

Women in the skies

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Abstract. Since its beginning, Humanity has projected its stories in the skies. Each civilization at its proper historical moment imprints values and culture in the stars. Just over a hundred years ago, the current constellations of the Western world were defined, based on the Hellenic tradition. The result was 88 constellations, most of which tell the stories of warriors and heroes. Among them, only six constellations tell women's stories. More than this, while the idealized male figures stories highlighted qualities were courage and strength, female figures are usually depicted as secondary characters in an hero's life and their biggest quality comes out as beauty. As expected, these stories reinforce Western society's gender stereotypes. Since this point, we developed a teaching strategy to talk about women in the skies and discuss gender equality. From this point, we suggest that these differences be brought into the discussion, in order to foster reflection—particularly among girls—about their role in society, complementing activities that promote the presence of women in the Natural Sciences.

Resumo. Desde o seu início, a Humanidade projeta suas histórias nos céus. Cada civilização, em seu momento histórico, imprimiu seus valores e cultura nas estrelas. Há pouco mais de cem anos, as constelações atuais do mundo ocidental foram definidas, tendo como base tradição helênica. O resultado foram 88 constelações, a maioria das quais conta histórias de guerreiros e heróis. Dentre elas, apenas seis constelações narram histórias de mulheres. Mais do que isso, enquanto as histórias das figuras masculinas idealizadas destacavam qualidades como coragem e força, as figuras femininas são geralmente retratadas como personagens secundárias na vida de um herói, e sua maior qualidade aparece como a beleza. Como esperado, essas histórias reforçam os estereótipos de gênero da sociedade ocidental. A partir desse ponto, sugerimos que essas diferenças sejam trazidas para o debate, de forma a proporcionar reflexões, principalmente entre meninas, sobre seu papel na sociedade e complementarmente às atividades que promovem a presença de mulheres nas Ciências Naturais.

Keywords. Teaching of Astronomy - Sociology of Astronomy

1. Introduction

The discussion of gender in Science has consolidated, in recent decades, as a relevant field of historical, social, and epistemological investigation. Although scientific production has always involved the participation of both men and women, the contributions of women have been systematically rendered invisible, undervalued, or attributed to male colleagues (e.g., Porter and Ivie 2019, Von Mertens et al. 2024, Barbara Laslett et al. 1996). This phenomenon is not limited to a specific field of knowledge, but spans different scientific domains, reflecting broader social structures marked by gender inequalities. In Astronomy, this dynamic is particularly evident. Figures such as Caroline Herschel, responsible for significant observational discoveries in the eighteenth century, and Henrietta Swan Leavitt, whose work was fundamental for determining extragalactic distances, had their achievements recognized belatedly or partially, often dissociated from their true scientific relevance. The analysis of these trajectories demonstrates that the marginalization of women in Science does not stem from a lack of production or merit, but from historical mechanisms of exclusion and erasure. Thus, discussing gender in Astronomy is not limited to a biographical recovery exercise but involves questioning the processes of scientific knowledge construction and the legitimization criteria that have historically shaped the dominant narrative of Science.

In this context, a growing movement has emerged, both academically and socially, aimed at recovering, recognizing, and valuing women's contributions to Science. This movement is materialized through institutional initiatives, educational programs, and science outreach actions designed to encourage the participation of girls and women in scientific and technological fields. A notable example is the celebration of the International Day of

Women and Girls in Science United Nations General Assembly (2015). Celebrated annually on 11 February, it was established by the United Nations (UN) in 2015 and implemented by the Educational, Scientific and Cultural Organization of the United Nations (UNESCO) to promote gender equality and increase the visibility of women scientists. In parallel, there is an ongoing effort of historical reassessment that has brought to light previously neglected trajectories, such as those of Vera Rubin, whose work was decisive for consolidating the dark matter hypothesis, and Cecilia Payne-Gaposchkin, whose doctoral thesis, defended in 1925, established the chemical composition of stars and marked its centenary in 2025 (e.g., Vieira et al. 2021, Almeida Silvério et al. 2023). These recoveries not only correct historical gaps but also provide new symbolic references for young students, contributing to the construction of a more diverse and representative Science.

It was precisely in a context marked by these initiatives that the motivation for the present research emerged. During lectures and workshops on Women in Science at the Instituto Federal Fluminense, Bom Jesus do Itabapoana (RJ), which were focused on high school students, efforts were made to present relevant female trajectories and discuss the presence of women in the Exact and Natural Sciences. Throughout these activities, the dialog with the students revealed not only interest, but also questions that went beyond the traditional examples presented. In particular, a question spontaneously raised by the participating proved central to the development of this work: would it be possible to observe the night sky using exclusively female figures? The question highlighted a critical perception of how the sky is traditionally presented, predominantly populated by male characters, heroes, and gods. At the same time, it revealed the pedagogical

cal and symbolic potential of rethinking the sky as a space also marked by female narratives, capable of broadening students' identification with and engagement in Astronomy.

Based on this guiding question, a systematic survey of the night sky constellations was conducted to analyze how gender roles are represented in these celestial figures. The study aimed to identify constellations associated with female characters and understand the types of narrative and attributes traditionally linked to these representations. Beyond a simple cataloging effort, the investigation proposes a critical reflection on the symbolic meanings attributed to the feminine in the sky, often associated with passive roles, sacrifice, or punishment, in contrast to male figures, commonly related to action, power, and heroism. By examining these representations, the work situates itself within the field of Cultural Astronomy and Astronomy education, articulating discussions on gender, science, and education. In this way, it aims to contribute both to understanding the symbolic constructions present in constellations and to proposing more inclusive pedagogical practices, capable of responding to contemporary demands for gender equity in Science.

2. Methods

The present study has an exploratory and qualitative nature, structured in two complementary stages. The first stage consisted of a descriptive survey of the night sky constellations, using the official catalog of the International Astronomical Union (IAU) as a reference, which systematizes the 88 constellations recognized globally. This survey aimed to map the symbolic presence of both female and male characters, allowing a relative quantitative analysis of gender distribution within the constellations. The categorization adopted considered the traditional gender criteria as depicted in the mythologies and narratives associated with the celestial figures, recognizing that such classifications are cultural products reflecting historical conceptions of masculinity and femininity. The preliminary analysis enabled the identification of patterns in gender representation, indicating both the underrepresentation of females and the predominance of male figures in roles of heroism or prominence. This initial stage provided a solid foundation for the second phase of the study, allowing not only the quantification of constellations according to the gender of their figures but also the understanding of the historical context that influenced the symbolic composition of the sky.

In the second stage, the research focused on the qualitative analysis of gender characteristics attributed to the figures represented in the constellations, seeking to understand how these representations reflect societal values, norms, and stereotypes. Additionally, it aimed to reflect on the pedagogical impact of these representations, particularly regarding the perceptions of girls and young students toward Astronomy and Science in general. For this purpose, symbolic, narrative, and historical elements were considered and articulated with critical studies on gender and scientific culture. The qualitative approach adopted enabled an in-depth interpretation of the constellations not merely as stellar groupings but as cultural narratives expressing social roles and gender expectations. In this way, the methodology allowed the quantitative data from the first stage to be associated with a broader reflection on the symbolic construction of the sky, highlighting the interrelation between Astronomy, history, culture, and gender.

3. Results and Discussion

Table 1 presents the results of the quantitative survey of constellations from the Western sky tradition, as cataloged by the

TABLE 1. Distribution of the 88 IAU-defined constellations according to their nature. Of the 34 animals, only one is explicitly female; the same applies to monsters, with one indicated as female among a total of eleven.

Type	Quantity
Animals	34
Instruments and objects	26
Monsters and myths	11
Men	11
Women	4
Natural elements	2

International Astronomical Union. Of the 88 celestial groupings analyzed, 15 (approximately 17%) represent human figures, most of them inspired by characters from Greco-Roman mythology. Among these human figures, only four (about 4%) correspond to female characters, demonstrating a clear underrepresentation of the female gender in the symbolic composition of the night sky. In addition to human figures, one explicitly female animal, the Ursa Major, and one female monster, the Hydra, were identified. These data reveal the significant predominance of male figures, suggesting that historical choices for naming constellations reflected cultural and social values that favored male characters, often associated with heroism, strength, or prominence, while female figures were relegated to symbolic or secondary roles. This quantitative disparity highlights the persistence of social constructions of gender reflected in historical Astronomy and provides a starting point for discussions on representation, education, and female visibility in science.

Due to the small number of female constellations, it is possible to list the six figures associated with the female gender by name: Andromeda, Cassiopeia, Coma Berenices, Virgo, Ursa Major (animal), and Hydra (monster).

All these figures have a direct connection to a hero or mythological narratives involving prominent male characters. The attributes assigned to these figures range between attributes traditionally considered positive, such as beauty, devotion, or family protection, and negative attributes, often associated with punishments derived from vanity or disobedience. The case of the Ursa Major is emblematic, as her presence in the sky, according to various traditions, is understood as a consolation reward following suffering or forced transformation, highlighting the symbolic function of reward or redemption for the feminine (Davis 1946). In contrast, male figures predominantly appear associated with qualities such as courage, strength, talent, and heroic prominence. This comparison underscores the persistent inequality in the assignment of symbolic roles between genders, reflecting cultural and social patterns throughout history. By naming and cataloging the sky in this way, the astronomical tradition reinforces certain gender stereotypes, making the female presence not only numerically limited but also symbolically and functionally constrained. These results allow us to understand how historical astronomical imagination constructs and reproduces social representations of gender.

The discrepancy between the presence of female and male figures in the sky shows that the celestial space functions as a symbolic reflection of society, perpetuating stereotypes and historical conceptions of the roles of men and women (Criado Perez 2019). This observation makes the sky a privileged opportunity for debates on the social construction of gender, especially in educational and outreach contexts, such as workshops and activities with high school students, which motivated the development of this research. By observing the sky and discussing

constellations, it becomes possible to confront historical narratives, reflect on female invisibility, and raise awareness of gender inequalities present not only in Astronomy but also in other fields of knowledge. The study suggests that the way the sky is presented and interpreted can influence social and educational perceptions, serving as a tool to discuss not only gender roles but also the valorization of historically marginalized scientists. In this way, the survey of female constellations offers a starting point for pedagogical and science outreach activities aimed at expanding representativeness and encouraging the participation of girls and women in the Exact and Natural Sciences. This analysis highlights that the celestial space, far from being neutral, carries cultural meanings that can be critically explored to promote reflection and social engagement.

Although the analysis focused on constellations from the Western tradition recognized by the IAU, the results indicate the need for further research that considers other cosmogonies and cultural traditions (Lloyd 1993). Different cultures around the world have distinct systems of sky representation, in which the feminine may have a more significant presence or diverse symbolic roles. The inclusion of African, Indigenous, Asian, or Arab mythologies, for example, could reveal alternative patterns of gender representation, contributing to a broader understanding of the relationships between Astronomy, culture, and society. Furthermore, future studies could integrate pedagogical and educational analyses, exploring how these different traditions can be incorporated into school or outreach activities, promoting diversity and representativeness.

An expanded investigation would also allow for a comparison between the Western tradition and other worldviews, highlighting how the sky, as a symbolic space, reflects not only gender stereotypes but also cultural and social values specific to each context. In this way, the research points to the relevance of interdisciplinary approaches, combining Astronomy, gender studies, History of Science, and education, enabling a more critical and inclusive understanding of the night sky and the narratives inscribed therein.

Acknowledgements. The author thanks the Instituto Federal Fluminense for their support during the sky observation activities, and all the girls who participated in the International Day of Women and Girls in Science workshops, whose dedication and enthusiasm served as an inspiration for this work.

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