

## Digging Equality: The Challenges and Opportunities for Women in Paleontology

### *Excavando igualdad: los retos y las oportunidades para las mujeres en la paleontología*

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#### Abstract

Paleontology has grown significantly; however, women continue to face challenges in achieving equal opportunities in this field. Although our participation has increased considerably since the beginning of this century, barriers such as gender stereotypes, lack of mentorship, and difficulties balancing academic and personal life persist. This research examines the challenges and opportunities that female paleontologists face, and how their resilience and contributions are transforming a discipline that has traditionally been dominated by men.

One of the main challenges is the underrepresentation of women in leadership positions in scientific publications, a phenomenon linked to historical biases in the STEM field. Furthermore, fieldwork, essential in paleontology, often excludes women due to prejudices regarding their physical or logistical capabilities (*e.g.*, safety in remote areas). Additionally, we face funding and access inequalities within academic networks, as well as challenges in obtaining recognition for our work.

However, there are promising opportunities. Initiatives such as international organizations (OWSD, Geolatinas, GWS), conference sessions on gender perspectives, and the visibility of female role models are narrowing the gap. Likewise, global collaboration and innovative technologies are opening new doors. Women scientists are nurturing paleontology through research spanning both traditional paleontological fields and paleobiological studies, providing unique perspectives.

Although there is progress, the path to equity is long; therefore, institutional and individual efforts, such as the creation of international associations of women in the geosciences, are making a difference. Inclusion is not only fair but necessary for scientific progress and an evolution toward a more egalitarian future.

**Keywords:** Women in paleontology, gender inequality, academic opportunities, science equity.

#### Resumen

*La paleontología ha crecido significativamente; sin embargo, las mujeres siguen enfrentando desafíos para alcanzar la igualdad de oportunidades en este campo. Aunque nuestra participación ha aumentado considerablemente desde inicios de este siglo, aún persisten barreras como los estereotipos de género, la falta de mentorías y las dificultades para conciliar la vida académica con la personal. En este artículo se exploran los obstáculos y los avances de las paleontólogas, así como la manera en que nuestra resiliencia y contribuciones están transformando una disciplina tradicionalmente dominada por hombres.*

*Uno de los principales retos es la infrarrepresentación en posiciones de liderazgo y en publicaciones científicas, fenómeno vinculado a sesgos históricos en el ámbito STEM. Además, el trabajo de campo —esencial en la paleontología— a menudo excluye a las mujeres por prejuicios*

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sobre su capacidad física o logística (p. ej., seguridad en zonas remotas). De igual manera, enfrentamos desigualdad en el financiamiento, en el acceso a redes académicas, e incluso en la obtención de reconocimiento por el trabajo realizado.

Sin embargo, hay oportunidades prometedoras. Iniciativas como organizaciones (OWSD, Geolatinas, GWS), sesiones en congresos sobre perspectivas de género y la visibilización de referentes femeninos, están reduciendo la brecha. Asimismo, la colaboración internacional y el uso de tecnologías innovadoras abren nuevas puertas. Las científicas estamos nutriendo la paleontología con investigaciones que abarcan tanto los campos tradicionales como los estudios paleobiológicos, con el propósito de aportar perspectivas únicas.

Aunque hay avances, el camino hacia la equidad es largo, por lo que los esfuerzos institucionales e individuales, como la creación de asociaciones internacionales de mujeres en geociencias, marcan una diferencia. La inclusión no solo es justa, sino también necesaria para el progreso científico y para una evolución hacia un futuro más igualitario.

*Palabras clave:* Mujeres en paleontología, desigualdad de género, oportunidades académicas, ciencia y equidad.

### Non-technical Abstract

Women's participation in the field of paleontology has increased since the year 2000; however, they still face disadvantages, such as a lack of opportunities, leadership roles, and recognition. Female paleontologists continue to experience gender stereotypes, unequal access to funding, scarce entry into academic networks, a lack of mentorship, and challenges in balancing academic and personal life. These barriers have relegated them to lower-level positions and resulted in fewer publications. In addition, during fieldwork they must deal with prejudices about their physical abilities and the risks associated with working in remote locations.

Despite these difficulties, there are initiatives that weave support networks among geoscientists, opening spaces to discuss gender equity. Another important point is the growing visibility of female paleontologists, which provides younger generations with female role models. Meanwhile, women are being innovative by incorporating perspectives that differ from traditional ones. Recognizing their work and making paleontology a more equitable field will contribute to scientific progress and a more equal future.

### Resumen no técnico

La participación de las mujeres en el área de la paleontología se ha incrementado desde el año 2000; sin embargo, continúan teniendo desventajas, por ejemplo, en oportunidades, liderazgo y reconocimiento. Las paleontólogas siguen enfrentándose a estereotipos de género, desigualdades en el financiamiento, escaso acceso a redes académicas, falta de mentorías y dificultades para equilibrar la vida académica y personal, lo que las ha relegado a puestos de trabajo inferiores y a tener menos publicaciones. Por otro lado, en el trabajo de campo tienen que afrontar desde prejuicios sobre las capacidades físicas hasta riesgos en zonas remotas.

A pesar de estas dificultades, hay iniciativas donde se tejen redes de apoyo entre geocientíficas que están abriendo espacios para que se discuta la equidad de género. Otro punto importante es que se está dando visibilidad a las paleontólogas, lo que les permite a las nuevas generaciones contar con referentes femeninos. Las paleontólogas, mientras tanto, están siendo innovadoras al incorporar puntos de vista distintos a los tradicionales, por lo que reconocer su trabajo y hacer de la paleontología un campo más equitativo será en pro del avance científico para un futuro más igualitario.

## 1. Introduction

Paleontology is an interdisciplinary science that employs diverse approaches. However, this field also shares the biases and inequities found in other sciences, including racism, socioeconomic barriers, and gender discrimination (Carter *et al.*, 2022). Western geology and paleontology have often been linked with practices such as oppression, exclusion, and the exploitation of others, such as Indigenous peoples or People of Color (Monarrez *et al.*, 2022). Gender has also been a reason for unfair treatment in Earth Sciences. For example, the number of professional female paleontologists

is lower than that of males, although the number of students of both genders is almost equal (Arens *et al.*, 2024).

From the beginning, women played key roles in paleontology as scientific illustrators, fossil collectors, benefactors, and educators. Despite their contributions, many female paleontologists went unrecognized and unpaid for their work and discoveries. From early fossil collectors to groundbreaking researchers, female scientists have made extraordinary contributions to our understanding of pre-historic life, despite facing significant barriers in a male-dominated discipline.

Pioneers such as Mary Anning, who had limited education, as was common for women in Lyme Regis, taught herself geology and anatomy. In 1811, twelve-year-old Mary made a discovery that would change her life. After her brother unearthed a peculiar fossilized skull, Mary took charge, excavating the rest of the massive skeletons that were studied and eventually named *Ichthyosaurus*. By 1823, Mary discovered the skeleton of a plesiosaurus. The specimen was so bizarre that skeptics soon dismissed it as a fake. After a lengthy debate at the Geological Society of London, the fossil was officially recognized as genuine (Eylott, n.d.). She was also the first person to discover pterosaurs (*Dimorphodon*) outside Germany and a pioneer in the study of coprolites, belemnites, and ink sacs (Ancient Odysseys, 2023).

Though male scientists regularly purchased, studied, and published papers on the fossils Mary Anning discovered, cleaned, and identified, they routinely failed to acknowledge her contributions. The institutional bias ran so deep that the Geological Society of London barred her entirely; women would not gain admission until 1904, long after her death (Eylott, n.d.).

Meanwhile, during the 19th century, male scientists frequently employed female assistants, typically selecting from their relatives, wives, and daughters, with these being the most common choices. The perfect example is Mary Elizabeth Horner Lyell, Leonard Horner's daughter and Charles Lyell's wife, both renowned geologists (Letters from Gondwana, 2014). The consensus of most articles written about Mary Elizabeth is that her husband overshadowed her. The little that is known about her scientific contribution comes from the letters that she wrote to her husband and his contemporaries. From these letters, it is evident that Mary discussed fossil identifications and supplied Darwin with fossil barnacles. Remarkably, she attended select Geological Society of London meetings with her husband since the Society formally excluded women (Hunter, 2013).

Mary E. Horner Lyell was far more than an assistant; she played an important role in her husband's scientific work, cataloging their rock, mineral, and fossil collections, and transforming raw data into publishable research. Beyond documentation, she bridged international collaborations, translating correspondence with European geologists thanks to her fluency in French and German, skills she expanded by learning Spanish and Swedish. Without her linguistic expertise, data analysis, and systematic approach, Charles Lyell's groundbreaking contributions to geology would not have reached the same level of influence (Hunter, 2013).

Mary Ann Mantell's case represents yet another instance where a woman's groundbreaking paleontological contributions were systematically omitted. She made the groundbreaking *Iguanodon* discovery; however, history books attributed it solely to her husband, Gideon Mantell. The full extent of her contributions only came to light after her divorce. The explanation? The all-too-familiar distortion we find throughout paleontological history: the bias preserved in our scientific record (Turner *et al.*, 2010).

As Turner (2021) remarked, during the 18th and 19th centuries, women in paleontology were largely restricted to Britain (Figure 1), certain European regions, and the United States of America, with very few able to secure paid employment. Limited access to education and professional opportunities meant most young women and girls had little chance to pursue meaningful aspirations and personal development.

By the early 20th century, women had begun establishing themselves as professional scientists in museums and universities, publishing research under their own names, and playing an active role in the oil industry, serving as leading experts in their fields. Among them, the work of Carlotta Joaquina Maury, an American geologist, stands out. She was involved in geological expeditions

in Venezuela and the Dominican Republic, worked in an oil Company in Venezuela, and is considered the first official paleontologist in Brazil (1914), equally recognized in her trajectory as a lecturer and professor in universities of North America and South Africa (Nascimento and Sarges, 2020). As such, Carlota Joaquina Maury can be considered the first woman to work formally in paleontology in the Caribbean and South America (Figure 2).

Paleontology has undergone a profound transformation in the 21st century, evolving from a descriptive science to a dynamic, interdisciplinary field (Schweitzer, 2023). Moving beyond the historical exclusion of women exemplified above, modern paleontology is being reshaped by women leading pioneering research and fostering a more collaborative and inclusive scientific culture.



Figure 1. Mary Anning, Mary Elizabeth Horner Lyell, and Mary Ann Mantell, the first female paleontologists, whose contributions are still unrecognized, but without whom significant progress in the discipline would not have been made.

Contemporary female paleontologists are no longer exceptions but are central to the field's most innovative research. They are spearheading investigations that bridge traditional disciplinary boundaries. For instance, the groundbreaking work of Dr. Mary Schweitzer on molecular paleontology, challenging paradigms about the preservation of soft tissues in dinosaurs, exemplifies how female-led inquiry can redefine fundamental assumptions (Schweitzer *et al.*, 2005). Similarly, the research of Dr. Leslea J. Hlusko, using advanced computed tomography (CT), particularly synchrotron imaging, to generate detailed three-dimensional fossil reconstructions and conduct non-destructive histological analysis, deciphers the origins of morphological variation (Monson *et al.*, 2022). As well as Mariam Tahoun, Marianne Engese, Christa E. Müller and their team, who detected organic compounds, such as pigments (heme, melanin) and structural proteins (collagen, keratin), within non-avian dinosaur fossils, using advanced analytical techniques, ranging from non-invasive methods like electron microscopy, infrared (IR) and Raman spectroscopy, to more invasive approaches including liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS), time-of-flight secondary ion mass spectrometry, and immunological assays (Tahoun *et al.*, 2022).

These contributions are characterized by a willingness to employ novel methodologies, from synchrotron radiation micro-tomography to stable isotope analysis, often driven by diverse perspectives that expand the scope of paleobiological questions.

The influence of women extends to framing paleontology's relevance to modern society. Their research is increasingly pivotal in using the deep-time record to inform our understanding of current crises. By analyzing past extinction events, ecosystem responses to climate change, and long-term evolutionary trends, female scientists are providing crucial context for the Anthropocene's biodiversity loss and climate disruption. This work positions paleontology

not as a science of the remote past, but as an essential tool for forecasting and mitigating future environmental change.

Tracking historical patterns of gender equality in scientific fields enables us to identify successful interventions and determine what additional measures are needed to foster inclusivity (Plotnick *et al.*, 2014). This work examines the remarkable achievements of women in paleontology, the barriers they have faced, and their lasting impact on the study of Earth's ancient past. A key reason to look beyond Mexico is to include other regions, thereby challenging the typical Anglo-centric focus in the history of science. By intentionally including figures from Latin America, Europe,

and studies from Asia and Australia, this work actively decolonizes the narrative. Therefore focusing only on Mexico would risk presenting a partial view and missing the opportunity to reveal the global story of resilience and intellectual contribution that defines the history of women in paleontology.

## 2. Historical and current challenges

The underrepresentation of women in paleontology is not a recent phenomenon, but rather a historical pattern shaped by systemic barriers in academia, fieldwork culture, and societal expectations. This disparity functions as a result of deep-seated structures, including the historical exclusion of women from higher education itself. Furthermore, definitions of merit in the field have long been tied to male patterns. This is compounded by societal factors, such as the lack of affordable childcare, which disproportionately affects women's ability to meet rigid career demands. Despite notable exceptions, women have long been excluded, marginalized, or erased from the discipline's history, creating a persistent gap in mentorship, recognition, and leadership roles.

Even if we want to think we are far from Anning's time, history shows that we have not yet achieved gender parity in paleontology. Two centuries after her discoveries, a gap has persisted in paleontology, a field dominated by males. Exclusion for scientific institutions was an early barrier; for example, the Geological Society of London did not admit women's membership until 1919 (Hunter, 2013), and many universities limited access to education for women until the late 1800s/early 1900s (Attridge, 2025). During the Middle Ages, universities such as Oxford, Cambridge, Paris, and Bologna rose to prominence; however, higher education remained an exclusively male domain. Women were systematically barred from entering professions such as the clergy, law, and medicine, reinforcing their exclusion from formal academic institutions (Attridge, 2025).



**Figure 2.** Carlotta Joaquina Maury, an American geologist who can be considered the first woman to work formally in paleontology in the Caribbean and South America.

The 19th century witnessed a gradual yet significant shift in women's access to higher education, dismantling centuries of exclusion. This progress clashed with Victorian ideals of domestic femininity, sparking resistance from many traditional colleges reluctant to adopt coeducation. Women pursuing academic careers during this era had two main options: attending progressive coeducational institutions, such as Oberlin College, or choosing newly established women's colleges, such as Wesleyan College (Attridge, 2025).

Despite accepting women, coeducational institutions often maintained unequal treatment. When Oberlin first enrolled female students in 1837, they were excused from Monday classes to wash the laundry of male students. Even women's colleges approached female education with caution, framing it as a potentially risky social experiment. The disparity extended to campus design. Men's colleges adopted the "academical village" model, with separate dormitories and classroom buildings that encouraged movement and intellectual exchange. Women's colleges, however, employed a more restrictive seminary-style layout, confining students to single buildings where they both lived and studied. This architectural control reflected societal fears about protecting women's "virtue" rather than fostering academic independence (Attridge, 2025).

In Japan, for example, women were excluded from imperial universities until after the Second World War. This is because, in agreement with the Confucian gender ideology, higher education was seen as unnecessary, even dangerous, for women, as it might distract them from their "proper" roles. During the Meiji period, women could attend girls' high schools that focused on domestic skills rather than science or advanced academic training (Nolte and Hastings, 1991). After Japan's surrender in 1945, the US Occupation (General Headquarters, GHQ) mandated democratic reforms, including the 1947 "Fundamental Law of Education", which guaranteed equal access to education,

but some faculties resisted admitting women (Franz, 2007). Japan still lags in gender equality in STEM (only 16% of Japanese researchers are women), being among the lowest rates in the Asia-Pacific region, and paleontology remains male-dominated (Hori, 2020).

For generations, women have waged a relentless struggle for equal access to higher education. While they now constitute the majority of college graduates, significant challenges remain. Contemporary battles for educational equality now focus on challenging stereotypes about the "appropriate" fields of study for women (and men), ensuring fair representation, and achieving equal pay, support, and recognition for women in academic careers.

Outdoor activities, essential to paleontological work, have historically been considered masculine tasks, linked to the idea that this work requires physical fitness and prolonged exposure to uncomfortable, sometimes remote and isolated places. Furthermore, the necessity of travel created a unique set of obstacles shaped by societal structures. The pervasive expectation that a woman's primary role was domestic, to stay home and care for children, directly conflicted with extended fieldwork. Compounding this were the significant risks of violence that women faced when traveling, making such expeditions not just logistically difficult but often perilous. In the past, these recollection activities were permitted for working-class women, as exemplified by Mary Anning, but were considered difficult for high-class women (Burek and Kölbl-Ebert, 2007). Thus women were relegated to work in local places, near where they lived or worked with their relatives, commonly their husbands. An example is the paleontologist Etheldred Bennett, a single woman who described the fossils and layers from a quarry owned by her brother (Torrens, 1985).

During the first half of the 19th century, fashion trends limited women's mobility and hindered their field trips. It was not until the French Revolution that bloomers were invented, allowing women greater mobility.

By the late XIX century, the problem was "decency"; during these times, the professors (male) who decided to take female students on field trips needed to take their wives and other older women (*chaperones*) to prevent gossip. This problem continued until the 20th Century (Burek and Kölbl-Ebert, 2007). The underlying mechanism for this paradox was romantic paternalism: a set of ideologies that, by positioning women as figures requiring male protection for the sake of their virtue and 'decency,' actively curtailed their freedom and professional advancement in the name of safeguarding them.

Gender discrimination in employment frequently operates through implicit channels. One of the most powerful is the informal male network, which fosters camaraderie and professional opportunities. The exclusion of women from these networks means that stakeholders (employers, coworkers, and clients) demonstrate an unconscious preference for male colleagues through everyday choices, from mentorship to project assignments. These patterns become discernible through their aggregate effects on occupational segregation and wage disparities. More overt forms emerge when traditional norms enforce compliance, punishing nonconformity. The most tangible discriminatory practices have included formal restrictions on women's vocational training and explicit employment prohibitions (Goldin, 1988). Beyond implicit biases and exclusionary networks, women in paleontology also face the overt threats of sexual harassment and sexual violence, particularly in the isolated and often unregulated context of fieldwork. This hostile environment directly compromises women's safety and professional participation, creating a significant barrier to retention and success (Marin-Spiotta *et al.*, 2023; Mattheis *et al.*, 2022).

Until the mid-20th century, the lack of academic and professional opportunities ran deep; few women held faculty positions in geology or paleontology. While married women were often forced to resign from academic posts ("Marriage Bars" in the US and

U.K. until the 1950s), women who did remain were frequently relegated to support roles (*e.g.*, illustrators, lab assistants) rather than to lead researcher positions.

The term "marriage ban" refers to discriminatory hiring practices against married women in the United States during the 1900s. However, this policy took two distinct forms: the "hiring ban," which barred employers from hiring married women, and the "retention ban," which forced women to leave their jobs upon marriage (Wilkes, 2024).

It is also necessary to consider pregnancy and parental responsibilities, which represent a significant and persistent source of career discrimination within paleontology and the geosciences, directly intersecting with the field's demanding physical and temporal expectations. The necessity of extensive, often remote fieldwork creates a structural incompatibility with pregnancy, postnatal recovery, and early childcare. This can lead to the exclusion of pregnant researchers from critical field campaigns, due to the perception of them as less committed or capable, and the penalization of career trajectories that accommodate family leave. Consequently, individuals who bear children often face tangible setbacks in publication rates, project leadership opportunities, and funding acquisition, reinforcing a systemic bias that equates uninterrupted, extended field presence with scientific merit and disproportionately drives women from the discipline (Duffy *et al.*, 2025; Lininger *et al.*, 2021; Tollefson, 2023).

Marriage bans disproportionately targeted educated, middle and upper-class white women. Professions like teaching and clerical work were the most heavily restricted, while lower-class women and women of color, often employed in agriculture, domestic service, or waitressing, faced far fewer such barriers (Wilkes, 2024).

At the turn of the 20th century, working married women were often stigmatized as irresponsible spenders, neglectful mothers, or wives of lazy drunkards. This social scorn alone discouraged many from remaining in

the workforce (Broadbent, 2020). Eventually, in the United States, the marriage bar was documented as a discriminatory barrier between 1920 and 1950 (Goldin, 1988); however, in the Irish civil service, it remained in place until 1973 (Irish Congress of Trade Unions, 2023). The employment rate of married white women grew dramatically during the 20th century, with the most significant surge occurring after World War II. This dramatic shift stemmed partly from improved educational opportunities available to younger generations compared to their predecessors. Before 1950, workplaces showed little flexibility toward married and older female workers, with many employers outright refusing to hire them. Still, institutional barriers were particularly severe in certain professions; for example, most school districts prohibited married women from teaching (Goldin, 1988). For married women in academia and science, job retention often hinged on their employer's stance, leaving careers vulnerable to arbitrary bias (Broadbent, 2020).

In paleontology, across most regions, female students outnumber women in senior roles, a disparity that has persisted for decades (Stigall, 2013). While optimists argue that increasing the representation of early-career women, coupled with intentional hiring practices, will soon achieve gender parity (Ranganathan *et al.*, 2021), regional disparities reveal uneven progress. In North America and Europe, formal equity policies have gradually increased women's participation in academia; however, attrition remains high at mid-career stages, often due to unequal access to fieldwork, funding biases, caregiving penalties (Clancy *et al.*, 2014), lack of support from family and community, the "Double Burden" of work and family, negative stereotyping and societal attitudes (CEDAW, 1996-2025), devaluation of work, insulting remarks, threats to physical safety, and bullying and intimidation (Tollefson, 2023). In contrast, institutions in the global South face compounded challenges, including scarce funding, limited academic infrastructure, and cultural norms that restrict women's mobility for fieldwork or collaboration (Gómez-González *et al.*, 2022).

The persistent underrepresentation of women in leadership roles, particularly in regions with fewer institutional safeguards, suggests a 'leaky pipeline' (Alper, 1993) shaped by intersecting systemic and geographic inequities.

### 3. Disadvantages for women in paleontology

Despite progress, women continue to face significant underrepresentation across STEM fields, particularly in leadership positions. Palaeontology, like other sciences, still reflects this persistent gender disparity (Berenbaum, 2019) (Figure 3).

Systemic barriers continue to exclude marginalized groups from educational and professional opportunities across sectors. STEM fields represent a particularly stark case of gender disparity, a global phenomenon that manifests with acute severity in Latin America. The inequality begins in primary education, where Latin America's unique socioeconomic context perpetuates unequal access. Rural communities face especially pronounced disadvantages, with all children experiencing educational deprivation (ECLAC, 2022), a crisis that intensifies during adolescence. This foundational discrimination creates a pipeline of disparity that directly shapes and constrains participation in higher education. Students from rural and impoverished backgrounds arrive at university gates (if they arrive at all), carrying the burden of this early systemic neglect, often academically underprepared and financially disadvantaged (Howley, 2006). Within these challenging conditions, girls face compounded exclusion from the earliest stages, as evidenced by regional statistics, a double marginalization that later manifests in their underrepresentation in STEM fields and heightened vulnerability to gender-based biases within the university structure itself (ECLAC, 2022). For example, in Latin America, women researchers, particularly in fields like paleontology, regularly encounter gender-based prejudice, which manifests as a credibility deficit, exclusion from fieldwork

opportunities, gendered role stereotyping, and the pervasive threat of a hostile work environment. These professional barriers are not isolated incidents but are the logical extension of a system that has systematically undervalued women's intellectual contributions from the very beginning of their educational journey. This not only hinders their ability to conduct and publish research but also reduces their prospects of attaining leadership roles in their respective fields. The stark gender disparity at institutions like Ohio University, where women constitute less than one-quarter of paleontologists, is not a mere anomaly but a quantifiable outcome of systemic barriers within geosciences.

This underrepresentation is a predictable endpoint of the "leaky pipeline," a phenomenon extensively documented in STEM literature, where women are progressively filtered out due to a combination of implicit bias, a lack of mentorship, and gendered institutional policies (e.g., Alper, 1993; Cannady *et al.*, 2014; Ellis *et al.*, 2016). However, the situation extends beyond passive attrition to include actively hostile environments. The field's deeply ingrained gender-based discrimination, often manifesting as a credibility deficit and the relegation of women to nurturing rather than leading research roles, is compounded by the widespread prevalence of sexual harassment (Mattheis *et al.*, 2022). Groundbreaking studies, such as those by Clancy *et al.* (2014), have empirically demonstrated that hostile fieldwork climates are a significant deterrent to the retention of women in disciplines like paleontology and archaeology. This "chilly climate" functions as a powerful mechanism of exclusion, where the cumulative weight of microaggressions and the very real threat of harassment serve to push women out of the profession. This echoes Black's (2018) quote, "women are still trying to dig out from the attitude that paleontology is a boys' club."

Despite its progressive ideals, scientific publishing continues to perpetuate systemic gender inequities, with imbalances evident across editorial boards, peer review systems, and author bylines (Berenbaum, 2019). Women remain underrepresented in the Geosciences academic literature; they are also less represented as first authors and systematically undercited and overlooked compared to their male colleagues, which contributes to create a "Matilda Effect" (Dutt *et al.*, 2016). Therefore, they face more pressure to add co-authors and are less frequently invited to participate as peer reviewers (Lerback and Hanson, 2017). The rise in female-authored publications is primarily attributed to increased collaborative efforts and the inclusion of students as junior co-authors (Plotnick *et al.*, 2014). In their institutions, females are more often assigned to teaching and administrative roles (Warnock

## Disadvantages for Women in Paleontology

- 1. Systemic Barriers**
  - Limited access to field opportunities
  - Male-dominated leadership in institutions
  - Lack of mentorship for career advancement
- 2. Underrepresentation in Academic Positions**
  - Fewer women in tenured or senior faculty roles
  - Stereotypes influencing hiring and promotion
  - Invisible labor (mentoring, diversity work)
- 3. Discrimination**
  - Biased peer review and grant funding processes
  - Women's research cited less often
  - Exclusion from collaborative projects
- 4. Gender Pay Inequities**
  - Women earn significantly less than male peers in academia and industry
  - Salary negotiation gaps and lack of transparency
- 5. Sexual Harassment**
  - High incidence during fieldwork and academic events
  - Lack of institutional support or reporting pathways
  - Fear of retaliation or damage to career

**Figure 3.** An academic overview of the persistent challenges faced by women in paleontology, highlighting systemic barriers, discrimination, and gender-based inequities that impact career progression and workplace safety.

*et al.*, 2020), based on the supposed capacity of women for specific tasks, such as caring for others. This institutional reliance on gendered stereotypes creates a significant and often invisible 'service burden', whereby female academics report performing a disproportionate amount of student mentoring, emotional support, and departmental 'housekeeping', essential labor that is systematically unnoticed and undervalued in formal structures of recognition and promotion.

Despite women's underrepresentation in academia generally, their absence as conference speakers and panelists is disproportionately severe (Vila-Concejo *et al.*, 2018). While often presented as neutral explanations, it frequently masks deeper, gendered structural inequities such as travel logistics that disproportionately impact women (LERU, 2012), intertwined with primary caregiving roles (Bos *et al.*, 2017), coupled with the financial constraints of smaller grants, which can make accepting speaking invitations prohibitively difficult (Witteman *et al.*, 2019). As gender equity gains attention in higher education, event organizers increasingly face scrutiny over male-dominated speaker lineups, particularly when audience demographics approach gender balance. Common justifications include unsuccessful recruitment efforts or claims of a lack of senior women in the field.

Similar disparities are also evident among faculty, where hiring women typically comprises fewer than 30% of applicants (and sometimes fewer than 10%) (Ceci *et al.*, 2014). When pressed to diversify candidate pools, selection committees often assert they've exhausted their networks but cannot find qualified female candidates (Handley *et al.*, 2020). This defense, however, frequently reveals a narrow and often gendered understanding of 'qualification'. Committees may overvalue metrics tied to prestige while undervaluing equally critical indicators of excellence, such as innovative research pathways, impactful public engagement, or a demonstrated commitment to teaching and mentorship (Smith-Doerr *et al.*, 2017). This restrictive definition, often

mirroring the profiles of the (mostly male) incumbent faculty, effectively conflates exclusivity with excellence and allows homophilic network recruitment to be misconstrued as a meritocratic search, thereby perpetuating the exclusion it claims to lament (Clauset *et al.*, 2015; Moss-Racusin *et al.*, 2012).

The relatively low citation rates of Latin American paleontologists limit their chances for collaboration, securing funding, and conducting and publishing research. This perpetuates existing barriers and reinforces the perception that they cannot attain the same academic standing as paleontologists from the Global North (Valenzuela-Toro *et al.*, 2025), especially for women.

### 3.1. Discrimination

In agreement with the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), article 1, discrimination is understood as "any distinction, exclusion or restriction made on the basis of sex which has the effect or purpose of impairing or nullifying the recognition, enjoyment or exercise by women, irrespective of their marital status, on a basis of equality of men and women, of human rights and fundamental freedoms in the political, economic, social, cultural, civil or any other field" (UN, 2009). In the US until 1970, women were openly excluded from some academic programs, and their inclusion in educational institutions was not allowed (Conefrey, 2001). In Latin America, the situation was not so different. For example, in Mexico, Concepción Mendizábal Mendoza became the first Mexican woman to receive a degree in Engineering in 1927. The first Mexican woman to graduate in Mathematics in 1944 was Enriqueta González; Josefa Cuevas Aguilar was the first geologist, while the first to graduate in Physics was Alejandra Jáidar Matalobos in 1961. All of them were strong women who chose to enroll in traditionally masculine fields and overcame numerous difficulties throughout their formation and careers.

The worst part of discrimination is that even if it can be recognized, all the consequences and significance for affected people are underestimated, diminished, and misunderstood (Conefrey, 2001). Discrimination of all kinds must end because it affects people's rights and opportunities, and because a society with equal opportunities results in the recruitment (in all areas) of the most talented people, regardless of their gender or other circumstances (European Commission, 2008). The development of discrimination against women in geosciences, including paleontology, can be a whole topic of another research; nevertheless, here are some of the most common ways of discrimination.

A common hidden belief is that women lack the same level of ability, resilience, or ambition as men. The motherhood penalty perpetuates the misconception that a woman who pauses her career lacks commitment, creating a justified anxiety that any break will lead to professional criticism and devaluation (Correll *et al.*, 2007). Then, women need to work harder to prove to their male counterparts that they can do the same job as well as they can, and work as hard as they do.

Menstruation and pregnancy are topics that have not been considered as something natural, if not as a limitation for women in geosciences. Pickering and Kosha (2023) rightly entitled their work "The geological period that no one talks about: menstruation in the field," where they consider that "it is a global issue of silence;" if women do not feel confident to talk about this with their counterparts, they will never do so with their superiors. Even in the XXI century, it is an uncomfortable topic that most paleontologists, male and female, prefer to keep quiet about.

In a camp organized exclusively for women, Pickering and Kosha (2023) found that all the women felt at some point discomfort, pain, and anxiety that hindered their field work performance during menstruation.

On the other hand, pregnancy has historically been viewed as an obstacle to women's professional development. In the past, it was even

grounds for dismissal in many workplaces. Unfortunately, paleontology is no exception; both students and professionals still face workplace discrimination due to pregnancy, often perceived as a limitation rather than a natural part of life. The lack of institutional support and clear policies to accommodate pregnant researchers or students exacerbates these challenges, contributing to mental health struggles and career setbacks for women in the field. This is another effect of the gender inequality in paleontology.

Pregnancy-based discrimination remains pervasive, particularly in demanding fields like paleontology. This discrimination manifests in three key stages: (a) before motherhood, (b) during pregnancy, and (c) after childbirth. Notably, post-childbirth discrimination often intersects with broader caregiver and family-related biases, exacerbating career challenges for women in academia and fieldwork (Frías, 2024). Even though parenting and raising children should be shared, in some countries, it is still difficult for men to have paternity leave.

For Geoscience, only one explicit guideline about pregnancy was found, belonging to the Institut for Geoscience at Aarhus Universitet, titled "Geoscience guidelines for Pregnant and breastfeeding women." This document outlines safety guidelines for pregnant and breastfeeding personnel in geoscience settings. This protocol is an individualized risk assessment required prior to any field or laboratory work. A significant focus is placed on addressing logistical challenges in the field, such as expressing and storing breast milk and maintaining milk supply. In laboratory environments, the guidelines are more stringent, mandating a clear separation between workspaces and designated, hygienic areas for breastfeeding. The file was developed based on "Pregnant and breastfeeding employees' working environment," available only in Danish (Geoscience LAMU, 2018).

For female paleontologists, these barriers are especially pronounced. Fieldwork frequently lacks accommodations for pregnant

researchers or nursing mothers, while institutional policies fail to address the logistical and physical challenges they face. Consequently, many experience delayed research progress, limited fieldwork opportunities, or even attrition from the field altogether.

Fieldwork continues to hinder professional opportunities for women. These perceived difficulties are often hidden under paternalistic concern to justify excluding women from field-based roles. This constitutes a particularly insidious form of systemic discrimination because it is disguised as benevolence. Many employers and colleagues remain unaware of their attitude, making discrimination difficult to confront or dismantle. In paleontology, such attitudes disproportionately marginalize women. Assumptions about physical capability, safety risks, or logistical constraints (e.g., childcare during expeditions) are routinely cited as "reasonable" grounds to restrict women's participation, perpetuating a cycle of exclusion under the pretense of protection (Burek and Kölbl-Ebert, 2007).

### 3.2. Gender pay inequities

Despite traditional gender expectations around childcare and family, women's employment rates remain relatively high, particularly among those without children. Even in workplaces with insufficient childcare, rigid working hours, limited part-time opportunities, limited transit access, low wages, and social stigma against working mothers, many women of prime working age remain employed (Zajac et al., 2023). While women's educational advancement has played a key role in reducing gender income inequality over time, persistent disparities across academic disciplines continue to put women at an economic disadvantage (Bobbitt-Zeeher, 2007).

The gender pay gap is a statistical metric representing the disparity in median or average earnings between men and women within a defined workforce. It serves as a key indicator of gender inequality at organizational, industrial, or national levels (WGEA, 2024).

Gender pay gaps remain substantial across many high-income countries, with women earning considerably less than men (Woolston, 2021; Organisation for Economic Cooperation and Development, 2023). STEM graduates experience a much wider gender pay gap than those in non-STEM fields. Women in STEM need to perform much better (overcompensate) than their male counterparts to achieve the same productivity but not the same salary (Aguinis et al., 2018). Even more, women do not receive the same recognition or economic compensation for their work (Samaniego et al., 2023). Additionally, Zajac et al. (2023) data reveal substantial variation in adjusted pay disparities across different STEM disciplines, showing that the gap between men and women is relatively smaller for graduates in the Earth Sciences. Nevertheless, Bobbitt-Zeeher (2007) considers that gender disparities continue as women are disproportionately concentrated in lower-paying academic fields, while men predominate in more lucrative areas.

While data from the past decade confirms that female academics are disproportionately represented in teaching-focused roles and institutions (University of California, 2014), framing this as a simple preference is misleading. A more critical analysis reveals that promotion and tenure structures at resource-rich research universities are designed to value a narrow set of achievements, primarily individual research output. This system simultaneously relies yet devalues the 'nurturing' labor of teaching, mentoring, and service, work that falls disproportionately on female faculty. Consequently, what appears as a 'gravitation' is often a rational response to a system that fails to recognize and reward their full contributions, pushing them toward institutional contexts where their labor is more valued (National Academies of Science, Engineering and Medicine, 2020; Kossek et al., 2023).

While some women might need to compromise in their careers to prioritize family, attributing the entire wage gap to personal choices would be an oversimplification (Woolston, 2021). Agreeing with data from the

Government Accountability Office (GAO), an agency of the US federal government, Marquit (2025) concludes that a significant share of the gender pay gap remains unexplained, potentially attributable to unmeasured factors as non-federal work history, discrimination, and personal career decisions. Another potential explanation is that men may be more inclined to negotiate for better pay (Woolston, 2021).

The gender wage gap imposes significant financial burdens on women in multiple ways. Lower initial salaries create a reduced foundation for future raises, compounding earnings disparities over time. Career interruptions for caregiving responsibilities not only limit opportunities for higher wages but also disrupt retirement savings contributions. This shortfall is particularly concerning given women's longer life expectancy and higher risk of poverty in old age (Marquit, 2025).

The cultural dismissal of women's labors as lesser has not only depressed earnings but also normalized discriminatory pay practices across intersecting identities.

### 3.3. Sexual harassment

Documentation of harassment in scientific fieldwork has emerged only within the past decade, revealing widespread misconduct (*e.g.*, Burke, 2017; St. John *et al.*, 2018; Tenbrunsel *et al.*, 2019). As such academia has the highest rate of sexual harassment, only after the military (Clancy *et al.*, 2020).

Sexual and gender harassment has received attention during field trips in areas such as anthropology (Wasson *et al.*, 2008), geography (Monk *et al.*, 2004), and, more broadly, in the academy (Clancy *et al.*, 2014; 2020). The data from these studies reveal a starkly gendered pattern, with women reporting significantly higher frequencies of harassment than men. This disparity means women are disproportionately targeted, bearing the brunt of behaviors that range from microaggressions to sexual coercion, a skew that underscores how harassment functions as a mechanism of power and exclusion within

male-dominated fields. Another significant difference between the genders indicates that the sexual harassment of men has a horizontal dynamic, whereas for women, this is vertical, which means that women were molested by professional superiors in the hierarchy (Clancy *et al.*, 2014). This is clear in vertebrate paleontology, where Black (2018) documented with data that "women trainees were the primary targets" of harassment, while the perpetrators are senior in their profession. During field trips, the women can also be led to unsafe scenarios where victims are left alone with harassers and abusers, without clear policies about how to manage and report these situations (Clancy *et al.*, 2014).

A growing body of research reveals that institutional strategies for addressing sexual harassment are not merely ineffective but often actively counterproductive, creating a self-defeating cycle of harm. This failure begins with a fundamental disconnect between policy and practice. As McDonald *et al.* (2015) identify, a significant "gap" exists where formal anti-harassment policies are rendered inert by informal workplace cultures, entrenched power imbalances, and inadequate implementation. For instance, common training modules often focus narrowly on punishment and procedure, thereby ignoring the relational and social dynamics of power that enable harassment in the first place. Furthermore, the specific framing of these trainings can provoke backlash; Tinkler *et al.*'s (2022) research demonstrates that approaches which target "sexist men" can trigger defensiveness, actually reducing the likelihood that male employees will report misconduct they witness.

This failure of prevention is then compounded by the profound inadequacies of institutional response systems. The primary mechanism for redress (formal reporting) frequently fails to protect those it is designed to help. McLaughlin *et al.* (2017) document the severe professional and economic retaliation faced by women who report, proving that the system itself can become an instrument

of career damage. When institutions fail to prevent harassment and then respond with a punitive or ineffective response, they commit what Smith and Freyd (2014) term "institutional betrayal." This phenomenon, where the institution charged with protection compounds the original trauma, serves as a powerful critique of standard response strategies, revealing how they can transition from being merely useless to actively harmful. Thus, from flawed prevention to punitive response, the institutional framework often perpetuates the very problems it claims to solve.

To try to avoid physical, verbal, sexual harassment and assault, the institutions must have a clear position on this misconduct. This implies legal consequences for both the aggressor and the leader, underscoring the urgent need to establish robust policies with explicit statements.

However, not only exist the sexual harassment but also gender harassment, which includes unwanted sexual advances, touches, or threats used to coerce sexual activity, as well as "comments, cartoons, jokes, gestures, and other insults to members of one sex". It is the purpose of this conduct to insult, humiliate or subdue another one, for this conduct lies "under the water line" (Clancey et al., 2020). From the lived experiences of women in the field, it is also clear that mansplaining is a frequent and draining reality, a direct manifestation of the sexism perpetuated by paleontology's entrenched gender imbalances.

Persistent gender-based harassment can harm productivity and mental health as much as overt sexual coercion. Allowing such attitudes creates an environment that enables unwanted advances and pressure (Clancy et al., 2020) (Figure 4).

#### 4. Current opportunities

Expanding opportunities for women in geosciences, including paleontology, requires boosting the number of female scientists to inspire the next generation. This means not

only increasing female representation at all career levels but also actively introducing girls and young women to geoscience pathways through early education and mentorship programs (Schneider et al., 2018). Current proposals for closing the gender gap in leadership roles primarily focus on increasing women's representation in senior academic positions. However, other critical areas, such as women's participation on scientific journal editorial boards, are also important aspects to examine (Henriques and Garcia, 2022). Effective solutions require a comprehensive approach that targets not only the recruitment pipeline but also the systemic and cultural barriers



**Figure 4.** Iceberg model illustrating the levels of gender and sexual harassment. Sexual harassment constitutes a threat to the academic development of women in Paleontology. To combat sexual harassment, effective prevention mechanisms and severe sanctions are essential if it occurs.

that drive the 'leaky pipeline' phenomenon. Cultural change must involve cultivating an active male alliance, demonstrated through the support of women leaders and the equitable citation of their work. In parallel, structural reform is imperative, including transparent promotion and funding processes, robust family-friendly policies, and systematic protocols to mitigate implicit bias. Only through such integrated efforts can institutions transform into environments where women are fully empowered to succeed and lead. Key opportunities to address these challenges are examined in the following sections, with particular attention to networks, societies, mentorship programs, and grants supporting women in paleontology (Figure 5).

#### 4.1. Networks, Scientific Societies, and Mentorship

Geoscience professional associations, including those in paleontology, serve as vital pillars for the geoscience community, encompassing government, industry, and academia. They offer crucial accreditation, validate professional experience, and confer awards that enhance members' career prospects and advancement opportunities. Ideally, these associations should mirror the gender diversity of the fields they represent. However, participation from historically underrepresented groups, particularly women, often reflects the existing demographics of current membership and event attendees, rather than the broader industry composition (Handley *et al.*, 2020).

Paleontological societies play a crucial role in supporting early-career researchers by offering bridge funding between graduate studies, postdoctoral positions, and permanent employment. These organizations also facilitate career advancement through financial support, visibility initiatives, and enhanced networking opportunities (Plotnick *et al.*, 2025). For women, these societies can help mitigate systemic barriers in a historically male-dominated field. The gender dynamics within professional associations

may visibly influence the broader geoscience community through several channels, for example: the composition of divisional committees and specialist groups, the allocation patterns of awards, and the demographics of speakers at affiliated conferences and events (Handley *et al.*, 2020).

Women-focused professional networks provide safe spaces for women to discuss shared workplace challenges, exchange tailored advice, and build solidarity. Furthermore, such collectives amplify advocacy efforts by



**Figure 5.** Infographic presenting resources and opportunities for women paleontologists. Women-focused professional networks provide safe spaces for women to discuss shared career challenges, exchange personalized advice, and build solidarity. They also connect members around the common goals of promoting gender equality and improving women's career opportunities.

uniting members around the common goals of advancing gender equality and improving career opportunities for women (Handley *et al.*, 2020) (Figure 6).

The parallel rise in both female authorship and the average number of authors per paper may reflect established research showing that women scientists tend to engage in more extensive collaboration networks (van Rijnsoever and Hessels, 2011) and favor mentorship-focused collaborative approaches rather than the skills-based partnerships, which are common among male researchers (Bozeman and Gaughan, 2011).

Numerous professional organizations have emerged globally to support and advance women in geosciences. These societies provide crucial networks, resources, and advocacy for female geoscientists at all stages of their careers. Below are some of the most prominent international associations dedicated to this mission: AAPG Women's Network (<https://www.aapg.org/womens-network>), previously known as PROWESS, is an international

network that comprises both male and female professionals committed to advancing the technical and career development of women in AAPG. Their initiatives include organizing networking sessions and workshops at major conferences (ACE/ICE), advocating for female members in AAPG award nominations, collaborating with partner organizations, and producing media content that showcases the career trajectories of women geoscientists.

The Association for Women Geoscientists (AWG) (<https://www.awg.org/>), founded in 1977, is a global organization dedicated to enhancing women's engagement and advancement across all geoscience fields and inspiring girls and young women to pursue careers in geoscience. With members representing the full diversity of geoscience disciplines and professions, it offers exceptional opportunities for networking, mentorship, and professional development.

The Earth Science Women's Network (ESWN) (<https://eswnonline.org/>), founded in 2002 by women atmospheric scientists from multiple institutions, emerged from a shared



**Figure 6.** Image of guidance from experienced mentors enhances the professional development of early-career paleontologists.

recognition of the need for stronger support networks among female researchers. Now a formal nonprofit, the organization champions geoscience diversity through building supportive professional communities, driving systemic change to remove barriers to inclusion, and empowering scientists through career development. Governed by volunteer Boards of Directors, the group implements programs that foster equitable and inclusive environments while working to fundamentally transform scientific culture toward justice, respect, and belonging. Its enduring objectives focus on creating value-driven communities and supporting career growth through mentorship opportunities.

GeoLatinas (<https://geolatinas.org/>) is a circular organization that empowers Latina geoscientists through elevating their professional visibility, equipping them with career-long resources, and cultivating future talent. Simultaneously, this organization tries to dismantle barriers by sharing opportunities, sparking scientific interest, and addressing language/cultural divides in the geosciences.

The Association for Early-Career Women Archaeologists and Paleontologists (<https://awap-science.org/>) unites archaeologists and paleontologists from diverse backgrounds who are dedicated to promoting gender equality in STEM. Their aims include building a strong professional network for women in these fields, highlighting research by early-career female scientists, and fostering cross-disciplinary collaborations to address shared scientific challenges. The organization also creates forums to discuss gender-related barriers, develops actionable strategies for equity, and showcases women's scientific achievements to inspire future generations of researchers.

#### 4.2 Grants for women

Professional associations play a crucial role in conferring prestigious awards that establish excellence benchmarks. These honors provide significant career advantages by enhancing recipients' professional visibility and

credibility, two critical assets for promotions, employment opportunities, and securing research funding. Consequently, equitable recognition of women through these awards is essential for both retaining female talent and advancing their careers (Handley *et al.*, 2020).

The Association for Women Geoscientists (AWG) (<https://www.awg.org/>) offers professional and student awards. The professional awards are: a) Professional Excellence Award, which celebrates women with exceptional, sustained accomplishments spanning the public sector, private industry, and academic research; b) Outstanding Educator Award, which since 1988 honors exceptional female educators who advance geoscience training, diversity initiatives, and public engagement through their teaching; c) Mid-Career Excellence Award, where outstanding mid-career women scientists are nominated in any of three streams: academic researchers, industry professionals, or government scientists—annual selection includes one honoree per category.

Meanwhile, the (AWG) student awards include: a) The Jeanne E. Harris Chrysalis Scholarship, designed for women geoscientists whose studies were disrupted; this scholarship provides the financial support needed to complete their graduate degrees, covering final-stage expenses like defense travel, tuition, and childcare. b) The Geoscience Inclusion, Diversity, Equality, and Accessibility (IDEA) Scholarship funds women from underrepresented and marginalized backgrounds entering Earth Sciences/Geosciences education and careers; with numerous studies demonstrating that Geoscience remains the least diverse STEM discipline, the scholarship program works to address this disparity and cultivate a more inclusive future workforce. c) Association for Women Geoscientists Maria Luisa Crawford Field Camp Scholarships is designed to support expenses for field camp. d) The Undergraduate Excellence in Paleontology Award will subsidize an exceptional female paleontology student throughout her academic program. e) Winifred Goldring Award also aids women

paleontology students through their studies; this award honors Winifred Goldring, New York State Paleontologist (1939) and first female president of the Paleontological Society (1949). f) Sand Student Research Presentation Travel Award Application supports women geoscientists presenting at Geological Society of America Connects by covering conference travel, lodging, registration, and research presentation expenses. g) Takken Student Research Presentation Travel Award Application assists women geoscience students in presenting their research at major professional conferences worldwide. Each chapter of the AWG has awards and scholarships for female geoscience students with different profiles and needs.

The Paleontological Association (<https://www.palass.org/>) offers some awards named in honor of female paleontologists. Nevertheless, they are not exclusive to women.

The Mary Anning Award recognizes exceptional contributions to paleontology by non-professionals. Eligible candidates include amateur researchers, collectors, and independent scholars whose work may encompass: curating significant fossil collections, advancing preservation methods, or publishing original research in peer-reviewed journals.

The Dorothea Bate Award honors exceptional early-career paleontologists within five years of completing their PhD, who have made significant contributions to the field during and immediately following their doctoral research. This award commemorates Dorothea Minola Alice Bate, the pioneering Welsh paleontologist who revolutionized archaeozoology through her groundbreaking work on extinct megafauna and the phenomenon of island dwarfism.

The Gertrude Elles Award celebrates excellence in paleontology public engagement. Bestowed by the Council, it recognizes outstanding institutional or amateur-led initiatives that effectively communicate paleontological science to diverse audiences. Eligible projects encompass museum exhibitions, school/community outreach programs,

art-science collaborations, digital media projects, and other innovative approaches to public education in paleontology. Gertrude Elles (1872-1960) completed her studies at Cambridge in 1891, a time when women were not yet eligible to earn degrees. Despite this, she became Cambridge's first female reader, revolutionized graptolite research and Lower Paleozoic stratigraphy, and pioneered the study of fossil communities. Among the first female Geological Society Fellows (1919), she received the Murchison Medal for her foundational graptolite classification system, which remains influential today.

Between the National Awards, the Geological Society of Australia (<https://www.gsa.org.au/>) established a new award in 2021, the Beryl Nashar GSA Medal, to assess gender representation. The Beryl Nashar Medal became the first Australasian geoscience award, named after a female researcher, providing national-level recognition for Australian women's accomplishments in the field.

The geosciences require a robust, multi-tiered system of grants and awards that specifically support women, not just through international programs, but also through national paleontological associations and private societies. At the same time, international awards create high-profile role models, national and society-level opportunities address localized barriers and career-stage needs.

In this context, targeted childcare grants for women in STEM are a crucial tool for addressing systemic inequities, particularly in supporting conference attendance and professional training. These grants help mitigate career disruptions that disproportionately affect female researchers. A proven model exists: The European Molecular Biology Organization (EMBO) launched childcare grants in 2019 (<https://www.embo.org/>) to enable scientists with young children to participate in essential career-building activities. Paleontology, with its demanding fieldwork and conference-heavy networking culture, urgently needs similar dedicated funding mechanisms to retain women in the field.

### 4.3 Public perception

The stereotypical image of a paleontologist—a white man digging for dinosaur bones—does little to support women in the field. Although there is no study specifically addressing female paleontologists, Johnson (2018) examined Hollywood portrayals of women in Geology and found that from 1986 to 2016, only 31% of actors playing geologists were women, far fewer than the real-world demographics (34%). Even when films portray female scientists in high-status roles, Steinke (2005) found that, between 1991 and 2001, their characters were often relegated to romantic subplots or judged by their appearance rather than their professional skills.

Enhancing the visibility of women scientists represents one of the most potent strategies to challenge persistent stereotypes about scientists' identities (Miller *et al.*, 2018). Research quantifies this impact, showing that each visible female role model effectively doubled students' likelihood of pursuing geoscience careers (Hernandez *et al.*, 2018).

Challenging this narrow perception, The Bearded Lady Project: Challenging the Face of Science (<https://thebeardedladyproject.com/>) was launched in 2014 and released in 2019 under the leadership of paleobotanist Ellen Currano. Through photography and film, the project highlights the contributions of female paleontologists, fostering awareness and recognition of their significant contributions to the discipline. Expanding initiatives like "The Bearded Lady Project" can amplify the visibility of women in paleontology.

To effectively modify the deep-seated social and cultural patterns based on stereotyped roles for men and women, the field must leverage tools that reshape public perception at scale. Here, initiatives like the Bearded Lady Project are critical. By using the global reach of social media and digital platforms, such projects

directly combat the prejudices that underlie gender inequity. When female paleontologists use Instagram Reels, TikTok, or Facebook Live to broadcast their work, they do more than just increase visibility—they engage a broader public and inspire younger generations by providing counter-stereotypical role models. This consistent, accessible representation is a powerful means to achieve the elimination of the customary idea that paleontology is a masculine domain, fundamentally changing the culture both within and outside the academy.

### 5. Conclusions

While women have made significant progress in higher education, they remain underrepresented in leadership roles across many scientific disciplines, including Paleontology. Female paleontologists are often overlooked for top academic positions, key speaking roles at major conferences (such as plenary speakers), and leadership opportunities within professional organizations. This disparity persists despite their contributions to research and fieldwork, highlighting systemic barriers that must be addressed to achieve equitable representation in the field.

While progress has been made, female paleontologists still face systemic barriers worldwide. Addressing these challenges requires institutional reforms, better fieldwork policies, and active efforts to promote gender equity in STEM.

Closing paleontology's gender gap requires a multifaceted approach: amplifying women's visibility through media and conferences, establishing robust mentorship networks, creating targeted funding opportunities, reforming hiring practices, and strengthening support through scientific societies. These concrete actions must build upon recognizing the existing contributions of female paleontologists to create meaningful change.

## Contributions of authors

(1) Conceptualization: CGE, MCG, RGA; (2) Project administration: CGE; (3) Supervision: CGE, (4) Visualization: CGE, MCG, RGA; (5) Writing – original draft: CGE, MCG; (6) Writing – review & editing: CGE, MCG, RGA.

## Conflicts of interest

The authors declare that there are no conflicts of interest related to this article.

## AI-assisted tools disclosure

The authors declare that ChatGPT Professional was used for the creation of Figures 1–4 and 6. Figure 4 was subsequently modified using Adobe Illustrator. Grammarly was also used for grammatical checking of the manuscript.

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