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0521815169 - Darwinian Heresies

Edited by Abigail Lustig, Robert J. Richards and Michael Ruse

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## CHAPTER ONE

### Introduction

#### Biologists on Crusade

Abigail Lustig

The intellectual landscape of Darwinism for the last 150 years bears a certain resemblance to Germany during the Thirty Years' War. Sects and churches, preachers and dissenters, holy warriors and theocrats vie with each other for the hearts of the faithful and the minds of the unconverted, all too often leaving scorched earth behind.

Such an extravagant metaphor is not much of an overstatement. Accusations of heresy – and equally shameful, imputations of orthodoxy – have been thrown around in the history of evolutionary biology, from within and outside the community of scientists, with reckless abandon. Nor are these terms metaphorical: they are the ones that biologists have used themselves in defense of friends and denigration of foes. Antagonists on all sides of debates about evolutionary biology have wielded the language of holy warriors, declaring crusades to expunge heretics from the domains of biological science. Locutions such as these have become organizing tropes for biologists since the time of Darwin. Yet this aspect of the history of evolutionary theory has – rather surprisingly, in light of the inordinate attention given to evolution's entanglements with religion – usually been ignored.

Why is evolutionary biology so rife with the terms and emotions of organized Western religion? Numerous factors have played a role. Evolutionary biology's emergence from traditions of religious reasoning and writing, into contexts where religious thinking remained prominent; the propensity of evolutionists themselves to paint themselves, ironically or seriously, as dissenters or believers; their tendency to draw, unconsciously or consciously, their scientific frameworks from preexisting religious ones; and their impulse to take

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[More information](#)

it on themselves to pronounce on issues formerly the domain of religion – all of these have prompted biologists to armor themselves in the language of religious combat. We hope that, while this volume may not serve to bring about the Peace of Westphalia, it may help at least to taxonomize some of the combatants.

Usage of religiously charged language has a venerable history in evolutionary biology. In the 1910s, the American ant biologist William Morton Wheeler spoke wryly of his own commission of the eighth and ninth “deadly sins” in evolutionary theorizing, anathema to the “orthodox behaviorists” – anthropomorphism and Lamarckism.<sup>1</sup> Wheeler’s German Jesuit evolutionist entomologist contemporary, Father Erich Wasmann, teasingly lamented the placement of his own evolutionary works by the great German Darwinian apostle Ernst Haeckel, “on the index for Monism” for the threat they posed to “monistic dogmas” asserting the primacy of materialism and the unity of mind and spirit, which had had, ironically, the opposite effect: “his very denunciation has led no small number of victims into that snare.”<sup>2</sup>

The epithet “apostle” for Haeckel is not misleadingly chosen. Haeckel played a chief role in the acceptance and substantiation of Darwin’s ideas in Germany, both within scientific discourses – particularly in his work on marine invertebrates – and in popular culture, which he helped to shape in best-selling books. Moreover, Haeckel, like E. O. Wilson a century later, explicitly cast science in general, and Darwinism in particular, in the role of antagonist to and replacement for religion and particularly for Christianity. In *Monism as Connecting Religion and Science: The Confession of Faith of a Man of Science* (1895), Haeckel professed a “candid confession of monistic faith” that he anticipated could replace Christianity.<sup>3</sup> In the mystical and romantic *Riddle of the Universe at the Close of the Nineteenth Century* (1900), Haeckel asserted that “what we call the soul is, in my opinion, a natural phenomenon” and claimed that a monistic view of the universe was tantamount to pantheism, or the idea that divinity inhered in all matter, and was

<sup>1</sup> William Morton Wheeler, “A Study of Some Ant Larvae, with a Consideration of the Origin and Meaning of Social Habits among Insects,” *Proceedings of the American Philosophical Society* 57 (1918): 293–343, at p. 294; William Morton Wheeler, “On Instincts,” *Journal of Abnormal Psychology* 15 (1921): 295–318, at p. 303.

<sup>2</sup> Erich Wasmann, *Modern Biology and the Theory of Evolution*, 3rd ed., trans. A. M. Buchanan (London: Kegan Paul, 1910), p. xvi.

<sup>3</sup> Ernst Haeckel, *Monism as Connecting Religion and Science: The Confession of Faith of a Man of Science*, trans. J. Gilchrist (London: A. and C. Black, 1895), p. vii.

Cambridge University Press

0521815169 - Darwinian Heresies

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Excerpt

[More information](#)

## Introduction

3

“the world-system of the modern scientist.”<sup>4</sup> Haeckel’s mystic monism was explicitly opposed, rhetorically and substantively, to Christian theology, which he found scientifically outdated and politically dangerous (in the context of the German church–state struggles of the late nineteenth century). He hoped to replace the mealy-mouthed “useless” and “unnatural” love-your-enemies ethics of Christianity with a monistic morality learned from the “goddess of truth . . . in the temple of nature,” rooted in naturalistic psychology, and balancing the coequal demands of egoism and altruism.<sup>5</sup>

Herbert Spencer, whose evolutionary philosophy was at least as influential during the late nineteenth century as Darwin’s, if not more so, and whom Haeckel credited with “founding this monistic ethics on a basis of evolution,”<sup>6</sup> likewise conceived of an ethics that could be detached from transcendental religious, and particularly Christian, underpinnings. Spencer, however – like John Stuart Mill with regard to utilitarianism,<sup>7</sup> – prided himself on the assonance between the most highly evolved moral state, to which modern civilized human beings were tending, and the ethics of pragmatic Anglican Christianity. For Spencer, in fact, the appearance of religious and political authorities in ages past was a first step on the path that led to the evolution of an absolute altruism that would require no impetus from outside the individual, being entirely internalized. The task of the moral scientist was, according to him, to hasten the “disentanglement” of the latter from the former, as the butterfly from the chrysalis.<sup>8</sup>

British scientists and theologians of the 1920s and 1930s – combating what they saw in retrospect as the monolithic materialism of the late Victorian period, embodied in Spencer and Haeckel – appropriated religious language to discuss the content and context of science as well. They felt that scientific advances, during the period just before the Modern Synthesis began to achieve its hegemony, pointed the way to a reconciliation of evolution and natural theology – usually liberal Anglican but sometimes Catholic – by way

<sup>4</sup> Ernst Haeckel, *The Riddle of the Universe at the Close of the Nineteenth Century*, trans. Joseph McCabe (London: Watts and Co., 1900), pp. 91, 296. See also Chapter 6, this volume.

<sup>5</sup> Haeckel, *Riddle of the Universe*, pp. 362, 345.

<sup>6</sup> *Ibid.*, p. 358.

<sup>7</sup> John Stuart Mill claimed that “[i]n the golden rule of Jesus of Nazareth, we read the complete spirit of the ethics of utility. To do as you would be done by, and to love your neighbour as yourself, constitute the ideal perfection of utilitarian morality.” See John Stuart Mill, *Utilitarianism*, in *The Philosophy of John Stuart Mill*, ed. Marshall Cohen (New York: Modern Library, 1961), p. 342.

<sup>8</sup> Herbert Spencer, *The Data of Ethics*, 1879. Reprinted together with *Justice* (London: Routledge, 1996), p. 121.

Cambridge University Press

0521815169 - Darwinian Heresies

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Excerpt

[More information](#)

of progressionist evolutionary theories and concepts of “emergence,” often linked to nonmaterialistic physiology, psychology, and comparative sociology. These authors’ construction of the Victorians as universally dogmatic materialists was, of course, factitious, as an equally great diversity of views on religious and evolutionary issues had been canvassed at all periods since Darwin.<sup>9</sup> Their sense of being engaged in a great crusade to promulgate a true view of evolution, however, was evidenced in the titles of their books: *The Basis of Evolutionary Faith* (1931); *Landmarks in the Struggle between Science and Religion* (1925 – taking, despite its title, the opposite side to Andrew Dickson Carr’s famous *History of the Warfare of Science with Theology* of 1896); *The Flight from Reason: A Criticism of the Dogmas of Popular Science* (1932); *The Gospel of Evolution* (n.d., 1920–1930s).<sup>10</sup> In many of these works, the metaphorical tables were turned, as Wasmann had done on Haeckel, to cast mechanistic evolutionists in the role of unthinking “dogmatists” preaching an unsustainable “gospel.”

The last thirty years have seen an unabashed resurrection of the use of religiously charged language by participants in evolutionary debates. E. O. Wilson’s announcement of the promulgation of a “New Synthesis,” the subtitle of his *Sociobiology* of 1975, helped to catalyze evolutionary biologists around the revival of thoroughly mechanistic and reductionistic theories of evolutionary mechanisms, particularly W. D. Hamilton’s inclusive fitness or kin selection theory. A number of these biologists – among them Wilson and Hamilton themselves, and including the likes of Richard Dawkins, Richard Alexander, and Robert Trivers – asserted that their theories of the origins of sociality and social behavior, including human sociality and behavior, had grave implications both for the origins of human morality and for the historical appearance and development of religion.<sup>11</sup> Several have further asserted, like Haeckel, that evolutionary biology, in one form or another, is slated to replace religion in its social functions as well. A number of these biologists have confessed to “conversion experiences” of one kind or another, in which a youthful

<sup>9</sup> See Chapter 3, this volume.

<sup>10</sup> Floyd E. Hamilton, *The Basis of Evolutionary Faith: A Critique of the Theory of Evolution* (London: James Clarke, 1931); James Young Simpson, *Landmarks in the Struggle between Science and Religion* (London: Hodder and Stoughton, 1925); Arnold Lunn, *The Flight from Reason: A Criticism of the Dogmas of Popular Science* (London: Eyre and Spottiswood, 1932); J. A. Thomson, *The Gospel of Evolution* (London: George Newnes, n.d.).

<sup>11</sup> See Richard Dawkins, *The Blind Watchmaker* (New York: Norton, 1986); Richard Alexander, *Darwinism and Human Affairs* (Seattle: University of Washington Press, 1979); Robert L. Trivers, “The Evolution of a Sense of Fairness,” in *Absolute Values and the Creation of the New World: Proceedings of the Eleventh International Conference on the Unity of the Sciences* (New York: International Cultural Foundation Press, 1983), pp. 1189–1208.

Cambridge University Press

0521815169 - Darwinian Heresies

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Excerpt

[More information](#)

## Introduction

5

faith in organized religion came to be replaced by modern neo-Darwinism – this narrative too harks back to Haeckel.<sup>12</sup>

Partly as a result of these perceived challenges to religion, and partly as a consequence of quarrels within evolutionary biology, Darwin's modern apostles have been much given to the invocation of religious language in their writing in order to defend themselves and to anathematize their scientific and cultural opponents. George C. Williams, in *Adaptation and Natural Selection* (1966), a seminal work of the new synthesis, argued that the “ground rule [of Darwinism] – or perhaps *doctrine* would be a better term – is that adaptation is a special and onerous concept that should be used only where it is really necessary” – a teaching seldom heeded. Williams concluded the book by asserting, with deliberate provocation, that although the strict modern theory of natural selection “may not, in any absolute or permanent sense, represent the truth . . . I am convinced that it is the light and the way.” L. B. Slobodkin, in reviewing *Adaptation and Natural Selection* for the *Quarterly Review of Biology*, picked up at once on the tenor of Williams's crusade. “Williams has written,” he observed, “a polemical tract against what he considers to be heresies and deviation in Neo-Darwinian orthodoxy.” He continued wryly: “When heresy is being sought out, I am always slightly nervous until I can analyze precisely who the heretics are. Perhaps I, too, am a heretic.”<sup>13</sup> Williams's chief heretic, notoriously, was not Slobodkin but Vero Wynne-Edwards and his notion of group selection. David Sloan Wilson noted tartly that by the 1990s group selection had come to be “treated as such a heresy that the only thing to learn about it is ‘Just say no.’”<sup>14</sup>

The advent of sociobiology has provided the most vitriolic accusations of heresy and orthodoxy in modern biology. Mary Jane West Eberhard, in a prominent review of *Sociobiology* for the *Quarterly Review of Biology* in 1976, cast sociobiology's genesis in mythic terms by rewriting it as a parable:

*[T]here was one small group [of biologists] without a name. They went about dressed in the castoff clothing of the titled sciences, and often failed to recognize each other, even when they hurried along the same paths. So they suffered greatly. Sometimes they had to learn to collect birds or identify ants in order to get jobs. Then one day there rose up a man*

<sup>12</sup> E. O. Wilson, *Naturalist* (Washington, DC: Island Press, 1994). See also Chapters 6 and 9, this volume.

<sup>13</sup> L. B. Slobodkin, “The Light and the Way in Evolution [review of G. C. Williams, *Adaptation and Natural Selection*],” *Quarterly Review of Biology* 41 (1966): 191–4, at p. 191.

<sup>14</sup> D. S. Wilson, “Introduction: Multilevel Selection Theory Comes of Age,” *American Naturalist* 150, supp. (1997): S1–S4, at p. S2.

Cambridge University Press

0521815169 - Darwinian Heresies

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Excerpt

[More information](#)

from among them. He had been called Entomologist, Ecologist, and even Biochemist. But that was not enough. All grew quiet as he raised his golden pen: "There shall be a new science," he said, "and it shall be called SOCIOBIOLOGY."

And the opening sentence of her review left no doubt of the cultural valences she intended to invoke – sociobiology's founder as benevolent God the Father: "Edward Osborne Wilson, the kindly bespectacled father of sociobiology, has assumed god-like powers with this book."<sup>15</sup> W. D. Hamilton – a darker, more pessimistic person – wrote with a certain self-congratulatory relish of the "heresy" he had unleashed on a complacent world, which "for the re-slanted spiritual descendants of the prim Victorians [remains] quite paralysing": the idea that inclusive fitness implied that members of a group "need and are expected to evolve a degree of xenophobia" and, in general, that the selfishness of genes implied the innate selfishness of people. A scientist had to be "tough" – by implication, tougher than any religious adherent could be – if he were to contemplate such painful truths.<sup>16</sup>

Participants in sociobiological controversies have been particularly fond of portraying themselves as martyrs – Galileo or Giordano Bruno by choice – condemned by the Catholic Church. Who plays which role, of course, depends upon the martyr's scientific and political position. Wilson, beset just after the publication of *Sociobiology* by controversy sparked by Harvard's Science for the People Sociobiology Study Group, compared himself to the Swiss theologian Hans Küng, "facing the fury of the theologians" for his liberal Vatican II views.<sup>17</sup> Alexander Morin made the category of "heresy" central to a 1979 analysis of the controversies, "Revelation and Heresy in Sociobiology," in *Science, Technology and Human Values*: "The attempt to 'biologize' the social sciences is resisted with the same ferocity that the Roman Church brought to bear on the Albigensians."<sup>18</sup> On the opposite side, the sometime Science for the People member Stephen Jay Gould deplored in 1979 the "expanding orthodoxy" of the modern synthetic theory, contrasting it with a "Darwinism . . . sufficiently broad and variously defined to include a multitude of truths

<sup>15</sup> Mary Jane West Eberhard, "Born: Sociobiology [review of E. O. Wilson, *Sociobiology*]," *Quarterly Review of Biology* 51 (1976): 89–92, at p. 89.

<sup>16</sup> W. D. Hamilton, *Narrow Roads of Gene Land: Volume 1. Evolution and Social Behaviour* (Oxford: W. H. Freeman, 1996), pp. 188–9.

<sup>17</sup> In W. R. Albury, "Politics and Rhetoric in the Sociobiology Debate," *Social Studies of Science* 10 (1980): 519–36, at p. 524. Wilson, "What Is Sociobiology?" in Gregory et al., eds., *Sociobiology and Human Nature*, pp. 1–12.

<sup>18</sup> Alexander J. Morin, "Revelation and Heresy in Sociobiology: A Review Essay," *Science, Technology & Human Values* 4, no. 27 (Spring 1979): 24–35, at p. 32.

Cambridge University Press

0521815169 - Darwinian Heresies

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Excerpt

[More information](#)

## Introduction

7

and sins.”<sup>19</sup> Later in life, Gould devoted numerous essays and a book, *Rocks of Ages*, to both celebrating the connections between and policing the boundaries of science and religion; he also never tired of contrasting his own evolutionary views, which were outside the central stream of the new synthesis, with the latter’s suffocating “orthodoxy.”<sup>20</sup>

Why is a modern science so riven with accusations reminiscent of the Spanish Inquisition? In great part, it is a product of the fact that evolutionary biology emerged within Western, largely Christian societies, tied at its birth to traditions of natural theology. The late nineteenth century was, moreover, a period of struggle over the implications of secularizing worldviews, driven not only by biology but also by anthropology, sociology, and biblical criticism. Evolution offered origin narratives that both echoed and threatened Christianity’s, as in Darwin’s evocation of the great Tree of Life of phylogenetic descent, given indelible visual form by Haeckel. The *Kulturkampf* of the 1870s–1890s between the newly unified German state and the Catholic Church helped to inflect German evolutionary biology with the crusading tone so characteristic of Haeckel and Wasmann.

The American context, which has been the scene of so much of the most vituperative counteraccusations of orthodoxy and heresy during the late twentieth century, has been particularly prone to this evangelizing mixture of the languages of evolution and religion, for two reasons. The first is the characteristically American history, continuing through the twentieth century, of religious fervor and revivalism, leading to anti-evolution outbreaks such as the carefully staged Scopes “monkey trial” of the 1920s. The rise of Protestant fundamentalist denominations that insisted on biblical literalism – in contrast to the long accommodationist intellectual traditions of Catholicism and Anglicanism – led believers of these sects – as, for example, the Seventh-Day Adventists – even to challenge evolutionists on their home ground.<sup>21</sup> The second factor virtually guaranteeing conflict between fundamentalist Christianity and evolutionists, which had the effect of causing evolutionists to solidify their own ranks and to feel themselves besieged by hostile Christianity – not the metaphorical Inquisitions of sociobiology’s critics but a literal war for souls – is the curious fact that, unlike the situation in most modern Western democracies, control over American school curricula is exercised exclusively

<sup>19</sup> Stephen Jay Gould, “Is a New and General Theory of Evolution Emerging?” *Paleobiology* 6 (1980): 119–30, at p. 119.

<sup>20</sup> Stephen Jay Gould, *Rocks of Ages: Science and Religion in the Fullness of Life* (New York: Ballantine, 1999). See also Chapter 9, this volume.

<sup>21</sup> See Chapter 5, this volume.

Cambridge University Press

0521815169 - Darwinian Heresies

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Excerpt

[More information](#)

at town, county, and state levels rather than through centralized national oversight. In practice, this has meant that, while the question of teaching evolution in European schools was settled decades ago, American biologists are still called out time and time again to defend themselves and their science in local and state school disputes. This has had the effect of encouraging them to defend their own orthodoxies – in this case, the fact of evolution and the theory of natural selection as its explanation – and to regard with suspicion any member of their own ranks who appears to present a weak flank to the enemy.

In other situations less charged with general cultural religious fervor, the language of heresy and orthodoxy in evolution has been changed or muted. Soviet biologists, of course, had to be careful in seeming to adhere to a different, aggressively secular, set of orthodoxies – Marxism-Leninism. Caught between intellectual orthodoxies, Soviet biologists, particularly during the period of Lysenko's hegemony, risked being placed in an awkward position in which “to be an orthodox geneticist was equal to being a political heretic.”<sup>22</sup> Here it was questions of the political rather than the spiritual authority of knowledge that dictated evolutionists' work and rhetoric.

Likewise, in the first enthusiasm for evolutionary ideas in non-Christian Japan, imported through the works of Darwin and Herbert Spencer, it was political rather than religious valences that were invoked by evolutionists, as Meiji reformers used evolutionary ideas to subvert the conceptions of nature that the Tokugawa shogunate had used to bolster its own claims to political legitimacy. The resonances and conflicts present in the West between evolutionary origin narratives and those provided by Christianity were quite absent in Japan, allowing thinkers there to turn evolutionary narratives to distinctly national ends, in a society historically lacking strong or unified religious authorities.<sup>23</sup>

Finally, another reason for the strong resonances between religious and scientific disputation in the case of evolutionary biology is often overlooked: both the Western monotheistic religions and evolutionary biology are to a strong, distinctive, and somewhat anomalous degree text-based. Evolutionary biologists use texts, particularly in the form of books, to a far greater degree than other modern sciences. Of the texts of lasting importance, Darwin's *Origin of Species* holds the preeminent place. On a rough count of the *Science Citation Index*, it has been cited a couple of thousand times in the period

<sup>22</sup> See Chapter 3, this volume.

<sup>23</sup> See Julia Thomas, *Reconfiguring Modernity: Concepts of Nature in Japanese Political Ideology* (Berkeley and Los Angeles: University of California Press, 2001), especially Chapters 4 and 5.

Cambridge University Press

0521815169 - Darwinian Heresies

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Excerpt

[More information](#)

and publications covered by the index, mostly by biologists – approximately 500 times since 1996 alone. By comparison, Newton’s *Principia Mathematica*, a work of immense importance in the history of mathematics and physics, is cited an order of magnitude less often – a few hundred times – and perhaps a third or more of those citations come from articles on the history of science, philosophy and the history of philosophy, or other disciplines outside physics and mathematics; nor are student physicists expected to read the *Principia*. But particularly since the architects of the Modern Synthesis made reference to Darwin part of their project of returning natural selection to centrality as an evolutionary mechanism,<sup>24</sup> evolutionary biologists have tended to use Darwin in two ways: either to prove that he agreed with their argument, by pointing to passages in the *Origin* or elsewhere in Darwin’s works that in their reading foreshadow their own conclusions; or to argue that he *would* have agreed with them, had he had the benefit of information that he lacked but that is available to the modern scientist. To this end, Michael Ghiselin, Stephen Jay Gould, Richard Lewontin, Ernst Mayr, Gareth Nelson, E. O. Wilson, and many many others pore over the text of the *Origin*, the *Descent of Man*, and other works with the assiduity of Talmudic scholars.

A representative example may be found in a quarrel in 1974 between the practicing systematists Ernst Mayr and Gareth Nelson, in taxonomic journals, over whether Darwin’s philosophy of classification in the *Origin* agreed with Mayr’s own or with Willi Hennig’s cladistics. While Nelson acknowledged that “[i]t may be that Darwin’s remarks will ever remain ambiguous by modern standards; that may be their virtue (their capacity to be reinterpreted anew),” he nevertheless decided, in the next sentence, “Perhaps so, but perhaps not.” Mayr’s and Nelson’s disputation over texts took on, yet again, the trappings of religious conflict. “I consider historically inaccurate,” Nelson grouched, “Mayr’s repeated assertions that ‘evolutionary taxonomy’ is orthodox Darwinism and that, consequently, ‘cladism’ – as Mayr uses the word, is some recent, more or less rootless, heresy.”<sup>25</sup> To be able to evoke Darwin’s textual authority for one’s own position is here a way not only of seizing the scientific high ground, but also of recapturing the idea of “orthodoxy” as desirable: the community of true believers descended from the patriarch – a contrast to the usage of

<sup>24</sup> See Vassiliki Betty Smocovitis, “The 1959 Darwin Centennial in America,” *Osiris* 14 (1999): 274–323; and Chapter 7, this volume.

<sup>25</sup> Ernst Mayr, “Cladistic Analysis or Cladistic Classification?,” *Zeitschrift für Zoologische Systematik und Evolutionsforschung* 12 (1974): 94–128; Gareth Nelson, “Darwin-Hennig Classification: A Reply to Ernst Mayr,” *Systematic Zoology* 23 (1974): 452–8, at p. 453.

Cambridge University Press

0521815169 - Darwinian Heresies

Edited by Abigail Lustig, Robert J. Richards and Michael Ruse

Excerpt

[More information](#)

sociobiologists, who have delighted in portraying themselves as “heretics” persecuted by a world of hostile Marxist and anthropological orthodoxies.

These shifting uses of “Darwinian heresy” and “orthodoxy” reflect also the historical fact that the content of what is called “Darwinism,” and therefore the accepted canon of texts and dogmas, has been ceaselessly shifting over the last 150 years. Consider just a few of the issues that have drifted in and out of favor, often without regard to their presence or absence in Darwin’s own works. Foremost among these is Lamarckism, which Wheeler called the “ninth deadly sin” of orthodox Darwinism. Notoriously, no other mechanism in evolutionary theory’s history has come in for the opprobrium of the inheritance of acquired characters, even before the fiasco of Lysenkoism. The inheritance of acquired characters was, as is well known, an essential evolutionary mechanism in Darwin’s own writings, particularly in relation to the evolution of instinct and of social behaviors, but in the Weismannism that wielded great power among theoretical biologists early in the twentieth century, and which was often called at the time “neo-Darwinism” (no term except “Darwinism” itself has been so often reinvented in the history of evolution as “neo-Darwinism”), natural selection precluded all other mechanisms. A self-described “antiquated” natural historian like Wheeler could thus feel himself on the defensive against it and indeed take pains to denigrate Darwin’s character and achievements, in a manner unthinkable for an orthodox evolutionary biologist, of whatever sect, today.<sup>26</sup>

Lamarckism’s tortured history reached an apogee with the Lysenko affair in the Soviet Union during the 1940s and 1950s. While the struggle there was couched in terms not of religious but rather of Marxist-Leninist orthodoxies, the conflicting demands of politics and scientific fidelity could put evolutionists in very awkward positions indeed. The evolutionary entomologist Georgii Shaposhnikov, for example – an aphid taxonomist by training who had performed a series of meticulous experiments during the 1950s demonstrating the rapid speciation of asexual lineages of aphids introduced onto new plant hosts (their parthenogenetic reproduction precluding the action of natural selection on new variants) – was forced to walk a careful line in interpreting his results against a series of changing orthodoxies, political and scientific, over five decades. His experiments appeared definitively to demonstrate Lamarckian speciation; yet in order to avoid being pulled into the witch hunts taking place over Lysenkoism, he refrained from publicly interpreting his own results until the 1980s, lest he be excommunicated (or worse, given

<sup>26</sup> William Morton Wheeler, “The Ant-Colony as an Organism,” *Journal of Morphology* 22 (1911): 307–25, at p. 307. On Wheeler’s downplaying of Darwin, see Chapter 8, this volume.