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Gender Gap in Science and Academia: A Study on the Professional Careers of Spanish Scientists

Marta Romero-Delgado and Simone Belli *

Abstract. The incorporation of women in the world of science has improved over recent decades. However, the gender gap still remains significant. Furthermore, the discrimination women have to face is often subtle and hence is sometimes difficult to identify in an explicit manner. What is clear is that maternity leave, the implicit gender bias, the lack of specific references in certain areas, the distribution of roles, publications and collaboration between equals are, among other questions, clear examples of a problem that persists over time. Through fieldwork consisting of 23 semi-structured interviews of women and men that are members of research groups with projects financed by the European Research Council, we will address their careers and, thanks to their testimony, will try and uncover this discrimination and explore the current gender gap in the field of Spanish science.

Keywords: Gender, scientific research, leadership, working groups.

1. Introduction

Despite the androcentrism present in all dominant forms of science¹, the incorporation of women into the world of science and academia has

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¹ Harding S. (1986) The science question in feminism. Ithaca, Cornell University Press.

significantly increased in recent decades². However, the gender biases present in these fields –as in society as a whole– make the gender gap larger or smaller depending, among other factors, on the country and field of specialisation.

Recent reports have concluded that the number of women students and holders of bachelor's and master's degrees and PhDs has increased considerably and constantly over the last few years. Specifically in Europe, the number of women with a bachelor's and master's degree now exceeds the number of men, with 54% of the total, and women graduates with 59%. And, although at a PhD level, these drops compared with the aforesaid figures, the figure remains at 48% of women students. However, when analysing the figures for women in relation to researchers, they only account for 33%. At the highest academic level, women professors are clearly underrepresented, standing at 26%. Here, the “scissors diagram” and “leaky pipe” effect appears; in other words, there are many women in the lower ranks or echelons; however, as you move towards higher and more prestigious positions, their number drops. We can see this gender gap at a global level, where men account for 72% of the total number of researchers; consequently, the high number of women in education up to the level of PhD does not inevitably translate into a greater presence in research. Despite this, we should point out, as emerges in the UNESCO report³, that this figure has significant variations according to country and region. Accordingly, in Southeast Europe, women account for 49% of researchers, a similar figure to the Caribbean, Central Asia and Latin America, where they stand at 44%. In Arab countries, women researchers account for 37%, and 30% in Sub-Saharan Africa. Although, as mentioned above, women researchers in European Union countries account for 33% of the total, the contradiction emerges with the fact that only one in four researchers in Germany, the Netherlands and France are women. The percentage of women researchers decreases in countries such as South Korea, with 18%, and Japan, with 15%, the lowest of all the members of the Organisation for Economic Co-operation and Development (OECD). The lowest figures in the world can be found in Ethiopia, with 13%, Togo, with 10% and Nepal, with 8%. Finally, the countries with the highest number of women researchers are Bolivia, with 63% out of the total population, and Venezuela, with 56%⁴. Despite the fact that this last figure is good news for the region of Latin America,

² European Commission (2021) She figures, 2021. Gender in research and innovation: statistics and indicator.

³ Huyer S. (2018) Is the Gender Gap Narrowing in Science and Engineering? UNESCO.

⁴ Huyer S. (2018) Is the Gender Gap Narrowing in Science and Engineering? UNESCO.

companies show the highest degree of segregation, where women researchers in the private sector account for less than one third of the total globally⁵.

Women are underrepresented in many scientific fields and face greater challenges and inequalities than their male colleagues⁶. Gender socialisation is one of the factors that could explain this phenomenon, and, with that, the prejudices, stereotypes and expectations of what is traditionally considered more appropriate for men and for women. This is crucial to understand the choice of fields of study and university degree, where women primarily choose those that are traditionally considered more ‘feminine’, like Humanities and Social Sciences, while men tend to choose the STEM⁷ subjects⁸. Furthermore, this bias against women in scientific and academic fields is fundamental when it comes to understanding these differences⁹.

Similarly, women tend to occupy more subordinate positions¹⁰, compared with the higher positions occupied by men in the STEM sciences in the USA¹¹ and in Europe¹². In addition, women hold fewer positions as

⁵ OEI, Organización de Estados Iberoamericanos (2018) Papeles del Observatorio N° 9: Las brechas de género en la producción científica Iberoamericana. Buenos Aires, Observatorio Iberoamericano de la Ciencia, la Tecnología y la Sociedad de la Organización de Estados Iberoamericanos (OCTS-OEI).

⁶ Fox M.F. (2010) “Women and men faculty in academic science and engineering: Social organizational indicators and implications”, *American Behavioral Scientist*, 53(7), pp. 997-1012. Shaw A.K. & D.E. Stanton (2012): “Leaks in the pipeline: separating demographic inertia from ongoing gender differences in academia”, *Proceedings of the Royal Society of London*, 272, pp.3736–3741. Larivière V., C. Ni, Y. Gingras, B. Cronin & C.R. Sugimoto (2013) “Bibliometrics: global gender disparities in science”, *Nature*, 504, pp.211-213. West J.D., J. Jacquet, M.M. King, S.J. Correll & C.T. Bergstrom (2013): “The role of gender in scholarly authorship”, *PLoS ONE*, 8.

⁷ An acronym for the fields of Science, Technology, Engineering and Math.

⁸ Agudo Y. (2006) “El lado oscuro de la mujer en la investigación científica: ¿es la ciencia una ‘empresa’ masculina?”, *Cuestiones de género: de la igualdad y la diferencia*, 1, pp.15-51.

⁹ Moss-Racusin C.A, J.F. Dovidio, V.L. Brescoll, M.J. Graham & J. Handelsman (2012) “Science faculty’s subtle gender biases favor male students”, *Proceedings of the National Academy of Sciences*, 109, pp. 16474-16479. Knobloch-Westerwick S., C.J. Glynn & M. Huge (2013) “Science faculty’s subtle gender biases favor male students”, *Science Communication*, 35, pp. 603–625.

¹⁰ Wutte M. (2007) “Closing the gender gap”, *Nature*, 448: NJ101–NJ102. Reuben E., P. Sapienza & L. Zingales (2014): “How stereotypes impair women’s careers in science”, *Proceedings of the National Academy of Sciences of the United States of America*, 111, pp. 4403–4408.

¹¹ National Science Foundation (2012): *Science and Engineering Indicators 2012* (NSB 12-01). Arlington, National Science Foundation.

journal editors and members of the editorial boards of journals. Accordingly, in the 1980s, only 18% of journal editors of the American Psychological Association were women, a figure which has barely changed over time, given that in 2005, this figure had only increased to 28% for women editors¹³.

The gender wage gap that affects women scientists, academics and researchers is also worthy of mention¹⁴. These women receive fewer subsidies¹⁵ and their salaries tend to increase more slowly than those of their male colleagues¹⁶. They are also allocated fewer resources and less funding¹⁷.

Academic promotion, evaluation and subsequent public or private funding is primarily determined by scientific production and the impact factor (IF). Also considered necessary are collaboration, cooperation and the forging of networks in general¹⁸, where gender gaps once again stand

¹² European Commission, Directorate-General for Research and Innovation (2013) *She Figures 2012. Gender in Research and Innovation: Statistics and Indicators*. Bruselas, Publications Office.

¹³ Mayer S.J., & J.M.K. Rathmann (2018) "How does research productivity relate to gender? Analyzing gender differences for multiple publication dimensions", *Scientometrics*, 117(3), pp. 1663-1693.

¹⁴ Trower C.A. & Chait, R.P. (2002) "Faculty diversity: Why women and minorities are underrepresented in the professoriate, and fresh ideas to induce needed reform", *Harvard Magazine*, 104, pp. 33-37. Umbach P.D. (2007) "Gender equity in the academic labor market: An analysis of academic disciplines", *Research in Higher Education*, 48, pp. 169-192.

¹⁵ Hosek S., A.G. Cox, B. Ghosh-Dastidar, A. Kofner, N. Ramphal, J. Scott & S.H. Berry (2005) *Gender differences in Major Federal External Grant Programs*. Santa Monica, RAND Corporation. Pohlhaus J.R, H. Jiang, R.M. Wagner, W.T. Schaffer & V.W. Pinn (2011): "Sex differences in application, success, and funding rates for NIH extramural programs", *Academic Medicine*, 86.

¹⁶ Zuckerman H. (1987) "Persistence and change in the careers of men and women scientists and engineers: A Review of Current Research", in L.S Dix, ed., *Women: Their Underrepresentation and Career Differentials in Science and Engineering*. Washington, D.C., National Academy Press, pp. 123-156. Long J.S, P.D. Allison & R. McGinnis (1993) "Rank advancement in academic careers: Sex differences and the effects of productivity", *American Sociological Review*, 58(5), pp. 703-722.

¹⁷ Stack S. (2004) "Gender, children and research productivity", *Research in Higher Education*, 45(8), pp. 891-920. O'Dorchai S., Meulders, D., Crippa, F. & Margherita, A. (2009) *She figures 2009. Statistics and indicators on gender equality in science*. Publications Office of the European Union. Larivière V., E. Vignola-Gagné, C. Villeneuve, P. Gélinas & Y. Gingras (2011) "Sex differences in research funding, productivity and impact: an analysis of Quebec university professors", *Scientometrics*, 87, pp. 483-498.

¹⁸ Wuchty S., B.F. Jones & B. Uzzi (2007) "The increasing dominance of teams in production of knowledge", *Science*, 316, pp. 1036-1039. Leydesdorf L., & C.S. Wagner

out¹⁹. The numerous research papers drafted in this regard have fundamentally been carried out based on surveys²⁰ and by other quantitative methodological tools; hence, the conclusions and results do not tend to explain the root cause of this problem. According to the data available, women researchers have lower output and publish fewer papers than their male counterparts²¹. Furthermore, they tend to collaborate less at an international level²², at a national level and in their own university departments²³, and even when they do so, their collaboration is less prestigious²⁴. In addition, various studies argue that a certain “gender homophilia” exists when publishing scientific papers; in other words, women publish with women and men with men with a higher frequency than would be expected if this were random in terms of gender²⁵.

(2008): “International collaboration in science and the formation of a core group”, *Journal of Informetrics*, 2(4), pp. 317-323.

¹⁹ Bozeman B. & E. Corley (2004) “Scientists’ collaboration strategies: implications for scientific and technical human capital”, *Research Policy*, 33, pp. 599-616. Holman L., D. Stuart-Fox & C.E. Hauser (2018) “The gender gap in science: How long until women are equally represented?”, *PLOS Biology*, 16(4).

²⁰ Abramo G., C.A. D’Angelo & F. Di Costa (2013) “Gender differences in research collaboration”, *Journal of Informetrics*, 7, pp. 811-822.

²¹ Kyvik S., & M. Teigen (1996) “Child care, research collaboration, and gender differences in scientific productivity”, *Science, Technology and Human Values*, 21(1), pp. 54-71. Larivière V., C. Ni, Y. Gingras, B. Cronin & C.R. Sugimoto (2013) “Bibliometrics: global gender disparities in science”, *Nature*, 504, pp.211-213.

²² Lewison G. (2001) “The quantity and quality of female researchers: A bibliometric study of Iceland”, *Scientometrics*, 52, pp. 29-43.

²³ Webster B.M. (2001): “Polish women in science: A bibliometric analysis of Polish science and its publications”, *Research Evaluation*, 10, pp. 185-194.

²⁴ Long J.S. (1990) “The origins of sex differences in science”, *Social Forces*, 68, pp. 1297-1316. Zeng X., J. Duch, M. Sales-Pardo, J. Moreira, F. Radicchi, H.V. Ribeiro, T. Woodruff & L. Amaral (2016) “Differences in Collaboration Patterns across Discipline, Career Stage, and Gender”, *PLOS Biology*, 14(11). Jadidi M., F. Karimi, H. Lietz & C. Wagner (2018) “Gender disparities in science? Dropout, productivity, collaborations and success of male and female computer scientists”, *Advances in Complex Systems*, 21(3-4).

²⁵ McDowell J.M. & J.K. Smith (1992) “The effect of gender-sorting on propensity to co-author: Implications for academic promotion”, *Economic Inquiry*, 30, pp. 68-82. Ghiasi G., V. Larivière & C.R. Sugimoto (2015) “On the compliance of women engineers with a gendered scientific system”, *PloS ONE*, 10. Teele D.L. & T. Kathleen (2017) “Gender in the journals: Publication patterns in political science.”, *PS: Political Science & Politics*, 50, pp. 433-447. Araújo T. & F. Elsa (2017) “The specific shapes of gender imbalance in scientific authorships: a network approach”, *Journal of Informetrics*, 11, pp. 88-102. Holman L., D. Stuart-Fox & C.E. Hauser (2018) “The gender gap in science: How long until women are equally represented?”, *PLOS Biology*, 16(4).

As we could appreciate, quantitative data paint the picture superficially as if women did not want to work, are lazy or not as committed to science as men, eliminating systemic bias and exclusion. Beyond the figures, the reasons that explain these gender differences in the degree of collaboration and production can be summed up by: gender prejudices against women and implicit gender bias²⁶ in science and academia²⁷, where we could also include the so-called “Matilda Effect”, which is the lack of recognition for women’s successes and the resulting attribution of their work to their male counterparts as a result of existing social prejudices²⁸. Furthermore, gender socialisation acts subtly on questions that are clearly less visible, such as due to less networking or forming professional relationships of women in scientific communities, men are more able to manage in these milieu²⁹; family and care obligations that are traditionally fulfilled by women³⁰; unequal access to conferences³¹ and travel funds³²; concerns related to sexual harassment³³ and gender

²⁶ See LERU (2018), for more information on “implicit gender bias” concept.

²⁷ Moss-Racusin C.A, J.F. Dovidio, V.L. Brescoll, M.J. Graham & J. Handelsman (2012) “Science faculty’s subtle gender biases favor male students”, *Proceedings of the National Academy of Sciences*, 109, pp. 16474-16479. Sharma J. & Poole, D.N. (2018) Gender bias in publishing. *Lancet*, 392, pp. 1515-1516.

²⁸ Gage M.J. (1883) “Woman as an Inventor”, *The North American Review*, 136 (318), pp. 478-489. Rossiter M.W. (1993): “The Matthew/Matilda Effect in Science”, *Social Studies of Science*, 23, pp. 325-341.

²⁹ Fell C.B., & C.J. König (2016) “Is there a gender difference in scientific collaboration? A scientometric examination of co-authorships among industrial-organizational psychologists”, *Scientometrics*, 108(1), pp. 113-141.

³⁰ Long J.S, P.D. Allison & R. McGinnis (1993) “Rank advancement in academic careers: Sex differences and the effects of productivity”, *American Sociological Review*, 58(5), pp. 703-722. Reskin B.F. (1978): “Scientific productivity, sex, and location in the institution of science”, *American Journal of Sociology*, 83, pp. 1235-1243. Wright A.L., L.A. Schwindt, T.L. Bassford, V.F. Reyna, C.M. Shisslak, P.A.S. Germain & K.L. Reed (2003) “Gender differences in academic advancement: Patterns, causes, and potential solutions in one U.S. college of medicine”, *Social Forces*, 68, pp. 1297-1316. Uhly K.M., L.M. Visser & K.S. Zippel (2017) “Gendered patterns in international research collaborations in academia”, *Studies in Higher Education*, 42(4), pp. 760-782.

³¹ Martin J.L. (2014) “Ten simple rules to achieve conference speaker gender balance”, *PLoS Computational Biology*, 10.

³² Bozeman B. & E. Corley (2004) “Scientists’ collaboration strategies: implications for scientific and technical human capital”, *Research Policy*, 33, pp. 599-616.

³³ Jagsi R., K.A. Griffith, R. Jones, C.R. Perumalswami, P. Ubel & A. Stewart (2016) Sexual Harassment and Discrimination Experiences of Academic Medical Faculty. *JAMA*, 315(19), pp. 2120–2121. Tenbrunsel AE, Rees MR & Diekmann KA (2019) Sexual harassment in academia: ethical climates and bounded ethicality. *Annu Rev Psychol.*, 70, pp. 245-270

differences in confidence and self-esteem³⁴, along with greater self-criticism by women when evaluating their merits and abilities³⁵. These last few questions could be framed within the so-called “Imposter Syndrome”³⁶; in other words, when women scientists move into a male-dominated and androcentric space, these female scholars continue to be viewed as invaders and strangers, which casts doubt on their acceptance and capabilities³⁷.

In this paper, we analyse the incorporation of women into the world of science and academia through interviews with both female and male scientists that work at scientific institutions in Spain. The results of the qualitative study show how these dynamics maintain the gender gap in our workplaces.

1.1. Scientific gender gap in Spain

As in other European countries, the situation of women in scientific fields in Spain has improved to an intermediate position; however, a “glass ceiling” still exists in those positions of greatest power and importance³⁸. This hierarchical discrimination is just one example of the difficulties women researchers face, with more direct ones such as the fact that they tend to be excluded from informal communication networks. All of this

³⁴ Bleidorn W., R.C. Arslan, J.J. Denissen, P.J. Rentfrow, J.E. Gebauer, J. Potter & S.D. Gosling (2016): “Age and gender differences in self-esteem-A cross-cultural window”, *Journal of personality and social psychology*, 111(3), pp. 396-410.

³⁵ Lerchenmueller M.J., O. Sorenson & A.B. Jena (2019) Gender differences in how scientists present the importance of their research: observational study. *BMJ (Clinical research ed.)*, 367.

³⁶ Clance P.R. & Imes, S. (1978) “The imposter phenomenon in high achieving women: Dynamics and therapeutic intervention”, *Psychotherapy: Theory, Research & Practice*, 15(3), pp. 241-247. De Montarlot, A. y E. Cadoche (2021): *El síndrome de la impostora. Por qué las mujeres carecen de tanta confianza en sí mismas*. Barcelona, Península.

³⁷ Durán M.A. (2000) *Si Aristóteles levantara la cabeza: Quince ensayos sobre las ciencias y las letras*. Madrid, Cátedra. García M.L., F. Arranz, C. Del Val, Y. Agudo, A. Viedma, C. Justo & P. Pardo (2006) *Mujeres y hombres en la ciencia española. Una investigación empírica*. Madrid, Instituto de la Mujer.

³⁸ Lara C. (2007) “La perspectiva de género en los sistemas de evaluación de la producción científica” *Revista de Investigación Educativa*, 25 (1), pp. 133-148. Unidad de Mujeres & Ciencia [UMYC] (2011) *Libro Blanco. Situación de las mujeres en la Ciencia Española*. Madrid, Ministerio de Ciencia e Innovación. Tomás M. & T. Mentado (2013): *Las temáticas y preocupaciones de las investigadoras élite en ciencias sociales de las universidades catalanas*. Madrid, CSIC.

means that, in general, women are “forced to endure discrimination suffer which is manifested in highly subtle and covert forms”³⁹.

One of the most important reports on this issue was published in 2018 by the Society of Spanish Researchers in the United Kingdom. This was a research paper on gender equality in Spain, with a sample of 1,295 people who worked for different national scientific institutions, which addressed such questions as the perception of gender inequalities. The results show that appreciating the gender gap in the field of science differs significantly between men and women, given that 55% of the women asked considered that men and women are treated equally in their department, compared with 79% of men. The differences are more startling when asked about their opinion as to whether being a woman negatively affects their professional career, with 46% of women responding affirmatively, compared with only 10% of men. However, where the gender gap is most clearly evident is when addressing the subject of maternity/paternity leave, whereby maternity leave is a clear example of how inequality operates directly between men and women in the field of research. In this regard, the consequences caused by requesting maternity/paternity leave in a research career are perceived differently: 60% of women consider this has negative effects, compared with 33% of men ⁴⁰.

The applications required to formalise a research work position or for promotion in a scientific career have also been analysed recently. This is the case of the six-year transfer, where the results reveal a clear gender gap. The applications presented by men are twice the number of those presented by women and, taking into account that the global success rate of these applications is 42.47%, applications by 73% of men were approved compared with 27% by women⁴¹. The applications presented by the National Agency for the Evaluation of Quality and Accreditation (ANECA) also suffer from a clear gender bias, which can be appreciated in such questions as the fact that only 34.62% of all applications were presented by women, including in fields traditionally dominated by women. Furthermore, clear inequality also exists in senior positions at evaluation institutions, where there are far fewer women holding decision-

³⁹ González M. & E. Perez (2002) “Ciencia, Tecnología y Género”, CTS+I: Revista Iberoamericana de Ciencia, Tecnología, Sociedad e Innovación, 2.

⁴⁰ SRUK/CERU-Society of Spanish Researchers in the United Kingdom (CERU) (2018): Percepciones que crean barreras. Igualdad de género en la investigación científica. Fundación COTEC para la Innovación. Madrid, Departamento de Política Científica, Sociedad de Científicos Españoles en Reino Unido - CERU.

⁴¹ López A., M.D. Pereira, S. Dema & C. Díaz (2020) “Informe encuesta AMIT sobre el sexenio de transferencia: resultados preliminares”, Revista Igualdad, 14.

making positions or sitting on proposal selection committees, along with the low number of professors with six-year tenures at universities⁴².

This underrepresentation of women spans all fields, as evidenced at the scientific awards of Spain granted from the years 2009 to 2014, with only 17.63% of female award-winners, a fact that is accentuated as the economic amount of the awards rises, falling to 7.14% for the three highest awards⁴³.

The gender gap can also be clearly appreciated in collaboration and cooperation between research groups, with only a quarter of the groups being headed up by women, and where women are more concerned with the formation of the team and the group atmosphere⁴⁴. In terms of authoring papers, men continue to be cited more often, that is, in a leadership role, while women stand out more as the authors of articles (production role) and as coordinators of monographs (organisational role)⁴⁵.

1.2. Methodology

The internal mechanisms that operate in scientific research groups are analysed in this research paper⁴⁶, while also identifying collaboration patterns and strategies that promote innovation and excellence in a broad sense. The transformations are also studied as a result of new technologies in the forms of collaboration adopted, affective networks and communication at a scientific level. The fieldwork consists of 48 in-depth interviews and ethnographic work divided into two phases: the first with 23 semi-structured interviews of members of research groups with projects financed by the European Research Council (ERC), both men and women, with different profiles according to their gender, the job position they hold (consolidated or principal Investigator - IP - pre-doctoral students and master's degree students) and the disciplinary field

⁴² López A. & M.D. Pereira (2021) "Transfer of knowledge: is it a gender matter?", *Ciencia, Técnica y Mainstreaming Social*, (5), pp. 16-30.

⁴³ González L. (2015) *Las mujeres en los premios científicos en España 2009-2014*, Madrid, Ministerio de Economía y Competitividad.

⁴⁴ Tomás M. & T. Mentado (2013): *Las temáticas y preocupaciones de las investigadoras élite en ciencias sociales de las universidades catalanas*. Madrid, CSIC.

⁴⁵ Segarra-Saavedra J., V. Tur-Viñes & T. Hidalgo-Marí (2020): "Género y perfil en las autorías y colaboraciones de 'Revista Mediterránea de Comunicación' (2010-2019)", *Index.comunicación*, 10(1), pp. 149-172.

⁴⁶ Project reference: 2018-T1/SOC-10409, Attraction of Talent Modality 1 of the Region of Madrid. Project title: "Innovation, decision making and leadership in science: How researchers work together".

they work in (Natural Sciences, Engineering, Social Sciences and Humanities). The other three interviews were carried out with a specialist in scientific collaboration (X1), a member of a group with fewer resources (X2) and a researcher that holds an important position at the ERC (X3) (Table 1)⁴⁷. The second phase of the fieldwork consists of 25 semi-structured interviews, where less than half correspond to scientists that are PIs in projects financed by the European Research Council and the rest are researchers and academics related to the field of Social Sciences, holding different job positions, such as professors, teaching assistants, tenured lecturers and pre-doctoral students⁴⁸.

Table 1: Profile of interviewees in the first phase

Id.	Sex	Discipline	Position
E1	Man	Natural Sciences	Tenured lecturer
E2	Man	Engineering	Professor
E3	Woman	Social Sciences	Professor
E4	Woman	Humanities	Professor
E5	Man	Humanities	Teacher/teaching assistant
E6	Man	Natural Sciences	Professor
E7	Man	Natural Sciences	Teacher/teaching assistant
E8	Woman	Natural Sciences	Professor
E9	Man	Engineering	Tenured lecturer
E10	Man	Natural Sciences	Teacher/teaching assistant

⁴⁷ This first phase of the research was run by the researcher Carlos López Carrasco, whom the authors express their gratitude to.

⁴⁸ And this second phase of the research was run by Marta Romero-Delgado.

E11	Man	Social Sciences	Teacher/teaching assistant
E12	Man	Humanities	Pre-doctoral
E13	Woman	Natural Sciences	Pre-doctoral
E14	Woman	Natural Sciences	Pre-doctoral
E15	Woman	Natural Sciences	Student
E16	Woman	Natural Sciences	Administrative staff
E17	Man	Humanities	Pre-doctoral
E18	Man	Natural Sciences	Post-doctoral
E19	Woman	Humanities	Post-doctoral
E20	Woman	Natural Sciences	Professor
X1	Man	Social Sciences	Tenured lecturer
X2	Man	Humanities	Tenured lecturer
X3	Woman	Natural Sciences	Professor

Source: Authors

Once transcribed, the interviews were analysed with a discursive analysis of collaborative practices, based on a coding of the interview material. We have tied in our perspective to the framework of the organisational discourse analysis, which sees an opportunity in this to draw closer to the “ways of life” of the organisation⁴⁹. In turn, we have used sociolinguistic

⁴⁹ Fairhurst, G.T. & M. Uhl-Bien (2012) “Organizational discourse analysis (ODA): Examining leadership as a relational process”, *The Leadership Quarterly*, 23(6), pp. 1043–1062.

tools, such as the study of the positions of the tradition of such authors as Harré & van Langenhove⁵⁰, without forgetting to refer to the social structures that dialectically form the discourse. Finally, we have associated the discursive and linguistic level with the socio-material contexts, with reference to the potential of ethnography to observe the practical context where certain ways of speaking are consolidated, even appreciating the actual interview as an interactive situation. Our methodological strategy, which is infrequently used in studies on scientific collaboration, is taking on a greater profile in the tradition of studies on organisations⁵¹.

This paper will specifically analyse the gender gap in the world of science and academia, along with the emotions this arouses, by means of coded interviews that are processed in the first phase of the fieldwork. In this first theoretical examination and the presentation of the issue at hand, our proposal will focus on an analysis of the subject of research in the world of Spanish science and academia.

2. Regarding the Pipe Dream of ‘Objectivity in Science’: How Can the Scientific and Academic Gender Gap be Explained?

It seems clear that fewer women exist in many departments, particularly in some fields of knowledge, and despite being obvious, the potential causes have not always been analysed, not even by women scientists and academics themselves. When asked directly, they only allude to this possibly happening in their own department or specialised field:

There are women, but not many, in this department: there are much fewer women who are professors, and specifically in my field, which is, let’s say, “micro” (Interview 3, woman).

The aforesaid phenomenon of the “scissor” or “leaky pipeline” effect is also observed in various fields, particularly in areas like academia or career

Carrasco, C. L., & Belli, S. (2023). “Back and forth” between the individual and the group: collaboration and emotional leadership in science. *Journal of Organizational Change Management*, 36(2), 305-325.

⁵⁰ Harré, R. & L. van Langenhove (eds.) (1999) *Positioning Theory: Moral contexts of Intentional Action*. Oxford, Blackwell.

⁵¹ Sutherland, N. (2016) “Investigating leadership ethnographically: Opportunities and potentialities”, *Leadership*, 14 (3), pp. 263-290. Carrasco, C. L., & Belli, S. (2023). “Back and forth” between the individual and the group: collaboration and emotional leadership in science. *Journal of Organizational Change Management*, 36(2), 305-325.

progression⁵², where there's an imbalance or loss of representation of certain groups as one moves up the hierarchy. In academia, this might refer to the decreasing representation of women or minorities as one moves from undergraduate to graduate studies, faculty positions, and higher administrative roles. It reflects a disparity in retention and advancement opportunities for these groups compared to others. As the people interviewed also appreciated, there are many women taking master's degrees, working at laboratories or training, but men tend to hold senior positions and be PIs.

Well, it caught my attention that many PIs tend to be men; that is genuinely the case. There are obviously also many women, but you end up realising that there is a high proportion of women on bachelor's and master's degree courses and the suchlike. And there are also many women in laboratory groups. But then, with the PIs, in the end there is a higher proportion of men. I don't know to what extent there is a major bias in that regard [...], I just don't know. Something else that grabbed my attention is that many of the technical staff tend to be women. [...] Yes. The truth is that... Even in companies, there was only one male. While there were some 20 of us. But, in contrast, the bosses were two men. There were also women bosses but the top bosses, they were men (Interview 14, woman).

The lack of female references is alluded to in the interviews as one of the possible explanations that may lie behind this lower number of women,

And if, on top of that, you add the lack of female references which, let's see, they do exist, don't they? We are starting to see that... there are starting to be female references, but there are undoubtedly more men... if you add that and then, well if you add everything, how you are brought up, how you are educated, the mental burden when you get home to your partner and everything else, well, I imagine that this makes it easier for there to be more men than women in the world of science (Interview 15, man).

When talking about the work environment and the daily routine at work, the existence of overly competitive and highly demonstrative attitudes

⁵² Shaw A.K. & D.E. Stanton (2012): "Leaks in the pipeline: separating demographic inertia from ongoing gender differences in academia", *Proceedings of the Royal Society of London*, 272, pp.3736–3741.

becomes clear, which could even lead to hindering collaboration⁵³. These attitudes may hinder collaboration and teamwork, as individuals may prioritize personal achievements over collective goals. This competitive environment can create barriers to effective communication and cooperation, ultimately impeding the organization's ability to work cohesively towards shared objectives. Specifically, the following interviewee calls this “male egos”:

And one of the greatest difficulties I encountered regarding teamwork and working with partners is the male ego. They are very complicated, truly complicated. I was going to say this particularly applies to older men, but I can see that younger men are more or less the same. That is complicated. The case is that in Humanities there have been more women for some time now and then, as part of a team, things can go relatively well and you are in an environment that is almost like an office, which is quite toxic, which is the coexistence that takes place in a single building with other teams. This is sometimes an added complication. And there is often an atmosphere of rumours, of mistrust, such that... This happens in coffee breaks, in corridors, in this kind of office atmosphere (Interview 4, women, PI at ERC).

This climate of competition and of a quite aggressive attitude is what, on occasions, demotivates and discourages some women in the sample,

It is true that above all in the field of economics we are all very critical of – what need is there to be aggressive? It is perhaps this attitude that discourages women... more women from signing up to this field, etc. (Interview 3).

Some women allude to the fact that they do not feel excluded or consider it necessary to change anything, alleging that there is no talk about gender discrimination in their team and that neither do they feel called on to do or say anything in this regard simply because they are women.

Personally, I don't believe I have seen any gender bias against women. That's what I believe. Or at least nothing that I have seen. I certainly don't think so. I haven't been

⁵³ López Carrasco, C., & Belli, S. (2023). “Back and forth” between the individual and the group: collaboration and emotional leadership in science. *Journal of Organizational Change Management*, 36(2), 305-325.

excluded or anything like that just because I'm a woman
(Interview 14, woman).

On occasions, women scientists argue that at the start of their career or when they were younger, they were not aware of certain forms of discrimination or, if they were, due to their situation of job instability or precariousness, they didn't want to mention it in case this had any negative consequences⁵⁴. Sometimes, with the passing of time, they become more aware of this situation, of the reality of the dynamics and, with greater job stability, their attitude and perspective also change.

I am now fed up with arriving at a seminar and seeing that I am the only woman. Because the attitudes are different, the dynamics are different, which I find somewhat tiresome. So, yes, I am fed up with it but, let's say, I have done my time and travelled my academic journey, I no longer have to aspire to a position, do I? So, I can afford the luxury of finding this tiresome, of being fed up with it and I would prefer it to be another way, but maybe for other women who are starting off their careers (Interview 3).

One issue that seems to be addressed much less when men are researchers, which alludes to the objectivity of science and the fact that there is negative or macho conduct in science, is an individual question of certain people, but not something intrinsic to science, as can be appreciated in the following interview,

Let me stress, I am not sure whether it is something specific, either to science or to my discipline. I don't know. But then I can think of several people who can say to you – look, he is either egotistical – as you have just described to me – or, he is not a scientist. Because, at the end of the day, if you base your research more on this type of question, you are performing bad science. You are performing bad science because what you want, what you are going to publish, is either a replay or a response not because you feel that bad science has been produced in this publication, but rather because you are going to fuck over, excuse the expression, this other person (Interview 5, man).

⁵⁴ González M. & E. Perez (2002) "Ciencia, Tecnología y Género", CTS+I: Revista Iberoamericana de Ciencia, Tecnología, Sociedad e Innovación, 2.

This argument, that of the “objectivity of science” emerges on more than one occasion, and is also used by some female scientists, but to a lesser extent. This is always a controversial issue, albeit one strongly supported; in other words, the pipe dream of separating observations from reality of those that observe them, with a view to appealing to the impartiality of the observer when it is the scientific community that proposes and transforms the frameworks, the language and the agreements with a supposed objectivity that is socially accepted⁵⁵. The problem of “recognition of excellence solely on the basis of pure merit does not always work well in practice and the idea that academic excellence is not always gender-neutral is not an easy subject in the academic world”⁵⁶. Furthermore, some men do appreciate that discriminatory attitudes exist regarding gender within the field of science,

There are not a lot of girls in science, there are few female references, in other words, it is... in the end, I imagine this is the case, but I cannot say much as to this. And I am sure that I have done things that have annoyed some girls or... but anyway, I cannot speak much as to this matter. I don't see battles of egos in the laboratory that affect girls, and as I don't and haven't seen them, although I am sure sexist attitudes exist (Interview 15, man).

As regards the question of collaborating in scientific teams, most interviewees consider that clear nuances or differences exist according to the gender of those making up these teams. According to the following post-doctoral researcher, although there is still a long way to go on gender equality in Spain compared with other European countries, what has caused this is that their bosses tend to be women, which is what marks the difference.

There are relatively few of us women that are post-doctoral researchers. There are a great many more male researchers. Hence no, there is not much sensitivity regarding this question because we are in the minority. But of course, people... well, I have always worked with well-educated, elegant people and... if it isn't about gender issues, it is about issues of general culture which, let's say,

⁵⁵ Popper K.R. (1977): *La lógica de la investigación científica*. Madrid, Tecnos.

⁵⁶ League of European Research Universities-LERU (2018) "Implicit bias in academia: A challenge to the meritocratic principle and to women's careers. And what to do about it". Advice paper, number 23.

haven't discouraged me. I haven't been made to feel like I don't belong in this field (Interview 19, woman).

She carried on by asserting that the fact that her PI is a woman is something that contributes and stands out in her group, which reflects the general culture of the group, the organisational and cultural definition of the nature of this group.

I feel that Mercedes treats us with a proximity that would be hard to find in a man. [...] Because she is a very busy woman, but somehow she tries to find out what is going on in her team, how you are personally (Interview 19, woman).

In the last few lines of this excerpt, we can identify how emotions differ in gender relations and leadership style. The interviewee gives us an example of how women in science try to look more into and become more familiar with many dynamics that go beyond the academic context but which affect the daily work. What we can deduce from these words from the interviewee is that a more emotional/closer/more caring relationship exists when a woman holds a position of leadership, while it is more distant and is less in-depth as regards sentiment when a man holds this position, which corresponds to traditional and hegemonic concepts in terms of masculinity and femininity. Many people interviewed, particularly women, agreed on the need for women to be members of groups and stressed the importance of all the levels of groups being mixed gender, which would also result in greater professional benefits.

When you look at it, it is true, laboratories tend to be particularly women dominated. And particularly women, because the laboratories in Spain are again primarily made up of young people. Students and post-doctoral researchers. [...] Then there is (she laughs) a total change (Interview X3, woman).

3. Analysis of Subtle Forms of Discrimination and Overt Discrimination

Some testimonies can be analysed from an intersectional focus, with a view to seeing the multiple forms of discrimination that operate

simultaneously and overlap⁵⁷. In this case, gender discrimination is interrelated with discrimination according to ethnicity/"race", class, gender identity and geographical affiliation, among others. This issue has been studied in recent decades especially by female Afro-American scholars⁵⁸. In the following example, for the interviewee, a PI on an ERC project, the arrogance towards women has certain parallels with the arrogance towards southern European countries since they are lower on the social scale. These asymmetrical power relations are also interconnected with other subtler questions and hence, according to her, these need to be addressed in an assertive and cordial manner.

The issue of male egos is a curious matter. And then you have cultural differences, don't you? There are European countries where the arrogance is tremendous and it doesn't even seem to annoy their own partners; either that, or perhaps the arrogance is mainly exercised against southern European countries or against women. [...] Anyway, these are complicated relationships because there is no clear power hierarchy as exists in other companies, with promotions and money; only your reputation. (Interview 4, woman).

⁵⁷ Crenshaw K.W. (1995) "Mapping the Margins: Intersectionality, Identity Politics and violence Against Women of Color", in K.W. Crenshaw, N. Cotanda, C. Peller y K. Thomas, eds., *Critical Race Theory. The key writings that formed the movement*. New York, The New Press.

⁵⁸ Thomas, G. D., & Hollenshead, C. (2001). Resisting from the margins: The coping strategies of Black women and other women of color faculty members at a research university. *Journal of Negro Education*, 166-175. Myers, L.M. (2002) *A Broken Silence: Voices of African American Women in the Academy*. Westport, Greenwood. Rollock, N. (2019) *Staying power: the career experiences and strategies of UK Black female Professors*, London: UCU. Flores, Y., Gutiérrez, G. & González, C. (ed.) (2020) *Presumed Incompetent II: Race, Class, Power, and Resistance of Women in Academia*. Lousville, University Press of Colorado. Dupree, C. H., & Boykin, C. M. (2021). Racial Inequality in Academia: Systemic Origins, Modern Challenges, and Policy Recommendations. *Policy Insights from the Behavioral and Brain Sciences*, 8(1), 11–18. Avery, D. R., Darren, K. B., Dumas, T. L., George, E., Joshi, A., Loyd, D. L., van Knippenberg, D., Wang, M., & Xu, H. (2022). Racial Biases in the Publication Process: Exploring Expressions and Solutions. *Journal of Management*, 48(1), 7-16. Holmes, O., Smith, A.N., Loyd, D.L. & Gutiérrez, A.S. (2022) "Scholars of color explore bias in academe: Calling in allies and sharing affirmations for us by us". *Organizational Behavior and Human Decision Processes*, 173. National Science Foundation (2012): *Science and Engineering Indicators 2012* (NSB 12-01). Arlington, National Science Foundation.

Similarly, this intersectional approach comes out over the course of the interviews, taking into account other social variables, as in the following case regarding class,

[...] I feel that the demands are greater on women than on men. [...] she was married to a very prestigious architect, who then died and she carried on working at a chemist's; she then went away every summer to... to stay somewhere, in France, I think, in other words, there was a lot of work like that, but she clearly had family money and she had helpers to look after her daughters, her children, sorry, in the summer. So, of course, she had these facilities that perhaps other women don't have. (Interview 18, man).

Certain subtler forms of gender discrimination exist, which are thus harder to identify. The following interviewee talks about her perspectives of the difficulties she has in being taken seriously at work because, according to her, she is firstly seen as a woman and not as an academic or scientist.

I feel that when I go somewhere, firstly I am seen as a woman and then as a researcher. [...] It is hard to take what I do seriously, isn't it? [...] Yes... or catch others' interest, don't you think? Oh... or... become... you know? The Smurfette. [In answer to the question, you can detect some level of competitiveness or aggression in her language] Quite the opposite. I would say a certain level of moderation, wouldn't you? When people talk to me, it's a bit like when they talk to a baby. [...] This can also seem somewhat aggressive, don't you think? (Interview 19, woman).

What she is saying and how it makes her feel is considered to be 'benevolent sexism'⁵⁹; in other words, promoting the stereotype of women as weak people that need to be protected by men. And despite her clearly giving voice to the fact that they treat her like a child, she does not consider that they discriminate against her due to this subtlety and to symbolic violence that is sometimes imperceptible⁶⁰.

⁵⁹ Glick P. & S. Fiske (1996) "The ambivalent sexism inventory: differentiating hostile and benevolent sexism", *Journal of Personality and Social Psychology*, 70, pp. 491-512.

⁶⁰ Bourdieu P. (1999) *Razones practicas. Sobre la teoría de la acción*. Barcelona, Anagrama.

A clear form of discrimination on grounds of gender, as well as being a turning point in the scientific and academic career of women, is maternity, and everything this represents, such as the pregnancy, upbringing, breastfeeding, care, etc., a question that emerges in all the interviews. Paternity leave is not such a major sacrifice, not even the impossibility, on occasions, of combining one's private life with one's personal and family life, as it is for women scientists of all ages in our sample, whether they have requested maternity leave or not. For the following interviewee, a PI on an ERC project, paternity is not a problem in combining it with their work; however, he is aware that the situation for women differs considerably and reflects on what it means to them:

[in response to the question, he says it is possible to combine paternity leave with his scientific work]. It is true that the situation is very different for women. Because, in the end, whether you want to or not, even however much you... They always have to invest a lot more. Because it is not only the pregnancy and breastfeeding, at the time in one's career when you have children, this is a crucial moment and it is true that it is... It is more difficult for women, unfortunately, to strike a work/life balance (Interview 10, man).

He questions current social policies at all levels and considers that there should be a more proactive approach to helping women, primarily in resuming their career after maternity. Because, according to this man, the type of disconnection mothers has at an employment level is far greater than for men, which he particularly attributes to biological questions.

"This is not a social aspect. In the end, it is more closely related to biological aspects. It is true that some... Well... In the end, this is a controversial issue, but it is true that... When you are a father, obviously your kids come first and during those first few months or years in general, they will always come first, but you remain connected to your work in such a way that sometimes mothers, for a host of reasons, are unable to do this because they have to... In the end, breastfeeding is very demanding. Because then you have certain dynamics with the children that... Kids want to be with their mothers more." (Interview 10, man).

Similarly, a pre-doctoral researcher speaks, as a man, about the difficulties women have in relation to their scientific and academic career. In addition to the competitiveness and job insecurity that already dominates scientific

fields, the fact of being a woman exacerbates this panorama, mainly due to gender issues, in other words, due to the time given over to caring, the work/life balance and maternity.

So, you have to have a very high level of publication, where any form of distraction pushes you out of the circle, because you don't get any money if you don't publish; if you don't get any money you can't publish, so... (Interview 15, man).

In addition, if you compare the situation of your boss who recently became a dad, but his situation is not comparable with that of any woman who is a scientist, which is why I consider that maternity requires a period of time when it is not possible for a woman to be at the same productive and publication level as a man.

Because this woman loses a minimum of at least one year. Then you have those grants you mentioned – the most recent publications in the last five years. Good Lord, if I had two children in the last five years, which isn't that unusual. So, I completely fall out of the loop. So, I feel that at a scientific level in Spain, [...] this is a total screw-up; in other words, women have everything to lose. (Interview 15, man).

However, this frenetic, competitive and aggressive rhythm that some interviewees talk about encompasses many employment situations, thus perpetuating the system, without criticising it, to such a degree that, according to the following woman interviewed, who also became a mother some years ago, the productivity and gender differences that exist have less to do with maternity than with how you distribute your time and with how committed, or not, you are to your work, without worrying about whether this affects your personal life. This all leads to the normalisation of even things like having to answer an email at midnight.

“Just look, I don't think it is so much combining this, for example, with maternity. It is combining... let's say, I was very struck by what one of my students who has just finished said, which for me was, let's say, I felt this keenly that she decided, and she will do it wonderfully, to go more into the field of teaching. And she is doing a master's degree at the moment... Whereas I feel that she had the talent to become a researcher. But she said to me, “I can't see myself like you, whereby I send you an email and you answer me at midnight” She said to me, “I don't

have that capacity for dedication”. And I said, “of course, maybe I answer at midnight but I take my time doing other things. That is the case because I don’t have any children. Well, I do have children but they are grown up, I don’t need to look after them. That is a life situation. When you have young children, you truly do not have... You organise your day differently.” (Interview X3, woman).

In other words, for this scientist, the heart of the problem of having more responsibility, of dedication to other people and everything related to the matter of care-giving, is due less to the agency of women, because they let themselves be influenced more easily and are fearful of commitment.

4. Conclusions

The incorporation of women in the world of science and academia has improved considerably over recent decades. However, an invisible reality continues to exist, or is even denied, that highlights the relations and structure of patriarchal power. In the specific case of Spain, as in other ‘Western’ countries, the situation of women in these scientific spheres has improved to intermediate positions; however, there is still a ‘glass ceiling’ in those positions with the greatest power and importance.

We have seen how the situation has improved compared with earlier studies⁶¹; however, there is still a long way to go for employment and professional conditions to be equal for both men and women in science. We acknowledge the limitations of a binary model of gender, and assuming the different gender constructions. In recent years, discrimination due to gender diversity and gender/sex bias in Academia and Science have been pointed out, mainly within STEM⁶².

⁶¹ Fox M.F. (2010) “Women and men faculty in academic science and engineering: Social organizational indicators and implications”, *American Behavioral Scientist*, 53(7), pp. 997-1012. Shaw A.K. & D.E. Stanton (2012): “Leaks in the pipeline: separating demographic inertia from ongoing gender differences in academia”, *Proceedings of the Royal Society of London*, 272, pp.3736–3741. Larivière V., E. Vignola-Gagné, C. Villeneuve, P. Gélinas & Y. Gingras (2011) “Sex differences in research funding, productivity and impact: an analysis of Quebec university professors”, *Scientometrics*, 87, pp. 483-498. West J.D., J. Jacquet, M.M. King, S.J. Correll & C.T. Bergstrom (2013): “The role of gender in scholarly authorship”, *PLoS ONE*, 8.

⁶² Smith, J. L., Handley, I.M., Zale, A.V., Rushing, S. & Potvin, M.A. (2015). Now Hiring! Empirically Testing a Three-Step Intervention to Increase Faculty Gender Diversity in STEM. *BioScience* 65 (11), 1084–1087. doi:10.1093/biosci/biv138. Hughes, B.E. (2018) Coming out in STEM: Factors affecting retention of sexual minority STEM students. *Science Advances*, 4(3). Boustani, K., & Taylor, K.A. (2020). Navigating LGBTQ+

A qualitative study of this nature can look in-depth at many of the dynamics that still prevail in relation to the inequalities that exist in our daily work contexts. It is clear that each of the aspects we have mentioned in our analysis would need to be studied and compared in different fields of knowledge, because clearly the situation is not necessarily the same. It would also be meaningful to compare small and large universities and scientific institutes and centres, according to their size, along with geographic area, which perhaps other studies could identify.

Consequently, the gender gap in the world of science and academia remains open in view of the primary and secondary data obtained in our research. It is necessary to implement social policies designed to redistribute responsibilities regarding care and a real work/life balance. Should this not occur, not only will the gender gap remain in place but will also tend to grow, as occurred during the recent health crisis caused by the Covid-19 pandemic, where the number of research papers and publications by women fell dramatically, among other factors, due to the inequalities in care-giving and in the distribution of leadership⁶³, a question we will address in future publications. It would also be meaningful to act in the first person as academics and scientists in our

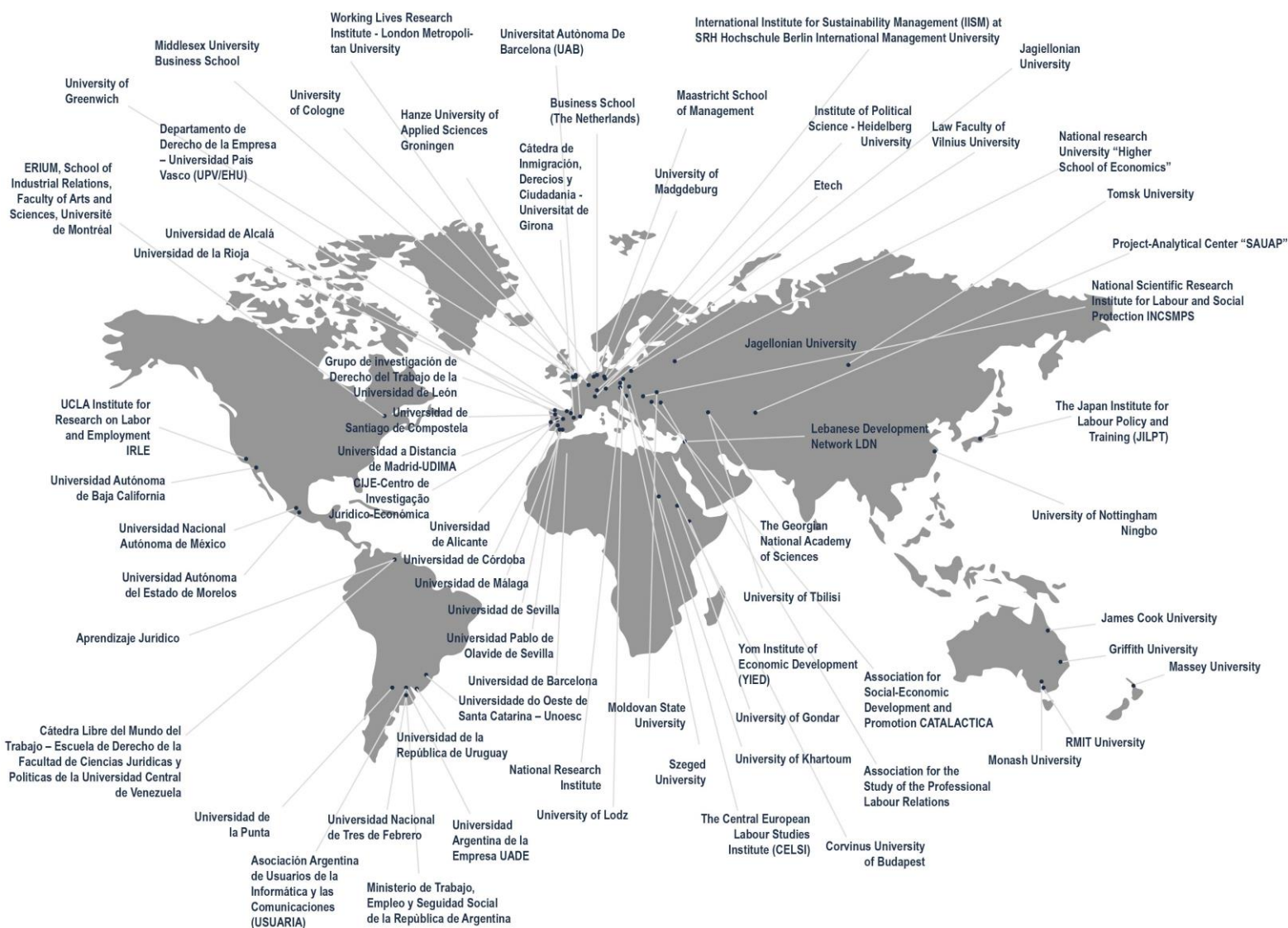
discrimination in academia: where do we go from here? *The biochemist*, 42(3), 16-20. Cascella, M. & Soares, T.A. (2022) "Bias Amplification in Gender, Gender Identity, and Geographical Affiliation" *Journal of Chemical Information and Modeling* 2022, 62 (24), pp. 6297-6301. National Science Foundation, Division of Science Resources Statistics (2023) *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2023. Special Report NSF 23-315*. Arlington, VA.

⁶³ Viglione G. (2020) "Are women publishing less during the pandemic? Here's what the data say", *Nature*, 581:7809. Cui R., H. Ding & F. Zhu (2020) Gender Inequality in Research Productivity during the COVID-19 Pandemic. Guatimosim C. (2020) "Reflections on Motherhood and the Impact of COVID 19 Pandemic on Women's Scientific Careers", *Journal of Neurochemistry*, 155, pp. 469-470. Pinho-Gomes A.C., S. Peters, K. Thompson, C. Hockham, K. Ripullone, M. Woodward & C. Carcel (2020): "Where are the women? Gender inequalities in COVID-19 research authorship", *BMJ Global Health*, 5:e002922. Andersen J.P, M.W. Nielsen, N.L. Simone, R.E. Lewiss & R. Jaggi (2020) "Meta-Research: COVI-19 medical papers have fewer women first authors than expected", *eLife*, 9: e58807, pp. 1-7. Yildirim T.M. & H. Eslen-Ziya (2021) "The Differential Impact of COVID-19 on the Work Conditions of Women and Men Academics during the Lockdown", *Gender, Work & Organization*, 28(S1), pp. 691–697. Squazzoni, F., G. Bravo, F. Grimaldo, D. García-Costa, M. Farjam & B. Mehmani (2021): "Gender gap in journal submissions and peer review during the first wave of the COVID-19 pandemic. A study on 2329 Elsevier journals", *PLoS ONE* 16(10): e0257919. Dahlberg M.L. & E. Higginbotham (eds.) (2021) *The Impact of COVID-19 on the Careers of Women in Academic Sciences, Engineering, and Medicine*. Washington D.C., National Academies Press, National Institutes of Health.

daily areas in order to deconstruct these practices. Furthermore, the same institutions should strive to raise awareness of equality in labour situations by activating seminars and workshops.

In conclusion, our research underscores the significant strides made in integrating women into the scientific and academic spheres. However, it also sheds light on the persistent reality of patriarchal power structures, which continue to limit women's access to positions of highest authority. While advancements have been noted in intermediate roles, the enduring presence of the "glass ceiling" impedes women's progression to positions of greater influence and significance. Our study contributes to this discourse by offering deeper insights into these dynamics, highlighting the need for social policies that address caregiving responsibilities and promote genuine work-life balance. Neglecting these issues not only perpetuates the gender gap but exacerbates it, as evidenced by the pandemic's disproportionate impact on women's research productivity. Looking ahead, proactive efforts by individuals and institutions are essential to challenge gender biases and foster inclusivity through educational initiatives like seminars and workshops. Through these concerted actions, we can strive towards a more equitable and inclusive scientific community.

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