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Research Article

Gender, Science and Technology: Feminist Discourses and Sociological Understanding

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Abstract

The intersections of science, technology, and gender have long been sites of contestation, critique, and redefinition. This paper reviews theoretical explanations and feminist perspectives that have shaped the discourse on women's underrepresentation in scientific and technological fields. Beginning with sociological approaches, it highlights how science is not a neutral pursuit but a socially and culturally embedded practice, influenced by power relations, gender norms, and institutional structures. Feminist analyses reveal the systemic exclusion of women, particularly through patriarchal ideologies, discriminatory practices, and institutional barriers that restrict women's full participation in scientific inquiry. In the Indian context, the analysis underscores how family structures, cultural ideologies, and professional biases create multiple burdens for women in science, while also acknowledging the emergence of collective consciousness and agency. Drawing on contributions from scholars such as Herbert Merton, Thomas Kuhn and Shapin, the study situates science within broader sociological debates on knowledge, power, and legitimacy.Feminist standpoint theory, critiques of biological determinism, and feminist epistemologies further challenge androcentric assumptions in knowledge production and open possibilities for inclusive frameworks. By tracing historical contributions, hidden narratives, and contemporary feminist interventions, the paper emphasizes the need to reimagine science and technology through plural, critical, and gender-sensitive lenses. It concludes that feminist scholarship not only exposes the gendered nature of scientific practices but also provides pathways for creating equitable and diverse knowledge systems that align with broader goals of social justice and innovation.

Keywords: *Gender, Science, Knowledge, Power, Patriarchy, Feminist Discourse*

Introduction

Women's enrolment in historically male-dominated professional courses and jobs like science and technology has expanded dramatically. However, the earlier trends showed that women continue to be concentrated in general, non-professional, non-lucrative courses, whereas men continue to assemble in large numbers in courses offering lucrative benefits (Mukhopadhyay, 1994; Parikh &Sukhatme, 2004; Rao, 2007). But in the last two decades, more specifically after the neo liberal structural reforms and subsequent widespread privatization of professional education (Perwez, 2019), more women appear to be entering non-traditional fields like engineering and science. However slow, a growing number of women enrolled in STEM programs in the post-2000s raises important questions about how this transformation occurred and why these fields have been so unwelcoming for women, or have the women gradually come to understand how to deal with and challenge patriarchal structures, allowing them to pursue occupations and degrees that were previously unsuitable for them? These are a few questions that cause us to reflect and look for answers in the extensive theoretical literature available to us. The paper examines and reviews the research and theory that falls largely within the domain of Social Studies of Science and Technology, which includes disciplinary literature such as sociology of science, new history, philosophy of science, the feminist critiques of science and postmodernism. This field addresses the issue of 'leaky pipeline' and the issue of 'women in science' through various theoretical standpoints. Within these fields, there is nearly the universal assumption that the problems identified with science have cultural bases which are derived from both the mores of science and the societies in which it functions (Lederman et.al, 2001). More particularly, the feminist analysis unveils the achievements and struggles of women scientists and engineers by claiming that the institutions, language, methods and interpretations of science comfortably follow a masculine model and what has become 'normal' in science is, in fact, constructed in a particular way (Haraway, 1978; Keller, 1982; Bleier, 1978). However, there is also an extensive body of literature available that highlights the experiences of women scientists and engineers and suggests how resilience and negotiations led to the steady success in their lives (Pattatucci, 1998; Godbole & Ramaswamy, 2008; Gupta, 2022).

A review of extensive feminist literature elicits several themes around the issues of women in science and technology. Firstly, that science is a cultural activity and science is political in the sense that it supports outcomes defined as advantageous by the Western, capitalist society that ironically, has evolved in parallel to modern science (Harding, 1998). Feminist analyses of how science is politicized have raised numerous issues about

the implications of scientific research. The second issue that comes out of the literature review is that women have distinct experiences in the scientific area of males. This means that the psycho-social environment in which women and girls practice science is hostile in many ways. According to Pattatucci (1998:2), "science is male territory," and as such, there is an institutional and social support structure in place to foster men's interest, drive, and success in the field. Thirdly, women's subjective experiences of resistance and negotiations in the field of sciences lead to the realization of a sense of agency in them and thereby a more equitable setup and social transformation. First and foremost, it is pertinent to understand why science and technology have been the arenas so unwelcoming for women. Therefore, the focus of this paper is to understand the sociology of science that will elucidate the culture of science as manifested through its traditions, practices, use of language and claims of objectivity to help understand why women have remained few in number and so insignificantly apparent in the field of science and technology and how transformation is underway.

Sociology of Science and Women's Social Situatedness

Science as a Social Endeavour

Science is not just a knowledge-making activity but a social endeavor. Contrary to the traditional view of science as a solitary pursuit, this perspective is a cornerstone of the sociology of science (Barnes, 1977). Sociologists of science, such as Cole and Cole (1973), argue that while intellectual factors are crucial in scientific development, social factors are equally significant. They propose a typology of influences on scientific development, suggesting that both external and internal factors, as well as social and intellectual factors, shape the trajectory of scientific advancement (Cole & Cole, 1973). These sociologists stress how crucial it is for scientists to work together and communicate with one another, as well as how funding organizations, governmental regulations, and public expectations affect scientific advancement. They contend that a complex interaction of intellectual and social elements shapes scientific knowledge rather than being exclusively dictated by individual brilliance. This viewpoint calls into question the conventional wisdom that regards science as an entirely autonomous and objective effort, emphasizing the necessity for a more comprehensive knowledge of scientific methodology.

The perspective that science is a social endeavor rather than a purely intellectual one opens up many important questions about the dynamics within scientific communities (Longino, 2002). One of these questions pertains to the role of power dynamics. Power dynamics can manifest in various ways within scientific communities, such as through the allocation of resources, the influence of senior scientists, or the impact of institutional policies and practices (Ackerly & True, 2010). These dynamics can shape the direction of scientific research and the questions considered important or worthy of investigation. Another critical issue from this perspective is the potential for bias and exclusion within scientific communities. Bias can occur when certain perspectives, ideas, or individuals are favored over others, while exclusion can occur when certain groups or individuals are systematically left out of scientific activities (Harding, 2015). These biases and exclusions can be based on various factors, including but not limited to race, gender, socioeconomic status, or institutional affiliation. The perspective also suggests that scientific progress may not always be driven purely by the pursuit of truth. Instead, it can be influenced by personal and institutional agendas (Mirowski, 2018). For example, a scientist might pursue a particular line of research because it aligns with their interests or is likely to secure funding. Similarly, an institution might prioritize certain types of research because they align with its strategic goals or because they are likely to attract prestige and resources. These factors have significant implications for the credibility and reliability of scientific findings. If personal or institutional agendas influence scientific research, it raises questions about the objectivity of the findings. Moreover, if certain perspectives or individuals are systematically excluded from scientific activities, it raises questions about the comprehensiveness and inclusivity of the knowledge produced.

Power Relations in Science: Key Perspectives from Sociology of Science

Another important consideration is the potential for scientific knowledge to be used for both beneficial and harmful purposes. While scientific knowledge can lead to advancements that improve human well-being, it can also be used in ways that cause harm or exacerbate inequalities. For example, scientific knowledge can be used to develop life-saving medical treatments, but it can also be used to create weapons of mass destruction. As we delve deeper into the social dimensions of science, it becomes increasingly clear that understanding scientific practice requires an interdisciplinary approach. This approach should incorporate insights from various fields, including sociology, philosophy, and history. Sociology can provide insights into the social

structures and processes that shape scientific activities, philosophy can provide insights into the underlying assumptions and values that guide scientific inquiry, and history can provide insights into the historical context that shapes current scientific practices. This interdisciplinary approach can provide a more comprehensive and nuanced understanding of scientific practice, shedding light on the complex interplay of social and intellectual factors that shape scientific knowledge. Key theoretical frameworks in this area include Thomas Kuhn's "Structure of Scientific Revolution" (Kuhn, 1962), Robert K. Merton's work on the sociology of science (Merton, 2017), and Stephen Shapin's "The Scientific Revolution" (Shapin, 2018). These works explore the social construction of knowledge and how it intersects with the social construction of gender. These frameworks challenge the notion that science is purely based on objective facts and reveal how societal factors, such as power dynamics and cultural norms, influence scientific practices and the knowledge produced.By examining the social construction of gender within scientific communities, these works shed light on how biases and stereotypes can shape scientific research and perpetuate inequalities. One area where the influence of societal factors on scientific practices becomes evident is in the field of medicine. Research has shown that gender biases and stereotypes can significantly impact diagnosing and treating medical conditions. For example, studies have found that healthcare professionals often downplay or dismiss women's pain, leading to delayed or inadequate treatment. This bias stems from societal beliefs that women are more emotional or prone to exaggerating their symptoms. As a result, women may be misdiagnosed or receive suboptimal care, ultimately perpetuating gender-based health disparities (Clareus & Renstrom, 2019; OECD, 2025).

The comparison of these three key theoretical frameworks in the sociology of science: Thomas Kuhn's 'Structure of Scientific Revolutions,' Robert K. Merton's 'Sociology of Science,' and Stephen Shapin's 'The Scientific Revolution' elucidates unique insights into scientific practice's social and intellectual dynamics. This comparison helps to illuminate the diverse perspectives and approaches within the sociology of science, highlighting the complexity and richness of this field of study. We can learn more about how scientific knowledge is created and impacted by social and cultural aspects by looking at these frameworks. A thorough grasp of the sociology of science is facilitated by Kuhn's idea of paradigm changes, Merton's emphasis on the standards and values that influence scientific communities, and Shapin's investigation of the historical background of scientific revolutions. By studying paradigm shifts, we can see how scientific knowledge is not always objective or universal, but rather influenced

by the prevailing ideas and beliefs of a particular time and place. Merton's emphasis on social norms and values sheds light on how scientific communities can be shaped by factors such as competition for funding and recognition, leading to biases and the prioritization of certain research areas over others. Shapin's examination of historical context further reveals how scientific revolutions can be driven by political, economic, and cultural forces, highlighting the complex interplay between science and society. Overall, this interdisciplinary approach helps us recognize that scientific knowledge is not simply a product of pure rationality, but also a result of social and cultural influences.
Our understanding of scientific advancement has been completely transformed by Thomas Kuhn's concept of paradigm shifts. In his groundbreaking book "The Structure of Scientific Revolutions," Kuhn makes the case that scientific progress is not a straight line but rather happens as a result of several paradigm shifts, in which an established scientific theory is superseded by a new one (Kuhn, 1962). This viewpoint emphasizes the impact of the dominant ideas and beliefs of a given period and location, challenging the conventional conception of science as an objective and universal pursuit. Robert K. Merton's Sociology of Science focuses on the social norms and values that shape scientific communities. Merton's work highlights how scientific communities can be influenced by factors such as competition for funding and recognition, leading to biases and the prioritization of certain research areas over others (Merton, 2017). His emphasis on social norms and values sheds light on the complex interplay between science and society, revealing how scientific practice is not merely a product of rationality but also shaped by social and cultural forces. Stephen Shapin's "The Scientific Revolution" explores the historical context of scientific revolutions, revealing how they can be driven by political, economic, and cultural forces. Shapin's examination of the Scientific Revolution provides a comprehensive understanding of how scientific knowledge is produced and how it is influenced by broader societal factors (Shapin, 2018). His work emphasizes the multifaceted nature of scientific practice and its impact on society, highlighting the complex interplay between science and various social and cultural influences.

Overall, these three frameworks offer unique insights into the sociology of science, illuminating the diverse perspectives and approaches within this field of study. By examining these frameworks, we can appreciate the complexity and richness of scientific practice and recognize that scientific knowledge is not simply a product of pure rationality but also a result of social and cultural influences. The mutual contributions of Kuhn's paradigm shifts, Merton's sociology of science, and Shapin's historical context

form a synergistic understanding of the sociology of science. Kuhn's concept of paradigm shifts provides a foundational understanding of how scientific theories evolve and change, emphasizing the non-linear nature of scientific progress (Kuhn, 2013). Merton's focus on social norms and values complements this by highlighting the social structures that influence scientific practice, revealing how biases and priorities within scientific communities can shape the direction of research (Merton, 2017). Shapin's exploration of the historical context adds another layer to this understanding, showing how scientific revolutions are influenced by broader political, economic, and cultural forces (Shapin, 2018). Together, these frameworks create a multifaceted perspective that recognizes the complexity of scientific practice. They illuminate how scientific knowledge is not merely a product of objective inquiry but is deeply intertwined with social, cultural, and historical contexts. This interdisciplinary approach enriches our understanding of science, emphasizing its dynamic and interconnected nature, and underscores the importance of considering multiple perspectives to gain a comprehensive view of how scientific knowledge is produced and evolves. This analysis has specific implications for understanding how the process of scientific and technological knowledge production impacts the lives of women who enter to serve these fields. In this backdrop, it is imperative to outline the sociological analysis of women's participation in scientific and technological activities over the years.

Culture of Science and Technology and the Feminist Critique

Historical Perspectives on Women in Science and Technology

The history of (restricted) access to the tools of scientific production and the contemporary position of women in the scientific profession must be the main topics of any analysis of the history of women's involvement in scientific organizations. The secret contributions made by women in a variety of scientific domains are revealed by Patricia Fara's historical study of women's involvement in research. Fara's work (Fara, 2013) emphasizes the importance of recognizing women's roles in scientific advancements, challenging the traditional narratives that have often excluded or minimized their contributions. Her research provides a comprehensive view of women's scientific achievements and the barriers they faced, shedding light on the gender dynamics that have shaped scientific practice. Londa Schiebinger's research (1999) explores the intersection of gender and science, focusing on how women's work in science has been systematically marginalized. Schiebinger's analysis reveals the structural biases that have

limited women's opportunities and recognition in scientific fields. In her book 'The mind has no sex' (Schiebinger, 1989), she raises a pertinent question, not why there were so few women scientists, but why there are so few women scientists that we know about. She contends that the social contexts of royal courts, salons, and artisan workshops, which did not inherently exclude women, were the birthplaces of modern science. Her work emphasizes the need for a more inclusive approach to scientific history and practice, recognizing the diverse contributions of women and other marginalized groups. With particular reference to the cultures of science, she explains that the sciences are identifiable civilizations with evolving conventions and folkways, notwithstanding assertions of objectivity and value neutrality. Many of these traditions have historically excluded women and/or been hostile to their participation.

Schiebinger's ideas were in direct contradiction with those of Sandra Harding, who gave the idea of Feminist Standpoint Theory in 1986. In Schiebinger's words, there is no 'female style' or 'women's ways of knowing' ready to be plugged in at the laboratory bench or clinical bedside. Women as females of the species do not do science differently: science should necessarily be 'for women, by women, about women.' Moreover, difference feminism or standpoint theory, as it is sometimes called, can tend to exclude men from understanding how gender operates." (Schiebinger, 2012, pp. 11). Sandra Harding's postcolonial standpoint theory (Harding, 1986), on the other hand, provides a critical viewpoint on the gendered dynamics of science that appears to be important. The significance of taking into account the historical, social, and cultural elements that influence women's experiences in science is emphasized by Harding's approach. Her research emphasizes how patriarchal structures and colonial legacies have shaped scientific practice, highlighting the need for a more sophisticated comprehension of the intricate relationships that exist between gender, culture, and science. According to her theory, feminist perspective theory seeks to describe how power practices and oppressive social relations are created and maintained by hegemonic institutions and their conceptual frameworks.

Second, it achieves this by revealing a novel perspective on how a hierarchical social structure functions in a form of political and material disadvantage or oppression. She goes on to discuss the distinction between viewpoint and perspective, emphasizing that a stance is something that must be attained rather than something that just happens. Harding goes on to say that simply recording the viewpoints of marginalized groups is not enough because it is likely that they have internalized prevailing ideas about the

hierarchy. To reach a standpoint, one must establish a collective consciousness; this is not the same as changing one's own perspective. A shift in an individual's location naturally results in a shift in perspective, but establishing a standpoint necessitates determining one's social position in relation to others whose experiences become perceived as shared by both parties. Susan Heckman, on the other hand, presents a postmodernist view for exploring the epistemological issues (Heckman, 1997) that illuminates women's subjective positions in science. She was, however, against considering women's standpoints as epistemically privileged and asserted that standpoint theory ignores the diversity of women and substitutes universal women for the modernist idea of the universal man, viewing certain traits of some women as necessary for all women.

Missed Standpoints and Hegemonic Masculinity in Science and Technology

Heckman's study highlights how crucial it is to acknowledge women's distinct viewpoints and experiences in scientific research. Her analysis highlights the need for a more inclusive and varied approach to scientific inquiry by demonstrating how traditional epistemological approaches have frequently disregarded or ignored women's contributions. Collectively, these academics offer a comprehensive perspective on women's involvement in scientific advancement. They highlight how women's contributions have historically been overlooked and marginalized, underscoring the significance of identifying and resolving the social and cultural elements that influence women's experiences in science. Their combined efforts highlight how important it is to advance varied viewpoints and equitable chances in scientific research in order to spur innovation and advancement for the benefit of society. They provide a thorough understanding of the intricate relationship between gender, science, and society by looking at the historical background and using a variety of theoretical frameworks. This emphasizes the need for a more inclusive and equitable approach to scientific activity. These academics have drawn attention to the historical marginalization and neglect of women's involvement in scientific advancement. They emphasize how crucial it is to take into account the social and cultural elements that influence women's experiences in science and how these elements interact with their gender identities. Additionally, their work emphasizes the need for more inclusive and diverse perspectives in scientific research to ensure a comprehensive understanding of the world. By examining the historical context, these scholars have revealed how patriarchal systems and biases have hindered women's access to education and professional opportunities in scientific fields. They have shown that the women's contributions to scientific discoveries and advancements have often been downplayed or completely ignored. Moreover, their

research underscores the significance of addressing these systemic barriers and promoting equal opportunities for women in science to foster innovation and progress for the betterment of society. In this context, feminists have brought up important equity issues, such as the restriction of participation freedom, which is reflected in the historical under-representation of women in scientific fields, as covered in this section.

Documenting the social construction of scientific knowledge, many of the most pernicious aspects of hegemonic masculinity have been exposed by numerous feminist studies; these aspects are pernicious because they are difficult to notice against the backdrop of claims to objectivity. One of the critical studies highlighting the language of defense intellectuals was conducted by Carol Cohn (2014). Through participant observation in the field of defense with the nuclear technostrategic experts, Cohn reveals the nuances of the discourse around nuclear weaponry and arms control. One can "think about the unthinkable," work in organizations that promote the spread of nuclear weapons, and make a living by mass-incinerating millions of people by using a variety of culturally grounded and culturally acceptable mechanisms that serve this purpose, according to the discourse of nuclear experts (Cohn, 2014). Through her research, she concludes that defense intellectuals argue that they are the only ones who can realistically and objectively address the existence of nuclear weapons in response to criticism of the ruthless inhumanity of the scenarios they create. People who strongly oppose the nuclear status quo are described as being irrational, unrealistic, and too sentimental. She further suggests that a cursory glance under the surface of their conversation, with technical jargon and its abstraction, does not seem to corroborate their statements. There are currents of heterosexual dominance, homoerotic excitation, the desire for competence and mastery, and the joy of belonging to a privileged and elite group (Cohn, 2014).

Feminist Engagements with Biology and Neuroscience: The Hormone Debate

Feminists' critiques of science also give rise to the hormone debate in science, which asserts that man is a stronger sex, whereas womenare a weaker sex and hence not capable of dealing with pressures emerging from tedious scientific inquiry. The hormone debate, led by scholars like Harding (2007), further explores the intersection of gender, science, and technology. This debate critically examines the scientific understanding of hormones and how it has been influenced by gendered assumptions and stereotypes. Harding's work challenges the simplistic binary views of hormones and gender, emphasizing the complexity and diversity of human biology. This viewpoint advances a

more complex comprehension of the interplay among identity, gender, and biology. Feminist criticisms of science have also elaborated on the consequences of assumed, implicit, and problematic concepts of nature and the natural with regard to women's bodies and brains, as well as how scientific theories are social creations. A renowned trailblazer, Ruth Bleier presented her first feminist book with a critical analysis, 'Science and Gender,' which was released in 1984. According to her, gender architecture and nature are products of the male psyche, reflecting how men think and conduct science and their obsession with sexism and women's inferiority. She contributed to the most potent domain, namely,the neurosciences, where attempts to prove women's inferiority had been made.It investigated whether differences in brain structure and function between the sexes could account for the reported discrepancies in cognitive abilities.

The writings of scholars like Bleier and Fausto-Sterling are referred to by Sandra Harding as spontaneous feminist empiricism (Harding, 1986). She was implying that although they are scientists who evaluate other scientists, they do it with a common set of principles about what makes for sound scientific practice. They made an effort to pinpoint the ways that prevailing sex and androcentric biases in society affected scientific research. According to feminist scientists, research on gender differences is well-established within a conceptual framework that has historically sought to support male superiority in behavior and abilities and to view anything connected to female sex as inferior on a genetic or biological level. This framework also assumes that human behavior is largely influenced by genetics and views the distinction between pure genetics and the environment as meaningful and sustainable. The feminist stance is founded on the idea that biology is a genetic and cultural construct, and that any claims that biology is isolated from culture, environment, and education, and that any behavioral differences between men and women are solely based on biology, are conceptually weak. In the book 'Science and Gender' (Bleier, 1978), Bleier's claims are supported by empirical analysis, and she notes that many of the studies that purport to show or explain the differences between men and women are conceptually or methodologically incorrect or they are inconclusive. One of the main points of contention in her criticism of mainstream biology is neuroscientific studies in which she asserts that, because brain growth is influenced by external stimuli, it is impossible to distinguish between biological and cultural conceptions. For biological determinists who link sex differences in social roles and behaviors to the early organizing effects of androgens on human male brains, androgen research on rats has provided a paradigm. In contrast to castrating newborn male rats, which has the opposite effect, giving androgens to newborn female rats boosts

their mounting and fighting behavior as adults. Thus, scientists came to the conclusion that androgens have an organizing influence on the growing brain that shapes adult behavior later on.

According to Bleier, studies on humans and other primates had not demonstrated the organizing effects seen in rats. Subsequent research also revealed that the idea that androgens masculinize the brain is overly simplistic and that it is impossible to distinguish between the effects of progestogens, estrogens, and androgens because they all follow different metabolic pathways and are produced by both males and females. She generally contended that conclusions drawn from those investigations were applied too rapidly to other species (Bleier, 1978). In their assessment of scientific research on the connection between sex differences in the body and brain, Rebecca M. Jordan Young and Rafaella I. Rumiati (Young & Rumiati, 2014) also make this observation. Their study evaluates the available neurobiological data about the importance of sex, sex differences, and sexuality in understanding the composition and function of the human brain, most of which comes from studies conducted on animals. They demonstrate how the concept that there are constant, universal biological distinctions between men and women is supported by neuroscience research that perpetuates assumptions about the significance of the two-sex system. As has also been contended by Anne Fausto-Sterling (Sterling, 2001) that scientific thinking and the interpretation of what we claim to observe are shaped by presumptions regarding gender, ethnicity, and sexuality. She claims that developmental biologists are merely mirroring the social norm that acknowledges men as powerful and women as invisible when they place an emphasis on male variables in sex determination research and ignore female influences. Theories that reinforce prevailing beliefs about gender, race, and sexual orientation are prioritized above those that question societal norms in the competition for scientific legitimacy.

Science as Culturally Embedded Practice and the Feminist Critique

According to Pattatucci (1998), the notion that scientists are objective observers unaffected by external factors was also called into doubt by feminism. Science does not happen in a vacuum. Rather than being a "holy" being watching over the culture, it is an essential component of it. Scientific inquiry is situated within a certain historical, political, and temporal context. She gives an example of how world warsfirst and two gave way to the tremendous advances in surgical techniques, development of aeronautical designs, complex communication systems and development of antibiotic medicines to

treat infections (Pattatucci, 1998: 173). Feminist perspectives on science encompass more than equity issues; however, feminist philosophy of science, as represented by Sharon Crasnow, Megan Halpern, and others, offers a critical lens through which to view the gender dynamics in scientific fields (Crasnow, 2021). This perspective goes beyond merely highlighting women's contributions to science; it critically examines the underlying assumptions and biases that have shaped scientific practice. Crasnow and Halpern's work emphasizes the importance of questioning traditional methodologies and epistemologies, advocating for a more inclusive and reflexive approach to scientific inquiry.

Complementing this, feminist technology studies, as exemplified by Heller (2006), delve into the relationship between gender, science, and technology. This field explores how technological advancements and innovations are influenced by gendered assumptions and biases. Heller's work reveals how technology is not neutral but is shaped by cultural contexts, including gender norms and expectations (Heller, 2006). This viewpoint emphasizes the importance of taking into account how technology can both support and undermine current gender inequality. With an emphasis on the coproduction of gender and technology for specific innovations, Francesca Bray (2014) further asserts that the primary goal of feminist technology studies is to examine how technologies contribute to gender inequality and to work towards more democratic forms of technology. This distinguishes feminist scientific studies from feminist technology studies. According to Bray, we would be better equipped to comprehend how gender politics are implemented through technologies across time and space in systems that resist change and consolidate power if anthropological methods were applied to the study of material culture, specifically the concept of sociotechnical systems.

Faulkner (2000) also observes that there are several indications that hegemonic masculinity is still dominant in engineering, with men continuing to hold the highest-paying and most powerful positions in the global technoscience sector. She writes that it is noteworthy that, in spite of almost two decades of government and business support for campaigns encouraging women to pursue careers in engineering, the proportion of women entering the field is still pitiful in the majority of countries, even if women are pushing their way into other influential institutions like science. The majority of girls and women are casting their ballots with their feet, whether or not they are the targets of prejudice or discouragement. They simply are not interested in technology; therefore, it never even occurs to them to pursue design positions in the field. Initiatives to increase

the number of women in engineering often overlook this important fact because they are based on the erroneous belief that women must be changed (socialized) to fit into engineering rather than the other way around. The efforts' virtual failure indicates that there must be a significant symbolic relationship between technology and masculinity (Faulkner, 2000).

Patrifocal Family System and the Indian Context

Family and Social Factors Influencing Women's Scientific Careers

Particularly in the Indian context, theories of feminism have established that it is primarily the patriarchal ideology and family structure that prevent women from pursuing careers in science and engineering, as they are the masculine domains and require extensive economic investments by the parents and potential marriageability problems (Mukhopadhyay, 1994). Studies on women's questions in science are relatively scarce, nevertheless. The earliest source of information on women scientists was the Indian Women Scientists' Association, which was founded in Mumbai in 1973. Family background and support for pursuing science careers were found to be of utmost importance (Parikh & Sukhatme, 2004; Mukhopadhyay, 1994; Rama Roy & Shenoy, 1998). Subramanyan's study revealed that due to socialization of women and lack of child care facilities, women have to work harder than men (Subramanyan, 1998). Studies also show that women scientists in India have fully internalized their gender roles and give great importance to family; moreover, they do not perceive that there is any other option to it (Parikh & Sukhatme, 2004; Rama Rao & Shenoy, 1998). Gupta and Sharma (2001) in their study on women academic scientists asserted that women scientists not only have a dual burden of job and family, but they also face some unique problems both as formal and informal organization of work, leading to an additional source of stress. Hence, they face a triple burden. According to a study by Chakravarthy (1986) comparing the work performance of male and female scientists, women are more likely to conduct "pure" research than administrative duties. This indicates that they participate less in an institution's decision-making process. Additionally, rather than being analytical and creative, their research is more of a compilation, collection, and review. Studies also show that women scientists had to work more to attain returns comparable to men scientists (Parikh & Sukhatme 2004; Subramanyan 1998).

Shifting Perspectives in Indian Feminist Scholarship on Science

The issue of discrimination against women in science is complex, involving several factors, and it is seen that only recent generations of Indian women are willing to acknowledge discrimination. Bal (2002), for example, opines that discrimination against women practitioners of science may not be due to conscious efforts from men colleagues, but it's the cultural upbringing and values that contribute to the discrimination observed. According to a study by Madheswaran and Shroff (2000), pre-market discriminatory practices in the family regarding nutrition, health, and education account for a larger portion of discrimination against women than does discrimination in the marketplace. Once more, there is an imbalance in the use of power and decision-making, even when there isno clear pay gap between men and women in the same position inside an organization. The socioeconomic background of women scientists was better than that of men, and the status of women's husbands was better than that of men's spouses, according to a study on the social standing of women engineers and scientists in comparison to men scientists and engineers (Jaiswal, 1993). It was discovered that the majority of female scientists were at a lower level of the professional hierarchy, that they were less committed to their jobs than men, and that there was covert discrimination against them at the organizational level (Jaiswal, 1993; Kurup, 2019; Kurup & Raj, 2022a & b).

In the Indian context, there has been a change in the manner of looking at the issues and problems of women in science from what was earlier called the feminist concern that looked at how women could accommodate themselves within the system. Scholars are now starting to pay attention to the institutional obstacles that prevent women from advancing in science and research, but these studies have not yet attempted to capture the culture of the institutions or the character of science within them. (Subhash, 2012). However, a comparison of Indian and Western literature on women and science suggests that the Indian perspective on gender and science is more of a liberal feminist tradition, whereas Western literature belongs to a wide range of liberal and radical traditions. Western studies on gender and science deal with empirical studies exploring the status and position of women in science, the culture of science and gender bias therein. Indian studies are largely focused on pointing out the various obstacles, status and performance of women scientists in India. Nevertheless, the scholarly attention on the topic of gender and science in India has been increasing in recent years, and studies on women in science as well as technology are also increasing. There has been much discussion and investigation into the goal of gender equality in science and technology.

Numerous studies have examined various facets of gender equality, including organizational policies and educational institutions, and how they affect women's involvement in these domains. These studies have brought attention to the ongoing gender gaps in science and technology, where women face obstacles to professional advancement and are underrepresented in leadership roles. Furthermore, studies have looked into how biases and prejudices contribute to these disparities, which have highlighted the need for interventions to address these problems.

When combined, these multidisciplinary methods offer a thorough understanding of the intricate relationships that exist between gender, science, and technology. Since science is not an isolated or objective activity but is intricately entwined with societal values and conventions, it emphasizes the significance of taking social, cultural, and historical factors into account when doing scientific research. The relationship between gender, science, and technology enables a more thorough examination of the hierarchies and power structures in scientific domains, exposing the systematic exclusion or neglect of marginalized groups like women and people of color. By critically examining these dynamics and challenging dominant narratives, researchers can work towards creating a more inclusive and diverse scientific community. Ultimately, incorporating feminist perspectives into scientific research has the potential to inspire innovative solutions, address long-standing inequalities, and foster a more equitable and socially responsible approach to science and technology.

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