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# Women In Physics: State of the France Nation

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**Abstract.** Since the beginning of the 21<sup>st</sup> century, the progression of women in physics support in France has evolved from observation to active intervention. This article reports on both the historical context and the broader European perspective to provide an overview of such support and to compare it to data. While quantifying the effects of initiatives from institutions or associations remains a challenge, this article seeks to evaluate the current status of women in the field of Physics in France.

## INTRODUCTION

While the French Ministry of Research and Higher Education (MESR) sets the scientific direction for the country, French public research in physics is organized around three distinct units. Firstly, the National Center for Scientific Research (CNRS) is dedicated to research and made up of institutes, 4 of which are dedicated to physics, covering fundamental physics through to astrophysics and engineering. Then, the universities ensure teaching and research in all disciplines. Finally, the French Alternative Energies and Atomic Energy Commission (CEA) is committed to research, mainly in the field of Science, Technology, Engineering, and Mathematics (STEM).

Diversity in research teams is essential, as it brings fresh ideas and fosters creativity: the role of women is a social issue in disciplines where men are over-represented at all hierarchical levels, and especially in decision-making positions. In the early 2000s, the question of the role of women in the academic world, and in physics in particular, began to take on an institutional dimension in France. In 2001, the CNRS set up the *Mission pour la place des femmes*. At the same time, the Femmes & Sciences association (“Women & Sciences”) was founded and the “Women and Physics” commission was created within the Société Française de Physique (SFP – “French Physical Society”). The few volunteers, mostly women, including the famous physicist Pr. Claudine Hermann, started proposing initiatives and organizing actions to shed light on women scientists and physicists. In this article, we present an overview of the French women status in physics based on recent and current indicators.

## STATISTICS AND DISCUSSION

Since the creation of its “Women and Physics” commission, the SFP has played a significant role in promoting gender equality by initiating various commendable initiatives: writing and editing newsletters, ensuring fair representation at its own events, organizing round tables and sessions at its main national events, writing articles about women physicists in magazines, and creating exhibitions dedicated to women. At national scale, SFP works closely with Femmes & Sciences by developing a mentorship program. Its actions include the formulation of a Charter for Gender Fairness at Conferences [1] and the creation of a best practice guide for inclusive videoconferencing [2]. While these actions are useful, their impact is difficult to assess and they cannot replace expended actions at institutional level.

Within the 7th framework program and its “Science in Society” projects, Europe has launched trials of structural changes in the organization of research with a focus on STEM disciplines, starting in 2010. A total of 14 projects were

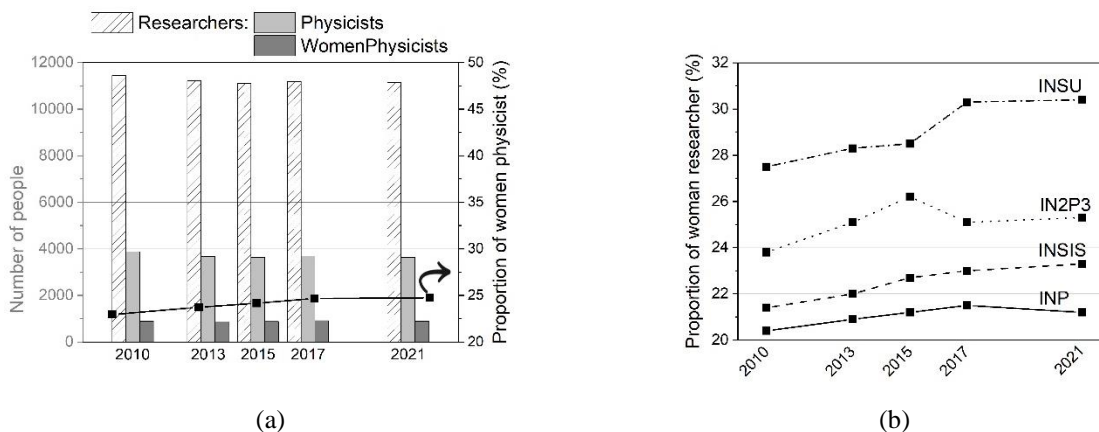
funded, in which France was often a sponsor or partner. At the MESR level, plans to promote parity have become more and more important since 2021. As part of Horizon2020, the program has been labelled “Science With and For Society” (SWAFs). The European Commission intends to follow the Ljubljana Declaration on Gender Equality [3] and therefore develop a coordination policy, implement a strategy against sexist and sexual violence, carry out a policy to strengthen actions to promote gender equality, and develop the consideration of gender in the evaluation of research projects.

**TABLE 1.** scientific women proportion in Europe (data extracted from [4])

Proportion of women as	In Europe	In France
PhD student	48.1%	43.9%
A-rank	26.2%	27.6%
Institution leader	23.6%	12.1%
Member of management committees	31.1%	35.9%
Inventors	12%	16%

Alongside European initiatives, “She Figures” (Gender in research and innovation: statistics and indicators) are published every two years by Europe since 2013 and compile statistical data on the women’s place in scientific research. At the French national level, these statistical data are available in the social reports of the three research organizations mentioned above. But these reports are snapshots that do not show developments or propose objectives. In addition, the lack of homogeneity in the presentation of data in these three organizations makes monitoring work particularly difficult. “She Figures” allows countries to be compared with each other by targeting large disciplinary groups. Table 1 shows that in 2021, the proportion of female doctoral students in France is lower than the European average. We also note that, while the proportion of women in A-rank or members of management committees is slightly higher than the European average, the proportion of women managing institutions is very low. Finally, it seems much more difficult for women to file patents at the European scale.

At CNRS, the number of physicists (men and women) has been almost constant over the last 10 years, and the percentage of female physicists has gained only 1 point over the same period, reaching almost 25% in 2021 (see Fig.1a). Although the CNRS built the Committee for Gender Parity and Equality in 2018, the evolution of the percentage of women is not the same from one institute to the other, as shown in Fig 1b. The institute devoted to the universe science (INSU) has the largest proportion of women, but also shows the largest male advantage ratio with 35.1% female researchers and 27.2% female research directors in 2022. The institute showing the smaller share of female physicists is the one devoted to fundamental physics (INP) and the share is now lower than in 2017.



**FIGURE 1.** (a) Proportion of women physicist at CNRS between 2010 and 2021. (b) Evolution, between 2010 and 2021, for each of the four CNRS institutes where physicists work: INSU - universe science, IN2P3 - nuclear and particle physics, INSIS - engineering, INP - fundamental physics (data extracted from [5-9]).

In French universities, from 2012 to 2023, the proportion of women in physics increased slightly, from 21.9% to 23%, and in engineering sciences, from 18% to 20%, an evolution similar to CNRS. However, recruitment at CNRS and universities is very different, since the former is carried out at national level and the latter at local level. Thus, the

training policies of hiring committees at CNRS do not seem, to date, to have any greater effect than in all French universities, where the recruitment strategy is not uniform.

All three institutions, MESR, CEA and CNRS have put in place action plans that concern a broader community than just physics. The action plan of ministry MESR highlights these five-points:

- Strengthen the governance of gender equality policies in the workplace
- Create the conditions for equal access to jobs and professional responsibilities
- Assessing, preventing and, where necessary, dealing with pay and career development gaps between women and men
- Provide better support for pregnancy, parenthood and the work-life balance
- Prevent and deal with discrimination, acts of violence (including sexual and gender-based violence), moral or sexual harassment and gender-based harassment.

Based on these five general points, CNRS has initiated a number of actions to attract more women in scientific careers and break the glass ceiling. These include training on gender bias for researchers involved in European projects, awards for excellence in research distributed equitably between men and women, maternity leave taken into account in career progression, and since 2023, the establishment of a network of parity-equality officers among researchers in each laboratory, on a voluntary basis.

To try and best implement the five-point action plan of MESR, CEA has joined a network of companies' women's networks, defined 5 indicators for assessing equal salary and acknowledged maternity leave in career evolution. Since 2003, average salary increases have been exactly the same for men and women. This follows professional agreements that, however, did not include gender-specific clauses. From 2016 to 2023, an agreement on professional equality has been carried out. By 2020, women accounted for around 30% of CEA researchers, and growth was linear. Therefore, it would be interesting to know how far this trend concerns women physicists.

While the proportion of women in physics has increased over the last 20 years, this progress speed has been particularly slow, with less than one point in 10 years for female academic researchers, whereas ~25 points are needed to achieve parity. A major improvement is that it is no longer possible to form a thesis jury or a hiring committee without the presence of women; the last ones being gender-balanced. As a result, women are over-solicited compared to their male colleagues, which inevitably impacts on their scientific careers. Gender bias, shared by both men and women, is often cited as a barrier to the rapid increase in the proportion of women in physics. Videos or awareness campaigns are regularly used to train hiring committees. However, awareness is an illusion of training, as panel members are not equipped to tackle identified biases. The existence of these biased environments is corroborated by the literature, which at best shows the presence of everyday sexism within laboratories, and at worst, the existence of sexist and sexual violence. Indeed, the latest study of L'Oréal/Ipsos [10] shows that 89% of French female scientists have experienced at least one case of sexism during their careers, 25% of them frequently. Even worse, one French female scientist in three has experienced sexual harassment. These phenomena concern all European countries and can be responsible for departures from academic careers.

## CONCLUSION

Despite major efforts and fundings allocated to achieve gender parity and promote the women's place in academia, the proportion of women physicists with a permanent position in a French institution is no longer increasing. Worse, this proportion tends to decrease. This means that major actions still need to be initiated by institutions, starting at high-school level to attract young women to Physics. Others are to show effective and efficient developments, to propose clear and defined objectives, to homogenize the presentation of data, to train experts in parity-diversity... Moreover, progress would be greater if more men would volunteer to defend parity that is a societal issue in which they play an active role as women's friends, brothers and/or fathers.

We hope parity in physics will be achieved in the next few decades in France rather than in the next few centuries!

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