967 and Lalana in 1970.

In my four decades of teaching, I have seen the number of girls in geology classes increase from three or four to almost fifty per cent of the class. Now they are stars in their own right, shining in their respective professions. However, we need more women to take up science as a profession. A large number of women scientists leave research after their marriage or childbirth. The funding for research in science needs to be increased to bring and keep more women in the fold. I do hope that shortly, we will have a different India where every girl will be able to choose her destiny. ■

Academic Profile

- BSc & MSc Geology, PhD, Jadavpur University
- Post-doctoral Fellow, Imperial College, London & Uppsala University

Awards & Fellowships

- Shanti Swarup Bhatnagar Prize, CSIR
- National Mineral Award, Department of Mines
- Antartic Award , Department of Ocean Development
- DN Wadia Medal, INSA

#CiscoForStartups

Are you the next big thing?

We're looking for ambitious startups who:

- Are complementary to Cisco's product line
- Have compelling value propositions
- Have the capability to scale up

Write to us at

ciscolaunchpad@cisco.com

@CiscoLaunchPad @CiscoLaunchPad @cisco-launchpad

Sulochana Gadgil, PhD

Former Chairman & Professor
Centre for Atmospheric and Oceanic Sciences (CAOS)
Indian Institute of Science, Bengaluru

Sulochana Gadgil is a famed meteorologist who worked on deciphering the Indian monsoon dynamics and used her research for applications in agriculture.

I was born in Pune on June 7, 1944. I was fortunate to be born in the city of Pune that pioneered girls' education in the 19th century. My family valued education and gave it utmost importance.

I did my schooling at the Rishi Valley and that institution changed my perspective on learning and I understood science as a curiosity-driven enterprise. My teachers were quite sincere and the focus was more on learning and not on competition to get marks.

Out of 78 years of my life, I have spent 57 years conducting research on various facets of atmospheric and oceanic sciences as well as their applications in agriculture.

My research work has made significant contributions to the understanding of the Indian monsoon and its variability, its links with atmospheric convection over tropical oceans and the relationship of such convection with the sea surface temperature (SST).

- I have always believed in the power of interdisciplinary research.
- Women researchers must not be hired because of gender, but strictly for their merit and competence.
- I have suggested flexibility in age metrics used for hiring women scientists. I am completely opposed to hiring or promoting women just to satisfy an imposed quota.
- Being aggressive about recognition and leadership roles will prevent you from enjoying research work.

Women who want to work in the field must accept scientific challenges and enjoy the work.

For my PhD at Harvard, I worked on the modelling of the meanders of the Gulf Stream and further honed my modelling skills by taking up a post-doctoral fellowship with Prof. Jule Charney at the Massachusetts Institute of Technology (MIT).

A major inspiration for me to do scientific research came from the years I spent at Harvard and MIT, where I learnt from the leaders in my field and participated with them in grappling with exciting, though difficult, problems.

The vibrant atmosphere of the Indian Institute of Science (IISc) in Bengaluru, which I joined later, ensured that the joy of doing high quality research continues to this day.

I was always interested in studying applied mathematics. I chose to work on ocean models at Harvard, because my husband, also a student at Harvard, was interested in studying oceans from a biological perspective.

After PhD, I decided to focus on monsoon dynamics as it was clearly the most challenging problem in atmospheric sciences and of importance to India.

I joined IISc in 1973 where I got an opportunity to carry out both cutting edge research as well as research of social relevance in India. I began my work on monsoon patterns in collaboration with D R Sikka, an expert on monsoons.

We discovered the important role played by the formation and northward propagations of the cloud band over the equatorial Indian Ocean that influenced the Indian summer monsoon. This resulted in a landmark research publication.

My studies demonstrated that the monsoon is not a gigantic land-sea breeze; rather it is a manifestation of the seasonal migration of a planetary scale system, evident over non-monsoonal regions as well.

I was amongst the first to analyse satellite-derived cloudiness over tropical oceans and demonstrate the presence of a SST threshold of about 28oC for organised convection.

Understanding and predicting the year-to-year variation of the monsoon remains the most challenging problem today. My studies have shown that a critical role in this variation is played by the equatorial Indian Ocean Oscillation (EQUINOO).

The skill in predicting the monsoon rainfall is poor because of poor skill in predicting EQUINOO and its link to the monsoon in models.

I brought together perspectives and data from disparate fields. None of

the economists had quantitatively assessed the impact of the monsoon on agriculture and the gross domestic product (GDP).

I did that and showed that despite a substantial decrease in the contribution of agriculture to the GDP over the last five decades, the impact of droughts on the GDP has remained large (2-5 per cent) throughout.

I have always believed in the power of interdisciplinary research and developed collaboration with agricultural scientists, ecologists as well as farmers. Together, we developed a theoretical framework for identifying optimum farming strategies using crop models in conjunction with climate variability data.

Responding to demands of farmers from a semi-arid part of Karnataka, I used this approach to determine the optimum sowing rates for groundnut to maximise average long-term returns.

With all this work, it was natural for me to assume a leadership role. I played a key role in the establishment and nurturing of the CAOS at IISc.

I have spearheaded the development and execution of the Indian Climate Research Programme comprising major projects over the Bay of Bengal, the Arabian Sea and Indian monsoon zone. I have been quite active in several international climate research programmes.

I was fortunate to be married into a progressive family. Both my husband and I decided to pursue PhD abroad, and luckily, we both got admission to Harvard. Our families supported us in every way.

Thus, I never had to face any gender bias at the personal and professional front. During my brief stint at the Indian Institute of Tropical Meterorology (IITM) in Pune, I got an opportunity to interact with top meteorologists, and they mentored me in a very enabling way.

My experience as a woman scientist has always been satisfactory from when I was a student till now. My professors were extremely encouraging and I have always had colleagues and collaborators who respected me as a scientist.

I have been particularly fortunate in getting a job at IISc, the best institute in the country, just after I embraced motherhood. However, several bright women have to give up research when they have children and the law that prohibits hiring new scientists after the age of 35 precludes women from getting a permanent job when they have the time and inclination.

So I have suggested flexibility in age metrics used for hiring women scientists. I am completely opposed to hiring or promoting women just to satisfy an imposed quota. I believe that no woman researcher must be hired or promoted because of her gender; rather it should be strictly on the basis of her merit and competence.

My only advice to women who want to work in the field is to accept scientific challenges and enjoy the work.

I was never in a rat race to win awards, as I had confidence in the quality of my research work. Success in terms of recognition, leadership roles, etc. will naturally follow. Being aggressive about such goals will prevent you from enjoying the work. ■

Academic Profile

- BSc, MSc Applied Mathematics, Pune University
- PhD in Applied Mathematics), Harvard University, US
- Post-doctoral fellowship, MIT, US

Awards

- Life-time Excellence Award for Earth Sciences, Indian Ministry of Earth Sciences (MoES), 2016
- National Award for Lifetime Achievement in Atmospheric Science and Technology, MoES, 2008
- Norman Borlaug Award, 1996
- Shri Hari Om Ashram Prerit Dr Vikram Sarabhai Award, 1989

Fellowships

- Indian Academy of Sciences
- Indian National Science Academy
- Indian Meteorological Society

Upasana Ray, PhD

Senior Scientist & Deputy Head
Infectious Diseases & Immunology Division
CSIR-Indian Institute of Chemical Biology, Kolkata

Upasana Ray is a translational researcher and works on engineering virus-like particle-based vaccine candidates against several viruses.

My scientist father worked towards shaping me as a scientist. My PhD mentor Prof. Saumitra Das at the Indian Institute of Science (IISc), Bengaluru, and my post-doc mentor Christopher Buck, PhD, at the US National Institutes of Health (NIH) made me understand the nature of virology research and its applications. I don't have many people who directly influenced my professional life in that sense. I faced various hurdles like several other women in science do and I would say that overcoming obstacles influenced me and groomed me as a better crisis manager.

At NIH, Bethesda, I worked on virus assembly and engineering virus-like particles for vaccine engineering against viral diseases. My work on virus-like particle-based vaccines against a viral disease called progressive multifocal leukoencephalopathy got translated into one of my most significant publications in Science Translational Medicine and also bagged a US patent, granted in 2018. This work was also highlighted at different scientific platforms. Further, this was licensed off to an India-based company for further development. So, this work went from laboratory to industry and the technology that I learnt established the foundation for my laboratory. At present, we work on engineering viruses like particle based vaccine candidates for other viruses. I have appeared on Rajya Sabha TV and Barkha Dutt Live for discussion on SARS-CoV-2 variants and vaccines.

- Overcoming obstacles influenced me and groomed me as a better crisis manager.
- Always trust your abilities and persevere to hit your targets.
- Women must express their views in the community.

Competition in the field and hurdles that I faced as a woman in STEM kept me active so that I could prove myself and attain success.

Being a woman in STEM in a male-dominated field partially puts you in a pool of hurdles in general. That is true in my case as well. I try to keep my hopes high, work hard and overcome those. Managing family and working together is another area that is difficult for all women. I try to balance both. Competition in the field and hurdles that I faced as a woman in STEM kept me active so that I could prove myself and attain success. I have received a few prestigious awards and those were the motivation and driving force to keep my survival curve in STEM on a continuous rise and not become saturated for long.

Always trust your abilities and persevere to hit your targets. Work hard and work smart. Never cry without putting cent per cent of your effort into achieving your goals. I would recommend that hard work and confidence is the key in this field. Women must express their views in the community. Women should read and learn stories of successful women leaders in the same field, a lot of motivation will come from there.

Recruitment of more women at various organisations and also at decision-making positions is important. Women should be allowed flexibility at workplaces like flexible reporting time, keeping work hours same and also arrangements to bring minor kids to work. Family is one of the most important reasons for women taking a step back from STEM. Thus, flexibility in completing work hours through a combination of in-person and remote attendance should be applied to women employees.

Our education system is sound. However, I think even in school and colleges, project-based international travel and exposure to international organisations is important. The other point that I think can be modified is the number of subjects and areas that students of STEM study at pre-PhD levels. The subjects in general could be modified as per recent requirements of STEM. ■

Academic Profile

- BSc & MSc, University of Delhi
- PhD, Indian Institute of Science, Bangalore
- Post doctoral fellowship: National Institutes of Health (NIH), Bethesda, United States

Awards & Fellowships

- ILDC-AMP Woman Excellence Award. International Leadership Development Council, 2020
- SERB-DST Women Excellence Award. 2019
- Early Career Research Award, SERB, 2019
- Federal Technology Transfer Award, NIH, 2014
- SERB POWER Fellowship, DST-SERB, 2021
- Ramalingaswami Fellowship, DBT, 2016
- Ramanujan Fellowship. SERB. 2015

Vandana Gambhir, PhD

Principal Technical Officer, Grant's Office and IPR Cell
Indian Institute of Science Education and Research (IISER), Pune
Former Grant Adviser at DBT/Wellcome Trust India Alliance

Vandana Gambhir is a grants management and intellectual property rights (IPR) expert. She manages research projects implementation, facilitates research agreements and MoUs, and trains scientists in the same.

I hail from Kharar, a small town in Punjab, and was brought up in Chandigarh. I had my first stint with research administration while pursuing my PhD and post-doctoral studies. I got the opportunity then to manage the research requirements of the group as well as support my mentors in putting proposals for research project funding. I decided to switch gears to full-time research administration, with a job opportunity at the DBT/Wellcome Trust India Alliance. The work involved performing due diligence on funding applications, finding reviewers, meeting screening and selection committee requirements and providing support to the awarded applicants during the project period.

I was lucky to receive an opportunity to lead the grants office and IPR cell of IISER Pune that provides support to facilitate partnerships with the industry and academia. The office shares funding opportunities with researchers, helps them understand nuances of the funding provisions and provides support to faculty to do budgeting for R&D projects. In addition, I oversee the implementation of funding agencies' policy, monitor fund flow on grants and ensure timely submission of reports and statement of accounts. My role as the coordinator of the IPR cell is to facilitate the due diligence of inventions by researchers, patent protection, timely action to queries received from the patent office, IPR policy formulation and its implementation, and licensing of technology.

- Research administration and management are a vital part of research.
- We need a policy on making research management career a lucrative option.

If you want to go fast, go alone; if you want to go far, go together.

As a researcher, I undertook challenging projects that required the expertise of a microbiologist, cell biologist, immunologist, structural biologist and a molecular biologist. This gave me a chance to develop a know-how of multiple fields. Setting up office processes, expanding the team, getting capable people and training them as per job requirements were the key challenges that I faced when I started the grants office at IISER. However, processes and operations soon fell in place due to the support of the institute leadership, my colleagues and peers.

I have grown professionally by being open to any challenge. I have been constantly striving to strengthen the research system both at local and at national levels. I had to allay all mis-information along with building the best management team and constantly training them to raise the standards of management at par with a professional management organisation. This task was arduous even when I managed to get all support from both internal and external stakeholders. Yet, given the returns it brought, it is definitely an exciting and rewarding journey.

There is a proverb that says 'if you want to go fast, go alone; if you want to go far, go together'. Research support services are like a circulatory system, whose function is to support all systems, and hence it can only be built on cooperation.

The scope of research management is wide, and hence, women who wish to lead in this area must strive to understand the spectrum of research ecosystem—being sensitive to the researchers need, research funding calls, priority areas, online grants management system, and legal and regulatory requirements for undertaking a research project. It is a new and evolving ecosystem and poses the scope for men and women professionals who are open-minded, ready to unlearn and learn new tools and processes.

In my field, women often face the challenge of being unable to be assertive due to the bureaucratic ladder. This can be taken care of by involving women leaders in deliberation and policymaking. We need to have more women leaders, whose achievements are celebrated. More internships or short trainings would improve the outcome of STEM careers for women. Women need accommodation facilities during these short-term training, and hence, authorities should deliberate on how this can be provided. ■

Academic Profile

- BSc Microbiology, Punjab University, Chandigarh
- MSc, Guru Nanak Dev University, Amritsar
- PhD, Institute of Microbial Technology, Chandigarh

Awards & Fellowships

- IRMI Research Grant Award
- DBT Post-graduate Fellowship
- CSIR JRF/SRF

Vatsala Thirumalai, PhD

Associate Professor
Senior Fellow, DBT/Wellcome Trust India Alliance
National Centre for Biological Sciences (NCBS), TIFR, Bengaluru

Vatsala Thirumalai leads fundamental research in neuroscience at NCBS. She uses zebrafish to understand how animals move around and how the neural commands for locomotion are generated.

Growing up, I wasn't aware of any scientists in my family or friends circle. It was my natural curiosity that led me to this field. I had some very good teachers in school and college who nurtured my natural interest in science. My parents offered constant encouragement to follow whatever field of study I was interested in. Having high-achiever elder siblings also helped a lot to keep excelling in school and college. Finally, my PhD mentor, Prof. Eve Marder, turned a role model for me as a great mentor and scientist.

Prof. Marder played a large part in my professional growth–she identified my strengths, gave me independence in pursuing research goals and offered positive feedback and critical career advice. I feel the best leaders are those who lead by example, earn respect through actions and choose what is correct and not what is easy.

Presenting my results in international conferences and being able to defend my ideas in front of the world's best scientists bolstered my confidence a lot and reinforced my conviction.

After finishing post-doctoral research in the United States, I joined NCBS in 2011. My research focus is to understand how animals move around and how the neural commands for locomotion are generated. We study the nervous system of larval zebrafish—small freshwater fish transparent during early life stages. Our research has revealed several interesting aspects of how the nervous system controls movement patterns. We discovered that one type of nerve cells has a special property called bistability, i.e., they exist in one of two states, just like a light switch can be in on or off position. These nerve cells perform different computations when they are in each of these states. In another study, we discovered how animals control speed of locomotion by using certain chemicals called neuromodulators. I continue to explore neural commands for locomotion in multiple ways.

- High school and college students must be provided with opportunities to visit premier STEM centres across the country.
- The best leaders are those who lead by example and earn respect through actions.

Keep your passion alive by engaging with experts in the field, reading literature or attending conferences, apart from doing your own research with gusto.

My research journey has been stupendous owing to my mentors. I suggest all women researchers to look for appropriate mentors. Keep your passion alive by engaging with experts in the field, reading literature or attending conferences apart from doing your own research with gusto. It is important to place yourself and your work as a part of the larger scientific community.

To promote women in STEM, the scientific leadership must strive to remove explicit and implicit bias in hiring, promotion and award decisions. Decision-making panels must have some representation of women so that implicit bias can be addressed.

It must be acknowledged that the scientific training years coincide with the years during which women also make critical life choices—getting married and having children. Several women drop out of science because the choice they make is incompatible with the scientific career path. For example, the location where the spouse works may not provide opportunities for research; access to childcare may not be available. Having lateral entry points into the academic stream, removing age barriers for hiring or awards, making sure that childcare facilities at academic institutions are top notch are some steps that might bridge the gender gap.

STEM education for women, and in general, needs to address several issues. While professional degrees are well known, there is little appreciation for what STEM research careers mean among students in our country. High school and college students, especially from non-metro areas, must be provided with opportunities to visit premier STEM centres across the country so that they get first-hand exposure to STEM research. ■

Academic Profile

- BTech Industrial Biotechnology, Anna University, Chennai
- PhD in Neuroscience, Brandeis University, US
- Research Fellow, National Institutes of Health, US
- Post-doctoral fellow, Cold Spring Harbor Laboratory, US

Awards & Fellowships

- Shanti Swarup Bhatnagar Award in Biological Sciences
- DBT/Wellcome Trust India Alliance Intermediate Fellowship
- DBT/Wellcome Trust India Alliance Senior Fellowship

Business Innovation Strategists

Aditi Kulkarni

Global Solutions Lead, Accenture Technology
Ex-Global Assets Engineering Lead, Accenture

Aditi Kulkarni is an expert in solutioning and delivering end-to-end enterprise technology programs and driving intelligent-automation transformations. She is a rope Mallakhamb (traditional sport) champion at the national level.

I was born and brought up in Mumbai. In my entire extended family, I was not only the first girl-child pursuing higher education, but also the first person to choose engineering. I was fascinated by computers and loved coding. Seeing my natural inclination to excel in this field, my banker father wholeheartedly supported me at every stage. While there may have been challenges in my life, nothing can be attributed to being a woman. My parents, my in-laws provided all help I needed to balance work and family. My other big fortune is my organisation, which has provided me coaching and mentoring right from the beginning with the right people at the right time to empower me.

I believe that often opportunities arrive in disguise as challenges. Every year, the IT industry is full of new learning. At a client meeting at the beginning of my career, I introduced myself as a data architect. After the meeting was over, a colleague advised me to speak the client's language during such conversations. I realised what was lacking in my conversation–the business context. This experience encouraged me to gain mastery on techno-functional expertise. I became the clients' preferred person to discuss projects.

- Often opportunities arrive in disguise as challenges.
- Leadership does not come by authority, but by the respect others show you based on your credibility.
- In the dynamic world of technology, nothing stays the same. So one has to be on a continuous learning path.

Another significant incident that taught me a lot was when I was sent to a client location for two days to firefight a challenging situation. It turned out that the issues were much larger, and the production systems processing was already delayed by a fortnight–a critical and a potentially hostile situation. I decided to stay on and find solutions with my team. Spending over 45 days instead of two at the client location, I managed to turn around the situation. It was one of the greatest learning experiences for me.

It is crucial to take decisions at the right time. Course correction after a decision is not a problem; however, indecisiveness never helps a leader.

In my current role, I lead a global team of highly qualified professionals who create market differentiated, innovation-led and business value-driven technology solutions for CxOs, strategising and solutioning their enterprise transformation journey. I led a product development team for Accenture's Intelligent Automation Platforms with artificial intelligence (AI) at the core. I also led the Automation, Agile and DevOps practice for Accenture Technology Centre in India, driving the modern engineering industrialisation and adoption within the Advanced Technology Centre. I have led the US Northeast banking and insurance account portfolio, managing and delivering large-scale application outsourcing and system integration programs with a team of more than 3,000 members.

My experience taught me that leadership does not come by authority, but by the respect others show you based on your credibility. Be ready to take calculated risks. It is crucial to take decisions at the right time. Course correction after a decision is not a problem; however, indecisiveness never helps a leader. In this dynamic world of technology, nothing stays the same. So we have to be on a continuous learning path.

Today the IT field is vast, spreading across industries and opening up numerous possibilities to make an impact. I urge all young, energetic women in technology to find and stick to their passion. It does pay. In the industry, we don't see differentiation in opportunities available to men and women at the entry level, but we do see a big challenge in retaining women technologists. For this, we need to make STEM learning and growth programmes more accessible to women in the private as well as government sectors.

Our education system can do much to cultivate and encourage women's interest in technology from a young age. STEM as a field is not just technical, but also highly creative and involves problem-solving skills. We must open-up channels for young women to interact with industry experts, understand the diverse specialisation options and connect with their role models. ■

Academic Profile

- BE Computer Science, Bombay University

Certifications

- Accenture Master Data Architect, Master Automation Architect, Senior Technology Architect,
- Enterprise Solution Architect
- Google Cloud Practitioner

Adity Ganguly

Head, Process Visualization & Diagnostics Techniques
Tata Steel Limited

Adity Ganguly works on creating process visibility using real time plant data, data-backed decision support systems and drives artificial intelligence (AI)- and machine learning (ML)-based analytics for value creation.

Choosing engineering as a profession at a time when very few women used to be in this field happened mainly due to inspiration from parents, especially from my father. Growing up in an industrial city like Jamshedpur had a huge influence on my thought process as a young STEM student deciding to choose a career. During my professional journey in Tata Steel, my superiors also played a vital role to shape my career. My professional growth is mainly attributed to my passion towards my job and lot of support and encouragement from personal and professional ecosystems.

At Tata Steel, I work towards facilitating data-driven decision making for improved operational efficiency by a created real-time process visualisation platform. I am involved in creating a pool of process model and innovative visual models for various processes for diagnostics and breakthrough improvements. I oversee developing of the knowledge base for benchmarking in measurement, sensorisation and process models. In addition, my work pertains to development of various systems and processes in the steel plant value chain like through process quality assurance systems, total quality management (TQM) vehicles for process improvement, etc. I was a part of various sustainability initiatives like reduction of specific energy consumption and improvement in wastewater quality.

- Creating a support eco-system is important for women professionals.
- Initially, male colleagues were a bit hesitant to mix up, and I used to feel alienated, but things started improving with more female employee joining the team.

Women leaders must have self-confidence and should not fall prey to self-doubt.

I did not face any tough experiences or major barriers women generally face in their professional journey as Tata Steel takes great care of female employees. I faced a few minor hurdles that may be common to many. In the initial phase, when I joined as a plant maintenance engineer, male colleagues were a bit hesitant to mix up, and I used to feel alienated. There were infrastructure issues like non-availability of female rest rooms. Things started improving with more female employee joining the team. After a few years, as a young mother, I faced issues like time constraints and work-life balance as there was no facility like work-from-home or child day-cares during those days.

Next-gen women leaders must have self-confidence and should not fall prey to self-doubt, which many women professionals are prone to. Follow your passion and give your best. Networking is the key in any field and creating a supportive eco-system is important for women professionals.

Opportunities for women in the technical domain are many as there are varied new areas and fields to explore. The pandemic has compelled us to shift to a non-traditional way of working that has offered more flexibility in the workspace and a better opportunity to create improved work-life balance. This should enhance greater participation of women workforce in manufacturing technology domain.

The government and the private sector can roll out policies to attract more women into STEM careers by considering avenues for early exposure of young girls to STEM professionals and connecting them with STEM mentors who can ease their confusions and doubts. In parallel, policies must offer incentives to female students with scholarship schemes and should be aimed at creating more job opportunities for STEM students. STEM education must focus on creating more infrastructure and facilities for experimentation in laboratories to facilitate hands-on and project-based learning and improve inquiry in classroom. ■

Academic Profile

- BE Electrical & Electronics, BIT Mesra, Ranchi
- PG Diploma in Business Management, XLRI, Jamshedpur

Achievements

- Gold assessor of data maturity assessment
- Certified Green Belt in Six Sigma methodologies
- Member of World Steel Association, Data Excellence Community of Tata Group

Anamika Krishanpal, PhD

Principal Domain Expert and Multi-omics Group Leader
Persistent Systems, Pune

Anamika Krishanpal leads life sciences R&D projects on genomics and multi-omics data analytics and interpretation for application towards human disease, precision medicine and healthcare.

My progressive and liberal parents are the biggest pillars of my life. They inculcated in me the importance of studies, gave me flexibility to choose my career interest and encouraged me to push the boundaries. I studied in Navodaya Vidyalaya, a residential school, which profoundly helped me in expanding my outlook towards life, developing social communication skills and imparted the wisdom to take charge of life-decisions. My teachers' teaching style made students develop interest and curiosity in science.

I was always inclined to learn more in biology. After Std XII, I was looking for courses in applied science. Just a year before, UGC had introduced a biotechnology course in Ranchi University, and I applied for the course. The library at Women's College, Ranchi, had some excellent books on biotechnology, biochemistry and immunology that attracted me towards this field. My PhD supervisor, Prof. Srinivasan at IISc, provided valuable guidance and helped me shape my career. He taught me the importance of maintaining work-life balance. I learnt both various technical and soft skills from him.

My team is now working on advancing precision medicine through genomics and multi-omics data integration and interpretation. Our aim is to offer informatics solutions that comprise development of standard customisable data analysis accelerators, pipelines, visualisation tools and database solutions. We specialise in handling data from multiple omics, including whole genome/exome sequencing, metagenomics, RNA-sequencing, and their integration to address its applications in disease subtyping, biomarker prediction and deriving insights from the data. In another project, we have developed enterprise-level software solution on biological data annotation to build a knowledge graph for healthcare and life sciences research.

- Women should not hold back on taking challenging roles.
- Listen to your heart and do things that excite you.
- Soft skills like teamwork, creative thinking, time management, networking are important.

R&D requires efforts and extra attention in terms of getting meaningful output that may or may not be directly applicable, and hence, it requires time and patience.

R&D requires effort and extra attention in terms of getting meaningful output that may or may not be directly applicable, and hence, it requires time and patience. Listen to your heart and do things that excite you. Think about what you strive for before taking the plunge. Develop a habit of researching and reading new trends and technologies in the biotech, biopharma and alike sectors. Keep yourself abreast of key business trends, including regulatory, financial and operational changes influencing industry sectors and be aware of commercial implications of your project, as well as how your project fits into the bigger goals of your organisation. Soft skills like teamwork, creative thinking, time management, networking, etc. are also important.

Though my journey has been professionally rewarding, it was not devoid of challenges. Going back to work after maternity break was a challenge. Getting support from my better half and facility of a creche nearby helped me get over that difficult phase.

My advice would be to build a strong support system to maintain work-life balance so that without much gap in career, you can climb up the ladder. Usually, there are only a handful of women in leadership positions compared to dozens of men. Women should not hold back on taking challenging roles. Organisations and senior leaders should encourage women to take up assignments that excite them and ask them what drives their ambition.

To promote and retain women in STEM, we must find ways of engaging and motivating girls at the grassroots level through different outreach platforms. Providing them job-relevant skills and childcare facilities in or near work centre will be a great enabler. Incentive to employers while women go on a maternity break will help support women through career breaks. Creating opportunities for women in the area of non-traditional fields where women are underrepresented is needed.

I think exposure to different aspects of STEM to students is importantas it will expose them to aspects of STEM career other than coding or running experiments. ■

Academic Profile

- BSc Biotechnology, Ranchi Women's College
- MSc Life Sciences, School of Life Sciences, Devi Ahilya University, Indore
- PhD in Genomics & Bioinformatics, IISc, Bengaluru
- Post-doctoral Fellow at IGBMC, Strasbourg, France

Anuradda Ganesh, PhD

Director & Chief Technical Advisor
Cummins Technologies India Pvt Ltd. (CTIPL), Satara
Adjunct Professor at the Centre of Policy Studies, IIT Bombay
Ex-HoD, Department of Energy Science & Engineering, IIT Bombay

Anuradda Ganesh has 25 years of teaching and research experience and is a global expert on alternate fuels and renewable energy. She advises on innovative technology, regulatory trends and policy.

My engineer father was a professor at the Indian Institute of Technology, Delhi. That he influenced me to choose STEM is true, but the realisation came quite late in life. In fact, when I think back, I realise that it was my mother who was instrumental in translating my father's teachings into influencing the choices I made.

At school too, the teaching style of two of my chemistry teachers was magical; they made chemistry feel like a game. I knew I wanted to do something with chemistry. I took up chemical engineering. My professor at Panjab University always said: "Accidents occur just once; you can't afford to make a mistake even once." So ingrained in me is the concept of trying to get it 'first time right'. Prof. PD Grover was my inspiration to pursue my PhD in the area of bioenergy, and his passion for developing technologies for rural applications was so magnetic that I imbibed the same passion. Later, John Wall, PhD, ex-CTO of Cummins Inc., inspired me to move out of my comfort zone, i.e., academics, and enter the corporate sector as a technical advisor. My journey in STEM has been very eventful, satisfying and exciting.

- If you have passion and intention, you can make a mark. Nothing can deter you.
- Attractive policies for a 'second career' and part-time jobs are required.
- Education can be given, but observation comes from training.
- A leader must appreciate efforts as much as results.

After my PhD, I joined IIT Bombay as a faculty to teach energy systems engineering. There was a lot that I hadn't been exposed to, and I had to learn on my own. I attended the undergraduate classes on IC engines and combustion, even did all assignments, teared down engines and put it back many a times. I was very fortunate to have a very strong woman engineer and mentor in Prof. PP Parikh.

Only when women support each other, can we achieve success together as a universal team, and sky is then the limit!

My team and I developed a technology to run an existing diesel engine on straight vegetable oil. This was done with minimum modifications and the engine performance was conforming to the then emission regulations. This was developed at the Cummins Engine Research Facility, a lab sponsored by Cummins at IIT Bombay.

The challenge was to actually take it to the next step of field testing wherein the reliability, durability, ease and application of the technology would be established. This was mainly targeted to electrify remote villages where conventional electrification was not possible. While visiting remote villages, villagers were initially reluctant to take a woman's advice seriously. However, things fell in place shortly and gender did not matter anymore.

For me, a leader is one who connects with people, takes them along and keeps them motivated; one who is able to bring out the highest potential in her employees, and that I believe can be done if you enable calculated risk-taking and carefully push the limits, enable independent thinking and allow mistakes within limits. A leader must appreciate efforts as much as results.

If you have passion and intention, you can make a mark. Nothing can deter you. There may be other women who need your support; step forward and motivate them. Only when women support each other can we achieve success together as a universal team and sky is then the limit.

While policies are important and many are in place, a mindset change is required to promote women in STEM. It is time that 'inclusion' as an emotion is ingrained right from school and at home while parenting and role modelling. Attractive policies for a 'second career' and part-time jobs are required. What is lacking in STEM education is the communication on importance of STEM in day to day life. More in-class experiments, application of STEM in simple things around can be helpful. Education can be given, but observation comes from training. ■

Academic Profile

- BE Chemical Engineering, Panjab University, Chandigarh
- PhD in Chemical Engineering, IIT Delhi

Awards & Fellowships

- Fellow of the Indian National Academy of Engineering, 2020
- SWE Prism Award, 2021, for impact on society and engineering community

Arpita Ghosh

Assistant Director Bioinformatics
Eurofins Genomics India Pvt. Ltd., Bengaluru

Arpita Ghosh is a genomics scientist who has worked in the diverse areas of genomics, agri-genomics, microbiome, clinical genetics and cutting-edge genomics techniques like single cell genomics.

I was born in Howrah, West Bengal. My father held a high post in the government and had a transferable job; thus my schooling has been in different cities across the country. My father inspired me in every possible manner for every little interest that I had. He always believed in my potential.

When I decided to opt for bioinformatics field, the area was emerging then in the Western world and India was having very limited scope and knowledge about this. I shared with my father that this was a new discipline to experiment, but is interesting as it provided a scope of interpreting biology using computer applications. My father supported me and told me to take up this as a challenge and craft a career out of the same. He knew well that I liked to take up new challenges.

If you have the passion, an analytic mindset and the zeal to explore and learn new things, the field of bioinformatics is for you. Here you can have interesting findings that you need to prove using analytical skills. You should be ready to read a lot of literature to upgrade and keep pace with the research and new methodologies that may emerge in this area.

- Learn as much as possible in the initial stages of career.
- Overcome all biases and deliver your best at work.
- Necessary skills need to be developed in students keeping in mind the current trends and industrial requirements.

For women who wish to be leaders, it is important to choose the field of your interest, work hard and be honest.

I have taken up all the opportunities that came my way to learn and excel. This built up my confidence that I can deliver whatever comes my way. I kept on learning and developing new skills, which in turn, helped me grow as a person and in the profession. I like to experiment with new things that enable upskilling myself. I am a self-motivated person.

I have rich research experience in the field of genomics, agri-genomics and clinical genetics data analysis. I have worked on big complex genomes, agri-genomics panel development, clinical exome and cutting-edge applications.

I have more than 35 publications and three book chapters (including a chapter in Encyclopedia of Bioinformatics) in different areas of genomics and clinical genetics in international journals. I have also been involved in developing machine learning approaches for predicting the SARS-CoV-2 genome.

In professional career, every woman encounters several barriers, gender inequality, workplace politics dominated by men. My case has been no different. I too have faced all this, but the challenge is how to overcome and deliver your best at work. I have been consistently working hard and in fact worked harder to overcome all the barriers. In my experience, all these barriers make you a strong and confident person.

For women who wish to be leaders, it is important to choose the field of your interest, work hard and be honest. Learn as much as possible in the initial stages of career; that will help you to get to the leadership position.

The specialisation of bioinformatics is the mainstream in which biology and information technology is tied together. The courses should be more practical-oriented. There are fundamental knowledge gaps in students' understanding. Necessary skills need to be developed in students keeping in mind the current trends and industrial requirements.

The government is now funding only government institutes; rather it should have some schemes to fund multinational corporations and private organisations for genomics and clinical genetics research in India. Policies should be strong for research funding. ■

Academic Profile

- BSc Zoology & MSc Bioinformatics, MS University, Vadodara

Aruna Achanna

Deputy Director, Applied Materials India

Aruna Achanna has over 18 years of experience in the field of software delivery and development, implementation and operations and has worked in service and product industries spanning diverse domains, handling both onshore and offshore assignments.

Born and brought up in Bengaluru, I was naturally driven into STEM subjects like most of my generation, so-called millennials. It all started with my mother who had to overcome several hurdles to become a science graduate in the early 70s, and then my elder brother, who is a senior scientist and who always motivated me to pursue science. I received constant encouragement from family and other inspirational senior women leaders in the organisation.

It is the success that is seen after achieving something outside of the comfort zone that has truly inspired me. During my early career days, I had to work with a very challenging and demanding stakeholder, only to realise later that these challenges paved the way for a faster knowledge gain and career growth.

Now I am an experienced professional in the field of software delivery, and have worked in the service and product industries spanning banking, government, life sciences and semiconductor domains, handling both onshore and offshore assignments. I started my career in Tata Consultancy Services as a .NET Developer, moved onto different service and product MNCs, held several positions as a senior developer, onshore technical coordinator, senior technical leader, technical project manager and senior manager prior to my current role with Applied Materials.

- Confidence and patience are key in a career journey.
- Hurdles are common, not only to women but to everyone. One should always strive to overcome those.
- STEM is naturally hidden in women; choosing this field will bring out their potential and yield success.
- The motto should be 'awareness and opportunity' to reach all girls.

Technology evolution is fast-paced and there needs to be a constant self-learning plan to come back on track after maternity break.

Though I wouldn't like to call it a 'tough experience' or a 'barrier', one of the difficulties that I faced was coping with rapidly evolving technology after taking two maternity breaks. Technology evolution is fast-paced and there needs to be a constant self-learning plan to come back on track. However, this evolution in technology has also enabled several learning platforms reachable at the tip of our fingers, that taking up a distant or a remote course/ remote working is no more a challenge.

From my experience, I would say confidence and patience are key in a career journey. Hurdles are common, not only to women, but to everyone. One should always strive to overcome those. I always keep reminding myself of what Sudha Murthy said in a conference in the context of women choosing corporate or STEM careers: "We chose this career, let's stand by it and let's prove to ourselves we were right."

In general, women are always curious to know about things, they have great management skills, a stronger mind and are known to multitask. STEM is naturally hidden in women, choosing this field will bring out their potential and yield success.

A lot is already being done to promote women participation in STEM. Maybe, conducting surveys in remote areas with women on their understanding of STEM careers, and awareness of the available opportunities would help further. More internships could be offered for lower-income groups in both government and private sectors, after the 12th standard, along with distance learning and parallel learning sponsorships. Awareness programmes for high school students on what STEM can offer for their future are the need of hour .This awareness at an early age can help both students and parents make better choices. And this awareness must reach all schools in India. The motto should be 'awareness and opportunity' to reach all girls. ■

Academic Profile

- BE Instrumentation Technology, BMS College of Engineering, VTU, Vellore
- MS Software Design & Engineering, Manipal University

Certifications

- Prosci Change Practitioner
- MuleSoft Certified Developer – Integration & API Associate
- Salesforce Platform Certified developer, ITIL Foundation
- ASP.NET & SQL Server Microsoft Certifications

Ashavaree Sahoo

Senior Technical Manager, Industrial Adhesives & Tapes Division
3M India

Ashavaree Sahoo has 14 years of experience in the construction industry. She engages with regulatory and statutory bodies to drive the building codes in India and is well versed with Indian, British, American (ASTM), Australian, European and US National Fire Protection Association (NFPA) standards.

I was born and raised in Bhubaneswar, Odisha. My parents inspired me to take up science as a career option and build my core expertise to serve the industry. I have been interested in science since childhood as I saw inventions and science being used for the betterment of mankind. Infosys co-founder Sudha Murthy the first female engineer hired at TELCO,has been my inspiration.

In my area of work, I have worked towards leveraging technologies and develop new applications,such as fire stop tape and endothermic technology. I worked with several laboratories to get these products custom tested for the country's requirements as per Indian regulatory standards. I initiated collaborations with regulatory bodies like the Bureau of Indian Standards, the Glazing Society of India and the Indian Road Congress to work on developing standards for new technologies and applications

In parallel, I grew my expertise working on multiple activities to contribute to organisational growth, such as specification development with industry consultants, direct engagement with clients across the value chain, project site survey with proper audit and detailed reports.

- Women should have the skills and confidence to succeed in mathematics and science.
- The academia and the industry must work to conscientiously dismantle gender bias.
- Parents can also work to counteract gender stereotypes by providing girls with high-quality STEM toys.

A more equal playing field could help narrow the male-female skills gap, increase employment and productivity of women.

I have demonstrated my leadership in external fora like Fire & Safety at Secutech and iDAC, both international conference events in India, and was the keynote speaker at these conferences creating awareness on fire safety science, codes and guidelines. In addition, I have published papers in leading publications like A&S, Fire and Safety India and FSAI, highlighting the importance of technologies, key challenges and how technology can help solve these.

Women who wish to join industry must understand that companies value skills differently, so it's best to learn from someone who has the role you want and works at the company you admire. That's the best way to figure out where you might need additional training or education. Then when you apply, make sure to highlight the skills and experience you have that are most relevant to the role.

Women now make up 56 per cent of undergraduate students, and are making strides in STEM fields ranging from genetics to gaming. Despite this remarkable progress, gender stereotyping remains one of the biggest obstacles. STEM programmes should be fully inclusive and the academia and the industry must work to conscientiously dismantle gender bias. Parents can also work to counteract gender stereotypes by providing girls with high-quality STEM toys and games from a young age and offer opportunities to participate in STEM-based enrichment. Supportive teachers and science learning culture in schools can play essential roles.

Women should have the skills and confidence to succeed in mathematics and science. They should be given equal encouragement, learning opportunities and have positive messages spread about their abilities in science and math.

Gender equity in STEM is important for many reasons. A more equal playing field could help narrow the male-female skills gap, increase employment and productivity of women, and reduce occupational segregation. It ensures a diverse and talented STEM workforce and prevents biases in these fields and the products and services they produce. Gender equality needs to be considered as part of the analysis of the problem, the formulation of research questions, the piloting of solutions and community engagement. ■

Academic Profile

- BTech, Biju Patnaik University of Technology, Rourkela
- Masters in Strategic Management, IIM Calcutta

Awards

- Best Technical Support Award, Godrej E&E Utkarsh
- Corporate Individual Award, CTEI, 2019

Bhawna Prabhakar

General Manager Marketing
Thermo Fisher Scientific, India & South Asia

Bhawna Prabhakar has over 21 years of experience spanning various roles and responsibilities, ranging from marketing and product management to strategy designing.

I am a self-made professional. I hail from a family of bankers, and did not have any personal guide at home to help me choose my career in science, and later industry. In fact, I broke the family tradition by being the first full-time working woman. Many small achievements, accolades won during my academic years acted as a catalyst for me to advance my professional aspirations. I have always looked up to successful women leaders who proved their mettle in the industry by their competence. Such inspirational women leaders have instilled the confidence in me to move forward in my professional journey.

I have been a relatively bold and strong woman since my student life. Opting for a full-time career in marketing after completing my MSc and e MBA itself was a testimony of my clarity, will and grit to follow my dreams. My parents supported and encouraged me towards pursuing my choices. Women certainly come across stereotypic challenges, especially during initial years of their career. But I never let my voice get ignored under any such biases or pressures at my workplace. I have been lucky to have worked with Thermo Fisher that espouses inclusiveness and diversity as an organisational culture. But having said so, living in a male-dominated world, it can get challenging for women to make a mark and receive a worthy acceptance.

- I broke the family tradition by being the first full-time working woman.
- Living in a male-dominated world, it can get challenging for women to make a mark and receive a worthy acceptance.
- Women need to identify their own purpose and then chase the same irrespective of challenges and difficulties.

Women are born with a lot of inherent traits that they must leverage to lead them along the progressive path of leadership.

I fully endorse and practice gender neutrality. Women are born with a lot of inherent traits that they must leverage to lead them along the progressive path of leadership. Women need to identify their own purpose and then chase the same irrespective of challenges and difficulties. Situations and circumstances will not always be conducive, but if the purpose, perseverance and integrity are stronger than trepidation, nothing can stop a deserving woman to reach top positions. With growing inclusivity and breaking stereotypic working cultures, it is time for women to break their self-limiting barriers to fully unleash their potential. I take this as my responsibility to nurture this culture in my team and immediately influence people in my work circle.

Marketing is a field that requires a lot of creativity, collaborations and communication skills. If these elements excite you and you have the aspiration and willingness to perform, then any career of your choice will turn out to be gold for you. Having worked as the marketing head in my organisation, my biggest contribution is to support customers by providing them with the right solutions and services and giving them a great experience in associating with us for their scientific endeavours. To see customers succeed by leveraging our solutions and services has been my most satisfying accomplishment.

Though recent years have seen a lot of gender inclusiveness and diversity in many sectors, data suggests much work needs to be done to uplift women, especially those who come from rural areas and small towns. Women need to feel secure to come out of their homes, make their own identity, live their dreams and stand on their own two feet. Inclusion does not have to be limited to work places, but rather need to be seeded at the family level, where womens' involvement and choices need to be respected right from asking for their inputs and consent for family matters as well. The transformation is needed at the grassroots level for which policymakers need to bring a paradigm shift in a way that it is not limited to just bringing changes in the professional landscape. ■

Academic Profile

- MSc, Mithibai College, Mumbai University
- e-MBA from Manipal Academy of Higher Education

Binuja Varma, PhD

Principal Scientist (Genomics), Life Science Group
Tata Consultancy Services

Binuja Varma is a population and disease genomics researcher, involved in developing genomics methods for clinical research and applications and establishing clinical research infrastructure.

I was born in Thiruvanathapuram, Kerala, and completed my schooling and college education from there. I was good at science subjects and was curious about technology. I took a special liking to bio-organic chemistry during graduation. My teacher Indira Ma'am encouraged me to explore beyond textbook learning and I would browse the library shelves looking for good reads.

Working with India's first public-private partnership model, the Centre for Genomic Applications (TCGA) in Delhi, I was fortunate to be part of several projects and had the opportunity to take a leadership role from the very beginning. My supervisor, Narayanaswamy, PhD, and Mitali Mukerji, PhD, deserve a special mention in this regard. I learned genomics technologies as part of the population genomics programmes of India, and they supported me in every manner. TCGA gave me sound exposure to learn new techniques and skills, and the experience is still relevant to my current projects.

While I was doing my PhD, our lab collaborated with the pediatric neurology department of AIIMS, and I would spend time in the clinic collecting muscle biopsy samples and analysing clinical data. It was a life-changing experience to see children, some toddlers, with various neurological and neuromuscular abnormalities and their debilitating life in front of me. The trauma of families in a perpetual odyssey of finding the right diagnosis and treatment for their children was appalling. I decided, then, to pursue a career in clinical research.

- There is always a learning phase, and one needs to complete that with patience and earnestness.
- It is of immense value to have the right mentorship.
- Policies to promote flexibility in working environment are needed.
- Women to get equal opportunities with pay parity.

One should pursue a multidisciplinary education that would instill the ability to work with multi-faceted teams, which is important in modern biology.

There are several instances where I felt it was tough to decide between career and family and I believe some institutional support could have brought significant benefits. A medically difficult pregnancy was a critical moment when I realised that I had to leave everything that I had built up over the years. As I was a fully hands-on experimental person, my project work stopped and reconstructing after a year and a half was inconceivable. To start afresh and to get a position where time for childcare needed to be factored in was a daunting task, and I felt that I had fumbled and failed at several steps.

It took several years for me to stabilise the loss of two years that I had taken time off for motherhood. Besides, the lack of childcare facilities like creches at the workplace has always put pressure on the family. Once you lose the crucial few years, competing with men with similar experiences has been futile and brought in more setbacks.

However, there is always a learning phase, and one needs to complete that with patience and earnestness. Besides, it is of immense value to have the right mentorship. One should pursue a multidisciplinary education that would instill the ability to work with multi-faceted teams, which is important in modern biology. We should work together to create safe identity workspaces, a safe space for learning and experimentation, and a community so that our collective experience can nurture more women in this field.

The government and private sector must roll out policies that promote flexibility in working environment and equal opportunities with pay parity. There are no half-baked solutions, and these policies should be enforced for women in science to enable them to reach higher echelons.

STEM education now is not ingrained with any foundational understanding of social science, culture and other humanities subjects. Besides, the STEM curriculum is focused on a large amount of information processing, but stops short of equipping students from pursuing non-research/technology-based career opportunities. There are endless opportunities for putting knowledge of science together with other kinds of careers, and examples include public policy, patent law, publishing, education and teaching, medical writing, journalism, venture capital, and science museum work. ■

Academic Profile

- BSc Chemistry, Govt. College for Women, Thiruvananthapuram
- MSc Biochemistry, University of Kerala
- PhD in Molecular Biology and Human Genetics, JNU, Delhi

Charu Srinivasan

Vice President Engineering, Azure Core and Cloud + AI India Site Leader
Microsoft India Development Centre (IDC), Hyderabad

Charu Srinivasan is the site leader for the growing Cloud + AI organisation at Microsoft and the leader in Azure core leading compute and cloud native technologies. She is known for her engineering excellence, innovation and organisational leadership.

I grew up in India in many cities, Bombay, Delhi, Coimbatore, Jamnagar, Ooty to name a few. I feel a huge sense of gratitude to all the people in my life-my parents, family, colleagues, managers, mentors and allies for helping me shape my career and supporting me as I made my own choices. I was inspired to pursue computer science when I attended a BASIC programming lab during Std. XI. In the 1990s, it was uncommon for unmarried women to pursue advanced studies in a foreign country, but my parents supported me to opt for that. My mentors were the lifeblood of my support system and encouraged me to take risks that led me to grow my own confidence and abilities. I developed a reputation for execution excellence and ability to innovate and take ideas to the market. Industry recognition showed up along the way.

I have driven innovations in numerous areas in the distributed systems, specifically database replication, server virtualisation, data protection, disaster recovery, migration, modernisation and hybrid management.

One of my key contributions has been to own the technical road map for Azure Site Recovery, a native disaster recovery as a service (DRaaS). I have led multiple initiatives that focused on building innovation excellence, empowering women leaders and mentoring senior engineering talent. I was among the founding members of Microsoft WISE Mentoring Programme, where tech leaders at Microsoft volunteer to mentor women in computer science and software engineering.

- Silence your inner critic and develop a sense of conviction and self-belief.
- Often a career is a marathon and not a sprint; so do stop and smell the roses.
- We all have self-doubts; we need to acknowledge inner fears and silence the inner critic.

Barriers can take many forms–cultural, societal or personal. What is important is the response one brings to these detractors.

I was challenged to find my leadership expression a number of times. I had to silence my inner critic and develop a sense of conviction and self-belief. The goals sometimes seemed unsurmountable; however, by being single-minded and focused, I was able to deliver success. Barriers can take many forms—cultural, societal or personal. What is important is the response one brings to these detractors. I focused on my ability to create deep technical impact with my contributions and set all barriers aside.

Women aspiring for technical career paths need to focus on three pivotal areas. The first is innovation and thought leadership—the ability to demonstrate passion to solve problems and influence others, to recognise and respond to technology shifts, knowing where the puck may land and act accordingly. The second is pride in craftsmanship—understand the business need and identify the right problem, persistently build domain expertise and relentlessly focus on execution. The last is about manufacturing success, which is about building products with the highest quality and focusing on market adoption and customer success.

Passion for technology and people is at the core of growing into a leader in my field. It is possible that we have self-doubts, but it is then that we need to acknowledge inner fears and silence the inner critic. It is important for all of us to know that each one's career journey is a function of her choices and constraints, and we need to own our choices. Often a career is a marathon and not a sprint; so do stop and smell the roses.

Women pursuing STEM careers face roadblocks around societal expectations, especially around childcare and eldercare. These expectations are more pronounced as they navigate marriage, maternity and motherhood. Providing mentoring opportunities to women during these tough times will be a great enabler.

Investing in STEM teachers through funding and skilling support can further strengthen STEM education. STEM teachers need to be proficient in interdisciplinary teaching and application to everyday problem solving and critical thinking.

There is also a need to create an environment and culture to enable women to grow into technical leadership roles. We should be willing to think through inclusive hiring approaches so that we can attract diverse talent. ■

Academic Profile

- BE Computer Science & Engineering, Anna University
- MS Computer Science, University of California, Santa Barbara

Membership

- Board Member, Confederation of Indian Industry National Committee on Technology

Debjani Nag, PhD

Principal Scientist, Coal & Coke Making Research Group
Tata Steel Limited, Jamshedpur

Debjani Nag is a coke and coal research expert. She has developed polymers to reduce coal blend costs in iron making. She is now working on developing catalysts to mitigate CO_2 levels in the iron and steel industry.

I was born and brought up in Kolkata. My parents always inspired me to work on something meaningful. My uncle, who was in the teaching profession, always motivated me to take up a STEM field as a career option. My colleagues, peers, seniors always inspired me to move forward and progress professionally. I would always notice hard-working and creative people around me and strived to inculcate the same traits within me.

I worked as a trainee engineer at the Nuclear Power Corporation of India Limited—my first job. In my initial days of joining, there was a problem of acceptance of a woman in the shop floor by elder colleagues. However, the scenario changed with time. This was a rather strange experience than a tough experience, as I never thought of gendered roles at professional workplaces. Other than this, I am privileged that I have had no experience of gender bias that hampered my work and growth as a women engineer.

I am fortunate to have been working with the best and leading groups in the steel industry of India. I have honed my expertise and skills in coal and coke research for the last 14 years. I have published my work in 30 reputed national and international journals and have filed 25 patents and patent cooperation treaties in which nine have been granted.

- Do not try to be a super woman.
- Do not always feel guilty if you are unable to do proper optimisation.Regardless of which STEM field you take up, do your best to develop deep knowledge in it.

From marks and grades, STEM teaching must shift emphasis to learning, student-led projects and special STEM clubs for girl students.

My work has helped the company to have better understanding of coal characterisation and coke making. I have worked on polymer development for different applications in iron making, which helps the company reduce the coal blend cost.

I have worked on the utilisation of non-coking coal that has national importance as it opens the avenue for utilisation of Indian non-coking coal in metallurgical coke-making. At present, I am working on catalyst development to mitigate CO_2, which is important for future strategy of the Indian steel industry.

I would advise women to give cent per cent to their role. Be empathetic and helpful. Do not always feel guilty if you are not able to do proper optimisation. The most important, do not try to be a super woman. Regardless of which STEM field you take up, do your best to develop deep knowledge in it. Develop sound networking skills as they help you connect with the right kind of people in the industry.

From marks and grades, STEM teaching must shift emphasis to learning, student-led projects and special STEM clubs for girl students.

Certain initiatives need to be taken at the policy level by the government and the private sector to attract more women into STEM careers. These include free education of girl child (disadvantaged and marginalized sections of the society) up to at least graduation, more scholarship schemes for young competent girl students, continuous effort on sensitization to break gender stereotypes thinking in family and society as large. ■

Academic Profile

- BTech Chemical Engineering, Science College, University of Calcutta
- MS Chemical Engineering, IIT Bombay
- PhD in Chemical Engineering, IIT & Indian School of Mines, Dhanbad

Awards

- Winner of Tata Innovista, 2020
- Best Project Award in process category, R&D, Tata Steel, 2013, 2019

Geetika Goel

Technology Head, Hero Vired, New Delhi

Geetika Goel is a seasoned IT professional with 20 years of experience in building extensive technology-focused organisations in diverse domains.

Born in Lucknow, I am based in Bengaluru now. As a young student, I had a natural interest in math, and my parents encouraged me to explore the subject further for my higher studies. I am intrinsically inclined towards solving problems. What I liked the most about programming were the algorithms and databases. Hence, it was an easy shift for me to enter the software world.

My family and friends have always supported me in my professional journey. I would like to mention a special incident though. I had taken a break from my work as I had to tend to my second child, who was a six-month-old infant. At a party, I bumped into one of my ex-bosses, a close friend. The moment she found out that I was not working to take care of my kids, she immediately offered me a flexible work option with her. That is indeed how I started the second stint of my career, a one that I cherish deeply. Thus, I feel women must support other women in professional space.

Another incident that I remember is when I felt somewhat stagnated or maybe needed some novelty in my work. One of my close friends and my husband sat with me to do a SWOT analysis, a bulleted list of my aspirations, and then helped me identify the right kind of opportunities to look for. This gave me the confidence to take a jump into the start-up world. I had the most valuable support system of family and friends indeed.

- All we need to do is to learn technology and practice it.
- Women need to embrace work-life balance.
- Women must support other women in professional space.
- Be fearless, get in there and go all out.

I try to instill the 'put yourself in the customer's shoes' adage in my team members.

I handle technology for my company and help cultivate efficiency at work. Automation is close to my heart. I try to instill the 'put yourself in the customer's shoes' adage in my team members. As long as we have a genuine interest in improving the experience for our customers, we will be on the right path. Be fearless, get in there and go all out. Dream big, and work hard to achieve it.

I have hands-on and in-depth understanding of technology with an ability to recruit, mentor and grow other technology professionals. I have previously worked for reputed organisations like Lowe's India, Infosys and Jigsaw. The number of opportunities and the variety of work that can be done in the software field is enormous. I have had the opportunity to work on both mainframes and modern systems, and the journey itself has been exciting. I wish everyone should be able to experience and enjoy the excitement.

Being a woman professional is different. After marriage, especially after maternity, women start feeling guilty about everything, such as being unable to give enough time at home, to the baby, husband, in-laws, etc. Since we don't like anybody to be able to point fingers at us, we start putting in extra efforts at the office. This takes a huge toll on our bodies and minds. Women need to embrace work-life balance without feeling guilty on either front.

STEM is among the most doable and exciting jobs in the world; but needs a lot of hands-on experience. All we need to do is to learn technology and practice it. STEM educators must allow students to excel in the areas they like as technology courses often have mandatory training in many disciplines. That needs to change. For example, a person who is strong in engineering design may not be as comfortable with the theoretical side of engineering. To promote women in professional space, policies must aim at bringing in good practices for women's safety at work and making flexibility a norm for both men and women from young nuclear families. ■

Academic Profile

- BSc Mathematics, Lucknow University
- MSc Mathematics, IIT Kanpur

Awards

- Artificial Intelligence Analyst 2019 Mastery Award, IBM
- Best Mentor Award conferred by Infosys chairman NR Narayana Murthy

Hem Shruti Bhardwaj

Application Manager, PROVision, Applied Materials (AMAT)

Hem Shruti Bhardwaj is trained in metallurgical engineering and materials science. She has rich experience in supporting many semiconductor fabrication units worldwide.

I was born and brought up in Odisha's steel city Rourkela and residing now in Bengaluru. My family has always inspired me to work hard to achieve the goals that I set in life and to strive for excellence in whatever I do.

However, more than anyone, it was the city that I grew up in, my everyday surroundings and my community that inspired me to take up engineering as my career. Rourkela is known for engineers contributing to the growth and building of the country.

My master's journey at the Indian Institute of Technology (IIT) Bombay and my thesis professor Amartya Mukhopadhyay have been highly influential in my professional growth. I experienced high quality research, exchange of ideas, collaboration with great minds and openness of thoughts during my tenure there as a student and it benefits me to this day.

I won a silver award for the distinguished master's research in the area of materials science and engineering from ASM India, the India chapter of ASM International, which conducts training programmes and workshops in diverse sectors.

- Always be open to learning new things and taking on challenging roles.
- Observe and learn from strong female colleagues and mentors.
- Work hard and develop a strong academic profile.
- Young girls need a lot of guidance on career opportunities available in STEM fields.

Be very vocal about your suggestions and needs. Never shy away from speaking about your accomplishments.

I joined AMAT four years ago as an application engineer, supporting many semiconductor fabrication units worldwide. I was a product specialist for the Taiwan Semiconductor Manufacturing Company Limited (TSMC) based in that country for a year before moving on to become a manager of a team of seven engineers.

I've led successful penetration projects of the new beam metrology platform of Applied Materials (PROVision) at important semiconductor customer sites like TSMC and Micron, contributing to its increased market share.

One of the biggest challenges I faced initially as a woman was a lack of confidence and not being able to speak up with the fear of being rejected or opposed. Getting to know, observe and learn from my strong female colleagues, mentors and relatives was quite significant in overcoming these challenges.

The kind of open, equal and inclusive platforms that NITs and IITs provide also did help prepare me to handle such tough situations.

Be very vocal about your suggestions and needs and never shy away from speaking about your accomplishments. Work hard and develop a strong academic profile; always be open to learning new things and taking on challenging roles.

I feel to encourage women in STEM, more exposure to those subjects from early on would be helpful. Young girls need a lot of guidance on career opportunities available in STEM fields.

This can be achieved through mentoring sessions by STEM achievers on leadership skills, countering stereotypes, etc.

In my opinion, making processes more experimental can increase the comprehension and learning growth of students—both girls and boys. Creative thinking and approach should always be encouraged. ■

Academic Profile

- BE Metallurgical & Materials Engineering (Silver Medalist), NIT Rourkela
- MTech Materials Science, IIT Bombay (Silver Medalist)

Kakul Paul

Vice President, Analytics
Accenture, Bengaluru

Kakul Paul has more than 17 years of experience in providing consultative strategic guidance to some of the top Fortune 500 clients.

I started my career with Glaxosmithkline Consumer Healthcare's marketing department. Lured by the start-up environment, I joined the trending analytics bandwagon. I was part of two successful start-ups. The first was Marketics, one of the early successful analytics start-ups in India that was eventually acquired by Mumbai-based WNS. The other was Marketelligent. I set up its consumer product goods and consumer analytics function from scratch. It was later acquired by Santa Clara, California-based Brillio.

I completed my secondary high school from Jamshedpur, which was the hotbed for engineers, given the presence of TISCO and TELCO there. My father, a retired Army officer, was a STEM student himself and a strong propagator of concepts-based learning. His teaching methods inspired me to pick this field as an academic specialisation, and eventually as a career.

An incident that touched and encouraged me the most was related to embracing motherhood. Life changed a hundred-fold after my son was born. I was debating on whether to take a career break, as a new-born and a start-up team, both were demanding. I was sceptical whether I could do justice managing both roles together.

After a lot of trepidation and worry, I finally mustered the courage to relay my decisions to my CEO. However, his response surprised me. He said we were in it together and the company will make it work for me. The leadership and the team, in turn, extended support on all counts to help me make a comeback. Overall, I have been lucky to have worked with inspiring leaders and have had awesome mentors. I owe a lot to my CEO and I hope I am able to deliver likewise and help support returning mothers as they make a comeback. This is one of the top reasons why we see a significant dropout of women in leadership roles.

- To increase retention of women in STEM, policies must encourage returning mothers who find it challenging to adapt to work rigour.
- We women typically shy away from networking, a key leadership skill, and this must change.
- It is vital to find at least one passion outside of work and family to keep yourself young and alive.

STEM education must emphasise more on an industry-driven, case-study approach and outcome-based learning over rote learning.

One of the areas where I had to invest significantly was building clients' trust and faith, making them believe that they can count on a woman leader to deliver for them. The trend is fast changing as we are witnessing an increase in successful women leaders who have gone above and beyond. Networking is an important leadership skill as it helps connect with the right people, seek diverse points of views and valuable career advice, and teaches new lessons. We women typically shy away from that, and this must change. It is vital to find at least one passion outside of work and family to keep yourself young and alive.

Prioritisation is important. Whether long-term, short-term or point in time, setting the right priorities is all that will keep us going. Be a mentor yourself, encourage and guide your coterie. Former PepsiCo CEO Indra Nooyi had rightly pointed out: "Women don't help women enough in workplace."

Women must strive to be strong on concepts and acquire new skills. While the overlaying technology is evolving, a strong hold of the underlying concepts will keep one relevant as the base concepts remain the same. But the most important point is one must have a zeal and hunger to understand the business impact she is driving.

To increase retention of women in STEM, policies must encourage returning mothers who find it challenging to adapt to the rigour of work. Flexible working hours can help them. We need to vouch for a level-paying salary, and enforce a similar pay structure for women.

I feel STEM education must emphasise more on an industry-driven, case-study approach and outcome-based learning over rote learning. At the college level, we need to drive more industry partnerships—sponsor projects and encourage webinars and lectures by SME and industry experts. ■

Academic Profile

- BTech, IIT Varanasi
- MBA, IIM Ahmedabad

Awards

- Best Customer Experience Award for consumer goods industry, Customer Engagement Summit 2017
- Best Analytics Services in sales analytics, Big Data Analytics & Insights Summit 2016
- Women Role Model Award, Brillio 2015

Lipika Sahoo, PhD

Founder-CEO, Lifeintelect Consultancy Pvt. Ltd., Bengaluru

Lipika Sahoo has 21 years of experience in academia and industry in technology, innovation and intellectual property issues. She is a registered Indian patent and trademark agent.

I was born in Baripada in Mayurbhanj district of Odisha and completed my education till master's degree in the state. For the last 24 years, I have been residing in Bengaluru, my place of work. I was always interested in learning by exploring new fields. Intellectual property rights (IPR) is an area where the work involves technological, legal and financial aspects in addition to strategy and consulting. My company helps firms, entrepreneurs and the government. My work itself is a source of inspiration for me.

My team is building an ecosystem where we are helping scientists, innovators, government organisations and business owners protect their ideas by enabling generation of valuable intellectual property, be it an invention, a design, a product, an idea or business process. We also support our clients in taking these IP forward through technology transfer.

I have served as president and vice president of Business Networking International-GEMS chapter, Bengaluru, managing a chapter of more than 60 business owners. I have been recognised and awarded by Great Companies an online business magazine featuring global stories of entrepreneurs, for being one of the top women entrepreneurs of 2020.

- Women comprise 50 per cent of our work force and must have equal opportunity in nation building.
- Industry -academia collaboration must be promoted in higher education.
- Mentorship for women in STEM is another important aspect that we need to emphasise on.

However, my decision to start this entrepreneurial journey and setting up the business in the first place was tough. My husband is my greatest support and helped me sail through this arduous journey. I am grateful to my parents, kids and friends for constant encouragement and motivation.

People management skills are very important, more particularly if you are in the services business.

I was a first-generation entrepreneur, and therefore, had to learn from my own experiences and keep going. For any leadership role, people management skills are quite important, particularly if you are in the services business. Sometimes you may have to take tough decisions. It is fine as long as you are focused on your goals. Women who wish to craft a career in IPR must be in a constant learning mode and keep adding new skills.

Compared to others, STEM careers have a longer route to attaining financial independence and are considered less lucrative in terms of money. Therefore, efforts must be made to make STEM careers equivalent to other well-paying jobs. Women comprise 50 per cent of our work force and must have equal opportunity in nation building. Encouraging options to restart career or studies after a pause will be helpful. Considering women take a major share of responsibilities in a family—bring up children, taking care of elders—we must provide flexible options to them wherever possible.

More practical applications of our education and industry-academia collaboration must be promoted in higher education. It would be helpful to students if they have early exposure to industry and understanding of skills required to excel in the industry and academia. Mentorship for women in STEM is another important aspect that we need to emphasise on. I am sure with a few of these changes, our STEM students are poised to reach greater heights, solving newer problems and taking India to the next level. ■

Academic Profile

- MSc, Sambalpur University, Odisha
- PhD, IISc, Bengaluru
- PG Diploma in IPR, National Law School of India University, Bengaluru
- PG Certificate in Business Management, Xavier Institute of Management, Bhubaneswar
- Advanced certification from World Intellectual Property Organisation

Meenakshi Malik, PhD

Senior Manager (Regulatory Affairs)
Siemens Healthcare Pvt. Ltd., Vadodara

Meenakshi Malik is a professional with extensive experience in the areas of global regulatory affairs in biosimilars/combinations, medical devices/in-vitro diagnostics.

I was born in Shamli in western Uttar Pradesh and studied in various parts of India during my academic career.

I was always supported by my family and professional mentors. My PhD supervisor guided me in every sphere of my life, which helped me reach my current professional stage.

I am now working as a regulatory affairs professional and am responsible for looking into regulatory requirements for molecular in-vitro diagnostics at Siemens Healthineers at Vadodara, Gujarat.

Prior to this, I was working for Biocon Biologics Ltd. in Bengaluru as Global Regulatory Lead.

I have engaged in the generation of microbial hosts for development and production of therapeutic drugs in the biopharmaceutical industry.

I played an integral role in getting in vitro medical devices and biological drugs manufactured in India by getting them registered in India and various global markets.

- Have patience and be determined towards your goal, and success will be yours.
- Academic curricula should be more inclined towards industrial requirements.
- To attract more women into STEM careers, 'work from home' policies should be implemented and special scholarships should be announced for women so that they can pursue their research inclinations.

Always believe in yourself and do not let any hurdle pull you against your dreams.

There were times when I faced obstacles in this journey. Owing to socio-cultural norms set by the society for women and young girls, the main challenge for me was to get married after my master's degree rather than pursuing a PhD.

I made efforts to take a stand for myself and eventually completed my PhD.

Another challenge that I faced during my professional career was common biases against women that every woman faces in multiple ways.

My advice to the next-gen women who wish to be in leadership roles is to always believe in themselves and not to let any hurdle pull them against their dreams. Have patience and be determined towards your goal, and success will be yours.

To attract more women into STEM careers, 'work from home' policies should be implemented wherever possible so that women can contribute towards their work from anywhere as per their convenience.

There are certain shortcomings in how STEM is being taught now. For this, academic curricula should be more inclined towards industrial requirements so that students are well versed with job requirements. This will help students to face fewer challenges on the job front.

In addition, students do not have to spend more time and money doing separate training and getting skilled. Special scholarships should be announced for women so that they can pursue their research inclinations. ■

Academic Profile

- BSc Industrial Microbiology, Kurukshetra University
- MSc Biotechnology, Chaudhary Charan Singh University, Meerut
- PhD in Biotechnology,Thapar University, Patiala

Awards & Fellowships

- Biopacer Award for contribution toward Insulin Business Unit (2017), Siemens
- Bio Achiever Award for outstanding performance (2016), Siemens
- Senior Research Fellowship, CSIR

Monica Joseph

Senior Manager, Software, Applied Materials India Pvt. Ltd., Chennai
Ex-Member Technical Staff, HCL Technologies

Monica Joseph is a software engineering leader with over 22 years of experience in delivering manufacturing execution systems (MES) for customer business requirements, primarily for semiconductor foundries (fabs).

I was born in Tuticorin and brought up in various places. This offered me sound exposure to different cultures, languages and education syllabi. And studying in a regional engineering college continued my exposure to diversity.

During my school days, there was neither career counselling nor self-analysis done to identify the field of interest. Though m y focus was on medicine, I got into the Regional Engineering College, Trichy, and realised it was a natural progression. I had the freedom and full parental support to move in this direction. The college environment got me interested in software.

The next big step was a software job opening in the semiconductor domain, the field relevant to my educational background. Sticking with software development for the semiconductor industry was completely a personal choice.

The decision to be part of the semiconductor industry had its challenges in the early 2000s. My base location was Chennai and semiconductor companies were in Bangalore and I could not relocate. Brooks Automation (later acquired by Applied Materials) opened the opportunity in Chennai. It introduced me to the world of MES, which is complex but interesting. The impact and importance of MES in fabs around the world keep me interested in continuously improving and making an impact with my contribution. Equal treatment at Applied Materials with no gender bias had a positive impact and contributed to growth.

- As a woman, being in a leadership role gives you a better opportunity to have a voice.
- There is a need for women's representation in technology and innovation.
- Women's mentorship programmes to encourage women to grow in STEM careers are needed.

Software engineering is not a masculine field. Mind power knows no gender. Do not hesitate to explore and learn; make your mark.

I have expertise in a broad range of technical skills that are required to transform products to make use of emerging technology. This, coupled with a clear insight into ever-evolving business requirements and challenges, has set my path. I have complete engineering ownership for multiple products. This involves supervising and leading the engineering team that develops solutions, collaborating for product releases with marketing, partnering with peers across geographical locations, project management, coaching people in different functional teams, and continuously improving process and automation.

The number of hours of presence in the office does not translate into productivity. It is how effectively you make use of your working hours. Establishing work hours took time and with the right support from the management, I was able to take care of this backed by a decent support system at home. Women must allocate time for learning that is required for professional growth. Compared to male counterparts, investing time for career growth must be a more conscious effort.

As a woman, being in a leadership role gives you a better opportunity to have a voice. Be yourself and be open to learning. Apply the learning from the right set of leaders (men and women) to grow and develop your style.

If you are passionate about a career in software applications, take it up. We also touch and influence the lives of people around us. Having connectivity with people during the COVID-19 lockdown and working remotely was possible because of digitalisation. Software engineering is not a masculine field. Mind power knows no gender. Do not hesitate to explore and learn and make your mark. There is a need for women's representation in technology and innovation.

I feel STEM career awareness is less among rural first-generation women. Hence, girls should have exposure at the school level and teachers must be trained. A STEM career should be an achievable goal for students from government schools and adequate scholarships must be provided. This must be part of the national development plan.

The dropout rate of women in STEM is higher when compared to other fields. Policies like six months of maternity leave, openings for women after a break, kids care at places close to the office are helping. A hybrid or remote work culture could reduce dropouts in future. Growth needs continuous learning and refining skills. Women's mentorship programmes to encourage women to grow in STEM careers are needed. ■

Academic Profile

- BE Instrumentation & Control Engineering, NIT, Trichy

Monideepa Mukherjee, PhD

Principal Scientist, Materials Welding & Joining Research Group
Tata Steel Limited, Jamshedpur

Monideepa Mukherjee is a metallurgical engineer leading the R&D activities in product development, materials welding and joining and additive manufacturing at Tata Steel.

I was born and brought up in Ranchi, Jharkhand. My parents were working professionals and had earned a lot of love and respect from their colleagues for their knowledge and dedication in their respective work areas. My parents were, therefore, a constant source of inspiration, and as a young student, I secretly wished to earn the same kind of respect for my work in my professional life.

My teachers at school and college professors encouraged me at every step to work hard with honesty and dedication and for creating an atmosphere of healthy competition. I received tremendous encouragement, guidance and support from my college professors, thesis supervisors, senior colleagues and external collaborators. They would show a lot of faith in me and would constantly push me to go a step further and made me take charge of my professional growth.

On the work front, I have had a decent growth as a professional. I have been able to publish my work in 23 international and national journals, 11 academic conferences, and a book chapter. I have filed ten patents, out of which five have been granted. Some of these inventions have helped my company to produce 'hot-rolled advanced high-strength steel' grades for automotive applications at a lower cost. The higher strength of these grades has enabled usage of thinner gauges and consequent reduction in the weight of the auto components without compromising on safety and functional requirements, leading to increased fuel efficiency and reduction in carbon footprint.

- As a leader one must be open-minded and have an empathetic attitude.
- Be approachable when your team and juniors need you.
- Keep yourself up to date with the latest developments in the field.
- Building collaborations with leading research organisations is important.

Give your best to whatever you do and be truthful and honest, no matter what happens.

I never faced any tough experiences or barriers women generally faced in their professional journey. I feel the most important aspect is to give your best to whatever you do and be truthful and honest, no matter what happens. As a leader, one must be open-minded and have an empathetic attitude. Be approachable when your team and juniors need you; it is another leadership trait one must inculcate.

My advice for women who wish to take up a R&D career in steel industry is to keep yourself up to date with the latest developments in the field. Building collaborations with leading research organisations to enhance expertise and proficiency in your field is equally important.

Policies to attract more women into STEM careers must focus on promoting conscious efforts to prevent stereotypical public messaging that promote gender disparity. The private sector must focus on improving policies towards making workplace safer for women, especially manufacturing sector shop floors. Provisions for structured institutional support for care of young children can be a huge support. Overall, a long-pending mindset change in families and society at large is required.

STEM education needs a paradigm shift with increase in practical training, lab work and do-it-yourself projects so that the theoretical aspects of science are better understood and appreciated. School teachers should be encouraged to use visual aid and technology to explain different theoretical aspects instead of only delivering lectures. ■

Academic Profile

- BTech Metallurgical & Materials Engineering, IIT Kharagpur
- MTech Metallurgical and Materials Engineering, IIT Kanpur
- PhD, IIT Kharagpur & Shinshu University, Japan

Awards

- Dr M Visvesvaraya Gold Medal Award, 2011 by the Institute of Engineers (India)
- Best Project Award for development and commercialisation of high-strength hot-rolled steel grades at Tata Steel)

Mridula Prakash

Senior Manager, Technical Architect Team
L&T Technology Services Ltd., Mysuru

Mridula Prakash has over 14 years of experience in the electronics industry, largely dedicated to embedded software. She drives the technology road map to provide and develop IPs, solutions, platforms and frameworks to address the latest technology advancements.

Technology did not seem like a career option during my early years. When I graduated from high school, I decided to pursue STEM simply because I saw it as the most challenging path. When I pursued electronics, I immersed myself in the world of semiconductors and the inner workings of chips, which made me choose a more technical career. I got excited about how technology can change the world and it ignited my passion to solve real-world problems for a better tomorrow.

My mother always encouraged me to continue my education and follow a career that I would enjoy. My engineer father always maintained an impressive work-life-family balance, which inspired me without bothering what gender stereotypes are pervasive in the society.

During my early years as an embedded engineer, I enjoyed my work but found myself getting frustrated whenever I was unable to get a full picture. I started finding ways to understand products targeted at customers and started directly interacting with clients. This allowed me to have a larger context and contribute a lot more in the early design phases. It helped me to quickly lead large development teams. I am most proud of the fact that I developed a growth mindset and acquired the skill of learning fast on the job.

- See obstacles as challenges to grow your skills and confidence.
- Don't set limits for yourself; be truly limitless.
- Young girls should be given an inside view of the industry and exposed to varied career opportunities.
- Develop a growth mindset and acquire the skill of learning fast on the job

Do not let anybody else steer you away in a different direction from the fields and ideas you are passionate about.

I started seeing obstacles as challenges to grow my skills and confidence. Luckily, early on in my career, I was surrounded by very supportive managers and peers. A few instances in my life have taught me that it's important to learn how to win in any environment. The point is, good work does speak for itself, but often some inherent biases in society do hold you back, and you have to push yourself doubly hard to just stay your ground.

I've helped our clients achieve their goals and provide confidence in our services. One of the initiatives I'm proud of is the 'Sustainability Initiative', which I spearheaded in my organisation and set in motion. I am happy to have laid the initial stepping stone for my organisation for transitioning toward a sustainable future.

If you enjoy technical roles, developer roles, sales roles, or any role that you wish to take up, there is no reason you cannot progress into leadership positions. Do not let anybody else steer you away in a different direction from the fields and ideas you are passionate about. If you work hard and continue to learn, you will have scope to progress in your career. Don't set limits for yourself; be truly limitless.

The tech industry is thriving and so dynamic that you can always find a place to grow your knowledge, expertise, responsibility and impact. I've seen it so many times in interviews and meetings, where women don't speak up and feel insecure about their own abilities. So my advice is to appreciate it is more important to speak up rather than silently resign.

In STEM, it is important to develop your 4C's—communication, collaboration, creativity and critical thinking. It is also important to connect disciplines and relate to them and keep it engaging. We have to realise that STEM education is directly proportional to innovation, invention and creative problem solving for future.

Young girls must be familiarised with new technologies at school, especially in rural areas, and given space to experiment. From an early age, young girls should be given an inside view of the industry and exposed to varied career opportunities that exist within the STEM courses. Affordable education, especially in STEM-related courses, should be encouraged by the government. ■

Academic Profile

- BE Electronics & Communication, VTU
- Global Advanced Management Programme, ISB-Kellogg School of Management

Dr Pooja Mukul

Technical Director, Jaipur Foot Organisation
Founder & Director, Enable Foundation

Dr Pooja Mukul is a rehabilitation physician and social entrepreneur. She works for people with locomotor challenges. Her area of expertise is designing high-performance, user-appropriate and affordable assistive devices.

Born in Alwar, Rajasthan, I did my schooling at Sophia School, Ajmer. My medical education was completed at Sawai Man Singh Medical College, Jaipur. My decision to pursue medicine did not stem from some childhood dream to be a doctor. Having been academically inclined in school, studying science was a choice. I would have picked mathematics over biology in high school, but Sophia, did not offer mathematics; so by default, I chose biology, which led me to medicine. My zeal to practice medicine developed when I started working with Dr P K Sethi, the orthopedic surgeon who designed the 'Jaipur Foot'. I learnt all I know, both medicine and the right work ethics, while being his protégé.

My patients are those who have either lost their limbs or are paralysed. We design and fit artificial limbs and assistive braces. After the treatment, they walk out of the clinic. In collaboration with Stanford University, we developed a Polycentric Prosthetic Jaipur Knee Joint. The 'Jaipur Knee' was featured in Time magazine's 23 November, 2009, issue as one of the 50 best inventions of the world for that year.

As part of a DST project, we standardised the Jaipur Foot. leading to Bureau of Indian Standards certification. In partnership with D-Rev, a not-for-profit based in San Francisco, the ReMotion Prosthetic Knee was designed and commercially launched in the United States and India.

- Your professional decisions will be influenced by the demands inherent to being a woman. Rise above those.
- Do not underestimate your abilities and self-sabotage your prospects.
- You must believe that you deserve equal opportunities as anyone else.
- Don't wait to be successful at some future point. Have a successful relationship with the present.

It is a privilege to be a doctor. It is a decision you make with your heart before you put your mind to it. Is it easy? No. Worth it? Absolutely.

I too was often confronted with the dilemma of choosing between professional goals and personal responsibilities. During the early years, children and family took precedence. There were times when quitting seemed inevitable, but my surgeon husband, backed me up all through. The barriers I faced were a consequence of gender-specific sociocultural expectations and I am fortunate to have never faced any bias, discrimination or disrespect from my male colleagues.

You will have to make difficult choices; your professional decisions will be influenced by the demands inherent to being a woman. Rise above those. If you are guilt-ridden both at the workplace and the home for not giving your best, you will end up doing just that. Do not underestimate your abilities and self-sabotage your prospects. You must believe that you deserve equal opportunities as anyone else. Don't wait to be successful at some future point. Have a successful relationship with the present. It is a privilege to be a doctor. It is a decision you make with your heart before you put your mind to it. Is it easy? No. Worth it? Absolutely.

We need imaginative, innovative students, quality teachers and better infrastructure. Elite institutions like the IITs, AIIMS and IISc were founded to be centres of innovation. The purpose is defeated when they choose to take the competitive exam-cracking achievers from coaching centres for whom rote learning is second nature and creativity alien.

Teaching is not the preferred career choice for the brightest minds. Amar Bose taught at MIT; how many IIT graduates do we have teaching at IITs? This needs to change.

In India we have the highest proportion of female graduates in STEM (43 per cent), but the lowest number pursuing careers in STEM (14 per cent).The high dropout rate is a definite consequence of assigned stereotypical gender roles and expectations as also of the system and policies. Policies need to accommodate career breaks that women have to take perforce, enhance re-entry options and develop infrastructure at the workplace that assists women with childcare. We need a change in the socio-cultural construct of gender that shapes the thought process of both men and women in our society. ■

Academic Profile

- MD Physical Medicine & Rehabilitation, Sawai Man Singh Medical College, Jaipur

Awards

- Dr PK Sethi Innovation Award 2010, Indian Orthopedic Association
- US-India Science & Technology Endowment Fund Award for Healthcare
- Wellcome Trust Grant for Affordable Healthcare in India
- Awarded for 'Innovative Practices' at the Zero Project 2018, UN International Centre, Vienna

Pradnya Desai

Managing Director, Accenture India

Pradnya Desai is an expert in the domain of technology architecture. She has deep transformation experience to drive change across global delivery IT services and is directly responsible for more than 2,100 professionals in this space.

My mechanical engineer father inspired me to choose the same field. When it was time for me to go to university, technology, electronics and computers were the buzzwords, and that inspired me to get my degree in electronics engineering with specialisation in robotics and telecommunications.

I started my career in a Netherlands-based product company as a product consultant. My first project was an implementation for a global aerospace company with enterprise architecture and integration on the forefront. It was my first onsite opportunity and a great start to my career with an open-world integration at a time when cloud and data platforms as concepts were still at a nascent stage. I, consequently, spent the next three years front ending projects across multiple industries for integration platforms as a product consultant. Soon I realised my true calling was in the space of design, product and platform development. That role led to the technology architecture space and that's how I joined Accenture in 2004.

My biggest focus area is changing the mindset of our people to be at the forefront of the digital revolution. Despite being a tech service provider, my team invests in automated platforms—moving from manual and automated testing to a quality engineering mindset. In 2017, I led a large scale offshore project with over 1,000 employees. This was the first account then to have achieved a gender-balance status. We received the highest sponsorship that led 80 senior women from our client organisation to mentor Accenture's women. I am also the Transformation and Automation Lead for Europe, overseeing 5,200 employees—a $125-million annual revenue responsibility.

- Women tend to overlook the importance of building their brand value.
- Find yourself a mentor; the guidance that you receive from an unbiased person can be invaluable.
- Never underestimate the power of networking. Take all opportunities to step out of your comfort zone.
- We need to bring in technology-related specialisations earlier in educational institutions.

While ambition is a great fuel to progress in career, it must be backed by a structure and a plan.

While ambition is a great fuel to progress, it must be backed by a structure and a plan. I use a technique called 'passive learning', which allows me to learn through observation. It allows me to absorb and learn multiple ideas together, ensuring that I can cope up with the ever-changing, fast-moving technology world.

I find that women, as they grow in their careers, often lose sight of the importance of continuous learning, which can hold you back in a tech career. This is something that I didn't let myself lose focus on. If there were phases where I felt out of touch, I took the time to retrain myself and stay relevant.

For women who want to be leaders, it is essential to define your brand. Women tend to overlook the importance of building their brand value. They shy away from discussing their achievements, expressing their points of view and sharing their experiences and ideas. If we don't do this, we will be lost in the crowd. Second, never underestimate the power of networking. Take all opportunities to step out of your comfort zone and go beyond your immediate network. Women often undermine the foundation years; be determined in ensuring that the learning continues, finding gaps and filling them. We all need help and support; therefore, if you can, find a mentor. The guidance that you receive from an unbiased person can be invaluable.

I have worked in campus recruitment over the years and have realised that all students should be enabled with experiences, assets and resources to enhance their learning. What I do observe is the lack of visual cues for our students—a visual display of what they can become if they pursue STEM. We need to offer them a vision, which includes many options other than the guy in a spacesuit or a lab coat. The application of science is quite weak in most educational institutions, where there is a stronger focus on theory and concepts. We need to bring in technology-related specialisations earlier in educational institutions, rather than at higher levels. ■

Academic Profile

- BE Electrical, Electronics & Communications, University of Mumbai

Achievements

- One of the 120 globally-certified Master Technology Architects in Accenture
- India's first MD to be recognised by Accenture as an Architect
- Jury Member at European Testing Awards, 2020

Pranati Sahoo, PhD

Senior Technical Engineer, Consumer Electronics, 3M India
Ex-Scientist, Axiom
Ex-Research Associate, Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam

Pranati Sahoo is a material science engineer. She applies her learning to solve real-world technological problems by synthesising novel materials with path-breaking applications.

I hail from Rourkela, Odisha's steel city. Growing up there fueled my curiosity in science and technology.

My academic journey started with a Master's course in chemical sciences where I was exposed to environmental and sustainable chemistry and interacted with prolific environmentalists and chemists. I interned at IGCAR. The experience was a turning point in my life, which answered my question of 'What next?'. By working closely on cutting-edge innovations, I realised that research was my forte. Luckily, I was able to secure a global outreach scholarship and admission in MS (Chemistry) in an American university. There, I was exposed to experimental science, and could synthesise novel materials.

Later, my PhD experience added a whole new dimension to my perspective. I was involved in making new materials called 'thermoelectric materials', which can turn waste heat to electricity. I was working on making them from scratch to characterise and them to understand their efficiency to meet the need. These materials have a wide spectrum of applications, from tiny wearables for soldiers to automobiles to space crafts, all of which need energy to thrive.

A lot of people have gone further than they thought they could because someone else thought they could. I have been lucky to have people who have inspired me and shaped my career: my family, which helped me dream; my teachers and my current professional mentors, who have supported me through ups and downs, showing me how to hone my leadership skills.

- Failure is a great mentor.
- Be a learner, not just a knower.
- A challenge only becomes an obstacle when you bow to it.
- Be different with your thought process; you will be valued for your thought leadership.

A lot of people have gone further than they thought they could because someone else thought they could.

I believe failure is a great mentor. I have learnt from experience that failure is a detour, not a dead end. To anyone who would like to venture into science and technology, I would advise them to be different with her thought process that she owns. You will be valued for your thought leadership.

A challenge only becomes an obstacle when you bow to it. Self-doubt often struck me. I always questioned if I was on the right track, if I am good enough or if I'm being heard. In the male-dominated scientific community, it is difficult to be heard and there is a chance of being lost in the crowd. What helped me was communication, which prevented me from being pigeon-holed.

Be strategic. It would help you immensely to sort through the clutter and find the best way out. It is a distinct way of thinking, having a big-picture perspective allows you to see patterns where others simply see complexity. Be a learner, not just a knower.

I would encourage all budding science enthusiasts to be passionate about innovation. Do not feel afraid of trying new things, learning from scratch, failing and bouncing back. Surround yourself with excellence that challenges you intellectually. This is especially important for women.

Giving women equal opportunities to pursue and thrive in STEM careers should be the focus of the government and the private sector. This will allow women to narrow the gender pay gap, thus enhancing women's economic security. Improving the hiring system, retention and growth and implementing inclusive work are other important enablers.

There are gaps in our education, especially in the way STEM subjects are taught. Despite having top-notch talent and capability, the exam- to score-focused education model is limiting students when it comes to innovation, problem solving and creativity. Educational institutions need to focus on creating awareness about the latest trends in the fields of science and technology as part of STEM curricula in schools and institutes of higher education to equip and build a future ready workforce. ■

Academic Profile

- MSc Environmental Chemistry, NIT Rourkela
- MS Material Chemistry, Advanced Material Science Institute, University of New Orleans, Los Angeles
- PhD in Material Science & Engineering, University of Michigan, Ann Arbor, US

Achievement & Memberships

- Nominated as Best Graduate for research accomplishments: TEG materials, University of Michigan
- Member of Society of Women Engineers, Society of Automotive Engineers

Preeti Menon

Senior Vice President, Happiest Minds Technologies.
Former Technical Director at AOL India

Preeti Menon has an experience of 26 years in the technology industry, leading large teams and delivering multi-million dollar projects. Her expertise lies in managing end to end delivery of products for IDCs as well as projects for independent software vendors (ISVs).

My father was the one who suggested I take up this field and urged me to join NIIT, while I had plans of pursuing my higher education in physics. I started my NIIT course along with my final year of under-graduation.

There have been multiple instances and people who have made a huge difference to my professional growth. Being selected to represent my first organisation and working with pharmaceutical giants to set up their 'adverse event tracking' workflows was one of them. I got this opportunity within the first two years of my career and this gave me a huge exposure and I understood requirement-based product customisation. I had the chance to work with excellent managers—Desikan, Shankar Kodumudi and Rajiv Jain—people I look up to and who gave me multiple opportunities to grow and excel. I've been continuously given new and challenging assignments at Happiest Minds, and these have helped me contribute back as well as grow professionally.

I'm responsible for customer delight and success of the Product Engineering Services (PES) team at Happiest Minds. I worked on business value generation for the company and implemented processes and mechanisms to track and improve product delivery, resulting in customer delight. This has led to significant growth and improved margins in the business. Our online delivery scorecard tracks key attributes and metrics helping us take the right action to provide quality deliverables within the agreed timelines.

- Women must aim for leadership positions, be confident, resilient and possess humility.
- There is no standard way of teaching STEM.

You need to strongly believe that you are as good as anybody else in this field.

As an organisation, we have created an environment, where technical knowledge and best practices are gathered and shared seamlessly. We focus on building a knowledge-based organisation, where members are encouraged to constantly learn and be on the cutting edge of technology. A lot of focus is given to building leadership from within. We focus on building an environment that's diverse and inclusive by identifying employees who have potential and providing them with the required training and mentorship to excel.

Over these past five years, we have had several women employees in the senior and technical management cadre. We have also been focusing on differently-abled onboarding members.

In my professional journey, tough experiences were a few, such as not being taken seriously and my opinions or suggestions being ignored. But they have made a huge impact on transforming me as a professional.

In my opinion, women must aim for leadership positions, be confident, resilient and possess humility. This field keeps changing, so believe in continuous learning and enjoy it. You need to strongly believe that you are as good as anybody else in this field. To attract more women into STEM careers, a lot of steps can be initiated at the policy level. Creating 30-minute mandatory courseware, where successful women talk about STEM and what they are doing currently, a strong mentorship programme in schools for young girls, focusing on creation of projects to be executed at zonal, state and country levels, having a few girls only teams, and availability of a credit system that would help them get into universities, are some.

There is no standard way of teaching STEM. It takes a lot to get students interested in STEM, and hence, we need to have standards as well as interesting certification programmes in place (level 1 to teach lower grades, level 2 to teach higher grades). It is necessary to generate awareness about such programmes and the various career options available. ■

Academic Profile

- BSc Physics, St. Xavier's College, Mumbai
- GNIIT, Mumbai
- Accelerated Management Programme, Indian School of Business, Hyderabad

Priya Kanduri

VP & CTO, Infrastructure Management & Cyber Security Business
Happiest Minds Technologies, Bengaluru

Priya Kanduri is a cyber security professional engaged in the development of next-gen managed security platforms offering proactive threat detection, security automation and data-centric security for new-age digital customers.

I was born and brought up in Tirupati and based in Bengaluru now. My passion for mathematics led me to take up further studies in computer science and engineering. The idea of what computers could do in the future fascinated me then. My mother has been a constant source of inspiration and the reason why I pushed my boundaries. I owe my success to my mentors, managers, customers and my team, which keeps me on my toes and motivates me to do my best. My company's chairman Ashok Soota has also been a constant source of encouragement. I have learnt critical aspects of career growth, such as having a long-term vision for the business and myself, from him. In my experience, the most critical success factor is having a strong belief in yourself and your vision, and achieving it through teamwork.

As the CTO, I am responsible for IP and innovation in IMSS business in my company. Solutions that we created have been recognised and awarded in multiple industry forums. I also carry the responsibility for the cyber security services business that contributes to 12 per cent of the company's revenue. I contribute to the company's diversity charter, and we have improved our diversity ratio by 10 per cent in the last two years. We have also managed to encourage many women to choose a career in cyber security; our number of women at entry levels now is higher than men.

- 'STEM jobs are not for women' is a myth.
- Women should prioritise networking, both personally and professionally.
- Every woman has her unique journey, which cannot be timed or compared with others'.

The constant doubt of whether I am giving my best both at home and at work was difficult to overcome.

Being a working mother to two daughters, I found balancing work and motherhood quite challenging when my children were young. I have always been in client-facing roles and had to travel extensively. Though it may sound stereotypical, the constant doubt of whether I am giving my best both at home and at work was difficult to overcome. One of the most challenging experiences I have had is when I cannot convince some of my women colleagues who decide to drop their professional careers or restrict their careers because of their domestic commitments or mental blocks.

In my opinion, women should prioritise networking, both personally and professionally. It is helpful to have a mentor who can be your sounding board for all your career debates. In my opinion, every woman has her unique journey, which cannot be timed or compared with others'. You need to enjoy the journey and stay focused on your goal of becoming a leader. I would like to specifically emphasise the importance of being a team player to be a successful leader.

The field of cyber security is all about fixing things that are not broken yet. To be a good cyber security professional, you need to pay attention to details, think on your feet, look at things holistically, keep up with trends and technologies, constantly upgrade your skills, think out of the box and have a hacker's mentality.

'STEM jobs are not for women 'is a myth. Both the government and the education board should introduce policies that debunk this thought right at the early stages of education. In addition to awareness campaigns, they should inform parents about the career prospects and the importance of job security, career growth and financial stability for women in STEM fields. For employers as well, creating a friendly and diverse workplace is crucial for organisational success and to inspire more women to pursue STEM careers and progress.

I would personally like to see the education system focus more on applied learning and refresh to match the current industry demands and trends and keep pace with global expectations ■.

Academic Profile

- B Tech Computer Science, SV University College of Engineering, Tirupati

Awards

- Women in AI, Trescon World AI Show, Dubai, 2022
- Women in Tech Award, Asia Pacific HRM Congress & Awards, 2021
- Recognition at the Business APAC Visionary Women Leaders, 2019

Dr Priyanka Narayan

Associate CPM Director
Clinical Leadership, IQVIA

Dr Priyanka Narayan has about 20 years of experience in clinical research in planning, execution, monitoring, risk, issue and quality management, and closure of clinical trials.

I was born and brought up in New Delhi. I completed my education till post-graduation in the same city. I have always been inspired by my parents. Coming from a small town in Bihar, my father went on to complete his PhD from the Nottingham University, UK. Post retirement, he teaches students of MBA in construction management at Amity University, Noida. My mother, a homemaker, taught me resilience, time management, multitasking and people management. I learnt to live my life with happiness, peace and satisfaction observing her all these years.

My first exposure to clinical research was with a non-profit pharmaceutical company called the Institute for One World Health. This was a Bill and Melinda Gates Foundation initiative working for an endemic disease, developing an orphan drug for treatment of kala azar. It is during this role that I developed a keen interest in the field of clinical research. This job offered me an opportunity to be in close contact with doctors who were treating patients on the ground and also interfaced with non-governmental organisations as well as the government departments working on providing social support needed to keep this disease at bay. It is here that I witnessed the great impact clinical trials can bring towards the management, eradication and treatment of diseases, and most importantly, to improving the quality of life of patients and their families.

Later, I worked with various clinical research organisations like Veeda Clinical Research, IQVIA RDS Pvt Ltd; and pharmaceutical companies like Daiichi Sankyo in various capacities. Most of my experience has been as a project manager, wherein I was responsible for planning, execution, monitoring, risk and quality management, quality management and closure of many clinical trials in different therapeutic areas like oncology, neurology, respiratory, cardiovascular, pain and inflammatory diseases.

Clinical research is an excellent option for passionate women who are inquisitive, and think out of the box.

I also recall an incident where one of my relatives was admitted to the hospital and needed treatment with a blood modulator. I was thrilled to know that the drug that was prescribed to them was one that I had worked on during its phase-III clinical trial. This was the only option that could be given to my relative in that condition. This was a first-hand experience that my work could have an impact on people across the globe.

It has driven me to work harder and better to bring newer treatments to the world and work towards improvement of lives. I feel proud of the various clinical studies that I was a part of, which led to successful drug discoveries.

I have not really had much adverse gender bias experiences as such in my professional journey Although there were some instances where people would probably ask questions to my junior male colleagues and not me; but in those situations, when I was able to address their questions with facts and examples, they gained trust in my knowledge and experience.

I have come a long way and now lead a team of 13 clinical research professionals from India and indirectly a team of more than 80 clinical professionals based in the Asia Pacific region. My advice to next-gen women who wish to be in leadership roles is: Follow your dream; believe in yourself; sit AT the table; and do not ever doubt yourself.

Clinical research is an excellent option for passionate women who are inquisitive, and like to think out of the box, learn fresh skills and acquire new experience through projects that they participate in. I now see many more young girls interested in STEM, passionate about mathematics, physics, space, and science in general. It would be nice to get some simulations or hands-on experience to add to their knowledge; exchange programmes with reputed organisations, colleges within India and international institutions can help in sharing knowledge and developing skills of young girls in STEM. ■

- Follow your dream; believe in yourself; sit AT the table; and do not ever doubt yourself.
- I feel proud of the various clinical studies that I was a part of, which led to successful drug discoveries.
- Exchange programmes with reputed organisations, colleges and international institutions can help in developing skills of young girls in STEM.

Academic Profile

- MBBS, Maulana Azad Medical College, New Delhi
- MD, Clinical Pharmacology, University of Delhi

Memberships

- Indian Pharmacological Society
- Indian Society for Clinical Research

Purna Airan

Site Quality Operations Lead (Sr. Director)
Pfizer, Vishakhapatnam

Purna Airan is a quality strategy expert and leads day-to-day quality oversight of commercial manufacture of sterile injectable products at Pfizer.

I was born in Meerut, grew up and completed my schooling in Modinagar, Uttar Pradesh. I was always interested in studying science as it intrigued me in many ways. It was during my master's degree that I came to develop an understanding of pharmaceuticals and decide to carve out a career in the vaccines or the pharmaceuticals industry.

When I entered the industry after completing my master's degree in microbiology, I realised that college education does not prepare individuals to work in the pharma industry. Education is mainly theoretical. I had to learn every process on the ground. Therefore, university courses must include general tests like bioburden, sterility, endotoxin and chemical tests performed in the pharma industry. Also, colleges must tie up with industries for internships so that individuals can have some industry experience before getting a job.

I started my career at Johnson & Johnson, India and had a brief stint there before moving to the United States, where I joined as a senior associate at Amgen. Later, I worked for a European regulatory body for which I audited medical device companies across the globe. I joined Pfizer in 2014 as a corporate compliance auditor in the United States. In 2016, I moved to India to lead manufacturing quality operations and investigations at Pfizer's sterile injectable plant in Visakhapatnam.

- Get out of your comfort zone, set your five-year goals.
- Defeat challenges and make bold decisions.
- Take charge of your career and treat it like a project.

In my career spanning over 22 years, I have held various positions of increasing responsibility in quality, regulatory audits and microbiology laboratory. I have worked in pharmaceutical sterile injectables, terminal sterilisation, and biopharmaceutical and medical device industries. I have thoroughly enjoyed all the aspects of the pharma industry, and continue to design and implement programmes that strengthen quality organisation, build capability and improve supply reliability.

In my current role at Pfizer, I undertook simplification of the processes, established a culture of quality and compliance while providing safe drugs to patients in a timely manner. I nurtured the development of colleagues and focused on increasing diversity at work place by introducing women to work shifts. All I strive for is excellence in every role that I take up and make a difference.

All I strive for is excellence in every role that I take up and make a difference.

I am a self-driven person. I love to challenge myself and solve problems that has resulted in my personal career growth. My self-drive has brought me to the position I am in today. As a woman, managing work-life balance, especially after giving birth to kids, has been my biggest challenge. Expectations from a woman in our society are very high. Society expects her to be the best mother, best wife, best daughter-in-law and best daughter; all this while managing professional career and growth. This attitude of society calls for a major transformative change. Some of it has already started to happen. But I feel we as a society still have a long way to go when domestic and professional lives are normalised equally for men and women.

My advice to next-gen women is to proactively and consciously take charge of their career and treat it like a project. Get out of your comfort zone, set your five-year goals, defeat challenges and make bold decisions to achieve your goals. In this process, you must be consistent and self-motivated. Nurturing your career along with doing justice to your family is difficult and requires sacrifice. It also requires support from mentors at work and family.

In the private pharma sector, women mostly work in general shifts that limits them to build a career in operations and engineering. Industries need to provide a safe working environment for women to work in shifts to enhance their career growth and offer significantly better opportunities. Women who wish to enter the pharma sector may start with getting a role in the industry and then learn the processes and procedures. Don't be in a hurry to switch jobs every year; focus on learning and delivering, and as an outcome, you will earn money and, most important, knowledge and skills that will prepare you to get into leadership roles. ■

Academic Profile

- BSc Life Sciences, Chaudhary Charan Singh University, Meerut
- MSc Microbiology, Gurukul Kangri University, Haridwar

Purnima Sharma, PhD

Managing Director
Biotech Consortium India Ltd., New Delhi

Purnima Sharma has 30 years of experience in technology evaluation and transfer, intellectual property rights (IPR) management, consultancy for setting up incubators and science parks, public-private partnership funding schemes, and entrepreneurship development.

I was born in Mysore and brought up in Punjab's Amritsar, Nangal and Chandigarh. I was a hard-working student and was interested in pursuing science in my academic life. I received academic distinction for securing second rank in the order of merit in my BSc as well as in MSc courses at the Panjab University in Chandigarh.

I was hugely inspired and supported by my late parents and husband to pursue biotechnology consultancy as a career option. Thus, my family has always been my driving strength.

I have been at the forefront of facilitating accelerated biotechnology commercialisation in the country for more than three decades. I have been spearheading innovation management, comprising patent portfolio management and technology evaluation, and valuation and licensing of intellectual property.

I have successfully facilitated more than 60 technology licensing deals and have guided technical training of over 5,000 biotechnology students in the industry.

- Women must find passion in their work and must not be afraid to step outside their comfort zone.
- Creating mentoring opportunities for more female students and professionals to connect with successful women in science will motivate them to pursue STEM as a career.

In addition, I have been instrumental in preparing a number of analytical reports on biotechnology, such as sectorial and status studies, market surveys, feasibility studies for setting up biotech parks in various states and technology landscape studies.

Women in STEM must not limit themselves only to their technical expertise. Knowledge about all related fields is equally important and is an investment in yourself.

I am a member of the number of national and state-level committees responsible for biotechnology development and commercialisation.

For women who wish to lead teams, it is essential to have confidence in your innate talent and a single-point focus on your goals. Women must find passion in their work and must not be afraid to step outside their comfort zone.

Women in STEM must not limit themselves only to their technical expertise. Knowledge about all related fields is equally important and is an investment in yourself. Adaptability to changing workplace ecosystems is an asset that helps individuals to flourish.

To my knowledge, the Indian government and the private sector are making concerted efforts to understand the barriers to female representation in STEM.

I feel attempts are already being made to sincerely address those barriers in a time-bound manner. The younger crop of women in science would benefit by these endeavours that highlight the contribution of women in leadership roles in STEM. Creating mentoring opportunities for more female students and professionals to connect with successful women in science will motivate them to pursue STEM as a career. ■

Academic Profile

- B.Sc & M.Sc (Honours) Microbiology, Punjab University, Chandigarh
- PhD in Experimental Medicine, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh
- Post-doctoral Fellow, IIT Bombay

Fellowship

- National Academy of Sciences, India

Award

- Vivek Chandrashekhar Memorial Award—gold medal and certificate for best research publication by PGIMER

Renu Agarwal

Deputy General Manager, Central Project Department,
Aditya Birla Group

Renu Agarwal is a process engineer with over 16 years of experience. She coordinates with suppliers and licensors, reviews technical documentation and manages projects, including feasibility study, planning and execution.

I was born and brought up in Janjgirnaila, a small town in Chhattisgarh. I did my schooling under the state board at a Hindi-medium school from Janjgir. I come from a middle-class business family where girls were not recommended to go for higher or professional studies, or to take up a job, especially in technical field. However, several people inspired me to take up this field. My personal interest was the major driving force that made me constantly excel in studies and opt for engineering. My school teachers, seniors and friends inspired and guided me.

My immediate supervisors and peers in all the organisations where I worked always encouraged me. There was one incident in Reliance Industries Ltd (RIL) when I wanted to leave the job due to personal exigencies, but my peer and lead supported me to take a short break, and resume once the situation settled down. This taught me not to give up, but to move on in life even when adversities strike you.

I started my career as a graduate engineer trainee in the process department in RIL Mumbai. I got exposure to work as part of the core team on major petrochemical, oil and gas projects in the world's largest refinery's expansion at Jamnagar. I also worked for Worley India Pvt Ltd. and Taaltech Engineering as the lead process engineer.

- Always keep learning and upskilling yourself.
- Always have confidence to try new concepts and ideas.
- Never underestimate yourself and make your voice heard.

Process department is the heart of any oil and gas company or a petrochemical or chemical plant. Being a core process engineer, I contributed in the area of the safety review of the plant design, looked after the review and preparation of various deliverables for process industries and carried out interdisciplinary coordination, technical audit, quality audit and mentoring.

Attracting and developing more women in STEM careers requires a company-wide change, driven from the top.

I was involved in training staff on software used for process discipline, preparation of process specifications, instructions and templates, and review of technical bid evaluation for equipment and instruments.

In the early corporate field, women employees are less likely to be asked for their opinions on the technical issues during discussions. I also experienced this trying to prove myself. When you become a mother, it becomes difficult to manage personal and professional life simultaneously. I remember, when I became a mother, maternity leave was only for 12 weeks with no further extension. I faced a lot of challenges in justifying myself in both the fronts.

So this is the wisdom that I gathered for women in senior and leadership: Always be yourself; don't worry about what others think of and say about you. Even if you were a perfect person, you'll still be misjudged by some others. Always keep learning and upskilling yourself. Always have the confidence to try new concepts and ideas. Never underestimate yourself and make your voice heard. Never stop learning and set boundaries around work.

Attracting and developing more women in STEM careers requires a company-wide change, driven from the top. While STEM careers remain male-dominated, the workforce is at last becoming more gender diverse and there are now women working across many of our sites and organisations. There have been a number of recent campaigns aimed at getting more women into engineering in general and into construction in particular. These are welcome and should be sustained.

The biggest shortcoming in the way engineering is being taught is many teachers are ignorant of the engineering skills used in industry, so they cannot relate them to their students or deploy them properly as part of an effective STEM strategy. As engineering and technology are applied streams in nature, they become elusive when taught without an industrial background. Thus, engineering courses must include industrial site visits and training programmes in the curricula for better understanding of skills used in the industry. STEM teachers should be offered some industry experience. ■

Academic Profile

- BE Chemical, Raipur Institute of Technology & Pt. Ravishankar University

Achievements

- Gold Medal in chemical engineering
- Subject matter expert, Pertamina refinery project, Worley Jakarta team

Ruchi Pandey

General Manager Technical, 3M India Limited

Ruchi Pandey has 17 years of experience in product development and application engineering in the field of adhesives, coatings and polymeric materials. She leads the converter market segment for the industrial adhesives and tapes division at 3M India Limited.

I have been interested in STEM since I was in school. STEM has always been my first choice for studying and building a career. I witnessed my seniors and elders doing well in this field and they inspired me. Many events too encouraged me.

When I developed my first lab prototype and launched the same product in the industry, I got a lot of appreciation. My first ever patent approval motivated me in a huge way. My first published standard in the Bureau of Indian Standard (BIS) gave me a feeling of positive accomplishment. Everyday excitement that comes from solving problems for customers using 3M solutions and supporting them with their requirements is what keeps me going with full energy and vigour.

I have developed and launched a variety of adhesives, tapes and coatings for the industrial and automotive market that have contributed to 3M sales of more than $100 million with 36 trade secrets and six patents (four have been granted).

- Women are natural leaders and are known multitaskers.
- All women must come forward and discover their capabilities and potential.
- STEM is the most powerful field to make an impact on business and society.
- Many myths about taking up STEM as a career choice for girls are getting busted.

In my current role, I am responsible for leading new product launches for India and the Asian region and application development for existing products for the electronics, appliances and automotive markets in the industrial adhesives and tapes division. Prior to 3M, I worked with organisations like Haldia Petrochemical Limited and GE Research Centre.

STEM is the most powerful field to make an impact in business and society.

We've collaborated with the 3M Germany team and launched 3MTM VHBTM LSE series tapes. Our team has commercialised tape portfolios for thin bonding applications for the Industrial market, label portfolios for general purpose, identification, tracking and tire label applications for the industrial market, new generation graphic films, paint replacement films and paint protection films for the two-wheeler and four-wheeler market.

Being a mother of two kids, I had to make many compromises on the professional front initially. I can certainly vouch women are natural leaders and are known multitaskers. If at home, most of the decisions are taken by women, then why should a workplace be different? I encourage all women to come forward and discover their capabilities and potential. There are many examples to highlight that women are doing wonders in leadership roles.

Today's society is grappling with problems that could be solved by STEM solutions. In my opinion, STEM is the most powerful field to make an impact on business and society. Being in the STEM field, one could be an agent of change, making our surrounding better for the future.

There are many myths about taking up STEM as a career choice for girls, which are getting busted every day with more and more women taking up roles in cutting-edge technology areas. The STEM field is interesting when you make it real through experiments. Our current pedagogy of science is theory-based, with great scope for practical experiments and problem-solving. Introducing this into the way science is taught will inspire the younger generation to think creatively, spark curiosity and develop a problem-solving mindset required to tackle the challenges of society.

Reforms should be brought in the education sector to provide more financial support to women in the lower strata of society. Awareness campaigns should be run across age groups to inspire more girls to take up STEM as a career choice. ■

Academic Profile

- BTech Chemical Engineering, Harcourt Butler Technical University, Kanpur
- MTech Polymer Science & Engineering, IIT Delhi

Awards & Membership

- 3M Genesis Grant, 3M
- Circle of Technical Excellence Team Award, 3M
- GE Scholarship, while pursing MTech
- Member of Adhesive Sub-committee of BIS

Sandhya Thyagarajan

VP, Strategic Electronics Business Unit
Centum Electronics Ltd., Bengaluru
Chairman, POSH Committee, Centum

Sandhya Thyagarajan has 30 years of experience in the development and delivery of many mission-critical modules, subsystems and systems for missiles, satellites, launch vehicles and radars platforms for the Indian Space Research Organisation (ISRO), the Defence Research and Development Organisation (DRDO), defence public sector units and ordnance factories.

My parents inspired me to be what I am today. My father guided me to take up technical education and my mother offered me abundant confidence and encouragement to chase my dream of taking up a difficult job as a manufacturing engineer, working in shifts, traveling and meeting targets under pressure, as she did all that for 33 years at the Bharat Electronic Ltd. The first person who recognised my ability and passion as a go-getter was Nicolas, a German who picked me from a bunch of fresh engineers and gave me an independent project of establishing a line. Then onwards, there has been no looking back.

When I joined Kodak as director of Kodak Operating Systems, a single profile, the CMD of Kodak India Limited promoted me as the head of entire operations within three months. I was pretty scared due to no prior experience. But I took that as a challenge to live up to their trust and confidence. I brought in at least five new projects and introduced many global practices. In the last 16 years, present Centum Group chairman Apparao V Mallavarapu has been a constant motivator and has trusted me on the significant technical changes in the defence, space and aerospace operations.

- Work smartly and passionately and develop risk-taking ability.
- Have a competitive spirit and become strong in your area of work.

Set your goals and don't let failures be your impediments. Maintain a balance between being empathetic, assertive and aggressive.

Prior to joining Centum, I gained experience in manufacturing and operations at leading electronics companies like Siemens, Ford Motor, GE-Medical and Kodak. I started as an automotive design engineer at Ford and was responsible for transfer of product lines from Brazil and Thailand to India. Subsequently, I led the entire business unit at Kodak as the director of Kodak operating system. From there, I progressed into developing processes in the manufacturing lines and then moved on to completely handling the essentials of operations management covering supply chain, program management and sales. People management has always been an embedded scope in my work journey. My areas of expertise cover manufacturing, quality, process, supply chain project management and customer relations.

Working long hours earlier in my career and even late into the night was a difficult task.

Traveling alone to far-off locations and leaving my child at home was another issue. Almost every time, I was the only woman (technical side) heading operations and dealing with men, I had to adjust or at times be quite uncomfortable dealing with different men—be it customers or suppliers or even a couple of colleagues. This made me bold, strong and determined to race with them and be a go-getter and acquire a must-win attitude.

Some of the shortcomings in how STEM is being taught are more theory, old syllabus and not connecting education to changing technologies. Also, the method of teaching is bookish and more scoring-oriented than fundamentals. There is no research orientation. Teaching staff are not getting upgraded with new methods, tools and topics. Not invoking thinking and solving skills is another major issue. Encouraging women's education, sponsorship or incentives can attract women to the STEM field.

My advice to the next-gen women is to work smartly and passionately and develop risk-taking ability. One needs to continuously upgrade oneself and be a people person. Maintain a balance between being empathetic, assertive and aggressive. Set your goals and don't let failures be your impediments. Have a work-life balance. Have trust and confidence in yourself. Create a solid backing at home in the form of a cook or caretaker. This gives you the mind-space to chase your dream. Have a competitive spirit and become strong in your area of work. ■

Academic Profile

- BE, University Visvesvaraya College of Engineering, Bengaluru

Awards

- Global Award for Kodak India

Saritha Poovanna

MD, Bosch Automotive Electronics India Pvt. Ltd.
Regional President for Automotive Electronics in Bosch India
Plant Manager-Technical, Naganathapura Plant

Saritha Poovanna has worked on introducing and ramping up multiple products, product relocations and new business models. She has mentored both men and women in leadership development and is an advocate of diversity across industry functions.

I had full family support for my choice of a professional degree in a branch that could be used in any kind of industry. In the early stages of my career, my managers mentored me in projects that optimised manufacturing costs, allowing me to explore the multiple facets of manufacturing. I was inspired by the growth, achievement and impact that some of my mentors had on the organisation and its success. This motivated me to opt for a career in the manufacturing industry.

I was always given equal opportunity and empowerment throughout my career at Bosch. My achievements were timely recognised, thus motivating me further. I was mentored at different stages of my career in formal mentoring programmes that enabled the development of my business skills and leadership competencies. The support and encouragement I got at the regional and global levels were key enablers to my growth in the organisation.

When I stepped into my first role as head of manufacturing, there was some apprehension about whether being a woman, I could handle the complexities of manufacturing and the demands it made on my time.

- Avoid self-doubt; you will know how successful you can be only when you try.
- Build a good support network for yourself—at home, at work and in the community.
- Seize opportunities of your choice that come your way.
- Challenge 'status-quo' and co-create improved business processes along with the team.

Women who strive to be leaders and make change must continuously learn and upskill to keep themselves relevant.

Over time, my collaborative efforts to meet key deliverables of all stakeholders, focus on organisational success and the development of my team members made my acceptance gradually strong. I have not faced any barriers as such in my professional journey. The challenge of making some compromises and finding an optimal balance between professional and personal priorities still exists.

I have led the plant to benchmark levels of integrated Lean and I4.0 across the value chain, resulting in awards and recognition at the national level and the global Bosch level..

My advice to next-gen women is to seize opportunities of their choice that come their way. Challenge yourself to work on topics beyond just your defined role, and strive to make an impact beyond organisational boundaries. Avoid self-doubt; you will know how successful you can be only when you try.

Build a good support network for yourself—at home, at work and in the community. This becomes more important when you try to balance professional, personal and social obligations. Network both inside and outside the organisation.

Learning, certification and employment opportunities, including in rural areas, especially in future jobs, should be introduced to promote participation of more women in STEM.

Strong commitment and policies that ensure visible role models, mentoring of women by women, support for mid-career prospects, industry-institute partnerships to nurture women in STEM needs to be done. There's a need for a balanced approach between imparting theoretical STEM education and ensuring exposure and experience in the real industrial set-up.

Integrated STEAM education (A = Arts), i.e, adding the humanities element to STEM, would make it more attractive to women as well.

Women who strive to be leaders and make change must continuously learn and upskill to keep themselves relevant. Be a 'hands-on' leader, who is not afraid to 'get her hands dirty' to address issues with the team. Lean on and draw from the expertise and experience of those around you. Challenge 'status-quo' and co-create improved business processes along with the team. ■

Academic Profile

- BE Industrial Engineering & Management, Rashtreeya Vidyalaya College of Engineering, Bengaluru
- PG Diploma in Business Administration (Operations)

Certifications

- Certified in Global Organisation Development, NTL Institute of Applied Behaviour Science
- Certified Internal Coach, Coaching Foundation India Ltd.

Satya Sarvani Malladi, PhD

Senior Director of Innovation, Kantar Analytics Practice, Chennai

Satya Sarvani Malladi is a business analytics professional. With her technical skills in analytics, basic statistics and concepts of optimisation, she has been driving measurable business impact at Kantar Analytics.

I was born and brought up in Visakhapatnam. My parents inspired me by example to always strive for excellence. They gave me unlimited confidence by enabling my interests in STEM subjects and by creating opportunities for me that transcend gender. My mother nurtured my penchant for mathematics since childhood. My mentor from BTech days, Prof C Rajendran, made me aware of the field of operations research as a potential area to pursue research. Women must focus on selecting a place where their core skills and expertise are valued and can be put to use.

I have played an active role in developing advanced solutions for optimisation in multi-touch attribution. I have worked on optimisation in marketing return on investment and in budget for growth (B4G).

I have been lucky to not have faced major tough experiences professionally. However, as a mom of a toddler, I have faced maternal guilt on some occasions. The guilt of leaving behind a baby in a nanny's care for my seemingly selfish intent of shining at my career engulfed me at certain times. To navigate these moments, cheerleading from my spouse and parents paired with assurance from others who have been through these phases helped me anchor myself. The advice here is to keep yourself emotionally balanced as you navigate motherhood while holding the baton of a successful professional career.

- Women must focus on selecting a place where their core skills and expertise are valued and used.
- Keep yourself emotionally balanced as you navigate motherhood and career.
- Seek opportunities to work on exciting fields instead of waiting around for something nice to come your way.

My boss once told me that anyone could ride into sunset years with expertise in one area. But constantly reinventing and equipping yourself with technical depth in orthogonal fields will add unique dimensions to your skill sets and present unimaginable career opportunities.

Never let your guard down on ensuring excellence of efforts, owning anything that you work on and assuming responsibility.

For women who wish to succeed in corporate careers, never let your guard down on ensuring excellence of efforts, owning anything that you work on and assuming responsibility. Equally important is the trait to accept and learn from your mistakes. Make yourself heard. Show your presence in meetings. Seek opportunities to work on exciting fields instead of waiting around for something nice to come your way. There has been no time like the present for the analytics industry. This space has very few people with theoretical underpinning and a practical mindset, making it a lucrative opportunity.

To increase participation of more women in STEM the government must try to catch them young. Science fairs, math competitions and internship programmes at the state and national levels inviting only female students will reduce some of the inhibition. To retain women in STEM careers, childcare facilities near office premises should be ensured. I feel the both the government and private sector must work in this direction.

A strong and effective STEM education in early years is the pivot for producing a competitive STEM workforce. Concepts of science and math during school are best understood by visualisation and experimentation. Screening documentaries containing biographies of and interviews with scientists for school and college students may inspire them. Students may be exposed to technology by organising visits to places like space research centres, physics labs, R&D cells and meteorology centres. Planning regular interactions with professionals from industry will help students get motivated to seek careers in technology innovation.

Most engineering courses are delivered without foundational depth, leading to superficial concepts in many students. Developing teachers and professors of high quality and strong conceptual strength with excellent presentation skills is the need of the hour. It is unfortunate that the education industry is not a high-paying one, making it less attractive to many interested and capable candidates. The government should set minimum pay associated with qualification and some continuous merit-rating system for teachers and college faculty that are comparable to industry standards. ■

Academic Profile

- BTech Civil Engineering, IIT Madras
- PhD in Industrial Engineering, Georgia Institute of Technology, Atlanta, US
- Postdoctoral studies at Technical University of Denmark

Fellowship

- Georgia Tech's Johnson Fellowship for graduate students, 2013-15

Shilpa Gupta

General Manager, India Engineering, GE Gas Power

Shilpa Gupta works as an executive leader and mechanical engineer with experience in leading engineering and business teams in energy, aviation and automotive sectors.

Born in Karnal, Haryana, I grew up in multiple cities like Pune, Hyderabad, Vijayawada, Mumbai and Bengaluru. My father was a physicist and worked as a scientist with the Department of Space. He was my biggest inspiration and my hero. In my community, women don't take up STEM, but my father inspired me and my sister to take up engineering. Despite it being unconventional 20 years ago, he was unfazed and ensured he got both his daughters into STEM.

I have also had strong and amazing mentors who helped me take the right decisions. The last person I give credit to is me. While you may get all the help from people around you, what finally makes a difference is what is within you—the strength of mind and character, thinking differently, taking risks, standing out, getting up after you fail and even building others as you grow.

Leaders that took a bet on me for the many roles I've done in the automotive, aviation and energy sectors inspired me in a huge way. Uncertainty and challenges have taught me to grow professionally. For example, I took up a business planning role at General Motors (GM). Being a technologist, I struggled at the beginning, and then spent time learning, listening and making changes to the way I think. It taught me that if you are willing to learn and work hard, you can grow even in a new domain. This learning agility has helped me navigate many industries, tyres, automotive, aviation and now energy. Being a life-long learner and not giving up when things get tough has been the best growth lesson.

- If you are willing to learn and work hard, you can grow even in a new domain.
- Be a lifelong learner and do not give up when things get tough.
- Be brave, take risks, and say yes to opportunities.

While you may get all the help from people around you, what finally makes the difference is what is within you—the strength of mind and character, thinking differently, taking risks, standing out.

The only time I felt the brunt of gender bias was when I had my son and lost a promotion that year. The perception that I would be okay with it and would let my career take a backseat was incorrect. So now, as a leader, whenever I have a team member going on maternity leave, I make sure I check during the promotion cycle for biases. Having a child is a life-changing event and a very vulnerable one. Many women drop their careers during that time. We should help them through that temporary phase so that they can break the perceived glass ceiling and move on to become senior leaders.

My key contribution in every role has been to take the team to the next level. There are always new areas that we venture into. For example, for gas power, I have led the team into energy transition activities and panel discussions on the theme. In the aviation segment, we employed data and physics instead of just physics (one software deployed for airline customers on image analytics) and had more than 70 patents in advanced technology (aviation) in my over two years with the team. I built external collaboration with academia, specifically with IIT Madras, to advance technologies in aviation.

Believe in yourself, have confidence; only then you can be a good leader. Be brave, take risks, and say yes to opportunities. Ask for help; nobody is perfect. STEM is an excellent field, and there are enough women role models to look up to. New-age technology is evolving in all STEM fields, and so don't lose the opportunity to be part of creating a better world.

More academia-industry collaboration must be fostered to showcase technology fields and to create awareness for STEM careers. Talks by women leaders to encourage girls to take up STEM must be organised in schools and colleges. We need more stories about women scientists in STEM in textbooks, and more media programmes showcasing strong women from STEM. ■

Academic Profile

- BTech Mechanical Engineering, Acharya Nagarjuna University

Awards

- GE Gas Power CEO Award for leading team through COVID-19 2nd wave
- GE India Leadership Award, WoW - Diversity & Inclusion Initiative
- President's Award, General Motors

Sruthi Kannan

Head of Cisco LaunchPad
Cisco Systems, Bengaluru

Sruthi Kannan works with deep tech start-up founders on fine-tuning their business strategies, co-creating end-to-end digital solutions, opening joint go-to-market opportunities and enabling funding prospects.

I am a strong advocate for start-ups that play a critical role in accelerating and amplifying the power of digital transformation. I am now engaged in orchestrating meaningful outcomes for start-ups in their scale up journey through Cisco LaunchPad. I have been recognised as one of the top ten innovators in India.

The power of technology attracted me towards computing as a career option. I was fortunate to receive the right guidance from my teachers at school and university, friends and family. In particular, my grandparents have had a huge influence on my steep and constant learning curve. They are my role models, as having battled several odds, they scaled new heights throughout their careers and continued to contribute to the society in impactful ways, even after retirement. A favourite saying of my grandmother has inspired me throughout: "Heights by great men reached and kept were not by a sudden flight. But they were toiling upwards through the night while their companions slept."

I mentored over 100 start-up founders in business strategy, technology architectures and global expansion. I am a member of the CII National Start-up Council and have advised the central and state governments on start-up policy decisions. I have worked as an honorary faculty at the CII Centre of Excellence for Innovation, Entrepreneurship and Start-ups (CIES). During the pandemic, I mentored start-ups working to provide critical ICU care in the Himalayas at Leh's SNM Hospital, and other cities, including Bengaluru and Nasik.

- Women must find good mentors in their professional network.
- Have a broad outlook, establish your niche in your area of expertise, acquire newer skill sets.
- The stigma associated with women resuming work after a maternity break is slowly dissolving.

I created the 'Kalki' platform, a metaverse for start-ups. In this virtual reality space, start-ups can not only demonstrate their solutions to customers and investors, but can also train users and facilitate remote maintenance. I launched the India-Technopreneurship Series, a powerful avenue to provide start-ups and aspiring student entrepreneurs from far-flung areas to become future unicorns.

Look beyond your desk and observe the real world live from closer quarters to discover opportunities, dream big and dare to succeed.

I suggest women find good mentors in their professional network. I wish to mention an anecdote : At the 2011 edition of the Connected Women Leadership Forum hosted by Cisco's Connected Women Employee Resource Group, I got the opportunity to not only hear from visionary leaders like Vinita Bali, but also to work with the core team of inspiring leaders and enthusiastic volunteers like Pallavi Arora, Sripriya Sridhar and Shaila Patil, who mentored and steered me towards many untrodden paths. Coming back into work force as a young mother served as a launchpad in my career.

As you ascend in your professional journey, it may get a bit lonelier. Finding the right people to network and building genuine relationships has been a challenge that I have faced. As a woman, I have had to strive twice as hard to demonstrate my capabilities and this has been an arduous task.

Advancing into leadership roles often requires one to be at the right place at the right time. Having a broad outlook, establishing one's niche in their area of expertise, acquiring newer skill sets, and building a strong network enable women to stand in good stead as they work their way into leadership roles. It is imperative to look beyond your desk and observe the real world live from closer quarters to discover opportunities, dream big and dare to succeed.

The government and private sector need to incentivise men in their endeavour to support women in their lives. The stigma associated with women resuming work after a maternity break is slowly dissolving. This needs to be extrapolated to accommodate for various needs at different periods of life. Regarding STEM education, we must stop being only theoretical. STEM teaching has to be made much more experiential and hands-on for students to experience its power. The entrepreneurial ecosystem, and in specific schools and universities should be equipped to play an enabling role in encouraging students to innovate in safe environments. ■

Academic Profile

- BE, Computer Science and Engineering, College of Engineering, Guindy
- MA Psychology, University of Madras
- Specialisation in Digital Transformation, University of California Berkeley
- Specialisation in Entrepreneurial Leadership, Stanford University

Memberships

- CII National Start-up Council, Executive Advisory Committee
- Start-up India Seed Fund Scheme
- Executive Committee of the Department of Science and Technology's NIDHI initiative

Shweta Jahagirdar

General Manager, Tata Motors Ltd.

Shweta Jahagirdar has more than 25 years of experience in the motor vehicle industry. She heads the electronics design unit at Tata Motors that involves design of various electronics aggregates in vehicles.

I was good in studies and it was my father who inspired me for working in a technical field right from my childhood. My father is my role model who motivated me at every step and always had my back when I would need it, especially during challenging times. My journey at Tata Motors has been long and eventful. I have spent close to three decades here. I joined the company as a graduate training engineer in 1995, just after completing my engineering degree in electronics and telecommunications.

My professional mentors at Tata Motors and my bosses were always an integral part of my career growth. They all made me learn the tricks of the automobile industry trade in India and helped me nurture my career even in critical environments like iron foundry and aluminium foundry, where I worked as the only lady engineer to set up the line. In a field that is otherwise dominated by men, my mentors gave me the confidence to achieve any critical delivery and always uplifted my spirit to prove my expertise and worth as a female engineer.

- Try and invent your own ways of maintaining work life balance.
- This the best age to break gender stereotypes and focus on deliverables not the gender.
- Enjoy womanhood as well as focus on good and quality career growth.
- We need policies that promote time flexibility to manage work and life together.

It was a tough decision when I decided to join the motor industry. I worked in a field dominated by mechanical engineering and in the area of diagnostics for many years in my career, when very few women close that area. I was probably one of very few women who had worked in shopfloor like foundry and press shop in my initial years at the company.

Try and invent your own ways of maintaining work-life balance, enjoy womanhood and focus on sound career growth.

I pioneered diagnostics and telematics in Tata Motors. Telematics is today the leading edge for leadership attributes at the company. I worked on 13 foundry commissioning machines within a very short span and worked on the Indica weld shop line set-up. I also became apart of the regulatory support at the company to ensure implementation of government regulations and standardisation. I am involved now in steps from component design to manufacturing and extending my work to support services as well.

My journey has been a mix of smooth and rough rides. The rough part was mostly because of the social-domestic role that is conferred upon a woman. A woman always expects an A+ in all the fields wherever she is placed. It is stressful to get that A+ everywhere, and this stress is the actual impediment for many women to enjoy, grow and prosper both in work and personal life. I had my share of bearing family pressure and trying to learn how to balance work and family. I have taken maternity and sabbatical breaks, trying to steal quality time for my children out of the work zone.

My advice to women is to try and invent your own ways of maintaining work-life balance, enjoy womanhood as well as focus on sound career growth.

For women who wish to join the motor industry, I have only one piece of advice: The world has changed since I entered this industry. This the best age to break gender stereotypes and focus on deliverables and not the gender. Give the best of your knowledge to the field you are working in. Forget about the majority workforce and focus only on the work you do.

The government and the private sector must promote women empowerment in the field of technology and science to think and innovate differently. This can be achieved by creating varied opportunities to attract more women in STEM careers. Policies that promote time flexibility to manage work and life together and provision of quality child care facilities to manage both simultaneously will be enabling in a huge way. ■

Academic Profile

- BE Electronics & Telecommunications, Cummins College of Engineering, Pune

Sindhu Gangadharan

SVP & MD, SAP Labs India
Head, SAP User Enablement

Sindhu Gangadharan has worked towards realising SAP's vision and strategy of the intelligent enterprise by orchestrating end-to-end process delivery roadmaps to rapidly transform data into valuable insights for customers.

I grew up in Bengaluru at a time when the city was on the cusp of a technological revolution. Many MNCs like SAP were setting up base in the city and redefining the popular culture for the youth. Growing up with brothers who were already into engineering, I was deeply inspired by the possibilities of technology and its immense potential to transform the world, and I chose computer science. I have been fortunate to have found some great mentors quite early in my career.

At SAP Labs India, our continuous efforts in the area of 'diversity and inclusion' (D&I) were published as a case study by the Harvard Business School. Separately, I recall the moment when I was tasked to head SAP's strategic and global Intelligent Enterprise Programme, reporting to the company's executive board. This role put me in the lead position to bring to life SAP's vision and strategy of the intelligent enterprise by orchestrating the end-to-end process delivery roadmaps to rapidly transform data into valuable insights for customers.

Third, organisations today are under immense pressure to rise to the occasion and leverage this unique opportunity to provide greater flexibility, without sacrificing productivity. The need of the hour is for a blended strategy that supports different parts of the workforce with combinations of in-person and distributed working. At SAP Labs India, we took this challenge and revisited our employee experience to create India's first hybrid workplace.

- Accept that there are no shortcuts!
- Neither your gender nor your background defines you or what you do.
- Women can have it all when they have an efficient management system in place—when they learn to delegate and let go.

If technology is your calling, own that journey. And once you do that, do not give up. So, identify your goal and resiliently work towards it.

I remember there have been times when I would be the only woman in a room full of male customers and fellow male engineers and would be overlooked in the conversation. During incidents like these, I would remind myself of the value I bring to the table that gave me the confidence to navigate these challenging situations.

If you are a woman trying to make your mark, the first and the most important point is to accept that there are no shortcuts. Second, empower yourself; no one will invest in you if you don't invest in yourself. No one will stand up for you unless you stand up for yourself. Third, build your support system. Women can have it all when they have an efficient management system in place—when they learn to delegate and let go.

Neither your gender nor your backgrounds define you or what you do; it is you, what you achieve, what you want to do—whatever that may be—that defines you. If technology is your calling, own that journey. And once you do that, do not give up. So identify your goal and resiliently work towards it.

Women must be and should be an important part of the STEM workforce. How do we bridge the gender gap in STEM? Several initiatives like SAP in India's Code Unnati are bridging this gap by offering a host of courses focused on IT skills development. SAP has partnered with the NITI Aayog to promote STEM education among secondary school children, especially girls. These initiatives aim to inspire girls from weaker socio-economic backgrounds to take up careers in STEM by building skill sets for the Internet of Things, data visualisation and key programming languages. We also need to retain these talents by creating more inclusive workspaces. SAP is the first multinational technology company to be awarded the global gender equality certification by the Economic Dividends for Gender Equality (EDGE).

There's a lot we can do to improve the quality of STEM education in our country. Increasing the training of STEM subjects in primary education, constant updating educational programmes at the pace demanded by the labour market, promoting experience-based learning in classrooms and workplaces, and equipping teachers with training and resources are important interventions. We can create advertisements through different channels, and for different audiences, that eradicate misconceptions about STEM education. ■

Academic Profile

- BSc Computer Science, Bangalore University

Awards

- Fortune Top 50 Most Powerful Women in Business
- Asia's Most Promising Business Leaders by *The Economic Times*

Somdutta Sinha, PhD

Adjunct Professor at IISER Kolkata & IISER Mohali
Ex-Professor, Department of Biological Sciences, IISER Mohali
Former Scientist, CSIR-CCMB, Hyderabad

Somdutta Sinha is one of the earliest researcher to start working in the interdisciplinary area of 'Theoretical Biology' in 1970s. She is lovingly been called by the younger generation as the "Grandmother of Theoretical Biology in India".

I was born in Kolkata and brought up in Shantiniketan. I lost my father when I was 11. My mother, who herself did not pass school, was insistent on our studies and stood like a rock when relatives questioned her on why should the girls study so much and not get married. My college teacher Prof. Samir Ghosh helped me with books, science magazines, science talent projects, and encouraged me to write articles in Bengali for scientific magazines.

My PhD guide's wife and my teacher Prof. Anjali Mukherji, who was a biology professor at JNU was a person who would always be by my side. Both my PhD guides, biologist Prof. Sivatosh Mookerjee and physicist Prof. J Subba Rao, encouraged me to explore the new area of theoretical biology. Prof. V Nanjundiah at IISc Bangalore gave me opportunities to work there and late P M Bhargava, PhD, the founder director of CCMB, had put faith in my abilities to give a faculty position right after my PhD.

I had particle physics and field theory as specialisations in MSc. I never had biology as a subject after Std VIII. Nobody thought about biological systems in a physics department. But while I studied, I used to wonder what physical laws control the arrangement of petals in a flower, or development of shape and structure in organisms. I am sure my thoughts were shaped by being in a beautiful place like Shantiniketan, surrounded by nature, music and art.

- Stereotyped roles for males and females need to be broken at the school.
- Independent thinking, focused plan for work and hard work to achieve goals are leadership traits.

I believe that a scientist has no gender— male and female brains are equally equipped to understand problems and ask questions.

I slowly got attracted to this new area and wanted to look deeper into it. I did some experimental work on pattern formation in hydra and also made models of daily rhythms. My guides gave me a free hand. This was both positive and negative, as I had nobody to help me and discuss with. I have worked on many different topics in biology–from genetics to ecology and epidemiology, along with its interactions with the society, economics, and environment. I have forayed into modelling biological systems at different scales, genome analysis using physical principles in computational biology, tissue pattern formation during development and analysing spread of malaria using mathematical methods.

In work, the general environment had been conducive and friendly, but when it came to giving support staff, nominating for awards and offering promotion, I did not get the support that my male colleagues got. In committees, most of the time I was the only female member who had to make an extra effort to be heard. I never signed on the dotted line without asking questions. That made me a 'difficult person' to many in positions of power.

Independent thinking, focused plan for work, hard work to achieve goals set by oneself and having the courage to speak against the tide if one finds it right are the traits leaders must have. There are both alpha males and females in science, who will patronise those who will only listen to them. I believe that a scientist has no gender–male and female brains are equally equipped to understand problems and ask questions.

Everything starts at the school. Stereotyped roles for males and females need to be broken there. Girls should be encouraged to take up science as their study area and career. School teachers need to be trained to inculcate scientific temper in children. Special fellowships to bright girl students to pursue science in school and college will be an additional attraction.

Special emphasis in maintaining equitable gender ratio in the faculty is another way to increase women's participation. The private sector can offer internships to women science students so that they get exposure and get attracted to such careers. ■

Academic Profile

- BSc (Hons) & MSc Physics, Visva Bharati University, Santiniketan
- MPhil & PhD, School of Theoretical & Environmental Sciences, JNU

Awards

- INSA Honorary Senior Scientist Award, 2022
- National Women Biotechnologist Award (Senior), DBT, 2013
- J C Bose National Fellowship, DST, 2012
- Raman Research Fellowship, Mathematical Research Branch, NIH, US
- National Science Talent Scholarship, India, 1969-1982

Subha Tatavarti

Chief Technology Officer, Wipro Limited
Governing Board Member, Openssf.org
Former Head of Data Product Platforms, PayPal

Subha Tatavarti has a rich experience in data-product platforms and technology commercialisation. She leads innovation-R&D, assets and platforms buildouts, talent cloud, technology strategy at Wipro.

I was born in Rajahmundry, Andhra Pradesh, and grew up mostly in New Delhi and a few other cities across India.

My inspiration cannot be tied to a single individual; rather my curiosity has led me to a career in technology.

I was greatly influenced by my parents' quest for knowledge and an attitude centred on life-long learning.

Throughout my education, I found myself wondering, 'the how and the why' behind everything. My career began to evolve with my curiosity leading the way.

I have always believed that you are your biggest advocate. Throughout my career, I have been open to feedback and transparency, and therefore, I can correct my course as needed to turn the best leader and individual contributor that I can be.

The tough barriers in my professional journey have been primarily believing in yourself and knowing that one is good at what she does. I needed to give myself the permission to be bold and ambitious and think that it was possible.

- You are your biggest advocate.
- Overcoming any label and inventing oneself is critical.
- Focus on what drives you as an individual regardless of the field you wish to enter.

You alone can be your biggest and best champion for professional growth and success.

The social conditions and norms were internalised to an extent where I would not believe my mentors who called out my strengths.

That changed when I gave myself the permission to chase audacious goals. Another challenge was the labelling done by others based on personal bias or experience..

The realisation that the labelling is done by them and not you is important. Overcoming any label and inventing oneself is very critical.

My advice to next-gen women who wish to be in leadership roles is to focus on what drives them as an individual regardless of the environment or field them wish to go into. You alone can be your biggest and best champion for professional growth and success.

I have always led myself with the question 'Why?', which has allowed me to not only understand legacy of successful thought processes, but also drive change.

Continue to push boundaries by letting your curiosity be the avenue that leads to new opportunities and growth.

In keeping with what personally drives me to participate in this field, there isn't a single action that will change someone's personal desire to pursue a career in STEM.

More exposure to STEM at an early age will offer women the opportunity to explore and learn whether this might be something they are passionate about.

We have made great strides in the STEM education system. However, there are always opportunities to bring STEM more into the forefront.

If we could weave STEM more seamlessly into the future curricula and daily activities, that passion will have more avenues to grow and prosper. ■

Academic Profile

- MS Computer Science, George Mason University, US

Suma MN, PhD

Technology Manager, Electrical System, GE Research, Bengaluru
John F Welch Technology Centre, GE India Industrial Pvt. Ltd.

Suma MN leads a team of more than 30 researchers in power systems, power electronics, embedded controls and monitoring and diagnostics. She drives next-gen technology innovations in areas like high-power density converters and controls for wind turbines, electrified flight, wireless power transfer, grid integration technologies and grid forming controls.

I was born and brought up in a small village in Cochin, Kerala. My father was my first inspiration and taught me and my sister simple tips and tricks for doing mathematical calculations. My physics teacher helped me to broaden my perspectives and gain experience by enrolling in science fairs, projects and science magazine subscriptions. My biggest inspiration was meeting in college a senior physics professor, who later became my professional coach and mentor. He influenced me into opting for physics and oriented me towards the field of electrical and electronics as a career option.

One of my mentors advised me to play to my strengths, invest in continuous learning and focus on taking a step at a time to own my destiny. The key takeaway for me was not to worry about the destination, but enjoy the journey itself and growth will follow.

I am the first woman in my village who pursued a career in STEM, earned a PhD degree and joined a corporation. My toughest challenge was to break some of the stereotypical biases the society had about women pursuing PhD, taking up a corporate career and relocating to a different city for a job. My parents were quite supportive of my dreams and helped me break some of these biases.

- Be resilient; there may be tough challenges and setbacks in your way.
- Be humble and have a growth mindset.
- Continuously upskill yourself to adapt to emerging capability needs.

I made significant contributions towards electromagnetics applications like electrical machines, induction heating, wireless power transfer and microwave sensors. I am an inventor with many patents (over 50) in these technology areas. I was a pioneer in developing wireless power transfer portfolios for GE and led the technology development for various GE internal and external applications. I have been a key contributor to the microwave sensor development for Safire 2.0 multiphase flow meter.

Have a positive attitude, balance your emotions and learn from failure.

The electrical and electronics discipline is a growing area as the world is moving toward a greener and more sustainable future. Electrification trends are driving new technology innovations; this is the best time to be in this field. Keep yourself updated about the new technology trends, and their impact on society, the economy and politics. Continuously upskill yourself to adapt to emerging capability needs. It's important to build depth in an area you are passionate about and also learn how to work effectively with a diverse multi-disciplinary team.

Be resilient; there may be tough challenges and setbacks in your way. Having a positive attitude, the ability to balance your emotions and learning from failure would take you a long way. Be humble and have a growth mindset. Always be curious, learn from different experiences or stretch assignments, and keep your mind open and curious to learn from people around you.

Attracting more women to STEM careers requires a concerted effort by employers, educational institutions, policymakers and society at large to create an inclusive environment that is truly empowering for women. Policies that encourage young high school girls to get exposure to STEM fields, workplace policies like equal pay for equal work, and policies and processes to remove human bias in the way we attract talent, retain and promote them will have a huge transforming impact.

STEM requires adaptive and creative teaching methods as opposed to conventional methods of sharing information. STEM education lacks bridging the gap between the classroom and real life; thus pedagogy approaches that encourage scientific thinking and problem solving are required. If the subject matter permits, encourage students to do a project from start to finish where they can apply their knowledge and learn new skills. This enables creative thinking, teamwork and leadership skills. Continuous improvement in the teaching curriculum and methods is required to adapt to the progress that is happening in STEM disciplines. ■

Academic Profile

- MSc Electronic Science & PhD in Electromagnetics, Cochin University of Science and Technology

Awards & Memberships

- Hull Award, Recognition for early-career achievements and technical contributions to Global Research and GE
- CTO Award for Leadership
- IEEE Senior Member
- Technical Member & Industry Expert, Wireless Power Consortium

Suneela Thatte

Vice President & Head of R&D, Merck KGaA India

Suneela Thatte drives the development and expansion of the Merck Healthcare R&D Excellence Centre in India. Her focus areas are execution of R&D strategies, developing a talent pipeline and building a strong Merck brand.

I was fortunate enough to have found my role model and utmost inspiration right by my side at my home while growing up. My mother is a pharmacist and has had a very fulfilling career in the pharmaceutical industry. I was inspired by her and always wanted to be part of the healthcare industry. As I started working in the clinical research and drug development field, I had an opportunity to interact closely with clinicians and realised the importance of having solutions in place for unmet medical needs. This made me passionate about this field, given the opportunity it offers to make a difference to human lives.

After completing my post-graduation degree, when I started looking for career opportunities, in spite of having an excellent academic record, I had to face many rejections based only on my gender. But that further strengthened my resolve to make an impact in the industry and I decided to support talented women professionals in having a fulfilling career.

However, once my career took off, I have been working towards driving customer satisfaction and improving operations at the companies I worked with. In my role as Vice President, Global Operations, at Quintiles Research (India) Pvt. Ltd., I served as the link between key customers and the company, overseeing the consistency of global operational excellence. I drove customer relationship to achieve partnership objectives and explored newer partnering opportunities. In addition, I set up Quintiles operations in Sri Lanka.

- Put your hand up for newer challenges.
- Build your professional network.
- Build your own professional brand.
- Seek mentorship and be mentors to juniors.

Create networks of successful women professionals who can be advisors for budding women professionals and leaders.

At IQVIA (formerly Quintiles Research India Pvt. Ltd.), as the Vice President and Head, R&D India, my role was to manage clinical development business in India and achieve financial goals across three business verticals. I led policy and regulatory advocacy for the organisation and the biopharma and clinical research industry.

From my experience in the pharma industry, I wish to share certain tips with women who would like to make it big here. Plan your career and strive to have a balance in your work and personal space. Put your hand up for newer challenges; it is difficult in the beginning but rewarding in terms of skills that you acquire as a part of the process. Build your professional network; it is important for you to gather information on what is happening in the industry and where your scope lies.

It is of huge importance to develop expertise in your field. Our work is all about saving lives and improving the quality of life of patients. Thus, build your own professional brand. Seek mentorship and be mentors to juniors.

To promote women in STEM, we need to create networks of successful women professionals who can work as think tanks or advisors for budding women professionals and leaders. On the STEM education front, policies need to focus on providing students opportunities to work alongside industry in making the curricula more aligned with the industry. ■

Academic Profile

- MPharma, Mumbai University
- MBA, TASMAC, Pune

Awards & Memberships

- Lifetime achievement Award, 2019, Indian Society for Clinical Research
- Healthcare Luminary 2017, Healthcare Business Women's Association, US
- President's Club award
- Former President, Indian Society of Clinical Research
- Member of FICCI Clinical Research Task Force
- Former Co-Chair of the Medical and Regulatory Task force, Organisation of Pharmaceutical Producers of India
- Member of CII Pharma Committee

Dr Swati Piramal

Vice Chairperson, Piramal Group & Director, Piramal Foundation, Mumbai
Board Member, Nestle India, Allergan India & Essilor Luxottica
Board Member of Dean's Advisors to the Harvard Business School, Harvard School of Public Health & Harvard's Global Advisory Council

Dr Swati Piramal studied medicine, and later steered the drug discovery research and development at the Piramal Group. She is a pioneer in providing cost-effective healthcare solutions.

I was inspired to take medicine when as a young girl, I saw a doctor save the life of a baby in my family. Though I was raised in a business family, my parents encouraged my decision to pursue a career in STEM. When I went to Harvard for my post graduate degree in public health, I met people from all over the world, and that really opened my mind to novel ideas and new ways of doing things. My constant quest for excellence, perfection, innovation and new technology took root at Harvard. After I came back, I soon started my own research centre with over 500 scientists exploring new drugs. It was this start that opened new vistas worldwide.

Over the past three decades, I worked on providing cost-effective and science-based healthcare globally, and our group emerged as one of the largest global producers of drugs. I founded the Gopikrishna Piramal Memorial Hospital in Mumbai and launched several pan-India public health campaigns against chronic diseases, osteoporosis, malaria, diabetes, tuberculosis, epilepsy and child immunisation.

As the director of Piramal Foundation, the philanthropic arm of the Piramal Group, I am deeply involved in developing innovative long-term and scalable solutions to resolve issues like public health, water, education, tribal health., I served as the first woman president of the Associated Chambers of Commerce and Industry of India in 90 years.

- Women make good leaders owing to their inherent resilience.
- It is essential to eliminate gender bias in teaching materials and strengthen the school STEM curriculum.
- Having a mentor is crucial.

As director of strategic alliances and communications, I managed pharma company Nicholas Piramal India Ltd. My responsibilities included R & D, information technology, medical services and knowledge management.

I faced a few roadblocks in my professional journey. When I pioneered intellectual property, a lot of people did disagreed. An association of pharmaceutical companies in India ousted me because I had completely different views than others. It took them ten years to change their minds, and everyone started believing in innovation.

Your strong beliefs and core ethics will help you stand the test of time, especially when you are confronted with difficult situations.

When I started my career, male dominated STEM fieldsThe word 'resilience' always comes to my mind. Women make good leaders owing to their inherent resilience. Always be eager to learn new things from people around you. 'Being yourself' entails embodying the ideals you hold dear and allowing them to influence your behaviour. Building consistency early on in your career will benefit you as a leader, your strong beliefs and core ethics will help you stand the test of time, especially when you are confronted with difficult situations.

Women in STEM must have a competitive outlook and should have the constant urge to learn. STEM as a sector is continually evolving, but having a mentor is crucial. Look for a mentor who is also your role model and work with them to reach your full potential. Today, I am a proud parent as my daughter heads our pharmaceutical business and my granddaughter, 10, is good at coding. This is like passing the baton of STEM over generations.

Gender mix is heavily skewed in favour of males in the STEM sector. Efforts are currently under way to encourage more young girls to enter and stay in STEM fields. As a leader, I created a conducive work environment for women, ensuring it was merit-based, established sound team processes and ensured safety during late work hours. It is essential to eliminate gender bias in teaching materials and strengthen the school STEM curriculum. Practical experience, design-based learning and out-of-curriculum STEM activities, especially for girls, hold promise.

I would recommend policy intervention during early years of education for promoting STEM. Teachers can also introduce students to initiatives that promote the role of women in STEM. Examples include Girlswhocode and the National Girls Collaborative Project. The private sector needs to provide financial grants, mentoring opportunities, internships and apprenticeships. ■

Academic Profile

- MBBS, University of Mumbai
- Master's Degree in Public Health, Harvard Business School

Awards

- Padmashri, 2012
- First Ladies Award by the President of India, 2018
- Global Empowerment Award, UK, 2011
- Rajiv Gandhi Award for Outstanding Woman Achiever, 2007
- Chevalier de l'Ordre National du Merite, France, 2006

Usha Barwale Zehr, PhD

Chairwoman & Executive Director, Grow Indigo Pvt. Ltd.
Chief Technology Officer & Director, Mahyco Pvt. Ltd., Jalna, Maharashtra.

A trained plant biotechnologist, Usha Barwale Zehr is working on providing cutting edge technological solutions to protect the interest of smallholder farmers.

I was born and brought up in Maharashtra, a state known for its strengths in agriculture. My inspiration has been my father, who encouraged me to study science, and my mother, who always emphasised the value of education. My PhD supervisor Jack Widholm had a commendable role in encouraging my professional growth. American inventor and engineer Charles Kettering once said: "High achievement always takes place in the framework of high expectation." When I look back, I realise how true this quote is. Let me elaborate this with my experience.

My PhD advisor was a hard-working scientist. He grew up on a farm, but later entered academics. While being a university professor, he farmed more than 10,000 acres. He was always supportive as I was willing to work hard. His expectation and goal was to transform his students as experts in their respective research areas. This high expectation was a driver to ensure that I was always well versed in my subject matter and creative in addressing my research problems.

I was trained as a plant biotechnologist and my research focus was to address some of the challenges faced by smallholder farmers. My work revolved around insect tolerance, disease tolerance, shortening the product development cycle by deploying molecular tools and using a combination of these tools to deliver improved seeds, which the farmers could plant and get benefitted from. Insect-tolerant Bt brinjal is such an example. It is now cultivated in Bangladesh, where insecticide use on brinjal crop has dropped by over 95 per cent, apart from a significant increase in marketable yield.

In the last four years, I have taken up a new responsibility to address the challenges around sustainable agriculture. We are working on adopting digital solutions to eliminate challenges in the agricultural value chain. Smallholder farmers can least afford the negative impact of climate change. We are exploring innovative ways to restore soil health, reduce chemical inputs and create transparency in the marketplace to get the most value in farmers' hands.

- There are not so many women scientists in agriculture and the opportunity is immense.
- The rigid structure of our education system, especially in universities, needs to change.
- Career guidance must begin at a young age to promote women in STEM.

The government needs to focus on policies that incentivise both men and women to support gender balance initiatives.

I have always been fortunate enough not to face any barriers or tough experiences as many women in STEM would do otherwise. I had an extremely supportive family environment that encouraged my decisions and independence to pursue whatever I wanted to and I continued to enjoy such support at the university level as well. When I look around at schools today, I see young women performing well everywhere. There is abundance of opportunities for young women and hence they must strive to emerge as future leaders. Four attributes are critical in a leader: self-belief, persistence, trustworthy behaviour and strong interpersonal skills.

With advances in science, the line between different disciplines has significantly blurred, creating more diverse opportunities for women in agriculture. For example, plant breeding is largely a field activity, but today it is combined with use of molecular fingerprints, drone technologies, machine learning and much more. STEM opportunities in agriculture include a broader basket of skills. For women who wish to pursue agriculture, inculcating new skills, developing a basic understanding and real depth in the area of interest is what will lead to success.

There are not so many women scientists in agriculture and the opportunity is immense. It is a field where one can make a direct impact on availability of food, health and nutrition, impacting rural livelihoods.

To promote women in STEM, career guidance must begin at a young age. We need to create broader awareness of STEM careers beyond young women desiring to become doctors and engineers. Our education system's rigid structure does not allow switching from one discipline to another. This needs to change, particularly at the university level, to allow students to choose subjects with flexibility. For teaching STEM subjects, a more practical, hands-on learning approach needs to be broadly implemented in schools. The Atal Tinkering Lab is one such example. More programmes like this are needed. ■

Academic Profile

- MS and PhD (Agronomy), University of Illinois, Urbana-Champaign, USA
- BSc, University of Bombay

Veena Panicker, PhD

Director, Biomonitoring, Science & Lab Solutions
Merck Life Science, India

Veena Panicker heads the microbiology business unit in science lab solutions of Merck Life Science, which provides solutions for microbial quality control assessment, critical in the pharmaceutical and food segments.

Life science studies have a direct impact on the health and well-being of people. Therefore, I chose this professional path as I am passionate about science and its applications. My job allows me to meet different professionals who are committed to scientific pursuits—both academic and commercial. What inspires me is the difference that the solutions we provide make to our customers. Every day I get to meet different scientists and industry professionals who contribute to my knowledge and that's what motivates me; it's a continuous learning process.

Being a part of my customer's success story is the real motivating factor. Technical sales management helps to live out my love for science as well as connect with people.

My first appointment was with Ciba Geigy as a medical representative in 1996. My stint in sales continued as I joined Johnson & Johnson in the life scan, diabetes management field. I further explored marketing with assignments at Allergan and Millipore, which helped me hone my skills as a marketing professional in the life science realm. Product portfolio management and people management skills were sharpened during my assignment at Thermo Fisher Scientific.

- Hone your technical selling skills, be digitally savvy, stay abreast of innovations and go ahead.
- Encouraging curiosity in educational institutions would help enhance innovations.
- An application-based curriculum will help in connecting theory with reality.

My advice would be to get rid of self-doubt, and just take the plunge when opportunity beckons.

In my current role, I am engaged in strategic long-term planning, commercial marketing, empowering leadership and digital engagement. I devised strategies of for keeping the team engaged and motivated and being a part of Merck skill development activities. I worked towards skilling science graduates to be industry-ready.

When I started my career 20 years back, the situation was not like how it is today in terms of ease of travel, stay at some remote locations and general well-being of the women workforce. Additionally, there was a barrier, especially in the minds of people and colleagues, to view women as seasoned professionals. I remember that in most meetings and sales conferences, women were a minority. The incredible support of my parents, spouse and colleagues along my journey helped me tide over the challenges successfully.

Today technology has helped women take bold steps without compromising on the overall experience of both career and motherhood. I think this is the best time for all women who aspire to take up career choices within STEM to take the plunge and contribute.

My advice would be to get rid of self-doubt, and just take the plunge when the opportunity beckons. Maintaining sound mental and physical health does help.

There are many inspiring women leaders in life science today. For all women who are thinking about a sales and marketing career, eventually leading to a business leadership role, just hone your technical selling skills, be digitally savvy, stay abreast of innovations and go ahead. A strong academic background in biology or chemistry will always be an added advantage.

Entry into a STEM career must be guided by a strong passion for science. Making science attractive in schools and colleges can go a long way in creating the spark. Access to a well-equipped laboratory, where students can experiment, can lay a strong foundation that can take them afar in scientific pursuits. Creating more employment options both as an entrepreneur and in the private sector would help. Recognising and celebrating the achievement of scientific entrepreneurs can make this segment very attractive.

Encouraging curiosity in educational institutions would help enhance innovations. Increased interactions with industry fraternity with the student community can help mould the path for future scientific pursuits in young students. An application-based curriculum will help in connecting theory with reality and that will help us achieve useful outcomes. ■

Academic Profile

- BSc Chemistry, Microbiology, Mangalore University
- MBA Marketing, Mangalore University
- PGDBM Human Resources, All India Management Association (AIMA)
- PhD in Business Administration, AIMA, Aligarh Muslim University

Vidya Shivashankar, PhD

Executive, Advanced Design Tools, GE Aviation

Vidya Shivashankar leads the team that builds software that engineers use to design various products for diverse use and application.

I was born in Bengaluru and lived there until the age of four when I moved to Dubai along with my family and did my schooling there. I returned to India for my Bachelors at IIT Madras. Thereafter, I went to the United States for higher studies and returned to India to work in GE's research wing for five years and then moved to its aviation business

My first inspiration was my father, a civil engineer. He used to spend hours every week poring over blueprints for different sites and I always found the connection between math, science and physical product intriguing. That is what drew me to engineering. During my graduate studies, my advisors greatly influenced my thought process.

During my post-doctoral work, I had started thinking more about applied research. However, I didn't have the courage to take the leap from academia to the industry. My post-doctoral advisor encouraged me to take that leap.

At GE, while I had just become a mother, I was thinking about accelerating my career growth. One of my mentors told me then that the story I tell myself about why I do something is what is most important. If I weaved the same facts into a story of guilt, I'd not be able to reason what I am doing; whereas if I weaved the same facts into a story of grit and resilience, it'll fuel me along my journey. I learnt that day that I am in charge of the narrative of my life and I can spin the story I want through the events that happen. It's been liberating to use that tenet to fuel myself with positivity and perseverance.

- We all need to be patient, learn as we fail and keep taking baby steps every day.
- You can do it. That attitude along with a great support network can make mountains move.

Find a field that you are passionate about. If you have a purpose around what you do, even the tough days will be fun.

In my current role, I look at two areas – the first is with regard to the business my team supports. The second area where I am laser-focused is on my people. I believe in the value of a high-performing team that is driven by purpose and finds working on our products rewarding.

I am fortunate and can say that I haven't faced any barriers as a woman. I did feel challenged once, after I had my first child and I was struggling to find my way back into work full-time. GE noticed this challenge for new and returning mothers and helped me along with a group of passionate volunteers craft a programme for women and their families as they go through maternity.

My advice to next-gen women who wish to be in leadership roles is this: You can do it. That attitude along with a great support network can make mountains move. I believe that every person has a unique story and the same formula won't work for everyone. So we all need to be patient, learn as we fail and keep taking baby steps every day. My advice for women who wish to take up any career (not necessarily in my field) is find a field that you are passionate about. If you have a purpose around what you do, even the tough days will be fun.

Dig into STEM, you will realise that it is one of the most logical and straightforward areas. We need to make STEM fun for children and combine application knowledge with theoretical knowledge so that children learn to use these concepts in their day-to-day lives. While there is a lot more that can be done in this place, I see schools are indeed adopting a learn-and-apply in concert model. While in university, I would encourage all students to do internships of some sort to get hands-on experience with how what you've learnt connects with the real world. This builds a wealth of perspective that can help you in deciding how you'd like to grow your career. ■

Academic Profile

- BTech, IIT Madras
- MS & PhD, Washington University, Saint Louis

Fellowship

- James McKelvey Doctoral Fellowship

Vinnie Jauhari, PhD

Learning & Skills Lead, Microsoft Corporation India Ltd., Gurugram
Former Professor & Director at IIMT (Oxford Brookes University), Gurugram

Educationist Vinnie Jauhari manages strategic engagements across evangelism and skills programmes in K-12 and higher education. She has enabled building a global research community on services management and innovation in education.

I have always been passionate about education and my family has been very supportive in my mission to make meaningful contributions to that realm. The key thought that has always inspired me is to positively impact lives of others and focus on excellence in every single endeavour. I have always enjoyed my work in education—training, research, teaching, building learning communities and thought leadership programmes for bringing in change. The recognition of my work inspired me to keep experimenting with new initiatives. Shaping and influencing my colleagues and academic teams to set up new benchmarks and creating an environment of excellence where everyone grew professionally were quite rewarding. In the industry, empowering students and teachers and seeing their impact on communities was satisfying as well.

A career in education can be rewarding if your heart is in it. The ability to be in a learning mode and contribute to the lives of so many people itself is a great feeling! I have managed and empowered teachers, research communities in education; driven curriculum development efforts in higher education and K-12 (kindergarten to 12th grade) space; facilitated the development of artificial intelligence curriculum, coding and data sciences for schools and partnered with various boards of education for the same.

- A strong personal support system enables one to focus with greater intensity at work.
- Leadership positions must be filled by rotation so that more women can be groomed for career progression.
- We need to rethink STEM education through innovative practices, learning from global experiences.

I have authored 13 books and published about 100 papers on services, innovation and technology management in national and international journals. I have shaped and built teaching-learning communities in India via the MS Showcase School Programme and Microsoft Innovative Educator Expert Community of teachers.

I am a member of academic boards at the B M Munjal University in Sidhrawali, SRM University in Sonepat, SR University in Warangal and the National Institute of Open Schooling. I am also a member of education committees at CII, FICCI and the PhD Chamber of Commerce.

Hands-on projects, tinkering with new technologies and doing away with exam-based learning can bring back creativity.

For women, to bring one's best to work and home requires a lot of effort and hard work. There are times when you have to deal with difficult situations, but keeping a calm demeanour and remembering the higher cause for which efforts are being made makes it easier. Being away for higher education when my child was young was a difficult time. Investment in strong family bonding and having a strong discipline in work life helped me to have a balance in life. A strong personal support system enables one to focus with greater intensity at work. Success comes with a lot of hard work, perseverance and having confidence in one's abilities. Mentorship also plays a very important role. Have faith in your abilities, and you can overcome every obstacle with patience and grit. Staying calm and anchored helps achieve a lot in life.

More women need to be in leadership positions, and that will definitely make a big difference. Academic careers can be made more rewarding and flexible work environments can enable a good work-life balance. Leadership positions must be filled by rotation so that more women can be groomed for career progression. This helps people stay anchored and also open opportunities for more people.

We need to have 21st century learning orientation in STEM education, and learning must be experiential. Hands-on projects, tinkering with new technologies and doing away with exam-based learning can bring back creativity. Game-based, inter-disciplinary learning and placing emphasis on building social and emotional resilience can go a long way in building skills that matter for a good life. We need to rethink STEM education through innovative practices, learning from global experiences. ■

Academic Profile

- BSc (Hons) Physics & MSc (Hons) Electronics, Panjab University, Chandigarh
- MBA, M L Sukhadia University, Udaipur
- PhD in Corporate Entrepreneurship, IIT Delhi
- Post-doctoral Fellow, United Nations University Institute for the Advanced Study of Sustainability, Tokyo

Yogmaya Verma, PhD

Chief Operating Officer, Indigram Labs Foundation, New Delhi
Ex-Deputy Manager, Biotech Consortium of India Limited

Yogmaya Verma manages operations of agri-food-tech impact incubator Indigram Labs Foundation. She is among the first 15 registered technology transfer professionals of India and a registered patent agent with the Indian Patent Office.

My father's friend KC Sharma, a former professor in MDS University, inspired me to pursue science and develop a career in STEM. As a student, I had a keen instinctive interest in animal and plant life. I remember in Std IX, I had cut open a lizard that had died accidentally in our home and was amazed to see its internal organs. Thus, exploring biology came naturally to me.

As a science enthusiast, I believed in my childhood that science has solution for everything. But when I realised that science still does not have cure for many diseases like cancer, it shocked me. I also wanted to make my skin fair (though I realised later that it was genetic and not possible). I was, therefore, keen to pursue biomedical research to find cure for cancer and skin fairness.

Life doesn't work the way we plan, so I entered the intellectual property (IP) domain, where I got to support researchers in getting their research to the next level towards market. I was not working on a single research aspect, but with multiple researchers, whose work included cancer drugs, medical devices, vaccines, plant varieties, farm machines for mechanisation of processes and innovative food products. I get to see a new face of scientific solutions and challenges every few days.

- Get in the game and become the game changer.
- The more the challenges you face, the more interesting becomes your professional journey.
- There is an urgent need to revise the teaching system in view of practical job requirements.
- There is a need to align academic and the professional worlds that are totally disconnected

Keep your focus on your aim, ignore the chatter, be the queen of your life, not a victim of socio-cultural conditioning.

Another motivation that worked for me was watching women cooking, cleaning, doing laundry in cycles day in and out, and I knew it was not my cup of tea. The only way out was to earn enough to be able to outsource most of these domestic chores. I decided to be financially independent and have a career of my own.

I have supported and facilitated more then 60 technology transfer deals in the academic and public research system and helped innovators in strategising their IP plan. I am now supporting start-ups in agri, food and biotech sectors to help them scale their business by mentoring and facilitating connects.

I have faced my own share of barriers owing to my gender. My family did not allow me to go and study outside my home town or city, thus I had a limited choice to opt for higher education in terms of courses and institutes and university.

I have learned that the more the challenges in a game, the more interesting it becomes, and so it is with your professional journey. Don't see barriers; I see challenges and prepare myself to win over these. Get in the game and become the game changer.

Follow your heart; you can achieve whatever you wish for. Keep your focus on your aim, ignore the chatter, be the queen of your life, not a victim of socio-cultural conditioning.

Except for a small percentage, most parents save for their daughter's wedding, and therefore, do not wish to send their daughters in STEM due to high cost of studies. So a BA or MA/MCom degree is preferred for daughters. Instead of reservation, the fee should be discounted for women education in STEM for a few years. Once a generation of women in STEM is ready, there would be no need for further subsidy.

The academic and the professional worlds are totally disconnected and there need to be efforts to align the same. There is urgent need to revise the teaching system in view of the practical applications and on job requirements. The teaching system and syllabus should be reviewed by experts every five years given the fast pace at which the technology scenario evolves rapidly. ■

Academic Profile

- PhD in Zoology, MDS University, Ajmer
- PG Diploma in Technology Management in Agriculture, University of Hyderabad & NAARM

Awards

- Woman Scientist Scholarship Scheme-C of Patent facilitating Centre, TIFAC, DST

Innovation Entrepreneurs

Akshita Sachdeva

Co-founder, Trestle Labs, Bengaluru

Akshita Sachdeva works on developing assistive technology, empowering the blind and visually-impaired to listen, translate, digitise and audiotize printed, hand-written and digital content across 60 global languages, including 13 Indian ones.

I started Trestle Labs immediately after college along with Bonny Dave. During the third year of my engineering, I worked on a college project—a reading and mobility glove for the blind. When my team took it to an NGO in Delhi for testing, a little kid after using the device called his dad to say: "Dad, some scientists have built gloves for my school and now I can read and travel on my own." Seconds later, he turned around asking, "When can I get this?" I did not have any answer to his question back then, but that acted as a pivotal point in my life and encouraged me to start Trestle.

I realised I had my heart set towards social impact. In pursuit of the same, I started looking for incubation centres and my trail culminated at Digital Impact Square (DISQ), a TCS Foundation pre-incubation centre. DISQ, at that time, had accessibility for the blind and visually impaired as one of the challenge statements for that year and given my previous work in the same arena, I was selected.

My team developed an innovative product suite, Kibo, which enables the blind and visually impaired community to listen, translate, digitise and convert to audio hardcopies of printed and hand-written documents. Kibo comprises three products—Kibo mobile app, Kibo XS Device and Kibo Desk—to address the lifestyle, learning and earning challenges of a visually-impaired person. I have seen myself evolve from a software developer to an entrepreneur, empathising with user-needs, mapping user-experience journeys, building technology products, hustling to find first paying customer, growing the team, planning the business strategy and measuring the impact, while constantly improving my pitch and fundraising to fuel the business and scale up its impact.

- Just stay true to yourself and persistent towards your goals, and change will follow; you are the change.
- Make sure you have the passion and empathy for the cause you are working for.
- Never ever be shy to seek help and take feedback positively to help you grow.

People flock to things that shine; and we need to make STEM attractive, lucrative and trending.

The road to this was not easy. Apart from sleepless nights and back-breaking diligence that every entrepreneur has to undergo in the initial years, I had to convince my family to come around to the idea of their daughter pursuing a financially uncertain career instead of going for a high-paying job.

I would highly encourage women to take up leadership roles and be aware that you are bound to face many challenges–societal and family barriers, financial roadblocks, gender biases and more. Just stay true to yourself and persistent towards your goals, and the change will follow; you are the change.

Making a career in social entrepreneurship takes far more than it would take to start a purely commercial business. Make sure you have the passion and empathy for the cause you are working for. Never ever be shy to seek help and take feedback positively to help you grow.

People flock to things that shine; and we need to make STEM attractive, lucrative and trending. We need to re-brand STEM education by building awareness about role models and their stories, showcasing the opportunities for women in STEM, one-on-one mentorship and career counselling, entrepreneurship programmes, incubation support, financial support as well as family counselling, as most decisions about careers are influenced by family members. Media and societal recognition for women in STEM will have a pivotal role to play in attracting more participation of women in STEM careers.

STEM education, while evolving, is still centred around the triad of teacher-content-student. Current teaching pedagogy, especially with STEM, does not take into account the different student motivations for the subject. We are still stuck with a 'one-size fits all' approach for teaching and learning. We need to adopt a more democratic approach in which the teacher's role is to inspire students on the subject, provide as many perspectives and approaches for a given problem as possible. This will also create opportunities for open innovation to explore, experiment and experience, while leveraging STEM to solve real-life problems. ■

Academic Profile

- B Tech Computer Science, Manav Rachna College of Engineering, Faridabad

Awards

- Residential Fellowship by Washington DC-based Halcyon Incubator
- Best Women Entrepreneur Award, Action for India, DBS Foundation Social Enterprise Grant 2021
- Prosus Social Impact Challenge for Accessibility Award 2021

Anuya Nisal, PhD

Principal Scientist, CSIR-National Chemical Laboratory, Pune
Founder, Serigen Mediproducts Pvt. Ltd., Pune

Scientist-entrepreneur Anuya Nisal is the lead inventor for a technology patent on silk for tissue regeneration that is licenced for creating medical products.

Pune is my place of birth, education till undergraduate studies and work. Ashish Lele, PhD, my doctoral studies advisor, played a pivotal role in developing my career. He instilled in me humility, the passion for science and technology, and taught me to give more than cent per cent to any job I undertook.

My other mentor, Premnath Venugopalan, PhD, co-founder of my start-up Serigen, motivated me to take the plunge in scientific entrepreneurship. His support and critical insights have steered my professional growth. I have learnt from him the skill of breaking down a huge challenge into smaller parts and carving out your own path to convert challenges into opportunities. This is what I do in my current job.

My research is in the areas of polymers for healthcare, biomaterials, medical devices and tissue engineering. My work has resulted in 27 peer-reviewed international journal publications and six patent families (patents granted in US, European Union, India, Japan). More recently, I have been actively involved in CSIR's 'Fight against COVID' initiative. I am the lead co-investigator of a team that conducted a successful pilot trial demonstrating conversion of decontaminated personnel protective equipment waste into useful agricultural and automotive products. My start-up Serigen Mediproducts won the National Award for Technology Innovation in 2019 from the department of chemicals and petrochemicals under the Ministry of Chemicals and Fertilisers.

- Be kind to yourself and realise that everyone can have a bad day.
- Set up a reliable support system in office and at home that allows you to focus and achieve your goals.
- Identify and stick hard to your priorities in life and align all your energies towards achieving that goal.

Identify and stick hard to your priorities in life and align all your energies towards achieving that goal. To minimise stress and conflict while balancing family and work, you must choose a partner whose thoughts align with your aspirations.

Women are limited only by the barriers they set for themselves. Free your mind and then sky is the limit. Be fierce, bold and fearless.

However, things were way different when I started my research journey. I joined PhD after my marriage as a mother of a 1.5-year-old toddler. I had to spend a semester at IIT Bombay away from my family and baby to complete the coursework. One of my neighbours told me about how she had never left her son alone even for a night. Such incidences always cast a shadow of 'guilt conscience' and blur your ability to justify your decisions. However, my parents, in-laws, and most importantly my husband, were quite supportive of my decision. Multiple such incidences affect women and the professional choices that they make. Women are limited only by the barriers they set for themselves. Free your mind and then sky is the limit. Be fierce, bold and fearless.

Plan your day and week ahead of time to minimise hassles. Despite the planning, some unexpected challenges may appear. Be kind to yourself and realise that everyone can have a bad day. Lastly, set up a reliable support system—maids, daycare centres, subordinates, family and friends—in office and at home, which allows you to focus and achieve your goals. Outsource low-priority jobs to this support system.

Women drop out of thriving STEM careers mostly at mid-management level due to developments in personal lives, such as childcare, maternity leaves or relocation. Although the government has some schemes that allow re-entry of women back into the mainstream workforce after a break, a lot more must be done to maternity leaves, flexi-time work schedules, etc. STEM education is still taught with a focus on few conventional career options like engineering, medical, academics and research. STEM students are now opting for diverse jobs like intellectual property, editors of science magazines, content writers for edutech companies and clinical research writing. Our STEM education needs to offer a flavour of various topics and expose students to new-age science careers. ■

Academic Profile

- BE Polymer Sciences, Maharashtra Institute of Technology, Pune
- MS Materials Science & Engineering, University of Delaware, Newark, US
- PhD in Chemical Engineering, IIT Bombay

Awards

- VASVIK Smt. Chandaben Mohanbhai Patel Industrial Research Award for Women Scientist, 2021
- Indian National Academy of Engineering Young Entrepreneur Award, 2020
- Leaders in Innovation Fellowship, Royal Academy of Engineering, UK, 2020
- TIE-BIRAC-WiNER Award, 2019
- National winner in Empower Tie-Women Global 2021

Aparna Saroagi

Executive Chairperson
Women Entrepreneurship and Empowerment (WEE) Foundation, IIT Delhi

Aparna Saraogi is an expert in investment banking, risk management, technology adoption, greenfield project deployment. She is an IIT Delhi alumnus, a Bharti Scholarship holder and a TEDx speaker.

I have set up and headed numerous teams in market risk, counterparty credit risk, stress testing, exposure management, operation risk, investment banking operations. I am also a Natwest Group Risk India Diversity Equity and Inclusion Employee Led Network lead.

I developed expertise in green field project deployment, moving teams up the value chain. I am a purpose-led leader who extensively leverages technologies like TABLEAU, robotics process automation, artificial intelligence, machine learning, natural language processing for value-added insights, automation of manual processes, false alarm reduction and data-driven business decisions.

I am the co-founder of social initiatives Women Entrepreneurship and Empowerment (WEE Platform) and Inclusive Innovation in New Normal (INSquare). Both are global platforms to strengthen economic empowerment of women and make positive climate change.

My first inspiration was my mother who embedded in me the 'can do' attitude. She taught me the value of continuous hard work, discipline, ethics and being nice and empathetic to others. As a teenager, I wanted to participate in the Mathematics Olympiad, but being an average student from a middle-class family, I was mocked by a few batchmates. However, my mother advised and encouraged me that I must enable myself to take on the Olympiad and ignore what others say. I did quite well in the Olympiad. I was also in the top 0.1 percentile in mathematics in the CBSE board. I won a trophy for being the batch topper. This taught me that everything is possible; just work for it mindfully, continuously and consciously.

- Always sport a 'can do' attitude.
- Action is important. It is fine to fail, but not to sit without trying.
- Understand your strengths; be brutally honest and properly quantify them.

Everything is possible, just work for it mindfully, continuously and consciously.

For pushing women into leadership I have used the SOLV principle—Strength Opportunities Leverage it with Velocity. I have mentored many entrepreneurs and leaders based on this principle. Women must explore opportunities where they can leverage their strengths and potential. Act on it with velocity: action is important, and it is fine to fail, but not to sit without trying. Learning from this model becomes your strength and enables you to explore bigger opportunities.

Another concept that I have used is Energy=MC² (Mindfully, consciously champion potential of others). When we champion potential of our colleagues, friends and communities, it becomes a super powerful positive circle that drives amazing and sustainable business results.

India is emerging as a leading start-up nation. This is high time that we move the overall Indian education system, and not just elite universities, from curricula based on stereotypes, hard work and rote memorisation to one based on innovation, entrepreneurship and purpose-driven education. STEM education must focus on real-time projects, solving real-life problems rather than grades. We need creative thinkers and passionate leaders, not top graders accustomed to rote learning.

The government should make it mandatory for listed companies to have gender balance or at least 40:60. This was implemented in Norway and has increased female board members in listed companies from 6 per cent in 2002 to 42.5 per cent in 2021, and is part of their overall ambition to strengthen female leadership in the private sector.

The government must ensure equal representation of women and men in councils, boards and senior committees of public institutions and listed companies. We are still far away from 'equal pay for equal work' even though it is mandated by the Constitution. More concrete steps are needed to ensure equal pay is implemented across workplaces.

Private institutions may enable increased celebration and recognition of women achievers to create role models; training managers and leaders to break unconscious bias and give equal opportunity to all. ■

Academic Profile

- BTech Computer Science, Bharti Vidyapeeth, Pune
- MBA Finance & Information Technology, IIT Delhi
- PG Climate Change Programme, University of Edinburgh Business School, UK

Awards

- Young Innovator and Leader Award from Israeli Embassy in India
- Shethepeople Entrepreneurship and Leadership Award
- Indian Women Entrepreneurs Leadership Award (I-WELA) in Social Leadership from BRICS
- IIT Delhi Business Women Leader Award

Ezhil Subbian, PhD

CEO, String Bio Pvt. Ltd., Bengaluru

Ezhil Subbian has 20 years of experience in bio-based product commercialisation and market growth. She aims to leverage technologies from the West and manufacturing capabilities of the East to cultivate innovations.

Growing up, I had an immense fascination for biology. I happened to be in the room when a friend's mom was convincing her about making a career in a new and emerging area called biotechnology. What caught my attention was the idea of using engineering principles to leverage biology at scale! This triggered a series of conversations with folks who knew about this area, and that led me towards building a career in the field. I continue to be in awe of the power of biology as I did 25 years back—in fact if anything, the fascination has only grown stronger over years.

I have had multiple role models: Steve Jobs and Elon Musk on innovation and selling a lifestyle, not just products; Jeff Bezos on building an indispensable global business; Kiran Mazumdar Shaw on breaking barriers; and my parents on ethics and values.

I played key roles in bio-based product innovation at different start-ups and early-stage companies in the Silicon Valley ecosystem. I was a part of early technology development at three companies—Gevo, Codexis and Intrexon—in the bio-based sector. All the three companies have had successful IPOs. At String Bio, we have developed a proprietary platform—the string integrated methane platform (SIMP)—which leverages advances in synthetic biology, fermentation technology, chemistry and process engineering to enable a circular value chain from methane. Using deep technology, we are creating carbon-friendly products using greenhouse gases as raw material that range from proteins for human as well as animal nutrition to agriculture inputs and cosmetic ingredients. Our products have significant performance differentiators that empower an easier transition to a low carbon economy and sustainable manufacturing. We have won multiple national and international awards including Future Food Asia Award, L'Oreal Innovator Runway Award, Hello Tomorrow Food & Agriculture Winner, BIRAC Innovator Award and Unreasonable Impact Member.

- Believe in yourself and your potential. Shed your inner inhibitions and follow your dreams.
- If you truly believe in an idea, put in work behind it.
- Balancing demands and expectations at home and at work is a continuous optimisation exercise.

When you don't hold yourself back from within, the external biases don't seem to exist.

However, all this would have not happened without balancing personal and professional life and having a family support system. Being a woman has never been easy in any socio-cultural setting—whether domesticated or professional, it does not matter. We are today a society where women have taken on career roles in addition to their roles at home. The reverse has not happened with men. So, women continue to be the primary caregiver at home. Balancing demands and expectations—both self-imposed and ecosystem-enabled—at home and at work is a continuous optimisation exercise.

Here is my advice to budding female leaders: Believe in yourself and your potential. Shed your inner inhibitions and follow your dreams. When you don't hold yourself back from within, the external biases don't seem to exist. If you truly believe in an idea, put in work behind it. It doesn't matter if it takes time—clarity comes from action, not thinking. Any idea, change or transformation takes time and energy to execute well, so make it worth your while.

For women entrepreneurs, biases still exist in the overall innovation ecosystem. While 2020 saw tremendous funding into start-ups and innovation, only 2 per cent of the overall funding went into start-ups with women-only founders. And this is in spite of the fact that women entrepreneurs were able to deliver better returns per dollar invested compared to their male counterparts.

The government and private sector should push for more support for women-led ventures, promote mentorship and networking opportunities for women in STEM and develop leadership training programs and professional development classes at the university level for girls to build that pathway to strong careers.

A lot of the traditional STEM curricula require students to sit through tedious prerequisite classes for years before they can touch upon projects that give them real-world training. Revisiting curriculums to improve upon student experience, developing mentorship avenues and access to internship opportunities as early as possible can drive more enthusiasm for the industry. ■

Academic Profile

- BTech Industrial Biotechnology, Anna University Chennai
- PhD Molecular Biology & Biochemistry, Oregon Health and Sciences University, US

Awards

- Women Transforming India Award 2018 from United Nations/NITI Aayog

Jugnu Jain, PhD

CEO & Co-founder, Sapien Biosciences, Hyderabad

Jugnu Jain's team built the first commercial biobank in India and created research platforms for pathology assays and products, providing high quality biospecimen and data services to pharma, biotech and diagnostic companies.

I was born in Jhansi and grew up in many cities across India as my father had a transferrable job. My uncle NK Jain, PhD, who was a director at a CSIR lab, encouraged me to go for a PhD abroad to pursue my passion for genetics. He often invited me to meet his scientist friends. I liked the way they learned from each other and pursued new frontiers every day.

I feel I carry each of my mentors' DNA in my current role. Several Miranda House College professors shared their original foreign edition science books with me. During my postdoc, I finally found my groove and grew as a scientist under the mentorship of Anjana Rao, PhD. I published my first Nature paper. I worked at Vertex Pharmaceuticals, US, for 14 years before resigning to return to India to launch Sapien.

The Nehru Trust for Cambridge University Scholarship in 1985 was a career-defining opportunity that allowed me to realise my dream of pursuing genetics. I learned problem-solving in science through my exposure to international scientists in the United Kingdom. Those three-and-a-half years made a deep impression about excellence, high aspirations and self-confidence. In 2004, I joined TiE-Boston to learn about the life sciences sector and companies in the Boston area. In this networking forum, the seed of forming a biobank also formed, in part, from my interactions with gutsy founders who took up new challenges and straddling business and science.

- What doesn't break you makes you stronger.
- Women have to be better than men to be accepted as equal.
- Don't hold yourself back because you are a woman.

We built the first commercial biobank in India using remnant samples or medical waste. Sapien is a pioneer in having built the single largest, most diverse biobank in the coverage of Indian diseases. Sapien covers all regions of India with a wide network of partner hospitals. We follow ICMR guidelines and international biobanking norms. Deep datasets of patient diagnosis, treatment and outcomes matched with tissue samples have been collated for close to 40,000 cancer cases, which is unique in India. My work received recognition and I was among the three people selected by the Global Entrepreneurs Summit to represent 'India in Health' at the Hague.

Entrepreneurship is harder in life sciences with longer incubation times, more investment and infrastructure.

I was keen on learning genetics but back in the 1980s, genetics was practiced in breeding new crops, and so I joined Pantnagar University to pursue MSc in plant breeding and genetics. They had no history of women in that course. I was the only woman in a class of 20. My classmates harassed me through those two painful years, e.g., deflating my bicycle tyre and leaving indecent notes on my table. But as they say, what doesn't break you makes you stronger.

Women have to be better than men to be accepted as equal. Don't hold yourself back because you are a woman. Help women in personal and professional life, as they have to struggle to remain professional after marriage.

Entrepreneurship is a lonely journey. Entrepreneurship is harder in life sciences with longer incubation times, more investment and infrastructure. It is more so in India as the ecosystem of suppliers doesn't exist and everything has to be imported for R&D. Statutory compliance and regulatory framework is equally tough. Therefore, have experienced entrepreneurs around you for guidance. We were naïve and made terrible mistakes.

We need to encourage women role models in every sphere. For example, invite women speakers and panelists in conferences and include women reviewers for grants. Partners must support women to enable them to travel for business meetings and conferences, tend to children and older parents. More effort needs to be made to promote outstanding women to showcase to the world. ■

Academic Profile

- MSc Genetics & Plant Breeding, GB Pant University, Pantnagar
- PhD in Genetics, Trinity College, Cambridge University, UK
- Postdoc in Immunology, Boston's Dana Farber Cancer Institute & Harvard Medical School

Awards & Fellowships

- Women Transforming India Prize, NITI Aayog, 2020
- TiE50 Entrepreneur Award, Tie-Silicon Valley, BRICS
- Lady Tata Memorial Trust Fellowship
- Leukemia Society of America Fellowship

Kavitha Iyer Rodrigues

CEO, Zumutor Biologics, Bengaluru

Kavitha Iyer Rodrigues has been in the field of biotechnology for 21 years. She is driving the Indian arm of Zumutor Biologics start-up that works in the area of developing immuno-oncology therapeutics.

I was born and brought up in Bengaluru, where I finished my schooling and undergraduate studies. After obtaining a master's degree in clinical microbiology, I worked across larger biopharma companies like Biocon and Millipore before launching my first start-up, Inbiopro. During that time, I decided to expand my business and management skills and hence decided to pursue an MBA degree. Studying management at IIM, Bengaluru, pushed me in the right direction with networking exposure and developing business-contextual depth, before I went to venture capitalists (VCs) to seek funding for my start-up.

Inbiopro was a biopharmaceutical company that worked on the process and product development of biosimilars for various markets. It was funded by a VC, Accel Partners, in 2007, and I sold it to Strides Arcolab in 2012 with a compelling pipeline of monoclonal antibodies and microbial products.

I founded Zumutor Biologics in 2013 that attracted a funding of $6 million from six major venture centres participating in value creation in the niche space of immuno-oncology. My team has successfully established a proprietary antibody platform: INABLR™. The pipeline of immune-oncology targets is focussed in the natural killer cells-driven antibody space. Ever since its inception, we have been working hard to attract investment and raise funds. Zumutor has raised $27 million till now and continues to garner capital for phase-I clinical trials for our lead asset.

- It is important for women to dream, but it is more essential to prepare themselves for failures or to deal with the unexpected.
- Women need to be cognizant of competition, talent, scalability and capital if they decide to take up entrepreneurship.

A supportive family, a good team and a sound professional network that always has your back are required for women to take on professional challenges and conquer them to reveal their best. My parents, siblings and my husband continue to be my pillars of strength. One cannot underrate the role of the core team, decent mentors and people who believe in your abilities more than the rest of the world–these are all that matter in the end. Mahendran Balachandran from Accel India is my mentor, my go-to for all things sensible.

A supportive family, a good team and a sound professional network are required for women to take on professional challenges and conquer them to reveal their best.

It is important for women to dream, but it is more essential to prepare themselves for failures or to deal with the unexpected. Women have an inherent resilience to navigate through unseen challenges. However, this trait is seldom uncovered as women don't challenge themselves enough. Learnings from my first start-up unearthed my true potential and made me realise that I can take on bigger challenges with better preparedness. I have never looked back after that. The birth of my daughter was also a kind of start-up project on new-found motherhood, and balancing domestic and professional life has been a difficult yet enabling and phenomenal experience. It gives me a surreal satisfaction to have rolled out one successful start-up to the next, putting Zumutor on the map in India and globally with the unique work that we do.

Being in the biotechnology sector itself is a tough one to start with, but I think being guided, mentored and supported is very important. I am fortunate to have had in my team, my mentors and venture capitalists who believed in my vision and invested in Zumutor.

The world and society is slowly changing for women with diversity and inclusion being given the top priority in the private and government sector. To harness this positive change to their advantage, I believe the next generation of women should be very thorough, focussed and sharp. They should be able to juggle, multitask and delegate to get things done. I believe they need to be cognizant of competition, talent, scalability and capital if they decide to take up entrepreneurship.

Attracting more women into STEM careers has been a long-standing issue. I think attractive opportunities for work, place of work and supportive infrastructure could be an incentive for more women in STEM-related careers. STEM needs to be gamified to the extent that it is gender-neutral and draws attention for early interest, and then a sustained pull factor with healthy growth of the technology ecosystem. ■

Academic Profile

- MS Clinical Microbiology, Kasturba Medical College, Manipal
- MBA, IIM, Bengaluru

Awards

- Fortune 40 under 40: 2015 & 2017
- ET list of 40 under 40 in 2017; among the top 5 finalists in the start-up category
- Entrepreneur of the Year 2020: BioSpectrum

Kavitha Sairam, PhD

Founder & CEO, FIB-SOL Life Technologies Pvt. Ltd., Chennai

Kavitha Sairam is a biotechnologist who is developing biofertilisers for promoting sustainable agriculture.

I was born and brought up in Pondicherry, now called Puducherry. For three generations, women in my family have been teachers and financially independent. This inspired my thoughts and was an impetus for my growth. When I started attending symposiums and scientific conferences during my BSc, I realised that very few women would make it to the podium. The strong feeling that this gap should be addressed and my passion for my subject made me excel in my studies and career.

Dr B C Koner from JIPMER was my mentor and guide for my MSc project then. He was the one who identified my potential and kindled my interest in research. Prof TS Chandra, my PhD guide at IIT Madras, played an important role in giving confidence to my efforts towards developing innovative products to solve problems in agriculture. The idea of entrapping agriculturally important microbes struck me a few years ago. I was working on stress signal transduction to improve secondary metabolite production in fungal systems. At that time, I was keen to start my own business and was exploring many ideas. That is when Prof. T S Chandra insisted that we should develop some technologies to address issues in agriculture.

- Women who wish to be in leadership roles must never miss a beat.
- It is every professional's responsibility to help women in their organisations to perform better.

I started working on biofertilisers that are supplied by mixing with inorganic carriers like lignite, peat and talc, which does not support their survival for long. Hence, I thought of exploring stress biology, where some stress stabilisers could be added in the bacterial media to stabilise them. I partnered with Anant Raheja, PhD, on nanofibre technology to increase the payload of cells per unit area using this technology to decrease the bulkiness of the material by reducing the carrier by a thousandth. The advantage offered was huge savings on logistics for distributors and users. As the stability of the organism improved, the efficiency in the field also substantially improved.

It is quite difficult to get opportunities to prove yourself. So make the best use of those and achieve what you wish to.

I have filed two patents on an ultra-light weight polymer nanofibre carrier for use in agricultural and industrial applications (granted) and a polymeric gel-based agrobiological composition (published).

My husband and my father-in-law, both are my pillars of support, encourage me and help me in every step. Due to difficulty in managing work and personal life, I wanted to quit my PhD after my daughter was born. My father-in-law gave me the emotional strength to change my decision. Childbirth and motherly responsibilities are demanding for women. We as women have to work twice to strike a balance.

Women who wish to be in leadership roles must never miss a beat. It is quite difficult to get opportunities to prove yourself. So make the best use of those and achieve what you wish to. I believe that basic research should help to make the world a little better. If we could contribute to science in such a way, there would be a lot of meaning to the journey we partake in.

I wouldn't accept that men and women are equal; as a scientist I know better that it isn't true. Career breaks are inevitable for women. Thus, the government has been helpful by providing enough age relaxation, fellowships for women researchers to come back after a career break. The Department of Biotechnology and the Department of Science and technology organise training programmes for women in STEM to improve their scientific knowledge. It is every professional's responsibility to help women in their organisations to perform better. ■

Academic Profile

- BSc Medical Lab Technology, MSc Medical Biochemistry, JIPMER, Puducherry
- PhD in Biotechnology, IIT Madras

Awards

- Emerging Women Entrepreneur Award, 2022, by MSME and SME Forum, New Delhi
- AIMA Dr JS Juneja Award for Innovation and Creativity in MSMEs, 2021
- Cavinkare MMA Chinnikrishnan Innovation Award

Rachna Dave, PhD

Founder-CEO, MicroGO, Chennai
Ex-Scientist, Bhabha Atomic Research Centre (BARC), Kalpakkam

Rachna Dave is scientist-cum-entrepreneur who is integrating science, engineering and technology to solve problems around hygiene and infection control.

I was born in Nadiad, Gujarat, and did my schooling in Kolkata. I reside in Chennai from where I run operations for MicroGo. Prof. Datta Madamwar's work on drug delivery systems (DDS) at the Sardar Patel University excited the researcher within me. Later, I spent a year at NYU-Polytechnic School of Engineering, New York, as a part of my PhD programme. I was exposed there to the research of Prof. Richard Gross of Brooklyn Poly, New York and Prof. Robert Langer of MIT, Cambridge, on DDS. These experiences with established researchers inspired me to take up a career in applied research.

Prof. Madamwar and Prof. Gross were engaged in collaborative research. Three months into my PhD, Prof. Gross sent a material that required anti-microbial research. The material lay on the coffee table in the lab for days. I was new and PhD labs have their own decorum–the seniors decide. All my seniors had a problem area they were focused on and I was still in the problem finding stage. After a few weeks when no one picked up the material, Prof. Madamwar asked: "Is no one interested?" I looked at my seniors and asked him if I could try working on it. That yellow material (sophorolipid) changed my career path. We did some fantastic work on it and later Prof. Gross invited me to work with him and that's when I further learnt about DDS, which continued to be my area of interest during my work at BARC and at MicroGO. My team at MicroGO has made strides in the development of enzyme-embedded polymers for programmable and sustained drug delivery and have developed NOx (nitrogen oxides) releasing platforms for wound healing.

- Have clarity about what you want to achieve and embrace persistence.
- Just go for it; nothing is limiting in the world.

Entrepreneurship in deep-tech is going to be a long haul. One has to be insanely optimistic in the area of deep-tech start-ups.

MicroGO received the Biotechnology Ignition Grant award from DBT in 2017, the Small Business Innovation Research Initiative Award from DBT in 2018, the Grand Challenges India from the Biotechnology Industry Research Assistance Council (BIRAC) and the Bill and Melinda Gates Foundation Award in 2020.

We also received accolades for our work during the pandemic.in the form of several awards, including the DST-CAWACH Award (2020) and the TANSEED Awardfrom the government of Tamil Nadu (2021).

For next-gen researchers, I have only one advice: just go for it; nothing is limiting in the world. Young women researchers interested in research must take up an area only if they have clarity about what they want to achieve and if they can embrace persistence. If you are choosing deep tech-based entrepreneurship, it is going to be a long haul. And one has to be insanely optimistic in the area of deep-tech start -ups. Self-doubt has no place if you wish to taste success.

To promote entrepreneurship, we need minds that are capable of imagining solutions, innovating and thinking laterally. Thus, STEM needs a more practical approach than theory. We hardly were taught about real-life use of science and mathematics. Second, teachers and career counsellors must impress upon students to have a career beyond engineering and medicine.

I feel the Indian government is doing its bit to attract women in STEM. For example, The 'Knowledge Involvement in Research Advancement through Nurturing (KIRAN)' scheme of DST encourages women scientists through various programmes. Other schemes like the Women Scientist Scheme-A by DST and funding for women researchers who want to resume work after a career break are also available. ■

Academic Profile

- BSc & MSc Microbiology, PhD in Non-aqueous Enzymology, Sardar Patel University, Gujarat

Awards

- COVID Warrior Award, IKP Knowledge Park, Hyderabad, 2020
- Biotech Product and Process Development and Commercialisation Award, Department of Biotechnology (DBT), 2019
- Young Applied Technologist Award, Department of Atomic Energy, 2012
- Fast Track Award for Young Scientists, Department of Science & Technology, 2008

Renuka Karandikar, PhD

CEO, Bioprime Agrisolutions Pvt. Ltd., Pune
Former visiting faculty at National Institute of Virology & Institute of Bioinformatics & Biotechnology, Pune

Renuka Karandikar is a researcher-turned-entrepreneur and is developing technologies to better farmers' lives.

I grew up watching my grandmother manage our farms in a small village in Maharashtra. I used to accompany her to the fields every day during my school holidays. She demonstrated by example women empowerment and leadership to me even when it was unheard of. When it came to making career choices, there was nothing that I loved more than the fields, and so I took up plant sciences.

I studied bioactive molecules from plants for my PhD and switched over to genetic engineering in plants during my post-doctoral research. A part of my PhD work on bioactive coumarins production using cell cultures was transferred to an Indian pharma company. After spending 15 years in active research, I started feeling that it's not enough to make progress on the scientific front and have it confined to either research papers or patents. Something more needs to happen; all this research must ultimately benefit society. Hence, I knew it was time to get back to fields.

In 2016, the tomato-producing heartland of Narayangoa and surrounding areas witnessed five temperature spikes, recording the highest temperature in 50 years. These unfortunately coincided with the flowering time and led to flower/fruit abortions, and resulted in 95 per cent crop failure in 3,092 farms in 183 villages.

- Trust yourselves, dream big and don't settle for anything less.
- The government must provide equal employment opportunity to women.
- Hackathons and project competitions for young women should be increased.
- We are fortunate to be in a time where agriculture is transforming leaps and bounds.

On one such summer day, we met Shailesh Bhise, a farmer who could not even make ₹10,000 in an entire season after incurring an expense of ₹5 lakh. That same evening, I had to meet my friends who were celebrating their new promotions and did not even blink an eye in spending ₹10,000. Narayangoa and Pune, just two hours apart, felt like two different worlds to me. That day I decided to do everything under my control to end this disparity. Bringing back pride and profitability is the motto of Bioprime Agrisolutions.

Women who are inclined towards agriculture must not shy away owing to less number of females in the sector.

Our company is developing technologies that will transform agri inputs sector. We are helping make crops climate-resilient using targeted physiology modulating biomolecules. We are building India's largest plant-associated microbe library. Till now, we have helped more than 50,000 farmers and added more than 20 crore to their revenue.

When I started my journey, I was mindful that agriculture is a male-dominated sector. Right from agri business owners, company work force, distributors, retailers to farmers, all are mostly men. Women either work as labourers in the field or in packing and processing–in non-leadership positions. It does take a while for people to accept and understand women in leadership positions in agriculture. But the situation is changing and perceptions are shattering.

Women who are inclined towards agriculture must not shy away owing to less number of females in the sector. If there was ever a perfect time for change, this is it. Trust yourselves, dream big and don't settle for anything less. It is our time to shine. We are fortunate to be in a time where agriculture is transforming leaps and bounds. Technology will change the way we grow food, the way that food reaches us in the next five to 10 years. Women should be able to step up the game and leverage technology to be a part of this revolution.

Women education and leadership in STEM is a focus area and an indicator of progress of our society. Atal Innovation Mission's (AIM) tinkering labs in schools are fostering, cultivating interests in pure sciences in students. Hackathons and project competitions for young women should be increased. For graduates and undergraduate levels, real challenge-based competitions in association with corporations and start-ups should be organised. The government and the private sector have a huge role to play to ensure that they provide equal employment opportunity to increase the number of women in STEM careers. ■

Academic Profile

- BSc, MSc Plant Sciences, PhD in Plant Biotechnology
- Savitribai Phule Pune University, Pune

Ritu Malhotra

Co-founder & CEO, EzySpit, Nagpur, Maharashtra

Ritu Malhotra is an innovator who created a mobile spittoon cup with a solution that solidifies the droplets of spitting in a few seconds, making people pay for spitting.

I was born and brought up in Nagpur and completed my graduation in computer science from the National Institute of Technology (NIT), Nagpur. I always believed in living and conquering dreams. I started my career with EzySpit with a desire and aim to develop something creative and useful and am accelerating my life and career with full force and vigour towards shaping EzySpit. Together, we intend to turn this world into a cleaner space for all.

Random human behaviour offered me the idea of EzySpit. When people frequently ruin the beauty of roads and monuments by spitting, ignoring basic civic sense, such behaviour poses the threat of spread of communicable diseases like COVID-19, TB and seasonal influenza. The cost involved in cleaning is way higher, and the wear-and-tear it causes, especially at heritage sites, is an unbearable sight.

My mother was always there to support my dream, which motivated me forever to march ahead. My motivation to excel in my work is pretty different than one can expect. On the contrary, it was people showing disbelief in my intention, and above all, their opposing views about my innovative ideas that made me move forward with a much-strengthened resolve and desire to create change. Dedication, faith and consistency have brought me here and made me believe that the sky is the limit. Just follow the same to steal the race. Of course, time to time, the recognition that I received via awards continually accelerated me towards my aim.

- To bring extraordinary results, you need to put in extraordinary efforts.
- Choose a career if you are ready to devote yourself entirely to it.
- Patience and faith in your dream are the key to success.

People did'nt believe my product was possible; some even laughed at me; and demotivation would sink in me at every step. But I kept believing in my ideas and followed my conviction.

I have not faced any challenges precisely because I am a woman, but as an entrepreneur who wanted to usher in a revolution, I have had some challenging experiences. It is a normal reaction of people to create hindrances when someone tries to bring in a change. People did not believe my product was possible; some even laughed at me, saying no one would pay to spit; and demotivation would sink in me at every step. But I kept believing in my ideas and followed my conviction to make EzySpit a success story.

For women entrepreneurs, the first rule is that there is no shortcut. And the second, never forget rule one. Your hard work will take you ahead to the first row of success. Patience and faith in your dream are the key to success. Remember, to bring extraordinary results, you need to put in extraordinary efforts.

A woman is a creator, and if she wants, she can excel anywhere. Pursuing a career demands your time, patience, consistency, and above all, your dedication. Choose a career if you are ready to devote yourself entirely to it.

I recently read somewhere that women's role in R&D activities is somewhere near 16.6 per cent. I feel this number should increase. We need to bring and retain more women in STEM. The government should come out with a policy that promotes hiring of competent women researchers, engineers and scientists. Young girls in school must be exposed to the exciting career opportunities in STEM and must be mentored to believe in themselves. Different types of motivation can be offered to women in the form of awards, recognition and financial aid. These work as cherry on the pie. ■

Academic Profile

- BTech Computer Science, National Institute of Technology, Nagpur

Awards

- Loksatta Tarun Tejankit Award
- Forbes India 30 Under 30, Forbes Asia 30 Under 30, 2019
- Women Entrepreneur of the Year at Global Bio-India Summit, 2019
- CII Start-up Award & CII Industrial Innovation Award

Sanskriti Dawle

Co-founder-CEO, Thinkerbell Labs, Bengaluru

Sanskriti Dawle is working towards disrupting the way the visually impaired learn across the globe. Her team has created a flagship product 'Annie,' the world's first self-learning Braille literacy device. She handles all aspects of the organisation concerning vision, growth, business development, production management and investment.

I was born and brought up in Pune, after which I shifted to Bengaluru, where our company is based.

I am an engineer from BITS Pilani, specialising in computer science. My parents, Varsha Dawle, PhD, and Atul Dawle, inspired me to take the leap and become an entrepreneur.

I've witnessed their struggles, efforts and incredible dedication as entrepreneurs trying to start a business from the ground up, which has greatly motivated me to start my own company.

Them being equal partners in their venture also shaped my principles about how I approach the business. Raghunath Mashelkar, PhD, President of Global Research Alliance, has played the role of a great mentor in my life.

At Thinkerbell Labs, we created Annie, the world's first remote-enabled, self-learning Braille literacy device. It has transformed the lives of children with visual impairment.

- The only thing that helps you learn how to lead is leading itself; nothing prepares you.
- Always show up as a leader and take calculated risks.
- There has never been a better environment for start–ups.
- STEM education requires novel and dynamic teaching techniques and a collaborative environment.

Our goal is to make Annie accessible to every child in the world who needs it. At the moment, Annie is present in 16 states of India and all 50 states of the United States. It has been an incredible milestone for Braille literacy as it has enabled effective education for children and has been a strong support for the teachers in this field as well.

To be a tech entrepreneur, do intensive research on the problem you want to solve and then quickly iterate on the solutions.

The demonstration of Annie to the Duke and Duchess of Cambridge was followed up by Anand Mahindra committing on stage to invest in my final year of college. That incident changed the course of my professional life and greatly encouraged me.

As a woman, I am incredibly privileged to be surrounded by family, friends, colleagues and investors who don't factor in gender in their behaviour towards me. That said, my most challenging experience has been leading the company through the pandemic.

My advice to next-gen women who wish to be in leadership roles is to show up and take calculated risks. The only thing that helps you learn how to lead is leading itself; nothing prepares you.

To be a tech entrepreneur, do intensive research on the problem you want to solve and then quickly iterate on the solutions.

Get out there, talk to prospective customers, users and partners, and get theie feedback. The shorter and faster this loop, the better are your chances.

I think the government is doing a phenomenal job supporting women tech entrepreneurs. There has never been a better environment for start-ups. I feel STEM education has significantly improved over the years.

However, I believe engagement can be increased with novel and dynamic teaching techniques and incorporating a collaborative environment. ■

Academic Profile

- BTech Computer Science, BITS Pilani
- KVPY Fellowship by the Government of India
- National Talent Search Scholar by NCERT

Awards & Achievement

- Mantra Award for Social Leadership by BITSAA International
- Prof. Suresh Ramaswamy Memorial Award
- Speaker at TEDx BITS Goa

Sudha S Narayana Rao, PhD

Co-founder & Executive Director, Genotypic Technology Pvt. Ltd., Bengaluru
Founder-Director, Dhitiomics Technologies, Bengaluru

Sudha Rao is a genomics scientist-cum-entrepreneur with three decades of experience in genomics and developing genomics applications in diagnostics, rare diseases and other areas related to human health.

I was born and brought up in Mysuru in a family that prided itself as much in its contribution to engineering and science as patrons of music. My father promised us to give us the gifts of education and independent careers. My siblings, especially my sister Latha, contributed to establishing business processes at my company. Meena Vaidyanatha, my friend and colleague at various stages of my profession, helped me sail through rough patches and take sound decisions. My mother, my spouse, my supportive boys, family and friends were always there during all the difficult times of my career.

My professional mentors, including Prof. S Krishnaswamy, with whom I published my first research paper in bioinformatics; Steven Goldman, PhD, my postdoctoral supervisor; my PhD supervisor V Sekar and Prof. K Dharmalingam from Madurai Kamraj University; and Prof. Samir Brahmachari, all helped me craft my career in different ways.

After completing my post-doctoral studies in the United States, I moved to Quark Pharma, a biopharma company in Israel that was working on identifying and understanding antisense RNA for potential use in human therapeutics. The brief stint in Israel exposed me to the world of start-ups.

- Know and anticipate the constraints you might face as a woman in STEM.
- Make your choices on where you will spend your time and energy; follow your instinct.
- Leading requires conviction, energy, resilience.

Having received sufficient training and exposure to genomics, a burning desire to return to India and start a company that could enable researchers to have easy access to technologies in biological research led me to establish Genotypic Technology, the first in India, in partnership with Raja Mugasimangalam, PhD. Genotypic, which started as a home office, was later incubated at IISc Bengaluru under the mentorship of Prof. Brahamachari and in collaboration with Prof. Parag Sadhale. I was a visiting scientist at IISc then. In 2005, a collaboration with Agilent Technologies propelled Genotypic to the next scale and it became the genomics company to go to for any researcher in India.

Be a judge of yourself, don't let others judge you and embrace your own leadership style

My second stint at entrepreneurship was with Dhitiomics in 2014. It was started to address precision diagnostics. This has been a rewarding journey of over six years, having enabled diagnostics for a wide spectrum of patients with rare diseases who would otherwise spend years to get one.

During the COVID-19 pandemic, Genotypic undertook benchmarking of several kits and reagents and sequenced the SARS-CoV2 genome of Indian patients in collaboration with ICMR labs. As part of collaboration with IGIB, New Delhi, my company trained and deployed Nanopore sequencing technology for rapid sequencing of the SARS-CoV-2 genome. We also enabled the testing and launch of the Feluda CriSpR assay of IGIB for COVID diagnostics through a collaboration with TATA Medical and Diagnostics Ltd.

I was lucky that I faced no specific challenges as a woman much until I had embarked on a journey as an entrepreneur. The time and focus required to raise two boys alongside being a first-generation entrepreneur with no strategic financial back-up was challenging.

Every individual, woman or man, deserves to pursue her/his passion—small or big. Be a judge of yourself; don't let others judge you and embrace your own leadership style. Leading requires conviction, energy, resilience. Make your choices on where you will spend your time and energy, follow your instinct.

STEM fields demand time and effort spent on reasonable basic education. Know and anticipate the constraints you might face as a woman in STEM, and use it to manoeuvre through your career, but do not let that stop you from pursuing your dream. A support system that provides for childcare during the critical early years, ensuring at least a minimum representation of women in universities and teaching is among a few important initiatives that will help retain women in STEM careers. ■

Academic Profile

- BSc, Yuvaraja's College, Mysuru
- MSc Botany, University of Mysore
- PhD in Molecular Biology, Madurai Kamaraj University
- Post-doctoral research in Neurobiology, Cornell Medical School, US

Awards

- Smt. Chandaben M Patel VASVIK Award for Women Scientists (Chemical Science & Technology), 2019
- SAP Ace 2010 Award for Best Run Business

Tripti Bhatnagar, PhD

Founder & Managing Director, Codon Biotech Pvt. Ltd., Noida

Tripti Bhatnagar is an entrepreneur in biotechnology skill development space. She has rich experience in R&D, manufacturing, contract research and skill development.

My father, Arvind Bhatnagar, PhD, encouraged me to pursue my dreams. While working as head and associate professor in a college, I saw that in the biotechnology field, students are not offered proper practical skills and hands-on experimentation, and as a result, colleges were and are churning out unskilled science graduates and post-graduates. This is making it difficult for students to get placed in the industry, institutes and laboratories.

Being motivated and inspired by this situation, I started Codon Biotech, a company which manufactures and markets cost-effective practical kits for students to perform and learn in their laboratories. Codon Biotech also provides hands-on skill and experimentation work in its state-of-the-art labs where students are encouraged to use all equipment themselves and get skilled in their field.

We have completed two government projects related to waste conversion to economically important products without the help of any institute or college. We are highly effective in providing skill development and placement to college students. We manufacture and market cost-effective adulteration detection kits and we have memoranda of understanding with different universities for research and academic purposes.

- Be passionate and determined in your choice.
- Most students leave biology because it is taught in a very boring and unexciting way.
- Teachers should motivate and create excitement and passion in students through real-time procedures and training.

Always believe in yourself and your vision.

I have received appreciation from a number of different government and private colleges, universities and departments for conducting skill development workshops. I was among the top ten women entrepreneurs selected for depicting research work and got appreciation from Union Minister of Science and Technology Dr Harsh Vardhan on Women's Day in2018. My company was selected as a skill development company to offer industrial training through the Biotech Industrial Training Programme (BITP) of the Department of Biotechnology (DBT) for six years.

There are a lot of shortcomings in schools and college education: First, STEM, being experimental in nature, should be mostly experienced by conducting experiments and not just by directly teaching and writing on the board.

Most students leave STEM, mainly biology, because it is taught in a very boring and unexciting way. Teachers should motivate and create excitement and passion in students through experiments and real-time procedures and training.

I have experienced that many men and clients do not take you seriously enough to do business with. This was one of the challenges I faced in my professional journey as a woman. However, with conviction and demonstrating your expertise to people, you can easily overcome these issues. Always believe in yourself and your vision. Be passionate and determined in your choice, as biotechnology is a tough subject to succeed in.

To promote women in STEM, special teams should be made consisting of empowered women, who could go to universities and colleges and encourage and motivate women to innovate and opt for related careers. The government should then promote and fund the selected groups of women from different universities to develop new processes and products and help them in setting up business ventures. ■

Academic Profile

- BSc & MSc, MS University, Vadodara
- PhD, Indian Agricultural Research Institute, New Delhi

Awards

- IARI Gold Medal, Outstanding Academic & Research Performance in PhD
- The Best Biotech Company Award for Codon Biotech, Zee Business & Achievers India Ltd.
- Women Entrepreneur of the Year Award, Delhi Management Association.
- Distinguished Bio-Entrepreneur 2020, Microbiologists Society, India

Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, with around 9000 members from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 300,000 enterprises from 286 national and regional sectoral industry bodies.

For more than 125 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, livelihoods, diversity management, skill development, empowerment of women, and sustainable development, to name a few.

As India completes 75 years of Independence in 2022, it must position itself for global leadership with a long-term vision for India@100 in 2047. The role played by Indian industry will be central to the country's progress and success as a nation. CII, with the Theme for 2022-23 as Beyond India@75: Competitiveness, Growth, Sustainability, Internationalisation has prioritized 7 action points under these 4 sub-themes that will catalyze the journey of the country towards the vision of India@100.

With 62 offices, including 10 Centres of Excellence, in India, and 8 overseas offices in Australia, Egypt, Germany, Indonesia, Singapore, UAE, UK, and USA, as well as institutional partnerships with 350 counterpart organizations in 133 countries, CII serves as a reference point for Indian industry and the international business community.

Confederation of Indian Industry
The Mantosh Sondhi Centre
23, Institutional Area, Lodi Road, New Delhi – 110 003 (India)
T: 91 11 45771000 / 24629994-7
E: info@cii.in • W: www.cii.in

Follow us on

cii.in/facebook | cii.in/twitter | cii.in/linkedin | cii.in/youtbe

Reach us via CII Membership Helpline Number: 1800-103-1244