

THE SCIENTIFIC REVOLUTION THROUGH A GENDERED LENS: A REVIEW OF FEMINIST HISTORIES OF SCIENCE

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Editorial note. *This is an abridged English translation of a Russian review essay published in the same issue, which covers more works and discusses them in greater depth.*

In this brief survey, I will concentrate on the early modern period. I will do so for two reasons. Firstly, many female historians believe that it is the changes that occurred in Western and Northern Europe during that period which excluded women from prestigious types of activity such as science and philosophy. Secondly, radical feminists believe most conclusions of traditional¹ academic work on early modern science to be false.

As early as 1977, Joan Kelly wrote in a well-known and oft-quoted paper entitled “Did Women Have a Renaissance?” that

One of the tasks of women’s history is to call into question accepted schemes of periodization. To take the emancipation as a vantage point is to discover that events that further the historical development of men, liberating them from natural, social, or ideological constraints, have quite different, even opposite, effects upon women [quoted in Park 2006: 487].

Carolyn Merchant adapted this thesis to the history of science in *The Death of Nature: Women, Ecology, and Scientific Revolution*, published in 1980². Merchant tried to trace the processes by which women were relegated to a supporting role in European societies. She links these changes with the rise of new scientific and market values that sanctioned the exploitation of nature, which had hitherto been personified in feminine terms. One of the results of this process was that women became an object of domination; another result was the unconscious eroticization of knowledge—according to radical interpretations, a sublimated form of violence (Carrol 1989).

Sandra Harding, the author of a series of books on the feminist history of science (1986; 1991; 2006), is even more categorical. Harding claims that masculine dominance, racism, class-based exploitation, as well as colonial and imperialist conquest contributed to the formation of the logic and practice of science, and scientific knowledge is therefore fundamentally illegitimate.

So what have feminist studies’ critical review of history revealed? I will try to answer this question by outlining the controversy between traditional authors and gender-conscious historians of science and correlating it with social alignments in the professional field of science.

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1 I am using the term “traditional” here strictly as an antonym to “alternative” or “innovative.”

2 Republished in 1989. See also the recent debate in the *Focus* section of *Isis* (“Getting Back to *The Death of Nature*: Rereading Carolyn Merchant,” 97(3): 485–533), and Merchant’s recent work (2008).

One of the standard topics implicitly or explicitly present in any feminist study is a critique of the knowing subject. Feminists argue that positivist male epistemology erroneously portrays this subject as a distanced and disinterested observer. Feminists believe that “disinterested observer,” in this case, designates a white male who occupies dominant positions in the social hierarchy and is interested in objectivating the order that grants him power and recognition. This is why a range of feminist works strive to expose the supposed sexlessness of the traditional subject of knowledge. One of the ways to do this is to uncover erotic connotations in works of early modern science.

One of the most striking examples of this line of argument is Mary Campbell’s *Wonder & Science: Imagining Worlds in Early Modern Europe* (1999). Analyzing Galileo Galilei’s well-known *Starry Messenger* among other texts, Campbell brings to light a whole web of erotic associations usually ignored by male scholars: from “the incorporation of the pederastic language of courtly ‘intercourse’” (126) (in Galileo’s dedicatory letter to Cosimo de’ Medici) to the pleasure he gets from examining the Moon: “It is most beautiful and pleasing to the eye to look upon the lunar body” (Galilei 1989[1610]: 35). Unveiling erotic metaphors allows Campbell to attribute phallic functions to the telescopes themselves, as instruments that allow men to derive pleasure from penetrating the depths of the universe. She also discovers shades of scopophilia in the first emotional responses to the experience of using optical instruments.

Liberating Galileo from stern academic concentration and sexual indifference, Campbell refuses to adopt a long-term perspective that would focus on the improvement of optical technology and growth of knowledge. Instead, she places his work in the context of contemporary literary genres, and argues that it fits most closely into utopian writing and “classic voyage literature” (1999: 135). Campbell finds the use of an eroticized vocabulary functionally justified, because erotic discourse is much more focused on the signified and can therefore be used to create an illusion of presence, blurring the boundary between “seeing” and “being there”³.

Campbell’s approach closes the gap between the study of scientific ideas and the analysis of speech acts, allowing us to study the cultural, social, symbolic, and semantic transformations that led to the emergence of a scientific language. In particular, considering the specific ways in which scientific images were produced in early modern Europe, she discovers parallels between the concepts of “explicit language” and “graphic detail.” Campbell interprets the evolution of scientific language (both verbal and graphic) as a process of “fetishization”; she argues that this process allowed its practitioners to pin down its meaning, dispensing with superfluous chains of signifieds that coded the objects of scientific scrutiny in “unscientific” ways.

Campbell’s book exemplifies the agenda of feminist epistemology. She focuses on eroticism and visual culture. She displays an interest in utopia which, according to many female historians of science, is a central element in the self-definition of the feminist movement because utopia reflected the imaginary aspirations of women caught in a sexist society whose rigid distribution of gender roles made them unhappy (Sargisson 1996). Finally, her work is profoundly psychological, contrasting with the dispassionate subject of knowledge in “male” science.

Another way in which gender historians oppose the traditional history of science is in paying close attention to scientists’ emotional experiences. One example of this approach is Emmy Spary’s paper on “Codes of Passion” (1999). Spary attempts to find traces of spiritual drama in the work of yet another early modern scientist, Georges-Louis Leclerc Buffon. Spary argues that Buffon’s interest in taxidermy was provoked by the psychological trauma of his wife’s death.

Within the complex of images that are symbolically linked to femininity, Spary discovers an “elegant and carefree” bird⁴. Developing the psychoanalytic thesis that men are afraid of ecstatic female emotionality, Spary

3 On this point, Campbell echoes gender studies in the history of pornography (Falk 1993).

4 She is seconded by Crowther-Heyck (2003), who notes that the image of the open bird cage becomes an erotic symbol in paintings starting in the 18th century. Wine cooling jugs carried the same meaning.

interprets the stuffing of animals as a transgressive gesture that allows a man to overcome this complex and persuade himself that gender relations can be controlled. However, Spary does not stop at this rather trivial interpretation. Like Campbell, she develops her thesis against a larger background, which includes both erotic and political allegories.

Like birds in collections, living birds in aviaries were mere simulacra of nature, reflecting the moral outcomes of domestication in their own immorality. Sickness, idleness and adultery were the lot of those who lived in luxury, whether birds or French nobles. The problem of classifying birds thus became one with the problem of classifying society [132].

Nor does Spary disregard the problem of the emergence of scientific language. Her study employs the methods of semiotics and makes frequent references to the work of Roland Barthes. "Early modern collections [...] were clearly polysemic; they could support different meanings and connote different worlds" (118). However, as the epistemological status of the visual in taxidermic practices becomes problematic, scientists develop a projective imagination. They reduce the complexity of the eclectic collections assembled in their studies and build a new symbolic order that extends its influence to both natural and social relations: "In moving between text, image and specimen, a cognitive shift between memory and imagination was being operated. Imagination was 'the interior eye, and the measure of imaginations is relative to the measure of vision.'" (122).

The "imagination" is a central topic in these and many other works on the history of science from the gender studies school. To understand how the term is used in gender history, I propose to look at Ladina Bezzola Lambert's *Imagining the Unimaginable: The Poetic of Early Modern Astronomy* (2002). Lambert, too, focuses on Galilei's *Starry Messenger*. She analyzes the work by drawing stylistic parallels between Galilei's text and works by his contemporaries, scientists as well as literary writers:

I believe that his [Galilei's] imagery is fundamental to the argument of the *Sidereus nuncius* not only for the way it illustrates Galilei's description, but, more substantially, for fleshing out his argument in a very literal sense of this metaphor. It is to a large extent through his use of imagery, rather than argumentatively, that Galilei counters the dogmatic beliefs of the Aristotelian philosophers and tries to make his theory palatable to his audience [34].

Alan Gross, a specialist on scientific rhetoric, attacks this book with an aggressiveness that leaves me puzzled:

The title and subtitle of this monograph are seriously misleading. A book on imagining the unimaginable should concern itself with the heart of this oxymoron: though the imagination has common sensation as its only basis, it nevertheless produces something unique—namely, new knowledge. This is not Ladina Lambert's topic, however; she is concerned, as she herself says, only with the capacity of the imagination to reorder the mind's visual contents: to create satyrs out of images of men and goats or, more to the point, craters out of moon shadows. Nor is this really a book about early modern astronomy [2002: 695].

Gross finds fault with Lambert's arguments, but the main cause of his irritation seems to be her attempt to shift the boundaries of the discipline somewhat by analyzing Galilei's "scientific" work using not only scientific, but also literary categories. He continues:

True, it concerns itself with Galilei, Kepler, and Huygens. Galilei's *Sidereus nuncius* and his *Dialogue Concerning the Two Chief World Systems*, works certainly central to early modern astronomy, are the foci of a chapter. But the choices in the cases of Kepler and Huygens are eccentric indeed: Kepler's *Somnium* and Huygens's *Kosmotheoros*. It is equally odd that a book professedly about early modern astronomy should deal so extensively with Ariosto's *Orlando Furioso* and two novels each of Cyrano de Bergerac and Italo Calvino» [Gross 2002: 695].

Much can be said in support of Lambert. Science was only professionalized at the turn of the 19th century, and it is therefore inappropriate, at the very least, to view Galileo's text as exclusively "scientific." The models of persuasion that Galileo was developing were aimed at an audience of courtiers, with their own peculiar ideas about culture and literary sensibility⁵. Galileo's unique optical experience was indeed difficult to articulate, and finding detailed similarities between the surfaces of the Moon and the Earth was virtually the only way to assimilate this new knowledge, which had no counterparts in either the Aristotelian scholastic narrative or empirically oriented practice (van Helden 1992; 1994; van Helden and van Gent 1999). More than anything else, Gross's review seems to me to corroborate feminist attacks on masculine interpretations of the scientific revolution more than it refutes them.

But let us return to the logic of Lambert's reasoning. The use of the imagination in the *Starry Messenger*, Lambert argues, serves three main objectives:

(1) to create a physical world out of visual image; (2) to establish an essential similarity between the Moon and the Earth; (3) and to translate the meaningless telescopic images into familiar images that bear significance in the reader's mind. In so doing, it addresses some peculiar epistemological problems that the telescope and the kind of visual evidence it furnished posed: for one thing, the evidence was exclusively visual; for another, it was not evident, at least not self-evident [Lambert 2002: 34].

Like Campbell, Lambert interprets Galileo's experience of examining the Moon as a new type of interaction with the world—not so much intellectual (in the spirit of Aristotelian scholasticism) as physiological. The act of looking acquires a significance of its own and becomes an intermediate operation between perception and intellectual processing. The way in which the visible is reconstructed is such that at the beginning of observation, visual experience is viewed as inseparable from rational interpretation.

Lambert shows that in order to achieve his objective ("to make his theory palatable to his audience," as quoted above), Galileo made equal use of logical argument and rhetorical devices, playing on the polysemy of the expressions he employs. Moreover, her book offers what is probably the most successful explanation of a well-known paradox in the *Starry Messenger* that has occupied many a scholar—the clearly exaggerated size of the crater in one of the engravings included in the treatise. "Galileo," Lambert writes, "never uses the term 'crater'". This is a remarkable observation. Attributing to Galileo schemes of perception that appeared at later dates, historians of science sometimes disregard the original terminology used by early modern scientists. Lambert, by contrast, is initially interested in the "literary" aspects of Galileo's work and therefore focuses on his scientific terminology. The paradox is explained by a difference in attitudes between Galileo and his later interpreters. Galileo was much more interested in pointing out similarities, rather than differences, between the Moon's and the Earth's surfaces⁶. The imaginary resemblance between the two landscapes helps him articulate a new type of visual experience and at the same time serves to refute the Aristotelian idea that the sublunar and supralunar worlds are incomparable.

In describing the surface of the Moon, Galileo uses perfectly terrestrial concepts—"valleys" and "very high mountains." He seems unfazed by the strong dissimilarity between the peculiar features of the Moon's surface and terrestrial landscapes. Lambert argues that this attitude deserves particular attention. Galileo ignores these distinctions because they do

not fit his program, i.e., to emphasize *cognatio atque similitudo inter Lunam atque Tellurem*. Instead, he singles out one crater, magnifies it and compares it to the unique—but familiar—topography of Bohemia, thereby emphasizing that what looks strange on the Moon

5 A detailed analysis is offered in Biagioli 1992; 1993; 1996.

6 The concept of a "crater" appeared in the 18th, not the 17th century, serving a different task: to define those peculiar features of the Moon that *distinguish* it from the surface of the Earth.

also exists on Earth. He in fact not only argues that the crater *resembles* the topography of Bohemia, but even claims that it is the way the region of Bohemia would look from outer space. The crater therefore *is* Bohemia [Lambert 2002: 49].

Yet another alternative tendency in the history of science is the attempt to link changes in ways of explaining natural phenomena with the transformations that took place among early modern craftspeople and artists. Probably the most authoritative female historians in this field are Paula Findlen (1994; 2001), Pamela Smith (2004), and Pamela Long (2000). Outlining her main thesis in one of her articles, Smith writes:

In about 1400, northern European artists suddenly began to depict the natural and human world in a “realistic” or “naturalistic” manner. At about the same time, new ideas about how to describe nature realistically emerged among scholars investigating the natural world. Over the next two centuries, this new approach to nature (which eventually became known as “science”) and the belief that it could provide a realistic depiction of nature transformed human attitudes to nature and the material world. Artisans or craftspeople were central to this transformation and thus more important than is usually recognized in forming the new attitudes that characterized the Scientific Revolution [2000: 13].

This train of thought is not limited to gender studies. Feminist and traditional historians alike have tried to place scientific ideas in a wider context that reveals the first naturalists’ links with, on the one hand, craftspeople, engravers, and distributors of printed matter, and, on the other hand, the courts, although female authors are in a slight majority in this field (Jackson 2000). The same goes for the history of visual culture (Parshall 1993). These new fields of interest constitute zones of rapprochement between gender studies and other alternative tendencies in the history of science. Edited volumes on the contextual history of science therefore include papers by male authors, although they are usually much less represented than female gender historians (Smith and Findlen 2001).

Another current in gendered histories of science—and probably the most controversial one—focuses on the interpretation of purely female phenomena that are fundamentally absent from the male experience (such as the female orgasm or child-bearing). In these cases, professional contributions by men have inevitably resulted in a distorted or sometimes absolutely false understanding, which then came to be transmitted as scientific truth. Elisabeth Lloyd convincingly demonstrates this in her recent book *The Case of the Female Orgasm: Bias in the Science of Evolution* (2005). One by one, Lloyd scrutinizes explanations offered by men until the mid-20th century and refutes the once-popular idea that the orgasm has a beneficial effect on female fertility; that it is a secondary result of embryonic development (such as the male nipples), and many other delusions. In doing so, she shows male biologists’ bias in involuntarily attributing features of their own sexual life to the female orgasmic experience.

In a similar vein, Lianne McTavish argues in her book *Childbirth and the Display of Authority in Early Modern France* (2005) that the obviously implausible depictions of the fetus in 17th century obstetric treatises document pernicious intrusions by male surgeons into obstetric practice. In addition, the book offers an interesting analysis of strategies of authority formation among obstetricians.

Two recent tendencies stand out in the gendered history of science. Firstly, male historians have increasingly come to tolerate this line of inquiry; secondly, and most remarkably, some female historians specializing in this field have begun to voice moderate criticism of radical feminist approaches (Kohlstedt 2007). Patricia Fara makes an interesting observation in her review of an edited volume entitled *Figuring It Out: Science, Gender, and Visual Culture* (Shteir and Lightman 2006), which discusses women’s contribution to the creation of visual scientific imagery in the 19th century:

The cover of *Figuring It Out* correctly suggests that this collection is predominantly about women and nature. Although the volume contains many excellent articles, by gathering

them together under this rubric the editors implicitly reinforce the traditional dichotomy between word and image, with its associated assumptions of contrast between masculine reason and feminine superficiality, between rational language and natural unmediated impressions [...] paying particular attention to female involvement in the visual construction of gendered roles. As the editors themselves point out, more research is needed on masculinity, which runs the risk of being seen as a norm for women to define themselves against rather than as a variable category under constant reconstruction [Fara 2007].

It is all the more interesting to read such comments by female gender historians since responses by male scholars to works from the gender school mostly remain querulous, even though on the whole they have become more tolerant. In his review of Susan Parrish's book *American Curiosity: Cultures of Natural History in the Colonial British Atlantic World* (2006), which deals with the transmission of information from recently discovered America to the Old World, William Leach writes:

Perhaps the most troubling feature of this book is its writing and tone. Highfalutin theoretical language dealing with gender, race, and nationality, the product of the last twenty-five years in the academy, continually intervenes, and valid historical points get lost in a fog of unexamined generalizations. The author's tone is often smug and condescending. In a few decades, one hopes, this kind of analysis will be incomprehensible, and real historical work—of the kind that sometimes shines forth here—will once again make its claim [Leach 2006].

Robert Nye is much more restrained in his assessment of *Men, Women, and the Birthing of Modern Science* (Zinsser 2005), a collection of articles on empresses' or wealthy and socially high-ranking women's attention to natural science:

It is generally agreed that before about the middle of the seventeenth century, the activities and investigations of nature that eventually became modern science were open to participation by both men and women. Though women certainly did not engage in such activities in numbers equal to men, there was nothing in culture, law, or institutions of the late medieval period that directly ruled out female practitioners of medicine, science, or philosophy. Historians of science and medicine have been gradually piecing together the ways that the new scientific institutions of the seventeenth and eighteenth centuries and the new methods employed to ascertain the truths of experimental facts operated to exclude women [...]

All these essays usefully direct our attention to the social history of women's exclusion from modern science, which was—social development being so differential and uneven—partial, incomplete, and complicated by local developments [Nye 2006: 760–761].

My own research on the history of early modern science, which mainly deals with astronomy, the first results of the use of optical technology, and the technology of producing visual representations, has led me to many conclusions that are similar to those of the authors discussed here, although there are also points of divergence. Like them, I am strongly opposed to linear models in the interpretation of scientific knowledge that are reminiscent of Old Testament genealogy (Seth begat Enos, who begat Cainan, who begat Mahalaleel, etc). However, I believe that eroticism is not the only way in which the emotional component in scientific research can be expressed. Why not talk about left-right asymmetry, about the function of metaphor in scientific knowledge, or about other ways to resolve emotional conflicts generated by encounters with the unknown? Nevertheless, gender studies in the history of science undoubtedly allow us to reconsider the key stages in the history of visual culture. They add nuance to the history of scientific language and the construction of masculine models of impersonal perception, and thoroughly redefine the role and influence of utopia during the Enlightenment.

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