

Gender Equity in High Energy Physics in India: Status and Initiatives

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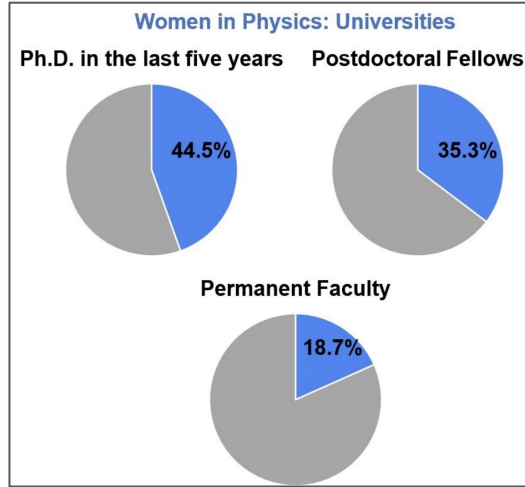


31st Lepton Photon Conference 2023
MELBOURNE CONVENTION
& EXHIBITION CENTRE
17 - 21 JULY

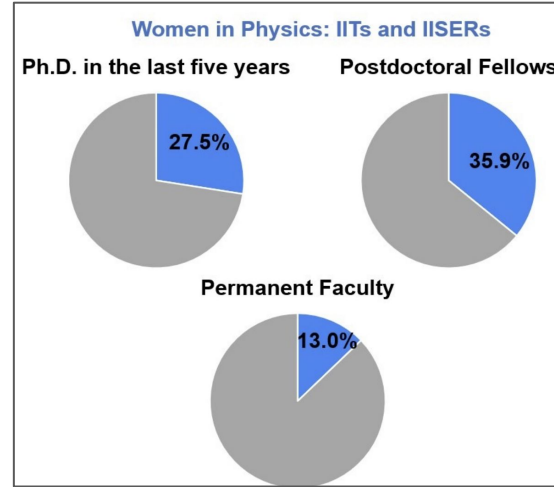
OUTLINE

- **Indian Gender Scenario in Physics and in HEP**
- **Gender in HEP working group**
- **Various Activities & Initiatives**
- **Concluding Remarks**

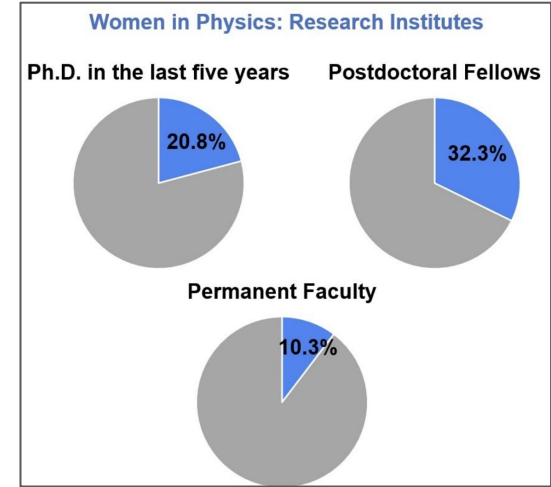
Representation of Women in Physics Departments



G1: Universities



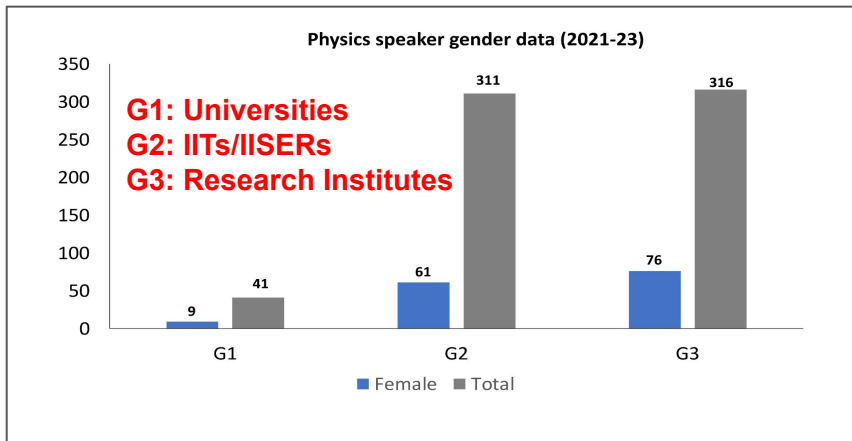
G2: IITs/IISERs



G3: Research Institutes

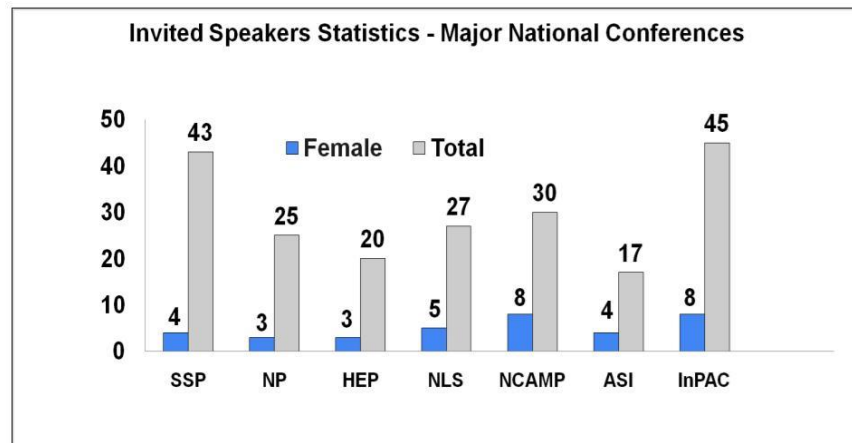
- The women PhD students to women faculty ratio is 0.42 (G1), 0.47(G2), 0.49 (G3). Across institutions, the leaky pipeline is evident.
- The postdoc fraction is almost uniform across institutions, while there is a wide difference in the faculty fractions for the three groups.
- The percentage of permanent women faculty is around 14.5% for old as well as the new institutions and has not improved since ICWIP-2

Representation of Women in Physics Conferences



- The fraction of women speakers is 19% (G1), 22% (G2), and 24% (G3), which is consistent with the fraction of women scientists (faculty and PDFs).

[The data has been collected by IPA-GIPWG for selected institutions and is only for representation purposes. About 30 institutions voluntarily participated in sharing the data.]



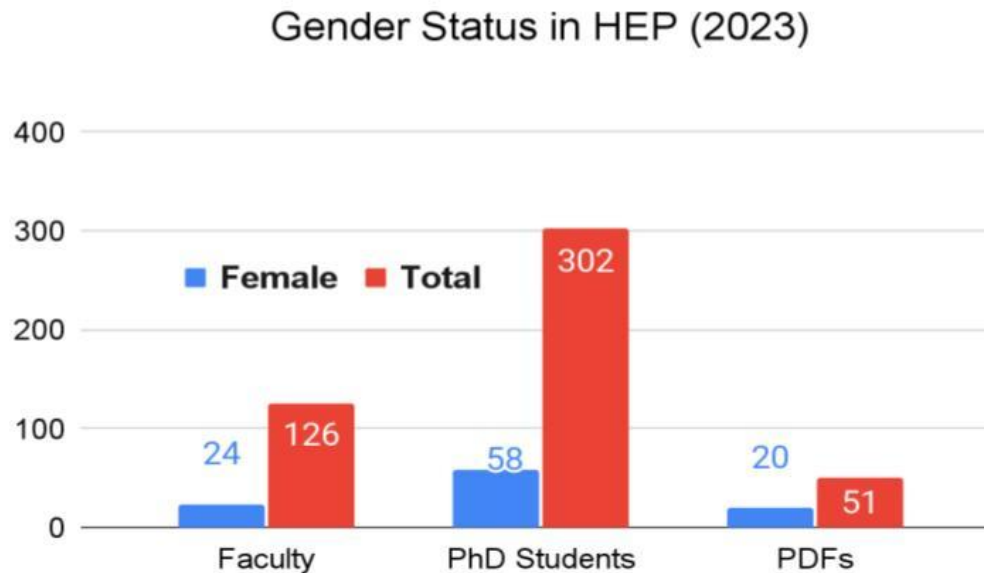
- The average representation of women as plenary speakers is 18% which is lower than the typical fraction of women scientists (faculty + Postdocs ~ 22%)

[The data has been collected by IPA-GIPWG for Department of Atomic Energy-BRNS sponsored national symposiums, Astronomical Society of India annual conference and the Indian Association for General Relativity and Gravity (IAGRG) annual conference. The data has been processed from conference websites and abstract books.]

Gender Status in HEP (2023)

- The data from the participant institutes across India shows the following fractions for female representation:

Faculty	16 %
PhD Student	19%
PDF	28 %



Participant Institutes: CU, UOH, TIFR, PRL, IISc, IITB, TU, IITBU, IITP, IISERB, NITJ, IITI, IITH, SINP

Courtesy: Dr. Pragya Pandey

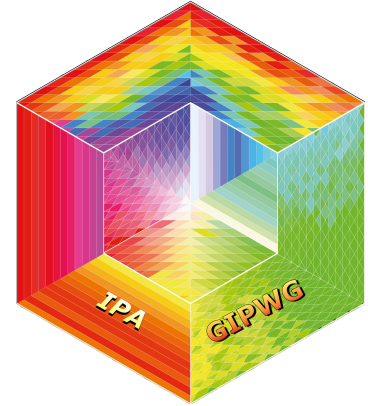
Gender in Physics working group (GIPWG) of IPA

- The Indian Physics Association (IPA) formalised a **Working Group on Gender in Physics** in May, 2017, with **the mandate of co-ordinating national efforts towards gender parity in the Indian physics profession.**
- The working group is intended to:

Collate information on the status of gender parity in the Indian physics profession, facilitate deliberations on the issue

Come up with recommendations from time to time to address the gender disparity in physics

Network with IUPAP and the corresponding national working groups of IPA's sister-organizations, viz., the Institute of Physics (UK) and the American Physical Society (USA), and also the Association of Asia Pacific Physical Societies of which IPA is a member.



<https://www.tifr.res.in/~ipa1970/gipwg/>

Genesis of Gender in HEP working group

- **Special Plenary Session** in the **DAE-High Energy Physics Symposium 2020:**
to deliberate the issues related to gender-gap in HEP
- **Formation of a gender group in HEP:**
In this meeting it was unanimously decided to form HEP Gender group under the Gender in Physics Working Group of Indian Physics Association



The Gender Group in High Energy Physics in India



Nabamita Banerjee
IISER, Bhopal



Harleen Dahiya
NIT, Jalandhar



Moon Moon Devi
Tezpur University



Srubabati Goswami
PRL, Ahmedabad



Rukmani Mohanta
Univ. of Hyderabad
(Chair, HEP gender
group)



Neha Shah
IIT, Patna



Ajit M Srivastava
IOP, Bhubaneswar

Activities (2021-2023)

- **First-ever gender session in Indian String meet 2021**

A panel discussion on **"Gender Imbalance in String Theory: Focus on India"**, with emphasis on the imbalance at the root level of education till higher level of employment for women researchers in String Theory. [<https://www.youtube.com/watch?v=DBgAjSAurwE>]

- **Gender Session in the 2022 DAE-HEP symposium**

A panel discussion on **"Two Body Problem in Academia and Possible Ways to Overcome it"** was held.

The two body problem is identified as a major cause of the **leaky pipeline syndrome**, and the panel discussed various issues related to this.

- **A detailed survey on women in Physics**

A detailed survey on the **fraction of women in the Physics profession in various Indian institutes** and the cause and challenges were discussed.

The study was presented in the **30th International Symposium on Lepton Photon Interactions at High Energies** in January 2022



Panel discussion on **"Gender Imbalance in String Theory: Focus on India"**, Indian String meet 2021 (online)



Panel discussion on **"Two Body Problem in Academia and Possible Ways to Overcome it"**, December 2022, 2022 DAE-HEP symposium (in person)

Panel Discussion : Gender imbalance in String theory focus on India

- **Women in String theory**

An experimental science like Biology that requires committed time in the laboratory attracts and retains more women researchers compared to Physics in general and String theory in particular. In this context the prejudices like myth of mathematics and theoretical physics being “hard for girls” were mentioned.

- **Bias, imposter syndrome**

Panelists discussed issues like bias related to women in science, imposter syndrome etc.

- **Need of affirmative action**

The need of affirmative action at all levels and support from family and colleagues, on campus accommodation, flexible work hours, child care facilities etc. were discussed.

- **Measures taken**

The measures taken at ICTP and by the Indian Academy and Govt. of India were also discussed.

Panel Discussion : Two body problem in academia

- **Two body problem in academia**

It exists since decades (**A major cause of leaky pipeline**). Spouses not having job at same place problem adversely **affects family balance, career growth, interruption in children's education and their emotional wellbeing.**

- **Loss in trained human resource**

Many times women are not able to realize their true potential

- **Discussions by Panelists**

Personal experiences, possible issues if both spouses are hired in same department, policy level changes needed as well as situation in countries outside India

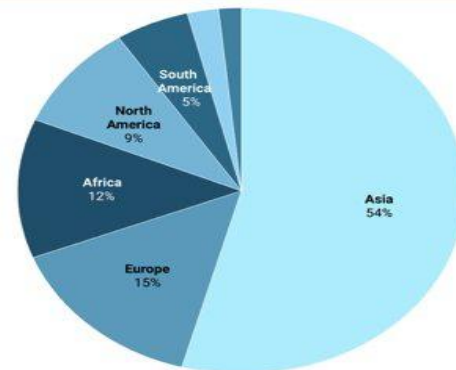
It was pointed out that in foreign countries many Institutions make effort to arrange employment at different levels to the spouse of employee as this kind gesture serve as win-win situation both the employer and employee. Similar solutions can also be looked at in the Indian context.

- **Creating two body opportunities**

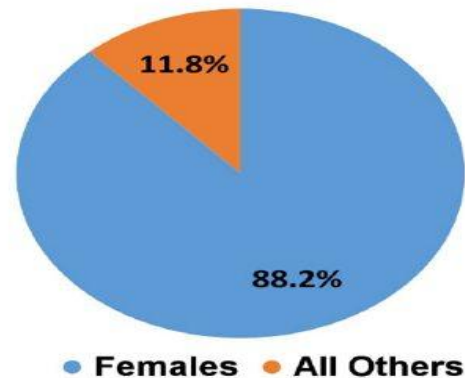
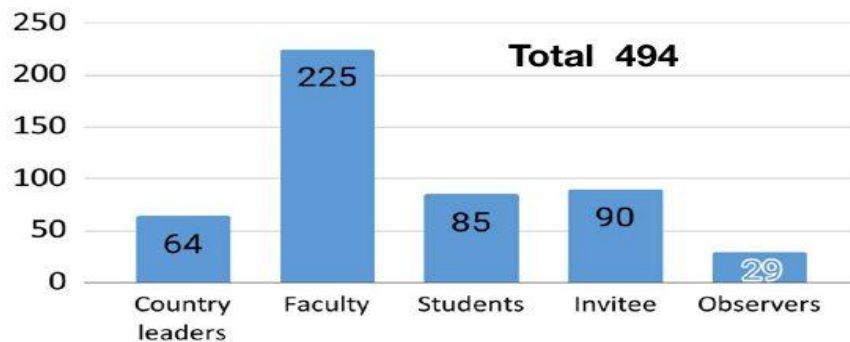
— Govt of India policies — **mobility grant for women researchers, various women in science schemes.**

8th IUPAP International Conference on Women in Physics (ICWIP2023)

- ICWIP2023 was held virtually during **10-14 July 2023**
- **India: host country; jointly organised by the Gender in Physics Working Group (GIPWG) of Indian Physics Association (IPA) and the Tata Institute of Fundamental Research (TIFR).**
- Hosted by: the **Homi Bhabha Centre for Science Education (HBCSE)** - a national centre of TIFR, strongly focused on promoting quality and equity in Science & Mathematics education from primary school to introductory college levels.
- Plenary Talks, Posters
- Workshops: **Physics Education, Social Science Data Analysis for Physicists, Interrogating Physics Practice with an Intersectionality Lens, Women's Leadership in Physics, The role of women in science for development**
- Satellite events: **Outreach, Workshops, PAVINARI lecture series, Panel Discussions**



Bifurcation of participants in ICWIP - 2023



HEP talks at PAVINARI Lecture Series (<https://tinyurl.com/pavinaritalks>)

- GIPWG IPA has initiated a lecture series: **PAVINARI** (PAdarth Vlgyan ki Nariyan)
- Showcasing the fantastic work done by women physicists and to motivate the young researcher

PAVINARI (पविनारी)
Lecture Series on Women Physicists

The Gender in Physics Working Group (GIPWG) of the Indian Physics Association (IPA) aims at co-ordinating national efforts towards gender parity in the Indian physics profession. As a part of this effort, the GIPWG has initiated PAVINARI (पविनारी), a public lecture series on eminent women physicists, which intends to cherish the fantastic work of women scientists and to motivate the younger generations.

PAVINARI-3: Promoting physics across borders :
some women who opened doors for others
The third lecture of PAVINARI series will focus on the contributions of a few women physicists, who have given back to the community by nurturing scientific talent and giving a platform for new ideas. The contributions of Emilie du Châtelet, Cecile DeWitt-Morette, Milla Baldo Ceolin and Binla Buti will be discussed.

Speaker: Prof. Bindu A. Bambah
(Jointly organised by IPA GIPWG and University of Hyderabad)
Venue : Seminar Hall, School of Physics, University of Hyderabad
YouTube live: <https://youtube.com/live/2sF12uKXU10?feature=share>
Zoom meeting ID: 867 2093 4428 , Passcode: 136787
📅 3 PM, February 3, 2023 ✉ gipwg-ipa@gmail.com

PAVINARI (पविनारी) Lecture 3
Lecture Series on Women Physicists

Promoting physics across borders :
some women who opened doors for others
We examine the contributions of a few women physicists, who have given back to the community by nurturing scientific talent and giving a platform for new ideas. These are Emilie du Châtelet, Cecile DeWitt-Morette, Milla Baldo Ceolin and Binla Buti. Emilie du Châtelet is known for translating Newton's *Principia* into French, and advocacy of Newtonian physics. Cecile DeWitt-Morette founded the famous Les Houches Summer school in France, where many new ideas of physics were generated. Milla Baldo Ceolin initiated the series of international workshops on neutrino telescopes at Venice. Binla Buti has a foundation for encouraging young Physicists.

Speaker: Prof. Bindu A Bambah, Honorary Professor, University of Hyderabad
She graduated from Panjab University and received her Ph.D in Theoretical Physics from The University of Chicago under the guidance of the Prof. Y. Nambu. She works on the interrelations between Particle physics, Fluid Dynamics, Quantum Optics and Cosmology. She was joint faculty in the Center for Women's Studies, working on factors that affect gender equality in Physics. She is a co-author of the Hyderabad Charter for Gender equity in Physics. She received the UNESCO Young Scientists Award for South Asia in 1991 and the Mother Teresa Award for Sciences.

**“Promoting physics across borders:
Some women who opened the doors for others”**
Prof. Bindu A Bambah

PAVINARI (पविनारी)
Lecture Series on Women Physicists

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PAVINARI-4: Overlooked for the Nobel:
Lise Meitner and the discovery of fission
The fourth lecture of PAVINARI series will give a glimpse of the inspiring journey of Lise Meitner, a pioneer behind the discovery of nuclear fission. Her commendable grit and passion to Physics overcame prejudice, misogyny and lack of opportunities in establishing herself as one of the great scientists of the 20th Century.

Speaker: Prof. Amit Roy
(Joint IPA GIPWG PAVINARI - ASET Colloquium, TIFR)
Online event
YouTube live: <https://youtube.com/live/nDRN1mCYWc?feature=share>
📅 4 PM, March 28, 2023 ✉ gipwg-ipa@gmail.com

PAVINARI (पविनारी) Lecture 4
Lecture Series on Women Physicists

Overlooked for the Nobel:
Lise Meitner and the discovery of fission
Discovery of phenomenon of fission was a momentous discovery that certainly deserved the Nobel Prize. Despite being a central character in this discovery, Lise Meitner was overlooked for the Nobel and it was awarded to her collaborator Otto Hahn alone.
The journey of Lise Meitner from her early childhood to one of the great scientists of the 20th Century is a testimony to her grit and single minded devotion to Physics in overcoming prejudice, misogyny and lack of opportunities. In this talk I shall try to give a glimpse of her epic and awe inspiring journey.

Speaker: Prof. Amit Roy
Amit Roy, a former Director of Inter-University Accelerator Centre, got his Ph.D. from TIFR, Mumbai. After continuing his research in experimental nuclear physics at TIFR till 1990, he shifted to IUAC where he led the building the Superconducting Linac at IUAC and pioneered the development of Niobium superconducting cavity for accelerators in India. He is a Fellow of the National Academy of Sciences, India and has received many accolades. His research interests are in Nuclear Physics, Accelerator Physics and Atomic Physics and he enjoys communicating science.

**“Overlooked for the Nobel:
Lise Meitner and the discovery of fission”**
Prof. Amit Roy

Role models in HEP



- The biography of Prof. Suman Beri titled **“Suman Beri – Higgs Boson, Top Quark and Single Top Quark – The Story of a Punjabi Woman Scientist”** was released on (April 30, 2023)
- Prof Beri was the **first woman professor** of the Physics Department of Punjab University, Chandigarh and the **first woman professor emeritus**.
- Being among the top scientists in the country, her big contributions include:
 - observation of the top quark in 1995
 - observation of single top quark production in 2009
 - observation of the Higgs boson in 2012

Government Initiatives

- **GATI: Gender Advancement through Transforming Institutions (GATI)** accreditation program in the line of Athena Swan, UK (2020)
- **STIP: Proposed Science and Technology Innovation policy (STIP)** of Department of Science and Technology (DST) of Govt. of India, emphasizes mainstreaming equity and inclusion (2021)
- **Power fellowship & Power grant:** 'Promoting Opportunities For Women in Exploratory Research' of Science and Engineering Research Board (SERB)
- **CSIR- ASPIRE:** 'A Special Call for Research Grants for Women Scientists' of Council of Scientific and Industrial Research
- **WIDUSHI:** 'Women's Instinct for Developing and Ushering in Scientific Heights & Innovation' by DST

The Way Forward!

- Implementation of proposed gender equity policies & recommendations at institutional level
- Continued efforts for addressing biases
- Inclusion of social scientists in the discourses
- Mandatory gender sensitization, nationwide surveys and statistics
- Career development & mentoring programs for young students
- Wider involvement of men in gender equity programs
- Moving beyond gender as a binary

Thank you for the kind attention!