

The future researchers in Optics and Photonics: gender bias in the PhD theses defended in Spain in 2015-2020

Rosa Ana Pérez-Herrera¹, **Alba de las Heras**^{2,*}, María-Baralida Tomás³,
Beatriz Santamaría⁴, Clara Benedí-García⁵, Ana I. Gómez-Varela⁶,
Verónica González-Fernández⁷, Martina Delgado-Pinar⁸

¹Dept. of Electric, Electronic and Communication Engineering, Universidad Pública de Navarra, Spain. ²Dpto. de Física Aplicada, Universidad de Salamanca, Spain. ³Instituto Universitario de Física Aplicada a las Ciencias y las Tecnologías, Universidad de Alicante, Spain. ⁴Dpto. Ing. Química, Mecánica y Diseño Industrial, Universidad Politécnica de Madrid, Spain. ⁵Indizen Optical Technologies S.A., Spain. ⁶Dpto. de Física Aplicada, Universidad de Santiago de Compostela, Spain. ⁷Dpto. de Óptica, Universidad Complutense de Madrid. ⁸Dpto de Física Aplicada, Universitat de València, Spain.

*e-mail: albadelasheras@usal.es

The lack of diversity in STEM areas (science, technology, engineering and mathematics) and, in particular, gender stereotypes, lead in the worst cases to inequality and discrimination. This issue, which has become a hot topic in the last years since inclusive science means a better science, must be solved because it is a matter of social justice. Also, the problem is shifting to earlier stages of the scientific career: the Equality Committee of the National Council for Research in Spain (CSIC) shows in its last survey (2020) that women do not even begin a PhD [1]. The scientific system does not seem to overcome the problem but the contrary, and thus, positive policies should be put in action as soon as possible.

In this work, we perform a quantitative analysis about the underrepresentation of young female researchers in Optics and Photonics. In particular, we have analysed the systematic gender bias in the theses defended in Spain between 2015-2020 in this field. To do so, we used the repository TESEO from the Spanish Ministry of Education [2], where all the theses defended in Spain are compiled. We classified the theses attending to their UNESCO codes, which is an international standard for identifying different research topics. We analysed 80 UNESCO codes and a total of 4200 theses, and identified the gender of the theses authors according to their first name, the accessible information from this repository.

Figure 1 shows the data disaggregated by gender, attending to the main blocks of the UNESCO codes where the theses with descriptors related to Optics and Photonics can be found, that is: 21 (Astronomy and Astrophysics, 5 descriptors); 22 (Physics, 45 descriptors), 23 (Chemistry, 11 descriptors), 24 (Life Science, 2 descriptors), 25 (Earth and Space Science, 3 descriptors), 32 (Medical Sciences, 3 descriptors), and 33 (Technological Sciences, 11 descriptors). As an example of the gender bias, only 7 of the 45 descriptors belonging to 22-Physics show a balanced composition between male and female PhD candidates, while there are fields where the imbalance from the parity is higher than 30%, favouring male researchers. There are also some other implicit biases that we are currently studying, that involve the nature of the scientific topic. Our data shows that even within the same area of research, male and female researchers choose different topics of study attending to the fundamental vs. applied nature of the field. This is a work in progress for the workgroup of Women in Optics and Photonics from SEDOPTICA, and it will be presented soon.

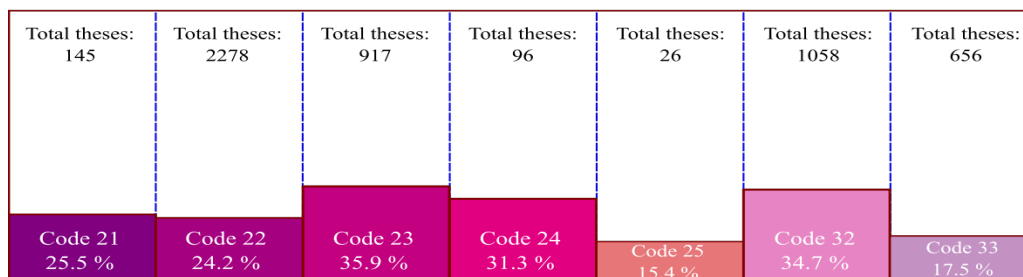


Figure 1. Percentage of female authors of doctoral theses in Optics and Photonics, 2015-2020, Spain.

[1] Consejo Superior de Investigaciones Científicas, “Informe anual 2020.” 2020. [Online]. <https://www.csic.es/es/el-csic/ciencia-enigalidad/> (accessed Apr. 1st, 2022).

[2] Ministerio de Educación, Cultura y Deporte. Gobierno de España., “Teseo.” [Online]. <https://www.educacion.gob.es/teseo/irGestionarConsulta.do> (accessed Apr. 1st, 2022).

Acknowledgements: To SEDOPTICA for its constant support, and Alcon for sponsoring the Women in Optics and Photonics Committee. We also thank the Spanish Ministry of Education for the TESEO database.