

CHAPTER 3

Cain's Legacy

The Mark of Lamarck in Late-Victorian Fiction

(*Edward Bulwer-Lytton, Samuel Butler,
H. Rider Haggard, Wilkie Collins*)

For twenty years past, my friend, I have been studying the question of hereditary transmission of qualities . . .

Wilkie Collins, *The Legacy of Cain* (1888)

The Victorians knew nothing about genetics, but they had a vigorous discourse about the hereditary transmission of behavior. Scientists and novelists alike wrestled with the problem of whether “character” was heritable. Today, for reasons that at first seem entirely unrelated, we are witnessing a resurgence of interest in the biological foundations of character. After some fifty years of ethical doubts about the wisdom of pursuing such avenues of research, the heritability of behavior is once again a hot topic.

In the biological sciences, this renewed interest comes from three main directions: genetics, which garners the lion’s share of public attention for its success in identifying genes that are associated with increased probability for a given trait (a success that has accelerated dramatically with the advent of genomewide association studies); neuroscience, a diverse field that draws variously on cognitive psychology, linguistics, brain imaging, and evolutionary biology; and epigenetics, which is the concern of this chapter. Because of its focus on nongenetic sources of inherited traits, epigenetics should be of interest to scholars of the nineteenth century, a period that did not yet understand the genetic mechanism of inheritance. Surprisingly, the reverse is true as well – some epigeneticists look back longingly to the moment in the late-nineteenth century when it seemed to many that Lamarck, not Darwin, held the key to evolutionary theory.

“Epigenetics” can be defined as the study of heritable characteristics that have a molecular basis independent of DNA. According to the journal *Nature*, which ran a special section on the field in May 2007, “epigenetics is riding a wave of popularity” (Bird v). Noting that more than 2,500 articles had been published on the subject within the year, the editors of

Nature observed that the media portrayed epigenetics as “a revolutionary new science” (Eccleston et al. 395). Epigenetic changes are crucial for normal cell growth and have long been a topic in developmental biology, but the recent discoveries have to do with how cells can transmit acquired traits to daughter cells through nongenetic modes of inheritance and with evidence that some variations in species may be directed toward a goal rather than being random. Eva Jablonka and Marion J. Lamb summarized the four main contentions of epigenetics on the first page of their book, *Evolution in Four Dimensions*: “there is more to heredity than genes; some hereditary variations are nonrandom in origin; some acquired information is inherited; and evolutionary change can result from instruction as well as selection” (1).

These are disorienting claims, which seem to violate some of the central tenets of genetics and contradict much of what we have learned about Darwinian evolution. They suggest that biological traits can be inherited from sources other than DNA, that natural selection does not arise solely from chance mutations, that Lamarckism may have more validity than most of us dreamed, and that evolution at times may be channeled in a particular direction rather than being random. I will explain more of the fundamentals of this new research as I proceed, but first I want to characterize the related debates that raged around inherited behavior in the late-nineteenth century.

During the last three decades of the century, the question of whether acquired characteristics could be inherited increasingly preoccupied popular novelists from Edward Bulwer-Lytton and Samuel Butler in the 1870s to Grant Allen and Sarah Grand at the end of the century. Many scientists also returned to Lamarck to explain what they saw as the inability of natural selection to explain the dramatic changes required by Darwinian evolution. The evidence appeared to be mounting from all sides that the gradual accumulation of small changes could not account for the diversity of life, especially after Lord Kelvin's (incorrect) calculations of the age of the earth seemed to demonstrate that there had been insufficient time for natural selection alone to have produced such abundant varieties of life.¹ Lamarck's model of inheritance offered an alternative explanation to scientists who were convinced of the truth of evolution but had come to believe that natural selection played only a secondary role in shaping descent. Rival conceptions of biological inheritance were fought out *between* circles of true believers in evolution: neo-Lamarckian novelists, periodical writers, and many scientists on the one hand, and Darwinians, on the other. By 1885, the year the term “neo-Lamarckism” was coined,

the anti-Darwinian party had become so strong that the historian Peter J. Bowler describes this period as “the eclipse of Darwinism.”²

“Neo-Lamarckism” was the name of a loose assortment of evolutionists who argued for the central role of the inheritance of acquired traits in shaping the descent of plants, animals, and humans. Little known today, it constituted a serious challenge to Darwin from within the ranks of naturalists, morphologists, and physiologists, as well as philosophers, novelists, and journalists. One of its guiding principles was the notion that characteristics that one learned during one's lifetime could be passed on to one's descendants. This idea applied equally to physical features and learned behaviors. Discredited during the 1930s, the period of the modern synthesis of genetics with evolution (discussed in Part II), neo-Lamarckism was long viewed with amusement or scorn by geneticists, who took it as a given that no acquired abilities can flow backward into the DNA of an individual. Even with the advent of epigenetics, which suggests nongenetic mechanisms for some acquired adaptations to be conserved for future generations, most geneticists still regard neo-Lamarckian ideas as preposterous. To be clear, so do I. But some epigeneticists, who perhaps do not understand all the implications of neo-Lamarckism, have aligned their research with this earlier movement.

The late-nineteenth-century revival of Lamarck incorporated other aspects of his thinking as well, including the directed nature of evolution, its progressive movement toward perfection of the species, use or disuse of an organ as a cause of species change, the importance of maternal inheritance, and the conscious, willed nature of some evolutionary changes. Darwin's theory of natural selection made room for some Lamarckian ideas (a fact that Samuel Butler never tired of pointing out). In *The Origin of Species* (1859), Darwin acknowledged that use or disuse of an organ could lead to morphological changes in the species, and more grudgingly, that habits could eventually be internalized as instincts. In *The Descent of Man* (1871) and *The Expression of the Emotions in Man and Animals* (1872), Darwin increasingly emphasized the role of both Lamarckian concepts. But Darwin always objected to conceiving of evolution as progressive or directed toward the perfection of the species. Moreover, Lamarck's more valuable ideas were often subsumed by neo-Lamarckians in popular culture under the banner of the heritability of acquired characters (Bowler, *Eclipse* 7n3; Otis 6). Samuel Butler established a powerful analogy for this process by arguing that acquired characteristics constituted an “unconscious memory” of the species, which directed evolution toward a purposeful goal.³ Every individual, Butler asserted in a series of polemical

books published over nearly a decade (1878–87), contained the collected wisdom of the race as its birthright, an inherited record of successful adaptive strategies.

Neo-Lamarckians did not have the field to themselves. Ranged against them were Alfred Russel Wallace, Thomas Huxley, and most important, August Weismann, whose publications of 1883 and 1885 developed the concept of the “continuity of the germ plasm” (104).⁴ Weismann argued persuasively against the “transmission of acquired characters” and disputed that “changes of the organism which result from external stimuli can be transmitted to the germ-cells and will re-develop in the next generation” (104). Instead, he maintained that the germ cell “transfers its hereditary tendencies from generation to generation, at first unchanged, and always uninfluenced in any corresponding manner, by that which happens during the life of the individual” (69), or as we would phrase it today, one’s genotype is inherited from one’s parents and cannot be affected by changes in the parents’ phenotype caused by experience or the environment. Historians of science have identified Weismann’s concept as a precursor to what would later become the “central dogma” of genetics, the principle that information can flow only in one direction, from genes to the proteins that they express.

Some exponents of epigenetics view Weismann’s work as a harbinger of a “wrong turn” that biology took in the twentieth century toward “genetic centrism” and away from inquiries into developmental biology that might have revealed the possibility that acquired characteristics were heritable (Webster and Goodwin 111–17). Richard Lewontin, Evelyn Fox Keller, Susan Oyama, and others maintain that the emphasis on the “causal primacy of the gene” (Keller, *Making Sense of Life* 125) led biologists for much of the twentieth century to underestimate the importance of developmental systems and epigenetic interactions for the resulting organism. It also obscured the possibility of extra-genetic mechanisms of inheritance of the sort that neo-Lamarckism emphasized. Jablonka and Lamb are unabashed neo-Lamarckians. But a too-easy equation of epigenetics with neo-Lamarckism carries the risk of duplicating some of the mistakes of nineteenth-century literature and social theory, including the kind of beliefs that led to racial science or that a supreme being was directing evolution toward perfection of the human race.

This chapter will consider several areas in which an overly hasty assimilation of epigenetics to neo-Lamarckism presents policy risks. The first involves the religious impulse that frequently accompanies talk about “directed evolution.” In the nineteenth century, the idea that evolution

might have a purpose quickly led to arguments for a divine Director as well as calls for eugenic interventions that would steer evolution toward goals that were assumed to be part of God's plan for the species. Today we see similar religious arguments put forward by creationists under the banner of "intelligent design."

A different risk stems from one of Lamarck's more valuable points, the importance of the maternal-fetal environment. Evelyn Fox Keller discusses "the long disregard of 'maternal effects' on development" (*Refiguring* 34n10), which she believes contributed to genetic centrism and impeded developmental biology as a discipline. Lamarck's salutary emphasis on the effects of maternal inheritance, when exaggerated and confused with gendered notions of women's roles (as was the case in much neo-Lamarckian thinking), could lead to unfortunate assumptions about women's proper place in society. A similar concern today is that epigenetics' valuable insights into the importance of the maternal-fetal environment will lead to "blaming the mother" (Smeele; Metzl) for anything that goes wrong. The danger is that well-meaning efforts to increase attention to embryonic development and early maternal care will result in restrictions on rather than empowerment for women, especially among mothers of low socioeconomic status. This is what occurred when neo-Lamarckians highlighted the deleterious effects on children of alcoholism and bad diet among indigent mothers. Instead of striving to improve the conditions of working-class mothers, many reformers advocated eugenic solutions such as sterilization campaigns to reduce the birth rate of the poor.

Finally, the belief in the inheritance of acquired characteristics in the nineteenth century eventuated in widespread assumptions that social behaviors – such as criminality or promiscuity – could be passed down to later generations. This dangerous assumption led to a deterministic conception of inheritance – your destiny lies in your genes, we might say today. The sins of the father, they said then, would be visited on the children unto the fourth generation. It was the curse of Cain.

Neo-Lamarckism in Late-Nineteenth-Century Popular Culture

Much popular fiction, especially in subgenres such as the imperial romance, detective novel, sensation fiction, utopian fiction, and the New Woman novel, drew on neo-Lamarckian themes. Why, then, were the major Victorian realists more attracted to Darwin? It would be easy to assume that canonical authors like George Eliot, Trollope, Gaskell, Meredith, and Hardy were simply more thoughtful than authors of

Victorian genre fiction, but in many cases, formal aspects of the kind of fiction they wrote played a role too. Realist conventions accorded well with Darwin's emphasis on the gradual accumulation of small changes; his insistence that species development was not unidirectional or predetermined; and his reluctance to think that a legacy from the past determined behavior in the present.⁵ All the same, I do not mean to suggest a causal relation between genre and evolutionary theories or vice versa. It is a mistake to think that formal structures entail a particular set of beliefs. What we find instead is a distinctive historical moment when a group of formal conventions interacted synergistically with a cluster of linked but not always consistent ideas about the nature and consequences of evolution. Not all popular texts took an interest in debates about evolution, and not all that did were neo-Lamarckian, but a significant number of the most popular and representative examples of Victorian genre fiction did.

I take my title for this chapter from a striking anomaly. Neo-Lamarckism was interpreted in popular culture through the notion that human evolution was guided by a collective destiny that was driving our species toward perfection. Each of our inherited talents is supposedly leading us inevitably toward a more perfect human race. Yet in the works I examine, the mark of Lamarckism is almost always Cain's. Why should this Biblical tale of jealousy, murder, and a curse that descends through the ages be a prominent metaphor in novels that embrace neo-Lamarckian theories that maintain evolution will lead our species to perfection? The reason tells us much about why some genres tended to treat evolution differently from the canonical novels of realism. The answer lies in the demands of a thrilling plot.⁶ The mark of a criminal inheritance in *Dr. Jekyll and Mr. Hyde* (1886), *She* (1887), *The Legacy of Cain* (1888), *The Fourth Generation* (1899), and many other genre stories responds to the needs of what H. Rider Haggard promises in the very first sentence of *She*: "one of the most wonderful and mysterious experiences ever undergone by mortal men" (11). Inconsistency means nothing. Coherence of idea or theme falls by the way in the face of what a good story requires. In his autobiography, Haggard spells the requirement out: "action, action, action from the first page to the last. For the rest, little matters" (*Days of My Life*, vol. II 94–95).

There is one exception. The genre of utopian fiction in the period puts little emphasis on thrilling action. In Bulwer-Lytton's utopia, *The Coming Race*, where perfectibility of the species governs the slow-moving plot as well as the neo-Lamarckian theme, Cain's legacy nowhere appears. This absence is hardly surprising, however, for the mark of Cain highlights an originary violence and its descent in man, which is clearly at odds with a utopian outlook.

Bulwer-Lytton's *The Coming Race*

The cultural influence of neo-Lamarckism predated the coining of the term in 1885. More than a decade before, three British publications gave a powerful boost to the ideas that would become pervasive in the mid-eighties: St. George Jackson Mivart's theistic account of evolution, *On the Genesis of Species* (1871), Edward Bulwer-Lytton's utopian novel *The Coming Race* (1871), and Samuel Butler's better-known utopia *Erewhon* (1872). Mivart's work was one of the leading sources for arguments against natural selection (Bowler, *Eclipse* 49); his vivid depiction of evolution as taking place by large, discontinuous leaps helped associate skepticism about Darwin's gradualism with the theistic argument by design. Bulwer-Lytton's and Butler's novels, though, set the mold for later neo-Lamarckian utopias, from W. H. Hudson's *A Crystal Age* (1887), with its "later race," which had developed the "passionless, everlasting calm of beings who had for ever outlived, and left [emotion] as immeasurably far behind as the instincts of the wolf and ape" (174–75) to William Morris's *News from Nowhere* (1891), with its socialist population that had evolved beyond the "hereditarily" weak, ugly, and idle people descended from slaveholders and capitalist employers (34) and to Grant Allen's *The British Barbarians* (1895) with its traveler from the future who tells of a human race that has evolved beyond "war, bloodshed, superstition, fetich-worship, religious rites, castes, class distinctions, sex taboos, [and] restrictions on freedom" (58).⁷

Neither Bulwer-Lytton nor Butler was an opponent of Darwin when they published their utopias. Bulwer-Lytton saw his fable as a strong plea for evolution by natural selection, just as Butler did the following year, when *Erewhon* came out. Both novelists believed that the struggle for existence was a motive force for evolutionary change. Here is how Bulwer-Lytton puts it: "since in the competition a vast number must perish, nature selects for preservation only the strongest specimens" (52). But they believed that the progressive direction of natural selection would be shaped by the inheritance of acquired characteristics: "We are all formed by custom – even the difference of our race from the savage is but the transmitted continuance of custom, which becomes, through hereditary descent, part and parcel of our nature" (Bulwer-Lytton 94).

The Coming Race was enormously popular in its day, which is hard to comprehend. Many readers today find it dull, although the satire on war, religion, capitalism, and democracy amuses some and the vision of a future in which women are more powerful than men contradicts stereotypes of

the Victorian age.⁸ Still, like many utopias, its static discursive chapters on linguistics and social customs can be heavy going. Whether one finds the work entertaining or not, this bizarre Darwin-haunted fable illuminates much about how evolution was assimilated by late-nineteenth-century popular culture.

Bulwer-Lytton's novel tells the story of a mining engineer who stumbles across an underground civilization vastly more advanced than his own nineteenth-century world. The subterranean people have abandoned industrial and technological progress and rely entirely upon an all-pervasive energy in the universe that they call "Vril" – something like the Force that Jedi knights channel in the *Star Wars* movies. The people have developed the ability to harness this power over thousands of years of directed evolution. Their greatly elongated thumbs, the outward sign of this adaptation, have been cultivated by "continuous exercise, of the Vril power" by people who "devote[d] themselves to that paramount science," and it could be "slowly developed in the course of generations" by the "higher beings of the [human] race" (58). The notion that the willed use of a trait could strengthen its powers and result in heritable characteristics became a pillar of neo-Lamarckism in the next decade. Vril is the source of the strange race's many abilities: telepathy, winged flight, control over matter, and the power to blast entire cities into atoms with a single ray. The evolution of such powers has led them to abandon war and all forms of aggression as useless since any individual could destroy all others with a wave of her Vril-stick – a Victorian version of the doctrine of mutual assured destruction.

The relation of these themes to utopia lies in the apparent rationality of making hard choices to guide the species. In the wake of Darwin, selective breeding and willed species change fit easily into the utopian genre's commitment to rational social planning. In Butler's *Erewhon*, citizens who fall ill are imprisoned, and the ugly or weak forbidden to reproduce. Bulwer-Lytton's Vril are eugenicists *avant lettre*,⁹ who strengthen their stock by exogamous marriages with distant communities and exterminate all weaker races. As a result of this rigorous program of social hygiene, an entirely new species of posthumans has evolved, the "coming race" of the title. Here is how the narrator describes them:

I arrived at the conviction that this people – though originally not only of our human race, but, as seems to me clear by the roots of their language, descended from the same ancestors as the great Aryan family, from which in varied streams has flowed the dominant civilization of the world . . . had yet now developed into a distinct species with which it was impossible that any community in the upper world could amalgamate. (119)

The Aryan reference is telling. As with later invocations of an Aryan destiny, the Vril are persuaded of “their ultimate destiny to destroy and replace our existent varieties of man” (119). Humanity’s only hope of survival would be miscegenation: “we might be saved from extermination by intermixture of race,” but the narrator is not optimistic: “instances of such *mésalliance* would be as rare as those of intermarriage between the Anglo-Saxon emigrants and the Red Indians” (119).

This ugly example of racial science looks forward to its pervasive role in the “imperial gothic” of Stevenson, Haggard, Conan Doyle, Kipling, and others (Brantlinger 227–53). The utopias that looked forward in time had a counterpart among adventure stories that portrayed lost civilizations from the distant past: H. Rider Haggard’s *She* (1887), to which I turn in the next section, or Rudyard Kipling’s *The Man Who Would Be King* (1888) and Arthur Conan Doyle’s *The Lost World* (1912). But there is a profound difference between the two forms, one that is simultaneously structural and ideological. Fredric Jameson has proposed that utopia incorporates a critical impulse by imagining an alternative to the existing social order (*Archaeologies* 12) – the feminism of *The Coming Race* is a clear example of this phenomenon. Lost world fiction, by contrast, tended to reinforce dominant ideology by flattering the existing social order’s vision of itself. In *The Coming Race*, the critique of society lies in the tension between an evolutionary destiny and present-day England, for the Aryan destiny belongs not to humanity but to another, posthuman species. The novel thus has it both ways. The white, Anglo-Saxon race may be the highest our planet has produced, according to the narrator, but England is not destined to be the home of the surviving Aryan line. A biological destiny that ends in the destruction of humanity manages to indict the existing social order and preserve the end-directed plot structure of utopia too.

Jablonka and Lamb are wary of any hint of goal-oriented evolution being read into epigenetics. Consequently, they are careful to assert that nothing in the evidence for directed variation entails believing in a purpose or destiny to evolution, and they explicitly reject an intelligent-design interpretation of their results. Scientists, however, rarely have control over how their findings are interpreted. Having a special destiny is a seductive concept – not only in religious belief systems but in popular literature as well, where formal closure is highly valued. The fact that nineteenth-century popular culture almost always invested directed evolution with spiritual meanings augers poorly for Jablonka and Lamb’s hopes.

H. Rider Haggard's *She*

Like Cain, I was branded – branded by Nature with the stamp of abnormal ugliness . . .

H. Rider Haggard, *She* (1887)

Holly, the principal narrator of Haggard's monumentally popular adventure, *She*, is introduced in the novel's first chapter as an abnormal specimen of humanity with "long sinewy arms," a "low brow," and "thick black hair," a throwback that makes one woman whisper that his appearance had "converted her to the monkey theory" (18). With this shuddering reference to evolution, Haggard announces the post-Darwinian provenance of his romance. Elsewhere compared to a "gorilla" and "baboon" (12, 112), Holly stands in sharp contrast to his ward, Leo, whose golden curls, tall stature, and broad shoulders make him an idealized representative of English masculinity. The dichotomy aligns neo-Lamarckian fears of degeneration and fantasies of racial superiority with basic romance conventions that tend to assign characters to positions in a symbolic system – light vs. dark, good vs. evil, etc.

The literary critic Richard Chase's influential account of romance fiction describes romance characters as "two-dimensional types," "abstract and ideal" figures (13), which lend themselves easily to allegorization – exemplified in *She* by Leo and Holly's nicknames, "Beauty and the Beast" (30). In contrast to the novel, "romance will more freely veer toward mythic, allegorical, and symbolistic forms," which often results in plots that have a "symbolic or ideological, rather than a realistic plausibility" (Chase 13). This symbolic or ideological dimension is what makes romance such an effective vehicle for articulating neo-Lamarckian social theories. Wendy Katz, in her book on Haggard and empire, extends Chase's point, arguing that romance's "ideological plasticity" gives the genre "an infinite capacity for political propagandizing." Romance's allegorical characters and symbolic landscapes can be "controlled and manipulated so easily that [they] can be made to do the romancer's ideological bidding" (Katz 44–45).

Haggard's novel is a veritable treasure trove of romance motifs. An orphan, a casket, occult wisdom, a shipwreck, prophetic dreams, a magical basin of water, a quest through symbolic landscapes to find eternal life, labyrinthine underground passages, trials that have doomed countless forbearers, a sorceress of mesmerizing beauty living in a city of the dead, a loyal servant named Job and a wise mentor, Holly – these are only some of the details that shape the story of Leo Vincey's legacy into a symbolic

rather than realistic form. Leo's legacy is the Sherd of Amenartas, a broken piece of pottery that has descended through sixty-six generations of Vincey ancestors. Inscribed on this Sherd is the story of an ancient quarrel between two women, one fair and the other dark, over Kallikrates, a man of uncommon beauty and the founder of the Vincey line. Ayesha, the imperious white Queen of an African tribe, kills her beloved Kallikrates in a fit of jealousy when she realizes that she cannot possess him and swears an awful oath to await his coming again, an oath whose fulfillment is made possible by her discovery of the Fountain of Life. Leo, we guess from the very beginning, is the destined heir, returned at last to the two rival women, but the consummation of this destiny destroys Ayesha and brands Leo, turning his beautiful head of hair completely white, a mark of Cain as visible as Holly's simian features.

She is equally a treasure trove of social Darwinian and neo-Lamarckian themes, which can be demonstrated by a comparison of Haggard's romance with the ideas of Samuel Butler, perhaps the most prominent voice in this period advocating Lamarckism. When Butler published *Life and Habit* in 1878, he saw himself as providing an interpretation for facts that Darwin himself could not explain, and Butler fully expected that Darwin would receive the work with respect. Instead, Darwin ignored *Life and Habit*, regarding it as mere speculation with little basis in anything but analogy and introspection. Darwin's neglect infuriated Butler, and in three subsequent monographs, he attacked Darwin for not acknowledging his numerous predecessors, particularly Lamarck and Darwin's own grandfather, Erasmus Darwin. The vitriol had some impact on Darwin's reputation, but Butler's arguments for the power of will to shape evolution toward an ideal destiny had an ideological influence of far more consequence.

Butler's books on evolution are obsessively repetitive, but even a small sampling of his arguments will show how they promote a reassuring destiny for the human species. Here is Butler arguing that something more than chance must be guiding species change: "I cannot think that 'natural selection,' working upon small, fortuitous, indefinite, unintelligent variations, would produce the results we see around us. One wants something that will give a more definite aim to variations, and hence, at times, cause bolder leaps in advance" (*Life and Habit* 261). And again: "Will the reader bid me wake with him to a world of chance and blindness? Or can I persuade him to dream with me of a more living faith than either he or I had as yet conceived as possible?" (307). Butler openly affirms "the whole theory of Lamarck, that the development of organs has been due to

the wants or desires of the animal in which the organ appears" (244–45). Hence, Butler often asserts that willed behavior is the source of evolutionary change: "a pigeon might in the course of ages grow to be a peacock if there was a persistent desire on the part of the pigeon through all these ages to do so" (202).

Butler's boldest idea was his explanation of heredity as unconscious memory. Since Darwin admitted that he did not know the mechanism by which hereditary information was transmitted from parents to children, Butler felt empowered to argue that something in the child must *remember* features of its parents' lives – remember both morphological processes and acquired habits of behavior. Memory, Butler asserted with increasing certainty, must be the hidden principle of hereditary descent, an idea encapsulated in one of the chapter titles from *Life and Habit*, "Instinct as Inherited Memory" (161). If an embryo can remember how to grow two arms and two legs, he reasoned, it must be capable of remembering other aspects of its ancestors' lives, even if not consciously: "each of the germs to which the memory of the new germ reverts, is itself imbued with the memories of its own parent germs, and these again with the memories of preceding generations, and so on *ad infinitum*" (122). For an author whose first book was a memoir and last an autobiographical novel, *The Way of All Flesh*, the recourse to memory as the principle of continuity should not be surprising. In the next chapter, I shall return to the link between memory and literature as a way of identifying part of literature's contribution to public discourse. For now, let me simply say that Butler's substitution of "unconscious memory" for a biological link between the generations is a literary or aesthetic act, dependent on analogy and metaphor rather than scientific evidence.

Unlike Stevenson, Haggard does not seem to have had a detailed knowledge of the science behind evolution, but he had clearly absorbed much of the popular debate about the subject.¹⁰ Throughout *She*, references to the more sensational aspects of evolutionary theory abound. We hear Herbert Spencer's notion of the "survival of the fittest" in lines like "Those who are weak must perish; the earth is to the strong" (*She* 204). Ayesha openly boasts of her eugenic breeding program, which she used to produce deaf and dumb servants: "it hath taken many centuries and much trouble; but at last I have triumphed" (157). Later, Ayesha invokes the idea of racial degeneration when she blames miscegenation for creating "a bastard brood" among the nearby tribes (184). She draws on ideological notions of progress when she describes the evolution of civilization from its primitive origins in Africa through Greece and Rome to its apex in present-day England (151).¹¹

Ayesha's death scene, in which she shrivels back through evolutionary stages until she resembles a "baboon" or "monkey" (292), invokes while reversing Haeckel's idea that ontogeny recapitulates phylogeny. Finally, Haggard anticipates Wells's vision of the extinction not only of humanity but also of the planet itself: "on and on, through periods, spaces, and times, from æon unto æon, till the world is dead, and the worlds beyond the world are dead" (189).

The most distinctive trace of neo-Lamarckism is the novel's view of reincarnation. Butler's notion that each embryo contains the memories of all its ancestors seemed to give a scientific foundation to the beliefs of many spiritualists in the late-nineteenth century. It was only a small leap from Butler's assertion that a person's "past selves are living in him at this moment with the accumulated life of centuries" (52) to the idea of reincarnation. Late-nineteenth century spiritualists from Madame Blavatsky to Annie Besant, although they do not mention Butler by name, were quick to make the connection between neo-Lamarckian conceptions of evolution and reincarnation.¹² Carolyn Burdett, who has written well on Haggard's interest in reincarnation, connects him with Annie Besant, noting wryly that the lifelong Tory imperialist and the radical socialist made "unlikely bedfellows" (Burdett 218). Jeffrey Franklin attributes the spread of the idea of reincarnation in the popular consciousness to the novels of Haggard and Marie Corelli (89) and suggests that Haggard's knowledge of Tibetan Buddhism came from Madame Blavatsky and several widely read Western scholars of the subject (94–96).

Reincarnation plays a crucial role in both *She* and its sequel *Ayesha*. In the earlier novel, Ayesha tells Holly that she has been waiting for more than 2,000 years "for one I loved to be born again" (153). She refuses to leave her hidden underground kingdom because "when he, my love, shall be born again . . . he shall find me *here* where once he knew me" (154). Her faith in this destiny is founded on a doctrine of descent through change. "There is no such thing as Death, though there be a thing called Change" (153), she declares, and Leo's father says much the same thing the night before he dies (23). Each of us may die to the world, but something is passed down, to be "born again and again" in different forms (153). The whole course of the plot seems to validate Ayesha's beliefs. Not only does Leo bear an uncanny resemblance to the mummified corpse of Kallikrates, but Ayesha's rival for Leo's love in the present age looks exactly like Kallikrates's first wife. Despite her belief in descent through change, Ayesha overlooks the consequences of her own failure to change. She

remains static, failing to develop or evolve over the course of sixty-six generations, and her timelessness proves to be her undoing.¹³

Ayesha's prolonged life comes to a horrific end when she steps back into the path of the burning pillar of Life. She is hoping to demonstrate to Leo and Holly that the fire that brought her supernatural longevity was harmless, but instead it wrought another transformation, causing her to age catastrophically before their eyes. This scene has had an indelible impact, visible from *The Picture of Dorian Gray* (1890) to *The Raiders of the Lost Ark* (1981):

she *was* shriveling up; . . . smaller and smaller she grew; her skin changed colour, and in place of the perfect whiteness of its lustre it turned dirty brown and yellow, like an old piece of withered parchment. She felt at her head: the delicate hand was nothing but a claw now, a human talon like that of a badly-preserved Egyptian mummy . . . Smaller she grew, and smaller yet, till she was no larger than a baboon. Now the skin was puckered into a million wrinkles, and on the shapeless face was the stamp of unutterable age. I never saw anything like it; nobody ever saw anything like the frightful age that was graven on that fearful countenance, no bigger now than that of a two-months' child, though the skull remained the same size, or nearly so. (292)

The moment has impressed critics too, provoking readings that link the episode to evolution, degeneration, gender (a beautiful woman is punished for her presumption), and imperialism (Western materialism triumphs over primitive magic) (Etherington xviii; Arata 101–3; Gilbert and Gubar 18–21; P. Murphy, 764–65; Stott 121–25). But I want to emphasize two additional points. First, in Ayesha's death agony, descent through modification triumphs over an unnatural existence that has endured through the ages without change. Of the two options for continuity over time – hereditary transmission of traits or near-eternal youth – the former prevails. Second, historical memory proves more powerful than timelessness. The memory preserved in the writing on the Sherd – a memory reinscribed by dozens of Leo's ancestors on its reverse side – sets Leo's quest in motion and leads to Ayesha's end.

Memory is intimately entwined with our sense of a human timescale rather than the incomprehensible *durée* of deep time. The poignancy of our memories of youth, of distant friends and lost loved ones, underlines the finitude of human existence as do few other emotions. A potent source of affect, memory has a privileged place in literary discourse, aligned with autobiography, lyricism, elegiac poetry, and closure in narrative. It is internal, subjective, personal. Its all-too-human qualities make it the very opposite of deep time.

Ayesha is immured from historical memory. In fact, she suffers from a memory disorder, traumatic fixation. She is "tormented by the memory of a crime . . . without companionship, without comfort, without death" (201). She is rooted to the scene of her crime, unable to forget her transgression or to move on to a new life. Nicholas Dames calls trauma the "conceptual opposite" of memory in the nineteenth century and quotes Cathy Caruth who argues that trauma is "a break in the mind's experience of time" (165). In this context, we might think of trauma, with its failure to heal over time, as the psychological equivalent of Ayesha's physical timelessness. Her identity is as static as her body is ageless.

The novel leaves it uncertain whether Leo is the literal reincarnation of Kallikrates or merely a descendant with an uncanny resemblance to his ancestor. But Butler's conflation of memory with both reincarnation and the mechanism of heredity makes this a moot point. Either way, two mortal men survive at the end of this romance, giving one the ability to continue his biological line if he chooses, the other to preserve his legacy through writing, which he does by composing the manuscript we have just finished reading.

By linking reincarnation to spiritualism, on the one hand, and neo-Lamarckian ideas, on the other, Haggard gave late-Victorian readers an attractive new way to assimilate evolution. Readers who were troubled by materialism but understood the power of science to transform the world could toy with the notion that something persisted after death, whether as spirit or as heritable personality traits, or both. Survival of the fittest, inheritance of acquired traits, willed species change, and directed evolution pass as background knowledge, the common sense shared by narrator and reader alike, in contrast to the outlandish events of the romance. In the process, this common sense served as an alibi for other ideological goals, such as justifying imperial expansion and eugenic measures to strengthen the position of white, middle-class Englishmen. This is one of the major ways in which repellent ideas become normalized by popular culture. And it is another reason why we should be cautious about linking the science of epigenetics with neo-Lamarckism.

Nineteenth-Century Literature and Science Policy Today

At this point, it is worth pausing to ask how one would go about making research on nineteenth-century novels useful for a policy discussion. Noting that fiction dramatizes the issues at stake and enables the public to identify with the consequences of ethical choices is an important first

step. A more problematic approach is that advocated by Leon Kass, chair of the President's Council on Bioethics: to insist that literature reveals enduring truths about the human condition. Literature presents a multitude of perspectives on human nature, even questioning whether there is such a thing. But even were one to embrace Kass's viewpoint, one would not want it to apply to all aspects of fiction, particularly not to the racist and eugenicist themes in works like *The Coming Race* and *She*. Yet these popular works had enormous impact on the reception of evolution in their time and for years to come.

In opposition to Kass's approach, many humanists would argue that readers learn to think critically about the human condition by situating a work of fiction in its own historical moment and by attending to the differences as well as the continuities between that time and one's own. Others might suggest that examining the formal complexities of a work of art could potentially undercut the very lessons Kass seeks to derive from it. In short, most humanists would advocate an approach that was more critical because it was more alert to historical or formal complications.

My approach is to treat these late-nineteenth-century popular novels as part of a case study of how scientific developments are mediated by the larger culture. They demonstrate the power of popular culture to assimilate science to its own preoccupations. This assimilation occurs not only on the thematic level – through explicit passages and polemical messages – but on the formal level too, as in Haggard's deployment of romance conventions for ideological ends. An adequate understanding of the impact of culture on the reception of science requires insight into the complex interactions of form and content, a perspective that can be aided by comparative literary-historical study.

A case in point: some epigeneticists have argued that knowing that the genome is not the only source of developmental traits might undermine genetic essentialism, the widespread belief that one's character is written in one's genes. As the editors of the special supplement of *Nature* put it: the field may be “an antidote to the idea that we are hard-wired by our genes” (Eccleston et al. 396). Jablonka and Lamb hold out a similar hope. They argue that molecular studies will help discredit the idea that “there is a gene *for* adventurousness, heart disease, obesity, religiosity, homosexuality, shyness, stupidity, or any other aspect of mind or body” (6, italics in original). They may be right: widespread awareness of the science of epigenetics might reduce the temptation to think there is a *gene* for adventurousness, intelligence, and so on, but it does not follow that belief in biological determinism will be undermined. Neo-Lamarckian common sense led to a

very different result. Faith in the inheritance of acquired characteristics spawned a whole host of deterministic theories about human behavior. Take, for example, the belief in a hereditary propensity toward crime, the subject of my next discussion.

Wilkie Collins's *The Legacy of Cain*

Children may inherit the disease of crime just as they may inherit the disease of consumption or gout.

Walter Besant, *The Fourth Generation* (1899)

The Legacy of Cain (1888), a sensation novel by Wilkie Collins and the final novel he published before his death, is structured as a case study of the respective influences of nature and nurture. The novel tells the story of two sisters raised in the same household, one the adopted daughter of a woman who was executed for murder, the other the biological child of the Reverend Abel Gracedieu and his cold, overly intellectual wife. The central question of the book is whether the daughter of the murderess will reveal a "hereditary taint" from her mother (237) or whether an orderly, religious environment will prove the stronger influence on the child's character. To complicate the mystery, the Minister, after his wife's early death, conceals that one of the two children was adopted. For much of the novel, the reader is kept guessing about which young lady is the daughter of a murderer. We find ourselves weighing each mental and physical characteristic of the sisters against our memory of the two mothers, the murderess, who dearly loved her daughter, and the Minister's cold, clever, and deceitful wife.

Let me relieve your suspense. If I don't reveal the sisters' names, I can safely disclose the outcome of this convoluted plot without ruining the novel for anyone who has not read it. The daughter of the murderess does indeed inherit the propensity for murder from her mother, but the biological daughter of the Minister and his intellectual wife is the one who ends up trying to commit murder. The unexpected twist of having the murderess's daughter resist the temptation to kill and the Minister's daughter give in to the same temptation stems from another neo-Lamarckian tenet: that maternal inheritance outweighs paternal influences. In the contest of nature vs. nurture, maternal inheritance beats out paternal environment. The outcome still seems paradoxical, though, until one realizes that the murderess's daughter inherits both her mother's propensity for violence and her great capacity for Love, and it is the latter that wins out in the end.

Collins reveals that the murderess's daughter is struggling against an inherited tendency toward murder by a simple novelistic expedient, ready at hand from gothic conventions. When betrayed in love, she finds herself literally possessed by her mother's murderous spirit. The ghost of her mother, in a perverse echo of Dickens's *A Christmas Carol*, comes to the daughter in her sleep and shows her three different ways to dispatch her rival. To make the overpowering force of heredity a bit more plausible, Collins borrows a device from his earlier novel *The Moonstone* by having her drink a dose of laudanum before she falls into her somnambulant trance. Nonetheless, when under the influence of what the narrator calls "the lurking hereditary taint" (237), the daughter feels overcome by a "new evil self" (153), a "hateful second self" (223). To dramatize behavioral impulses inherited from another rather than a product of one's own will, Collins lets the daughter be possessed by a spiritual revenant of her mother.

The eventual criminal, the Minister's biological daughter, ends up trying to poison her fiancé, for reasons I need not go into other than to say that they stem from her maternal inheritance. When crossed in love, the Minister's daughter does not resist the temptation to kill because she has inherited her mother's cold, rational disposition. Just as the impulse to Love in the adopted child is a finer quality that she has inherited from her mother, so an unfeeling nature is a legacy from the Minister's intellectual wife. In both cases, the mother is to blame. The criminal sister is last heard of in America, where she leads a utopian community dedicated to the "Worship of Pure Reason" and to the "superiority of woman over man" (346), a last authorial sneer at intellectual women.

The problem of inherited traits is not allowed to rest there, however. Collins confuses matters by postulating that there exists an inherent quality in womanhood that is independent of both nature and nurture. Although "inherent," it is somehow not derived from the nature side of the nature vs. nurture debate. Critics have attributed the novel's incoherence to Collins's supposed misunderstanding of Darwin (Ashley 120–21; Marshall 106, 114). This view is wrong on two counts. First, it is not Darwin whose ideas are being explored here but the neo-Lamarckian views circulating in the 1880s. Second, the confusion in the book does not stem from a faulty grasp of current thinking about heredity but from conventional assumptions about women's roles, assumptions that contradict what the novelist appears to have learned about the inheritance of acquired characteristics.

In several places, the narrator affirms his faith that "[t]here are inherent emotional forces in humanity to which the inherited influences must

submit" (217). These emotional forces do not come from the environment – the Minister's careful nurture of his two daughters was of inestimable value to their development, but the narrator insists that these emotional forces are "inherent" rather than acquired. In particular, they seem to be intrinsic to womanhood. The narrator explains why he believes in this inherent force in a long passage dedicated to assessing the possible influences on the good sister's character. While admitting the dominant power of heredity and marking a lesser role for environment, the narrator postulates a third, independent "power for Good," whose origin remains unexplained by either nature or nurture. The narrator proposes (comically enough) that the advent of this power comes with the onset of puberty. When a girl becomes a woman, her feminine capacity for Love protects her. In hindsight, we can identify this mysterious "power for Good" as a pure emanation of Collins's own ideological presuppositions about gender:

While, therefore, I resigned myself to recognize the existence of the hereditary maternal taint, I firmly believed in the counterbalancing influences for good which had been part of the girl's birthright. They had been derived, perhaps, from the better qualities in her father's nature; they had been certainly developed by the tender care, the religious vigilance, which had guarded the adopted child so lovingly in the Minister's household; and they had served their purpose until time brought with it the change, for which the tranquil domestic influences were not prepared. With the great, the vital transformation, which marks the ripening of the girl into the woman's maturity of thought and passion, a new power for Good, strong enough to resist the latent power for Evil, sprang into being, and sheltered [her] under the supremacy of Love. (216–17)

Woman's inherent power to Love exists independently of nature or nurture. Postulating this intrinsic quality in womanhood renders all the foregoing analysis of heredity incoherent. Gender assumptions trump everything Collins knows about nineteenth-century scientific theories of inheritance. If the change brought by time, the great and vital transformation that marks the ripening of the girl into womanhood, is nothing other than puberty, then why did the other sister not find strength in a similar transformation? The answer is simple but ludicrous: the other sister is just too bright. Collins emphasizes again and again how much smarter the evil sister is than the good one, and her cleverness, inherited from the Minister's intellectual wife, seems to prevent the ripening of a feminine power for Good.

In this context, we might recall Leon Kass's celebration of literature's ability to reveal enduring truths about humanity. Collins presents woman's

capacity for Love as one of the “inherent emotional forces in humanity” (217) that can counterbalance the effects of heredity. But who among us would be tempted to accept as enduring truths the gender assumptions that structure Collins’s belief? Who among us would endorse the principle that the possession of a strong intellect in a woman is liable to render her vulnerable to murderous impulses and that a woman’s inherent affinity for Love may be the only thing preventing her from giving into a biologically hardwired propensity for homicide?

In its very incoherence, Collins’s novel has something to teach us about the popular understanding of heredity in late-nineteenth-century England. It used to be commonplace to assert that Collins made “very little reference to the intellectual currents of his own time” (Marshall 114), but this view has been countered in recent years by the research of Jenny Bourne Taylor, Lyn Pykett, Christopher Kent, and others, who have demonstrated the ways in which Collins’s novels respond to the social and scientific debates of his day. Taylor stresses the novelist’s engagement with discourses of degeneration and points to an echo in *The Legacy of Cain* of Henry Maudsley’s work of the 1870s on “inherited taints” (J. Taylor 237–38). She also notes Collins’s familiarity with “Lamarck’s model of willed transformation” (138). Christopher Kent connects a minor character in the novel, Miss Chance, with Collins’s interest in the role of chance in evolutionary theory, and links the narrator, who begins the novel as the governor of a prison with notions of hereditary criminality prominent in late-nineteenth-century social science (61, 64). Given what we now know about the extensive preparation Collins made for writing his antivivisection novel, *Heart and Science* (1883), it is abundantly clear that the older view of the novelist as out of touch with intellectual debates is wrong.

In fact, Collins’s confused account of nature, nurture, and the inherent capacity of women for Love is typical of the unsettled state of evolutionary theory not only in the popular consciousness but among scientists themselves. As Morton puts it, “during the few decades which elapsed between the publication of the *Origin* and the foundation of Mendelian genetics around the turn of the century evolutionary biology was in a state of extraordinary confusion and ambiguity, and a wide range of writers were able to exploit the science for their own aesthetic or polemic ends” (6).

Epigenetics and Neo-Lamarckism

Let me end this chapter by turning again to the question of my argument’s bearing on science policy. Advocates of epigenetics think that attending to

the nongenetic sources of human inheritance might have desirable social consequences. For example, more than one have argued that this new science will challenge the reductive conclusions of evolutionary psychology in which human behavior is referred back to adaptive evolution in the prehistoric past, what John Dupré amusingly calls “the appeal to the stoneage” (80–98). Since “epigenetic variations are generated at a higher rate than genetic ones, especially in changed environmental conditions,” Jablonka and Lamb believe that people can adapt to altered life circumstances on a far more rapid scale than traditional, gene-centered evolutionary psychology would allow (114). They think that this insight might dampen appeals to the “Paleolithic brain” by enthusiasts of evolutionary psychology, such as members of the school of literary Darwinists.¹⁴ I agree – it might, and it should. But this insight also undercuts one of the most powerful scientific arguments used against eugenics in the early decades of the twentieth century, which is that genetic change moves too slowly to be directed toward the kinds of racial, social, and behavioral results dreamed of by neo-Lamarckians. Which social consequence of epigenetics will prove to be the most powerful remains to be seen. The example of the nineteenth century suggests that eugenicist conclusions might prove to have more popular appeal. Hence, policy advocates might want to resist the association of epigenetics with neo-Lamarckism.

Other commentators on epigenetics have suggested that a continuation of the neo-Lamarckian emphasis on maternal influences would have had a salutary effect on twentieth-century biology and helped curb some of the social ills arising from genetic centrism. Epigeneticists emphasize that the mother's cytoplasm makes an important contribution to the developing faculties of the embryo (Non et al.). They point to research on DNA methylation and RNA interference that suggests mechanisms by which heritable information other than DNA can be transmitted not only from cell to cell but from mother to child. These mechanisms can be activated by environmental stress, and if the stressful conditions continue for long enough, these cellular states can become subject to natural selection. This is, in effect, an explanation of how environmental conditions affecting the parent, especially the mother, can be passed on to the child (Barnes and Dupré 90–92).

Acknowledging the importance of maternal transmission of qualities, Jablonka and Lamb argue, would have encouraged research in developmental biology and have positive effects on maternal care. The example of Collins, among others, suggests something different. Although the popular understanding of heredity in the late-nineteenth century made ample

allowance for the kind of maternal influences on biological development that epigenetics stresses, in the hands of Collins and other commentators on the dangers of educating women, this point led to unfortunate polemics about the threat of intellectual women. Collins's assumptions about gender overruled his take on the science of the day, wreaking havoc with his novel's theme. In 2014, Sarah S. Richardson commented on a similar tendency in the popular reaction to epigenetics to "blame today's mothers" for the long-term health outcomes of their children (131).

The lesson is clear: The social consequences of science depend not only on how the population at large understands the research but also, just as much, on cultural concerns that may have little or nothing to do with the science. Literature and other symbolic forms are among the most powerful indicators of the concerns that are intertwined in people's minds with research results that may be relatively distant from those concerns. The association of popular literary conventions with neo-Lamarckian themes is a case in point. The example of Collins shows that the public could well view results that proved the heritability of acquired characteristics as powerful new arguments for biological determinism and that cultural presumptions about gender (and other issues) often outweigh what people know about science. While Collins was not tempted to see the hand of an intelligent designer in adaptive evolution, many other people in the 1880s were eager to draw exactly that conclusion – as they are today.

The mark of Lamarckism was inscribed in nineteenth-century culture through novels that took readers to the heart of Africa, deep below the surface of the earth, and into sensational murder plots. We are only beginning to glimpse where the mark of epigenetics will take us today.