



Doing (Particle)Physics as a Woman (in India)

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International Day for Women and Girls in Science.

ALICE Masterclass, Thessaloniki, Greece



Κάνοντας Φυσική (Στοιχειωδών) Σωματιδίων όντας Γυναίκα (στην Ινδία)

Ροχίνι Μ. Γκόντμπολε
Κέντρο Φυσικής Υψηλών Ενεργειών, Μπάνγκαλορ, Ινδία

Διεθνής Ημέρα Γυναικών και Κοριτσιών στις Επιστήμες
ALICE Masterclass, Θεσσαλονίκη, Ελλάδα

International Day of Women and Girls in Science - Masterclasses in Greece (Chania, Thessaloniki)

📅 Friday 10 Feb 2023, 08:30 → 18:00 Europe/Athens

Description



• hands on particle physics

The United Nations General Assembly adopted a resolution in December 2015 and declared February 11th as the **International Day of Women and Girls in Science**. This date should be recognised as a global celebration on equal participation and the accomplishments of female scientists.

International Masterclasses are launching Masterclass activities on the International Day of Women and Girls in Science. By arranging a special Masterclass event for girls we plan to support and promote the access of women and girls to science education and research activities.



Videoconference



ALICE-Masterclasses

I am a **theoretical particle physicist** from **India**, who works with theories of elementary building blocks of nature and how they are put together to form everything!

In particular I work at the exploration of these theories about laws of nature at colliders like the **Large Hadron Collider (LHC)** at **CERN, Geneva**. Hence I have worked very closely with my experimentalist friends Examples **Chara Petridou and Despina Hatzifotiadou** among them!

My speaking here to you tells you already how **global** particle physics is!

I have been working now for more than 45 years first as a Ph.D. student and then a scientist!

- Finding some new, howsoever small aspect of laws of nature which was unknown till then
- Seeing your theoretical predictions/results of calculation being agreeing with the data OR Teasing out some aspect of theory from observed data.
- Having spent a life time as a part of the worldwide community of 'Higgs Hunters' being present at CERN (the place where Higgs was discovered) on the day of the announcement and lecturing about it two hours later to summer students at CERN from all over the world.
- Meeting students of different nationalities, many different places in the world telling they recollect a lecture or lectures I gave them.

Last but NOT THE LEAST

A book I coedited with my friend Chemist, Prof. Ram Ramaswamy, containing stories of about 100 'Women in Science in India', called

"Lilavati's Daughters"

featured in the penultimate round (1/2 million dollars worth) of Indian version of 'Who will be a Millionaire?'

Importance of Women Scientists becoming part of the Indian social psyche!

Having studied in an all Girl's school where till 7th grade we were taught only 'Home Science' this was really the case of

'You have come a long way baby!'

My world line : a student of science and a young researcher

- My world line: a senior scientist
- My world line: a scientist who happens to be a woman
- What helped? What do we need to so that more young women become active scientists.

World line: Time line of my life

I plan to give you a short description of my journey to try and tell you what helped me arrive at this. This will give a glimpse into:

What is meant by the life of a scientist, of any gender?

What is the aim, the challenges and excitements of a life in science?

What does it require? What are the steps one needs to take?

What are the mile stones by which one measures this journey?

What are the special aspects because one is a woman?

The origin of this kind of talks is in a talk I gave at the first International Conference on Women in Physics held in Paris by the International Union of Pure and Applied Physics (IUPAP) in 2001.

For me this talk is very important as it marked the beginning of my involvement in the cause of Women's participation in Science.

Being a Woman Physicist: An Indian Perspective

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Being a Woman Physicist: An Indian Perspective

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I wrote in the article:

In India a student typically goes through 11 or 12 years of schooling (primary, secondary, and higher secondary), followed by three years of college toward a B.S., two more years, normally at a state-funded university, toward an M.S., and then joins a research program for a Ph.D. In some cases the B.S. and/or M.S. degrees are obtained at one of the eight Indian Institutes of Technology (IITs) or my own Institution, the Indian Institute of Science (IISc), which are the elite institutions of higher education in India. Most of the students who opt for professional courses such as engineering and medical do not then join these colleges. While the bulk of the research funding and activity in India happens in the research institutions, many of the good universities have active research groups focusing on somewhat smaller areas of research. Almost all the universities in India are state funded.

My world line has more or less followed the above-described general pattern. I studied in an all-girls high school for 11 years in my mother tongue, Marathi. I studied for my B.S. in a local college in my home town. This was followed by two years of a master's program in one of the IITs. I then worked for my Ph.D. at an American university. My post-Ph.D. time has been spent, almost in equal proportions, at a state university and the two most

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elite science institutions in India: the Tata Institute of Fundamental Research (TIFR) and the IISc. I began as a postdoctoral fellow at TIFR and am now a professor and Chairperson of the Centre for Theoretical Studies at the IISc. I have taught (and continue to teach) physics at various levels and am an associate editor of the *Pramana - Journal of Physics*. I have been involved in funding committees. Thus, I have experienced a broad spectrum of the Indian physics scene and should be able to communicate those experiences to you.

See the URL of the book 'Lilavati's Daughters' published by Indian Academy of Sciences (IASc).

https://www.ias.ac.in/Initiatives/Women_in_Science/The_Women_Scientists_of_India



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It's been an interesting journey

Rohini Godbole

I come from a typical middle-class Pune based Maharashtrian family, wherein intellectual pursuits were always encouraged. My mother started her teaching career in the prestigious Huzurpaga High School in Pune, after having completed B.A and M.A after the birth of three daughters and then a B.Ed. I had a grandfather who had decided not to marry off his daughters before their matriculation and a grandmother who, in spite of having studied only up to the fourth standard, was the only relative to send me a letter with a question after listening to my interview on the radio. So clearly I had a family which saw nothing odd in girls pursuing a career. In fact among my three sisters one is a physician and two are science teachers. However, even though the family had a few doctors and engineers, there had been no scientists.

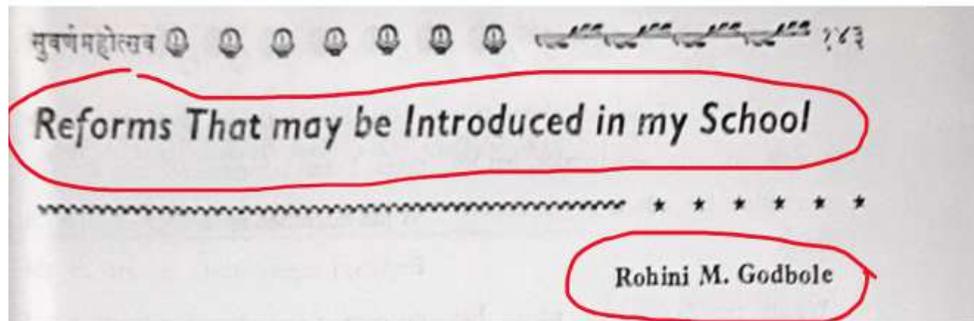
1952 Born in Pune , in a middle class family which valued education, a family with only girls!

Mother finished bachelors degree after 3 girls were born (masters after the birth of fourth daughter). Father supportive of her education. Mother had not learnt mathematics beyond 6th grade as there was no female teacher to teach it!

1968: Finished school in the top 30 in a state exam with roughly 20000 students. The scholarship was one rs. less than the school fee per month (Rs. 5 per month!)

First girl in my school to get it. This all girl's school taught only 'home science' till 7th grade. School teachers took extra time out to help me prepare for the examination. One teacher asked me to come home where her husband, also a school teacher, used to teach science.

(Tell how the school adapted!)



Our school has been teaching Domestic Science from the Vth standard. It is correct that girls should know Domestic Science to make themselves good housewives. But however, my practical experience is that this was a great handicap for me in my High school scholarship examination. Our knowledge in General Science was so poor in VIIth Standard

complaint. I don't suggest that Domestic Science should not be taught, but I suggest that General science should also be taught to enable to compete better in high school Scholarship and S. S. C. examination.

In our school higher Mathematics is being taught only in 11th class. My friends who have recently passed the S. S. C. examination, found it difficult to understand the portion. So it should be taught from the 10th onwards as it is done in other schools.

Moral of the story:

You have to figure out what you need to move on and try to create the resource. People help you if you help yourself!

Dont just always sit back and bemoan the lack!

1969: Appeared for the National Science Talent Search Examination which had started about 1964. Parent's income no bar BUT must study pure science. Widened horizons beyond my little hometown. Made possible the next steps.

Govt. programs to attract young to pure science and research helped me!

1972: Received my B.Sc. from Pune University (First rank in the Univ.) Went to IIT (Mumbai) for a M.Sc. in physics.

Big insecurities : Can I speak in English, can I manage in this elite institute?

Could go there ONLY because of scholarship. Otherwise staying out of town would not have been possible.

1974:

Masters in Indian Institute of Technology. Women's hostel had 50 rooms, not all full and about 800 male students, got Institute silver medal, First woman student to get it in Physics.

Extremely supportive and friendly class mates. We were 3 girls in a class of 17 and we all three were in the top 5. Can not sense that there was any gender bias in teaching or appreciation of success. Nor was there any bias in treatment by class friends
But protective attitude of some teachers.

1979: Ph.D. at State Univ. of New York at Stony Brook in the US. Came back to India in spite of two other offers one from Europe and one from USA(negative mentoring)

Family support and support of friends played an important role

1979-1983: PDF TIFR , three papers in Physical Review Letters in 24 months. Looking back, I could have certainly done with more support and **positive** mentoring. **Gender dependence of mentoring process apparent to me only now on reflection!**

1983-1993: University of Mumbai, three years among these at Univ. of Dortmund and Hamburg.

Met my (now ex) husband in Germany, married and led a multi tasking life across continents! **A few incidents which I interpret as woman unfriendly only now!**

Beginnings are always difficult. These are the most crucial years in the life of a scientist!

1983-1993:

It is this period where I developed as my own person! Created my own niche. Was lucky to hit upon some extremely interesting and productive areas of research. Started getting invited at the national level schools and conferences. (Tell an interesting experience)

Became an expert of sorts in collider physics. Started guiding Ph.D. students. Did work which got International recognition and appreciation. The work opened new directions of research in collider physics and also had implications for designs of particle colliders.

Meeting timelines of international collaborations. Super hard work!
My day had 48 hours!

1992 - 1994 : Election to Indian Academy of Sciences as a Fellow, IIT Distinguished Alumnus : First woman, first one from basic sciences.

Elected as Fellow of the [Indian Academy of Sciences \(IASc\)](#) : [first woman in Physical Sciences](#).

[Somehow provided the necessary nucleation centre for the awards and rewards, which kept on coming regularly after that.](#)

1994 :Move to Indian Institute of Science. (Driven by personal reasons which disappeared with time.) But professionally a very good move.

Started getting more and more involved also in the science administration at the National level. Member of the Editorial boards, selection committees, Scientific Advisory Committees, India-CERN collaboration. Chaired the SERC schools in THEP, Got involved in starting a series of International HEP workshops.....

Here I realised that women do have special edge when it comes to setting up collaborative efforts. Science is becoming more global, more collaborative..A distinct advantage if we have women participating in the process.

In fact after my move to IISc I built also various international collaborative projects, got involved in International study groups on (then) future colliders ..some of which now are reality (like the LHC) . Developed an International profile. Continued guiding students. Wrote graduate texts.

Never really thought much of gender and science till then! I never did think of myself as a 'woman' scientist. I wanted to be considered as a professional and valued for my science, not get some special dispensation due to my birth!

2018: Superannuated from IISc, continuing as Honorary Professor. Continuing with research. Writing a graduate text on the Standard Model of Particle Physics.

2019-2021: Received the fourth highest Indian Civilian Honour and one of the highest French Civilian Honours for foreigners.

Around 2000 I started looking at things through a different lens and realised women do suffer due to bias. I can not say the bias stopped me from achieving things, but may be if I were of a different gender, I might have got there sooner or more easily.

Worked from 2001 on Women in Science, Brought out two books, directed a survey, participated in report writing , putting in place some programs for Women in Science, Was involved in Women in Science Programs of the Department of Science and Technology of India. Indian Government included a chapter on 'Equity and Inclusion' in its Policy document of 2020. I was able to contribute to it as the chair of the group that drafted it!

The invisible bias may even be unconscious or unintentional, but it exists.

We need to be open about this elephant in the room and see how the challenges women face due to the bias can be eased.

Need of mentoring to make people realise how to handle the bias:
Both the mentors and mentee need to be aware of this.

Quote: Jennifer Doudna, Chemistry Nobel Prize Winner 2020

”We need to ensure that women feel welcome and enabled to contribute fully to society in whatever way they feel is important to them—whether it’s through being moms, or being involved professionally, or some combination.”

- 1 (Extended)Family Support. Dont feel guilty about asking for help.
- 2 Reality checks: Be confident. Dont let others decide for you, but Dont try to be a superwoman. Important to develop your own support structures.

Life in science: not necessarily easy

It is a bit of hard life..but all good things cost it.. All I can say ***IT IS ALL WORTH IT!*** especially if one in working in an exciting subject like particle physics

Special aspects of a life in science:

What is the difference between learning science, teaching science on one hand and doing science on the other! That too at the cutting edge of research where the competition is high and timing of essence.

Science does not wait!!. The body clock and science clock both are ticking!

Being independent matters! Doing a Ph.D. is not enough. One needs to create a niche for self! Doing own thing is important.

One needs to be professional about it as well. Having a good idea is not enough, you have to be ready to break your back, if necessary, to realise the idea into a concrete and useful investigation.

The joy and excitement is in thinking of an idea people have not thought about yet and do your two bits in uncovering some aspect of the truth about nature that was not known till then.

One also needs perseverance. Sometimes things take time to work out. Equally important to know when to give up!

Doing good research, training students is important.

As a scientist you also need to be involved with the scientific community.

At a senior level you need to participate in the processes which strengthen the activity in the country, in simple things such as referring journals, giving lectures in a school etc.