

CHAPTER 2

Darwinian Feminisms

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At first glance, the terms *Darwinism* and *feminism* may seem to have little in common. What could the scientific theory of the origin of species as formulated by British naturalist Charles Darwin (1809–1882) have to offer the political movement for sexual equality? Indeed, given the centrality of competition to Darwin’s theory of evolution and the importance of community and coalition building to feminist politics, it may be easier to imagine Darwinism and feminism as adversaries rather than allies. And yet, since the publication of Darwin’s *On the Origin of Species* in 1859, feminist theorists and activists have found in Darwin an ally in the battle against biological essentialism—that is, the assumption that human behavior can be explained by a series of unchanging, biologically determined facts. Invoking his theory of evolution in order to critique biological essentialism, along with the gendered norms and hierarchies that tend to accompany it, feminist theorists have used Darwin’s work as a platform for social and political transformation. If, as Darwin claimed, “human nature” itself is not a fixed constant but something constantly changing, then, some of Darwin’s readers argued, there can be nothing natural or permanent about the subordinate status of women in society. Thus, although Darwin’s major insights may appear to be contained to the natural sciences, his ideas have served as an important touchstone for feminist activism and theory from the nineteenth century until today.

That Darwinism has provided a useful set of tools for feminism, however, does not mean that Darwin himself expressed particularly progressive views on women. A product of his time, Darwin often relied on stereotypes of male and female behavior consistent with the dominant assumptions of his contemporaries in Victorian England. In his account of the process of sexual selection, *The Descent of Man and Selection in Relation to Sex* (1871), for example, Darwin proposes that a set of fundamental differences characterizes the two sexes, arguing that whereas woman has “greater tenderness and less selfishness,” man “delights in competition” ([1871] 2004, 629). Like many nineteenth-century scientists, Darwin believed that women were inherently weaker, more childlike, and less capable of rational thought than men. Even the title of Darwin’s *The Descent of Man*—in which the word *man* is used generically to refer to all of humankind—points to the fact that, throughout much of Darwin’s work, the male sex stands as the unquestioned ideal, standard, and norm against which all other sexes (e.g., female and hermaphroditic) are measured.

Although Darwin’s vocabulary and assumptions about gender were conditioned by his historical and social context, Darwinian science has something to offer thinkers interested in challenging gendered stereotypes and hierarchies. Indeed, although many

(including Darwin himself) used evolutionary biology to justify their belief in two distinct sexes with fixed characteristics, various of Darwin's readers contested this sexually determinist interpretation of the theory of evolution, arguing instead that Darwin's approach to matter in particular actually undermined the suggestion that sexual inequality—and even sexual difference—is natural and inevitable. Rife with implications for gender and sexuality theory, Darwin's understanding of matter as a fundamentally indeterminate and temporally conditioned phenomenon has been invoked by feminists to call into question biologically essentialist theories of sex and race, opening the door for the emergence of new, anti-essentialist accounts of the role of matter and the body in the human social world.

THE WOMAN QUESTION: EARLY FEMINISM AND THE PROMISE OF EVOLUTIONARY THEORY

Almost as soon as *On the Origin of Species* appeared in print, women writers, scientists, and activists began to engage the theory of evolution. Darwin's early female interlocutors were some of the first to critically assess the role of matter in conditioning human social behavior. The various women who responded to Darwin's work across the late nineteenth and early twentieth centuries did more than defend themselves from the biological essentialism that plagued early applications of evolutionary theory to human society, however. Indeed, they actively intervened in the debates surrounding evolutionary science, inspiring and producing new research into the extent to which human sexuality and gender are materially determined.

Beginning with the example of American scientist and cleric Antoinette Brown Blackwell (1825–1921) and touching on the work of various other turn-of-the-twentieth-century women, this section traces the origins of “Darwinian feminism” back to the nineteenth century, when early readers of Darwin's work began to question the ideologies of gender that informed scientific practice. Darwin himself often affirmed stereotypes about women's nature, but his theory of evolution emphasized the transformable quality of all matter and, with it, all secondary sex characteristics. He even went so far as to suggest that the two sexes had emerged over time in response to environmental shifts. In so doing, he provided fuel for women's rights advocates to claim that if men and women were at present unequal in either intellectual or physical capacity, such seemingly natural hierarchies could be transformed if women were given access to different material resources.

BLACKWELL'S *THE SEXES THROUGHOUT NATURE* AND THE ORIGINS OF DARWINIAN FEMINISM

In November 1869 Blackwell wrote a letter to Darwin, sending him a copy of her recently published *Studies in General Science* (1869). Responding with enthusiasm about the work, Darwin replied to Blackwell (on November 8, 1869) that he very much appreciated the citation of various “statements made by me & very little known to public” (Darwin [1869] 2016). From the nature of Darwin's response, however, it is clear that the scientist was entirely unaware that the author of *Studies in General Science*—A. B. Blackwell—was a woman: “Dear Sir,” his response to Blackwell begins, “I am much obliged to you for your kindness in sending me your ‘Studies in General Science,’ over which, as I observe in the Preface, you have spent so much time” (Darwin [1869] 2016). Darwin's

assumption that the author of *Studies in General Science* was a man speaks to the fact that few women in the nineteenth century had access to the institutional resources that would allow them to produce such a scientific study. Women like Blackwell were denied educational opportunities and refused entry to formal societies and groups and thus struggled to find their voice in the male-dominated discourse of nineteenth-century science.

The challenges that nineteenth-century women faced in intervening in scientific discourse were more than institutional, however. The theory of evolution itself seemed set against them. At the heart of many early applications of evolution to human life was the suggestion that men were more highly developed and “evolved” than women. In *The Descent of Man*, Darwin maintained that sexual selection had rendered man “superior to woman” both physically and intellectually ([1871] 2004, 631). “The chief distinction in the intellectual powers of the two sexes,” he wrote, “is shown by man’s attaining higher eminence, in whatever he takes up, than women can attain—whether requiring deep thought, reason or imagination, or merely the use of the sense and hands” (629). Like the peacock, which, as a result of sexual selection, had become increasingly more beautiful than the peahen, Darwin proposed, man had over time become more powerful and intelligent than woman. Thus woman is often represented in *The Descent of Man* as a less-developed man, her anatomy more childlike or “primitive,” her mental qualities (such as intuition and imitation) harkening back, as Darwin phrased it, to “a past and lower state of civilisation” (629).

Early feminists such as Blackwell were dissatisfied with this account of the female sex as unevolved, however, believing it to be not only politically problematic but scientifically flawed. In her groundbreaking study *The Sexes throughout Nature* (1875), Blackwell took issue with the presentation of the male sex in evolutionary theory as an unquestioned ideal against which all other sexes (e.g., female and hermaphroditic) were measured. “Current physiology,” she complained, “seems to be grounded on the assumption that woman is undersized man, with modified organs and special but temporary functions, which like other more or less abnormal activities are a direct deduction from the normal human energy” (1875, 233). Critiquing not only Darwin but also other evolutionary theorists, such as Englishmen Herbert Spencer (1820–1903) and Thomas Huxley (1825–1895), for basing their research on “the time-honored assumption that the male is the normal type of his species” (122), she contended that for all their “modern scientific reasoning” these so-called “eminent thinkers” had merely grounded themselves “anew upon the moss-grown foundations of ancient dogma” (231).

Blackwell herself did not use the word *feminist* to describe her intervention into Darwinian science (though the word was slowly coming into parlance at the time). Her study of sex in nature, however, can broadly be understood to develop a feminist approach to science in its commitment to showing how assumptions about what scholars today call “gender” influence how experiments are conducted, which data is analyzed, and thus what conclusions are drawn—and advocating for the development of a more egalitarian science.

The Sexes throughout Nature did more than serve to correct the male bias of nineteenth-century science; it also opened the door for future women and feminist scientists to conduct research into the role of sex and gender in the natural world. That women often lacked the formal training to contribute to scientific debates, Blackwell argued, should not prevent them from drawing from their experience to contribute to scientific knowledge production. “There are none but beginners among us in this class of investigations,” Blackwell admitted.

“However great the disadvantages under which we are placed,” she continued, “these will never be lessened by waiting” (1875, 22). Calling upon women to make use of the resources they had, rather than wait for society to change in their favor, Blackwell encouraged women to bring their own knowledge to the study of biology. “Woman herself must speak hereafter, or forever hold . . . her peace,” she wrote. “She must consent to put in evidence the results of her own experience, and to develop the scientific basis of her differing conclusions” (234–235).

TURN-OF-THE-TWENTIETH-CENTURY FEMINISM AND THE POLITICS OF EVOLUTIONARY SCIENCE

What did Darwin himself think of the efforts of women scientists to improve evolutionary science by advocating for more attention to the female experience? In the online documentary *Darwin’s Women* (2013), produced as part of the Darwin Correspondence Project at the University of Cambridge, historian of science Philippa Hardman proposes that Darwin’s personal letters reveal a more complex picture of his relationship to women than that found in his published works. Consider the case of the British Victorian suffragette and biologist Lydia Becker (1827–1890), a prominent activist in the women’s movement with whom Darwin corresponded in the 1860s. Darwin could not have been unaware of Becker’s feminist reputation when she wrote him to inquire whether she might distribute one of his publications to her organization, the Manchester Ladies’ Literary Society. Despite having published critical views on “the woman question,” Darwin responded to Becker positively, supplying her, as Hardman observes in her blog post “Darwin, Becker & Sexual Equality” (2011), with “not one but *three* papers to be read at the ladies’ inaugural meeting.” Such instances of Darwin’s support of women in science suggest that, although Darwin publically critiqued the women’s movement, his published writings should not be interpreted as the untainted expression of his personal views.

Whether Darwin felt pressure to conform to Victorian presumptions about women’s role in society or genuinely believed that women were less evolved than men, we cannot know. What we do know, however, is that Darwin’s female contemporaries—from fellow scientists to political activists and novelists—often turned to his work as a resource for contesting the subordinate role of women in Victorian society. As feminist historians and science studies scholars such as Gillian Beer ([1983] 2009), Stacy Alaimo (2000), Kimberly Hamlin (2014), and Abigail Mann (2011) have demonstrated, turn-of-the-twentieth-century feminist novelists, activists, and intellectuals sometimes looked to Darwin in order to demonstrate woman’s intellectual equality with—or even sometimes their superiority to—man’s.

Consider, as an additional example, American women’s rights activist Eliza Burt Gamble (1841–1920), who went so far as to claim that woman is actually more highly evolved than man. Developing her own interpretation of Darwin’s theory of sexual selection, in *The Evolution of Woman: An Inquiry into the Dogma of Her Inferiority to Man* (1893), Gamble claimed that Darwin’s observations of animals showed that males were driven in their decision-making by sexual desire. Females, on the other hand, were more intellectually motivated and thus capable of greater thought and restraint. Whereas Gamble insisted on the superiority of women to men, others looked to Darwin to make the case that men and women were different but equal.

Drawing on the work of biologists whom she had studied in her degree course at Columbia University, American intellectual and activist Helen Hamilton Gardener (born

Alice Chenoweth, 1823–1925) set out to challenge the assumption—widespread in the nineteenth and early twentieth centuries—that women’s brains are physically smaller and thus inherently inferior to those of men. In an article published in *Popular Science Monthly*, Gardener contested the erroneous claims of American neurologist William A. Hammond (1828–1900), an influential voice in the turn-of-the-century debates about brain size. Gardener disputed Hammond’s claim that, as he had put it in “Woman in Politics” (1883), “grave anatomical and physiological reasons demand . . . that the progress of [the women’s rights movement] be arrested” (138), arguing that if there was a difference between the male and female brain, it was less the result of “natural and necessary sex differences” than “difference of opportunity and environment” (1895, 107).

Gardener’s ultimate testament to gender equality, however, lay in her posthumous donation of her own brain to the Burt Wilder Brain Collection at Cornell University—an act Hamlin has described as “the most dramatic example of women using their bodies and their physical experiences to create a more accurate and inclusive biology of sex difference” (2014, 60). Gardener hoped that the comparison of her brain with those of men would prove once and for all that there existed no essential biological difference between men’s and women’s brains. She was by and large successful: an article published in the *New York Times* two years after her death with the headline “Woman’s Brain Not Inferior to Men’s” declared that Gardener’s brain donation had “posthumously substantiated her life-long contention that, given the same environment, women’s brains are equal of man’s” (1927, 1).

Why did women’s rights activists like Gardener and Gamble follow in Blackwell’s footsteps in trusting in science as an ally when it was so often used against them? Blackwell expressed great faith in science to reveal the truth of equality when she wrote in *The Sexes throughout Nature* that “it is to the most rigid scientific methods of investigation that we must undoubtedly look for a final and authoritative decision as to women’s legitimate nature and functions” (1875, 231). Encouraging scientists to study “the feminine constitution” more carefully and in more detail, she maintained that further research into female physiology would reveal that feminine traits were not inferior to those of man but simply different in nature (231).

In her book *Sexual Science: The Victorian Construction of Womanhood* (1991), American historian Cynthia Eagle Russett (1937–2013) proposed that nineteenth-century feminists felt compelled to take up scientific discourse given the “enormous prestige of science and the universal acceptance of its authoritative status in matters of sex difference” (13). Where Russett characterized nineteenth-century women’s use of scientific discourse as a power play, that is, invoked solely for the authority it held in Victorian society, others have made the case that so many women have looked to Darwin to advocate for equality because of the potential of his theory of evolution for rethinking sexual difference. As Alaimo has argued in *Undomesticated Ground* (2000), “although Darwin and many of his followers . . . used evolution to assert the natural origin of what we call gender, his story of human descent nonetheless [has allowed] feminists to diminish the significance of sexual difference in the distant past and in the perhaps not-so-distant future” (41). Indeed, as is demonstrated in the following section, Darwin’s insistence in *The Descent of Man* that secondary sex characteristics were historically and environmentally determined called into question the commonplace understanding of sex as a fixed and unchanging dichotomy, paving the way for biologists to advocate for an understanding of sex as a biological *process* rather than a biological *essence*.

UNDOING SEXUAL DIFFERENCE: FEMINISM AND EVOLUTIONARY BIOLOGY IN THE NINETEENTH CENTURY AND TODAY

With the introduction of the concept of gender in the late twentieth century, feminist theory distanced itself from the biologically grounded theories of sex that had dominated the nineteenth century. Extending the famous claim made in *The Second Sex* (1949) by French social theorist and feminist Simone de Beauvoir (1908–1986) that “one is not born, but rather becomes, a woman,” feminists of the 1960s to 1990s contested the understanding of sex as a rigid and stable biological phenomenon, emphasizing instead the socially constructed nature of sexual subjectivity. One of the most impactful arguments for the fluid nature of gender emerges in American philosopher Judith Butler’s (1956–) famous study *Gender Trouble: Feminism and the Subversion of Identity* (1990), in which she reasons that what appears to be a biologically given binary is actually a dynamic set of social behaviors that, taken together, produce the appearance of a rigid or stable sex. “Gender,” she writes there, “is the repeated stylization of the body, a set of repeated acts within a highly rigid regulatory frame that congeal over time to produce the appearance of substance, a natural sort of being” (2006, 33). According to Butler and her followers, although sex appears as a material and biological fact, its very appearance as such is an effect of power produced through the everyday performance of gender.

Profound as these critiques of the biological nature of sex have been, it is important not to impose a contemporary understanding of the sex/gender distinction onto earlier feminisms. Simply because nineteenth-century feminists used the word *sex*—and understood the phenomenon to be fundamentally biological—does not mean that they perceived sex as a fixed or unchanging category. On the contrary, engaged with Darwin’s evolutionary framework, many came to understand sex as both material and plastic—that is, transformable or open to change. At the heart of Darwinian feminist critiques of sexual binarism was the notion that sex, while it is material, is a historically contingent and environmentally determined phenomenon.

The temporal and environmentally responsive framework Darwin cultivated for understanding sex has been mobilized by feminists from the nineteenth until the twenty-first century to demonstrate that the seemingly fundamental biological difference between “male” and “female” is not as rigid as presumed and thus to critique the notion of sexual binarism from the perspective of evolutionary theory. The following sections address the extent to which biologists have looked to Darwin in order to argue for an understanding of sex as historically contingent and environmentally determined.

THE DESCENT OF MAN AND THE HISTORICAL CONTINGENCY OF SEX

In 1871 Darwin shocked readers by proposing that all life had evolved from a common ancestor, a single-celled hermaphroditic organism that was the “progenitor of the whole vertebrate kingdom” ([1871] 2004, 189). While in *On the Origin of Species* he had speculated that “probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed” ([1859] 1999, 472), in *The Descent of Man* Darwin further developed this thesis by proposing that this primordial form must have been hermaphroditic and single-celled. Over time, he contended, the two sexes had emerged to multiply the possible variations that offspring could inherit—a development that had allowed for the evolution of higher animals. The theory that sexual dimorphism itself had a limited history opened up the notion of sexual binarism to radical critique. “Darwin’s suggestion that all organic life had descended from a single-celled hermaphroditic

organism,” Hamlin explains, “troubled some men and women raised on the doctrine of separate spheres and the related idea that, physiologically, women were entirely distinct from men. To others, however, the possibility of a hermaphroditic past sounded exciting and opened up a new world of gendered possibilities” (2014, 33).

The theory that the two sexes had evolved over time allowed early evolutionary biologists to imagine a future in which not only social and behavioral but also physical differences between the sexes might transform or even disappear entirely. The very materiality of sex, some reasoned, was not fixed and stable but rather contingent upon historical and environmental factors. In his study of biological sexual difference, *Differences in the Nervous Organization of Man and Woman* (1891), the British physician Harry Campbell, to give one example, used Darwin’s theory of sexual selection to argue that what appeared to be a rigid distinction between male and female was actually “highly variable” (47). Woman, Campbell wrote, is “not what she is, and man not what he is, simply because the one has ovaries and a uterus, and the other testicles” (46–47). Thus it was entirely possible, as he put it, that “all the secondary sexual characters in man and woman might be transposed—that strength, courage, and fire of the man might be transferred to the woman; the weakness and timidity of the woman, to the man” (47).

In *The Descent of Man* Darwin himself stressed the contingent nature of all secondary sex characteristics. While man was at present smarter and stronger than woman, he suggested, this may not always have been the case: “The greater intellectual vigour and power of invention in man,” Darwin wrote, “is probably due to natural selection combined with the inherited effects of habit” ([1871] 2004, 674). Readers like Campbell interpreted such remarks to suggest that the two sexes could eventually evolve to exhibit entirely different traits—men might become more feminine and women more masculine. While Campbell himself was far from a feminist, his interest in Darwin’s theory of sexual selection led him to affirm the inherent contingency of biological sex. If the qualities that have come to characterize men and women were “not absolutely and inevitably necessary,” he reasoned, then “matters might have been otherwise” (1891, 46). The thesis that secondary sexual characteristics were contingent upon environmental factors, however, would take on an explicitly feminist tenor in the work of Havelock Ellis (1859–1939), an English physician and sexologist who was “one of the most authoritative spokesmen in the feminist cause” (Alaya 1977, 272).

Like Blackwell before him, Ellis contested the theory, prevalent in nineteenth-century scientific circles, that women were less developed than men. “To assume, as Herbert Spencer and many others have assumed,” Ellis stated in his study of sexual difference, *Man and Woman: A Study of Secondary Sexual Characters* (1894), that “woman is ‘undeveloped man,’ is to state the matter in an altogether misleading manner. . . . [Such a theory] is only true in the same sense as it is to state that man is undeveloped woman; in each sex there are undeveloped organs and functions which in the other sex are developed” (445). *Man and Woman* sold out of its first edition in 1894. Highly influential for turn-of-the-century discussions of sex, the book set out to investigate “how far sexual differences are artificial, the result of tradition and environment, and how far they are really rooted in the actual constitution of the male and female organisms” (vii–viii). If there was an essential difference between male and female, Ellis proposed, then it was impossible to discern. He concluded his study with the suggestion that there exist no “radical and essential characters of men and women uninfluenced by external modifying conditions” (440). By this, Ellis meant that the seemingly stable phenomenon of sex could not be considered separately from the dynamic material forces that produce it over time.

Man and Woman proposed that sex roles were influenced by a host of external factors, such as cultural practices, beauty ideals, and climate. In so doing, the book lent credence to the view, increasingly prevalent in turn-of-the-twentieth-century feminist circles, that sex is environmentally determined. “Interest in the environmental determination of sexuality,” the historian of science Ornella Moscucci explains, “represents a prominent theme in the nineteenth-century debate on sex differences. Throughout the century it was widely assumed that sex characteristics like many other physiological property [*sic*] of individuals, constantly interacted with a number of different external factors, such as geographical conditions, custom, and mode of government” (1991, 184). “Although in *The Descent of Man* Darwin appeared to sanction the separation of men and women into distinct spheres of aptitude and ability,” Moscucci continues, “his insistence that sex differences were due to the action of the environment rather than of the reproductive organs had radical implications for theories of sexual division” (184). One of the most significant implications of Darwin’s understanding of biological sex was that, while sex was no doubt material, as one’s environment changed, the very matter of the body could change.

It was thus no great leap for turn-of-the-century feminists to argue that what was perceived to be “women’s nature” might transform entirely if women were provided with different resources. That sex is highly dependent on environmental factors, turn-of-the-century scientists from Campbell to Ellis claimed, rendered it difficult to speak with certainty about the inherent “nature” of femininity or masculinity. Inspired by Darwin, they identified a structural indeterminacy at the heart of sex, paving the way for more recent work in biology and ecology on the environmental determination of sexual difference.

PLASTICITY THEORY AND THE ENVIRONMENTAL CONTINGENCY OF SEX

The suggestion that sex is environmentally determined has gained traction in recent years among evolutionary biologists working to challenge the gene-centric view of sex in favor of a view of sex as phenotypically plastic. In the biological sciences, the term *plasticity* has been taken up to describe the openness of bodies to change in response to environmental shifts (see, for example, Pigliucci, Murren, and Schlichting 2006; Schlichting and Pigliucci 1998). Likewise, the word *phenotype* is used to distinguish between the observable characteristics and behaviors of an organism and those that are inherited genetically (its *genotype*). To understand sex as plastic means to acknowledge that while sex is no doubt genetically mediated, the phenotypic expression of sex transforms in response to environmental factors. While Darwin did not invoke the term *plasticity* himself, he can be understood to have advocated for a conception of sex as plastic by emphasizing the responsiveness of sex, among other characteristics, to outside stimuli.

Such a view has been further developed by contemporary feminist evolutionary biologists who draw on Darwin’s work in order to understand the role of the environment in the production of sex (see, in addition to those discussed, Wood and Eagly 2012). One prominent example can be found in the work of feminist biologist Malin Ah-King. In her collaborations with the zoologist Sören Nylin and the trans theorist Eva Hayward, Ah-King has advocated for an understanding of sex as what in genetics and ecology is known as a “reaction norm,” that is, as a genetically mediated response to environmental change.

In their coauthored article “Sex in an Evolutionary Perspective: Just Another Reaction Norm” (2010), Ah-King and Nylin define a *reaction norm* as “the range of phenotypic expressions that one genotype can give rise to, in response to different environmental conditions” (237). As they point out, although sex is encoded in the genotype, the range

of expressions of each genotype is dependent on a host of nongenetic factors, such as the developmental process of the organism and environmental input. Building on Darwin's theory of sexual selection and the work of American feminist evolutionary biologist Joan Roughgarden (1946–) in *Evolution's Rainbow* (2005), as well as other theorists, the authors “argue against the norm of dichotomous sexes,” proposing that “there is not only flexibility in the proximate causation of sexes but also in ultimate causation of sexes, as selection pressures change over evolutionary time” (2010, 235). Within an evolutionary framework, they maintain that “sex, just like any other character, can evolve and be selected upon” (236).

In her article “Toxic Sexes: Perverting Pollution and Queering Hormone Disruption” (2014), coauthored with Eva Hayward, Ah-King further develops this argument through the case of endocrine pollution, or the introduction of artificially produced hormones into bodies of water. Various species, the authors begin by noticing, “have environmental sex determination, in which temperature, pH, or social environment (dominance hierarchies, sex ratio of group, sex of potential partner) influence an individual's sex” (6). In the case of endocrine pollution, hormones are often seen to affect the sexual morphologic characteristics and reproduction of aquatic organisms. While endocrine disruption is frequently cited in articles intending to demonstrate the negative effects of pollution, Ah-King and Hayward cite these studies toward a different end, showing how the case of endocrine disruption—as it operates across both nonhuman and human worlds—signals the fundamental plasticity of sex. “Instead of thinking of sex as a nature-given dichotomy, or essentially discrete characteristic,” they propose, “sex is better understood as a responsive potential, changing over an individual's lifetime, in interaction with environmental factors, as well as over evolutionary time” (2014, 6).

The work of Ah-King and her collaborators builds on the important work of earlier generations of feminist evolutionary biologists who fought to challenge the gene-centric view of sex from a Darwinian perspective. The next section looks at how feminists of the 1980s and 1990s challenged the genetic determinism of traditional evolutionary biology, developing more culturally attuned accounts of human sexual expression.

BETWEEN NATURE AND CULTURE: DARWINIAN SCIENCE AND TURN-OF-THE-TWENTY-FIRST-CENTURY FEMINISMS

To what extent do the principles of natural and sexual selection limit or inform human behavior, traditions, and norms? Are Darwin's theories at all relevant to the study of gender—or only its biological counterpart, sex? Do nature and culture operate on two separate planes, or are they intertwined? Late twentieth-century feminist scientists and cultural critics rigorously debated these controversial questions, reassessing the potential applicability of Darwinism for feminism and feminism for Darwinism.

At the heart of these turn-of-the-twenty-first-century scientific and political debates is the controversial argument, put forth by American biologist Edward O. Wilson (1929–) in his book *Sociobiology: The New Synthesis* ([1976] 2000), that all animal behavior, including that of humans, could be explained with reference to evolutionary laws. Wilson's sociobiological thesis—that gender roles are the result of genetically programmed, survival-driven functions—lent credence to the already pervasive assumption that gender is not a cultural construct but a biologically and materially determined phenomenon. Feminist theorists working in fields as various as biology, history, and cultural theory banded together in

order to undercut the biological essentialism of sociobiology and its contemporary heir, evolutionary psychology. Their strategies for doing so were diverse, and their approaches varied greatly. While some dismissed evolutionary theory, and the sciences more broadly, as essentialist and sexist (see, for example, Hubbard 1979), others took to the lab or the field to develop better and more culturally attuned scientific research practices.

FEMINIST EVOLUTIONARY BIOLOGY AND THE CHALLENGE TO GENETIC DETERMINISM

Throughout the 1970s and into the 1990s feminist evolutionary biologists such as Americans Sarah Blaffer Hrdy (1946–), Patricia Adair Gowaty, Linda Fedigan (1949–), and Barbara Smuts set out to address what they felt to be the androcentric bias of the field. Contesting dominant assumptions about the role of women and female organisms in nature, these primatologists, anthropologists, and sociobiologists worked to open up evolutionary biology to less binary and essentialist understandings of sex by showing how interactions between genes and environments affect the expression of an organism's phenotype. The aims of these scientists were diverse and their achievements widespread. In arguing for a more environmentally attuned biology, however, they sought to undermine genetically determinist approaches to sex that fueled assumptions about women's natural inferiority.

In her introduction to *Feminism and Evolutionary Biology: Boundaries, Intersections, and Frontiers* (1997), which grew out of the controversial symposium “Evolutionary Biology and Feminism” at the University of Georgia's Institute of Ecology, Gowaty proposes that, while their approaches may differ, “Darwinian Feminists” are unified in their contestation of the traditional view of natural selection as functioning only through the inheritance of genes. While “most modern readers assume this mechanism [of heredity] is genetic,” Gowaty explains, Darwinian feminists have demonstrated that “phenotypic expression is determined not by genes alone but by the interactions of genes with their environments” (11). In her important study *Mother Nature: Maternal Instincts and How They Shape the Human Species* (1999), for example, Hrdy shows how mothers in the natural world ensure the survival of their offspring not only through behaviors traditionally conceived of as maternal, such as devotion or selflessness, but also through the more seemingly masculine qualities of ambition and entrepreneurialism. Building on the work of American theoretical biologist Mary Jane West-Eberhard (1941–), who showed that phenotypical changes throughout the course of an organism's development play an important role in evolution, Hrdy argues that “gender is merely a potential” that depends on the kind of care an organism receives (1999, 59). In highlighting the difficulty of determining the nature of masculine and feminine behavior beyond environmental influence, Hrdy and others thus undermine what the editors of *Evolution's Empress: Darwinian Perspectives on the Nature of Women* (2013) describe as “Man the Hunter” of traditional evolutionary biology, a theory that considers men active and aggressive and women passive and nurturing (Fisher, Garcia, and Chang 2013b, 4).

Feminist evolutionary biologists at the turn of the century thus aimed to dispel the myth of women's natural inferiority by seeking both to minimize gender biases and to develop research practices more carefully attuned to female behavior—strategies that led American feminist science studies scholar Anne Fausto-Sterling (1944–) to describe this group of Darwinian feminists as “Blackwell's modern heirs” (1997, 50). Not all Darwinian feminists of this generation agreed that the best way to intervene in scientific practice was to stage experiments and conduct empirical studies. While some paved the way for the development of more objective and less androcentric research practices, for others the aim was less to

improve science than to critically examine its practices, aspirations, and assumptions. Working beyond the natural and physical sciences in the realms of philosophy, history, and cultural studies, the feminist scholars examined in the next section sought to develop a more humanistic framework for grasping the insights and limits of scientific knowledge production.

FEMINIST SCIENCE STUDIES AND THE SOCIAL CONSTRUCTION OF KNOWLEDGE

Around the same time that scientists like Hrdy, Gowaty, Fedigan, and Smuts were developing an evolutionary biology more attuned to feminist concerns, philosophers and historians of science such as Americans Evelyn Fox Keller (1936–), Sandra Harding (1935–), Anne Fausto-Sterling, Donna Haraway (1944–), and Austrian-born Ruth Hubbard (1924–2016) were launching a feminist critique of evolutionary biology grounded in linguistic and cultural analysis. In conversation with the work of their more empirically minded contemporaries, the latter group of feminist critics aspired to show how scientific practice, in its aspiration to objectivity, obscured the gendered power relations at work in the very production of knowledge.

One should not overstate the differences between these contemporaneous movements to rethink evolutionary discourse from a feminist perspective; many of these critics were not only in conversation but directly collaborated with one another. However, for the purposes of this chapter, it is useful to highlight their differences in methodology and approach: where the Darwinian feminists discussed in the previous section can be understood broadly to desire the improvement of evolutionary science by identifying and correcting its gendered assumptions, the thinkers highlighted in this section channeled their energy instead into developing more conceptual and theoretical frameworks for understanding how subjectivity, life, and knowledge are produced through entanglements of biology and history.

In response to the claims of sociobiologists that evolutionary theory can explain the distinctions between male and female behavior, Fausto-Sterling, along with other feminist critics of her generation, reasoned that scientific practice is bound up with power relations that render it impossible to reveal any form of objective truth. In one of her most well-known articles, “The Five Sexes: Why Male and Female Are Not Enough” (1993), Fausto-Sterling proposes that, in its usage of the biological designations “male” and “female,” scientific discourse has relied on an outmoded understanding of sex as a nature-given binary. Revealing the long history of intersexuality and showing how cases of nonbinary sex—despite their pervasiveness—are treated as exceptions or oddities, she shows how cultural assumptions about the two sexes have obfuscated the true variety of human sexual expression. “Biologically speaking,” she contends, highlighting the difficulty of knowing the true and untainted nature of sex, “there are many gradations running from female to male; depending on how one calls the shots, one can argue that along that spectrum lie at least five sexes—and perhaps even more” (1993, 21).

Fausto-Sterling’s work responds to that of historians of evolutionary science such as Evelyn Fox Keller, who demonstrated how ideology shapes scientific practice through linguistic and cultural conventions. In her essay “Language and Ideology in Evolutionary Theory” (1991), Keller shows how the ideology of competitive individualism informs the discourse of population genetics and mathematical ecology, two subfields of evolutionary biology. The emphasis on individualism in these fields, Keller maintains, has led evolutionary biologists to overlook the extent to which organisms cooperate. In accounts of

reproduction, to give one example, the importance of sexual difference and collaboration is downplayed as scientists reference reproduction as if it were something that just happened or is undertaken individually. “The linguistic conventions of individual reproduction,” Keller proposes, “—conventions embodying an ideological commitment to the a priori autonomy of the individual—both perpetuate that belief and promote its incorporation into the theory of evolutionary dynamics” (1991, 99).

While the empirical scientists discussed in the previous section remained hopeful that increased attention to female perspectives and behavior could correct biases long central to evolutionary science, the cultural theorists and historians discussed in this section thus held, quite differently, that evolutionary discourse was so imbedded in social and cultural norms about progress, individualism, and masculine forms of knowledge that “objectivity,” as it has previously been conceived, was impossible. In highlighting the epistemological limits of any attempt to know the world, however, critics like Fausto-Sterling and Keller did not mean to suggest that scientific inquiry was futile. Far from it—they hoped their work would inspire a more self-reflexive science, a science aware of its implication in networks of belief, value, and norms.

ELIZABETH GROSZ AND THE ONTOLOGICAL INDETERMINACY OF LIFE

Since the turn of the twenty-first century, philosopher Elizabeth Grosz (1952–) has shifted the conversation in feminist theory from its longtime emphasis on questions of epistemology (the study of how we know reality) toward questions of ontology (the study of the nature of reality). Where many of the Darwinian feminists analyzed so far have focused on the representation or analysis of gender in evolutionary biology, thus concerning themselves with the epistemological, Grosz instead uses Darwin to develop a theory of being—an ontology—compatible with the aims of feminism. One could thus summarize Grosz’s approach with the mantra “ask not what feminism can do for Darwinism but what Darwinism can do for feminism.”

Throughout her work, which spans the fields of philosophy, psychoanalysis, and science studies, Grosz approaches Darwin not only as a scientist whose findings apply to the study of biology but also as a thinker whose work can inform social and cultural phenomena such as gender, art, and politics. In *Becoming Undone: Darwinian Reflections on Life, Politics, and Art* (2011), Grosz proposes that “some of the most serious problems facing feminist thought . . . may be more directly addressed if we take seriously Darwin’s writings, writings that are not adequately understood without philosophical as well as biological concepts” (116). Darwinian feminists up to this point, Grosz claims, have operated on the false assumption that the political and the biological inhabit separate realms. To reduce Darwinism to a description of the world *as it is* and feminism to a theory of what *should be done*, Grosz proposes, is to underestimate the potential of both projects.

In her essay “Darwin and Feminism: Preliminary Investigations for a Possible Alliance” ([1999] 2008), Grosz criticizes Gowaty (discussed in the section “Feminist Evolutionary Biology and the Challenge to Genetic Determinism”) for presenting Darwinism as a biological science concerned merely with describing the causal operations of the natural world and feminism, by contrast, as the political attempt to establish equality between the sexes. “In attributing to [Darwinism] a *neutral*, noninfecting position *vis-à-vis* political, psychological, and cultural theory,” Grosz writes, Gowaty “has effectively secured Darwinism against its own most radical insights (a fundamental *indetermination* seems one of the most exciting elements of Darwin’s contributions to both science and politics), and has insulated feminism against any theoretical impact on, and protects feminism from being transformed by, Darwinism” (2008, 32). The

concept of “indetermination” is central to Grosz’s philosophical project, which extracts from Darwin’s theory of evolution a feminist-materialist theory of life. According to Darwin’s theory of evolution, life is not governed by a fixed or predetermined set of causal laws but is instead shaped by two open-ended materialist principles—those of natural selection and of sexual selection. Through the interaction of these two principles, differences are introduced into species over time, ensuring that life remains in a constant state of transformation.

In her companion books on the philosophy of time, *The Nick of Time: Politics, Evolution, and the Untimely* (2004) and *Time Travels: Feminism, Nature, Power* (2005), Grosz shows how Darwin’s insistence on the temporal quality of nature (that nature never *is* but always *becomes*) forecloses the possibility of an appeal to “nature” as a fixed essence—an appeal that drives many biologically essentialist approaches to identity. For Darwin, Grosz points out, time is relentlessly forward moving and yet nonteleological; species emerge from other species, but the exact form that each new species will take cannot be known in advance. Against progressivist or goal-driven theories of evolution, such as those forwarded by many contemporaries of Darwin (among them, Herbert Spencer), Darwin insists that all life, human and nonhuman, is fundamentally indeterminate; that is, one cannot speak of a creature’s essential being until it comes into being; even then, being is always open to change.

As discussed above, various feminist thinkers have turned to Darwin (and, in particular, to his theory that sexual difference is historically and environmentally contingent) in order to argue that the categories of “male” and “female” are neither natural nor inevitable. Grosz, quite differently, stresses instead the significance of sexual dimorphism to Darwin’s system. The motor of variation and diversity, sexual difference, Grosz points out, is the condition for the possibility of all other differences, as reproduction between sexually differentiated organisms allows for the introduction of new genetic material, while asexual reproduction does not. Scholars working in queer and trans studies, however, have pointed to the limitations of Grosz’s focus on the duality of sex, highlighting the plurality of sexual differences that make up human and nonhuman life. In her article “Spider City Sex” (2010), for example, Hayward critiques Grosz and augments Grosz’s account of the materiality of sex by proposing that the experience of transitioning sex (for example, from male to female) demonstrates that sex is always a temporally and environmentally conditioned process. “Though differently refracted through speciated milieus,” Hayward writes, “sex changing can be accounted for by the organism’s reading of changes in the environment” (2010, 235).

In her recent work, however, Grosz has developed a more nuanced account of sexual difference and differentiation. In *Becoming Undone* (2011), for example, she remarks that, for Darwin, sex consists in far more than the binary distinction between male and female: “Darwin spends literally hundreds of pages addressing the very different forms of sexual difference observable in animal and plant species: they cannot be adequately addressed in terms of only two” (122). In her discussions of Darwin’s theory of sexual selection, moreover, she highlights the important role that excessive and nonreproductive traits play in the evolution of species. Against the dominant trend in evolutionary biology, in which fitness and survival are positioned as the only goal of evolution, Grosz suggests that, for Darwin, sexual selection introduces a component of aesthetic inutility that works to complicate (and sometimes even works against) the force of natural selection by producing variations that do not—at least not always—result in the production of offspring better fit to survive. Think here of the bright blue feathers of the peacock, which do nothing to enable the survival of the species but are repeatedly selected by the female peahen. The principle of sexual selection thus, Grosz reasons, is “the condition for the production of biological and cultural

extravagance, the uncontainable production of intensification, not for the sake of skills of survival but simply because of its force of bodily intensification, its capacity to arouse pleasure or 'desire', in the capacity to generate sensation" (2011, 118). Darwin, Grosz contends, can help feminists understand the central role that emotion, art, and desire play in nature. Her work has been widely influential for materialist feminists seeking to explain the important role that matter and the body play in the production of cultural, social, and sexual difference.

Summary

In approaching human beings as a part of nature, Darwin brought human traditions and norms under the critical gaze of natural science. While in *On the Origin of Species* Darwin merely alluded to the question of human evolution, claiming that "light will be thrown on the origin of man and his history" ([1859] 1999, 477), in *The Descent of Man* he made good on this promise, proposing that human life, too, was subject to evolutionary laws. In demonstrating that the human was a material being like any other, Darwin opened the door to speculation about the biological limits and potential of the human compared with other nonhuman species.

To what extent human social phenomena such as gender or sexuality are determined by natural-scientific principles, however, has long been and continues to be a subject of much debate. While some of Darwin's early readers (e.g., Blackwell, Gardener, and Ellis) invoked the theory of evolution to contest claims about women's proper role in society, gendered biases in scientific research, and the nature of sex itself, various feminist scholars of the late twentieth and early twenty-first centuries (e.g., Hubbard, Fausto-Sterling, and Gowaty) have highlighted the risks and challenges of applying evolutionary theory, and science more broadly, to the study of culture. Still other feminist theorists and scientists (e.g., Grosz, Ah-King, and Hayward), however, have shown how Darwin's understanding of matter as a fundamentally indeterminate phenomenon points to the difficulty of ascribing a fixed essence or meaning to sex, gender, or sexuality.

Darwin has no doubt provided feminists with a dynamic and nonteleological framework for understanding the material world. From Blackwell to Grosz, however, feminists have also significantly contributed to the transformation of Darwin's system, providing new insights, evidence, and interpretative rubrics for understanding the relationship between matter and mind, nature and culture, history and biology.

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