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BOOK SYMPOSIUM

What-if history of science

Peter J. Bowler: Darwin deleted: Imagining a world without Darwin. Chicago: University of Chicago Press, 2013, ix+318pp, $30.00 HB

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Darwinian calisthenics

An athlete engages in calisthenics as part of basic training and as a preliminary to more advanced or intense activity. Whether it is stretching, lunges, crunches, or push-ups, routine calisthenics provide a baseline of strength and flexibility that prevent a variety of injuries that might otherwise be incurred. Peter Bowler has spent 40 years doing Darwinian calisthenics, researching and writing on the development of evolutionary ideas with special attention to Darwin and subsequent filiations among scientists exploring evolution (e.g., Bowler 1976, 1983, 1988, 1989, 1996, 2007). Therefore, we would expect that when Bowler engages in a counterfactual history—imagining a world without Darwin—he is able to avoid historical injury and generate novel insights. My assessment is that the results are mixed. Before we can see why, it is necessary to walk briskly through the main contours of his argument.

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Bowler begins with an *apologia* for a counterfactual approach to history by appeal to the way that *timing* and *interpretation* affect how a scientific theory is metabolized. Only Darwin was positioned to formulate a theory of evolution by natural selection in the mid-nineteenth century: "he had a unique combination of interests that allowed him to see links not obvious to others at the time" (7). With Darwin deleted, evolutionism (*sans* natural selection) still would have emerged, but with radically different consequences for science and theology—but not society. For science, Lamarckian theories and structuralist themes would have predominated. Natural selection would have appeared in the early twentieth century with the rediscovery of Mendelism and coalescence of transmission genetics. As a consequence, embryology would not have been marginalized in the Modern Synthesis: "Natural selection would have emerged in a form that blended smoothly into the still valuable remnants of developmentalism" (202). For theology, the materialistic implications of evolution would have been moderated ("Darwin presented his contemporaries with the harshest possible vision of nature" [277]), which would have helped to mesh the gears of science and theology more fruitfully: "the process would have proceeded far more peacefully and a working compromise would have been in place before natural selection was discovered sometime around 1900" (208). But for society, the removal of Darwin would have made little difference. Misguided applications of evolutionary ideas to society and politics (e.g., social Darwinism) would have manifested nonetheless; their various "survival of the fittest" formulations did not rely on natural selection and alternative evolutionary ideas could have and did supply adequate ersatz materials upon which to build nationalistic militarism or scientific racism (*inter alia*).

Historical payoff

How might we measure any payoff that Bowler has achieved in his counterfactual analysis of Darwinian history? One way is by comparing it to benchmarks for the kinds of advantages that can be drawn from historical counterfactuals. At least eight possibilities exist (Nolan 2013): (1) expanding the historical imagination, leading to new hypothesis generation; (2) highlighting disagreements among historians and the assumptions these result from; (3) mitigating the tendency to see the present as an inevitable outcome and more actively countenancing historical contingency; (4) assisting in understanding the point of view of historical actors, who contemplated a range of possibilities in coming to decisions; (5) providing a satisfaction of intrinsic curiosity about what would have happened; (6) drawing attention to the nature and kinds of causal claims relied on in our histories; (7) offering explanations that depend on robust counterfactual dependencies; and (8) informing how we assign credit or blame and otherwise evaluate historical actors. The first four of these do not require that counterfactual histories be nearly true or highly plausible, thereby blunting a frequently voiced objection. The latter four are anchored to "cautious" counterfactual reasoning, where we are careful in how large and what kinds of departures we make from actual history. This caution is warranted because of our lack of epistemic access to many potentially significant features of the past and the specter of radically underdetermined counterfactuals. Considering what would have happened if Alfred

Wallace did not exist might expand our historical imagination or help us contemplate what Darwin had to think through in the mid-1850s, but it might be more natural to say that we do not know what could have happened because there are too many unknown variables. Shifting the reception of Wallace's letter in 1858 back to 1857 is more likely to illuminate our causal claims and explanations about how Darwin's famous book came hastily into existence and was received without as much worry that pinning down the possibility space is infeasible.

Bowler's account is successful in several ways on the first four criteria. He puts (3) at the apex of his approach: "The exercise of imagining a world without his theory will be valuable if it forces us to reexamine links between theories and wider developments that we thought were inescapable …The whole point of counterfactuals is to challenge values and attitudes that rest on the assumption that the way things are is the product of historical inevitability" (16, 27). A theory of Darwin's vintage was not "in the air," and it is sheer anachronism to claim otherwise. Both the developmental trajectory of the science and its interpretative connections to religion were by no means inevitable. The historical imagination is expanded by drilling down into unexpected features, such as the ability of Darwin to provide a point of nucleation through his pictorial representation as Victorian sage (92ff) or reminders of how statist ideology stimulated toxic forms of nationalism without any special need for evolutionary input (250–253). Disagreements among historians are exposed most poignantly surrounding whether functionalist or structuralist approaches to evolution are understood as legitimate (e.g., 47–49), which is germane for both Darwin and contemporaries such as Richard Owen. We better understand decision scenarios contemplated by historical actors through the lens of Darwin's informal contact network (72–74) and recognize that a generalized evolution was primarily invoked to support aspects of a heterogeneous social Darwinism, such as the application of biological laws to human society. In summary, Bowler provides a profitable romp through the gardens of the Darwin industry, which have been tended and tilled over the past four decades.

While insightful in some respects, many of these claims are not surprising and flow straightforwardly from Bowler's earlier work. Much of chapter 5 is a rehearsal of the "Non-Darwinian Revolution" and "Life's Splendid Drama." Wherever one of his viewpoints has been challenged, Bowler dutifully cites a source and then doubles down on his original interpretation (e.g., with respect to whether Darwin delayed publication, whether Owen offered a structuralist version of the design argument, or whether we should consider Haeckel a Darwinian). The claim that "Darwin's decision to begin writing his big book on natural selection in the mid-1850s was influenced by a growing sense that the climate of opinion had changed to make such a hypothesis more acceptable to both public and the scientific community" (90) is exactly the sort of common wisdom that has been weighed in the balance and found wanting (van Wyhe 2007). This handicaps Bowler's achievements, which could have been more adequately nuanced in light of developments in historical scholarship surrounding Darwin.

On the second four benchmarks, Bowler's success is not so straightforward. The achievement is most notable for how society would not have been substantively affected with Darwin deleted. Militaristic conceptions of the nation state and free

enterprise individualism did not require Darwinian fuel (or even a match). This is a paradigm instance of producing an explanation that relies on robust counterfactual dependencies. But for the cases where the question is "what would have been different?", with respect to either scientific developments or relationships with religion, the departures made from actual history provoke serious worries about underdetermined counterfactuals. Although Bowler recognizes the need for cautious counterfactual reasoning where plausibility is preeminent ("Plausibility is the key problem identified by detractors of the counterfactual approach" [16]), his counterfactual history is hampered by two difficulties: (a) An overemphasis on theories as opposed to practices and other units of analysis and (b) a poverty in the concepts and categories utilized in his counterfactual explorations. Satisfying our intrinsic curiosity about what would have happened if things had been different involves more than just the timing and interpretation of theories. The degree to which causal claims are supported by counterfactual analyses depends on the kinds of historical descriptions we use to formulate the counterfactuals. A counterfactual about what would have happened if Darwin was deleted might be more or less plausible depending on whether it is described in terms of the effect of Darwin's theory versus the effect of Darwin's practices or his framing of problems. Assignments of credit or blame involved in evaluating historical actors rely on the specification of context and not just "someone else would have gotten there" because hypotheses of inevitability depend on what exactly is being described as inevitable (a theory component? an investigative practice? an entire research program?). We need to increase the diversity of activities probed in counterfactual reasoning and expand the range of motion by enriching our categories of analysis.

Increasing the diversity of activities

Bowler largely equates "science" with its resultant theories. His historical analysis about Darwin deleted—"to ask just how much difference it would have made if he had not been there to write the *Origin of Species* in 1859" (18)—concentrates on Darwin's *theory* of evolution by natural selection. When the question is about inevitability, whether the "science would have developed much the same" (1) or "if biology ultimately develops toward the same end product" (2), the assumption is that the only relevant units worth examining are theories. While it is undeniably important to examine theories, this approach overlooks how other items may be required for understanding the reception of these ideas in both the scientific community and wider sphere of the public. Richard Bellon has shown that some of the icy reception to *On the Origin of Species* melted in the wake of Darwin's 1862 book on orchids because it showed botanists how evolution was useful for dealing with specific scientific problems surrounding fertilization (Bellon 2011). The question was not simply accepting Darwin's theory but rather how the practices of biologists could be transformed by it. And where they were not, we might expect a lack of acceptance. Bowler ignores how many of Darwin's ardent allies with respect to natural selection were botanists and that the most robust non-Darwinian research program in subsequent decades was vertebrate morphology. A counterfactual

analysis premised on Darwin deleted needs to incorporate the diversity of things that would be removed.

Additionally, Darwin's intellectual output was directed at many different problems, the results of which did not always work out (e.g., pangenesis). If we treat Darwin in a more temporally extended fashion, instead of fixating on 1859 and *On the Origin of Species*, this becomes more visible and the same point applies to Bowler's entire counterfactual analysis. While Bowler has demonstrated convincingly that biogeography, paleontology, and morphology composed a non-Darwinian scientific *modus operandi* in the late nineteenth century (Bowler 1996), it is not at all clear that this degenerating research program on the phylogenetic architecture of life's history would have paved the way to a formulation of natural selection in the wake of Mendel's work being rediscovered. An alternative characterization of the shifting dynamics of evolutionary research is in terms of different research problems coming into and going out of focus in the nineteenth century. By moving away from "theory" as the unit of analysis and considering scientific problems, the historical narrative changes. And the change is illuminating for understanding the appearance of the Modern Synthesis (Love 2007). Rather than being a rival theory to Lamarckism, the Modern Synthesis represents a prioritization of particular research problems from a functionalist orientation and a neglect of the phylogenetic and developmental questions situated in a structuralist problem space (Amundson 2005). This neglect was not wholly intentional and was abetted by material practices, such as the choice of model organism (Love 2009). This raises serious questions about Bowler's claim that development could have been blended seamlessly with natural selection in the absence of Darwin, as well as his invocation of contemporary evolutionary developmental biology to vindicate the scientific status of non-selectionist "theories of evolution" from the late nineteenth century. Counterfactuals that undermine inevitability in our histories also serve as opportunities to import contemporary judgments into the alternative trajectories of what might have been.

Further worries arise around how Bowler thinks about theory structure. He routinely refers to *the* "components" of Darwin's theory in an effort to undermine inevitability: "The components of the theory may have been available, but no one else was in a position to put them all together" (31). This presumption about a predefined array of theory modules runs counter to Bowler's own emphasis on the contingency of rival conceptualizations. Different conceptualizations suggest differently shaped pieces, which would not fit together to produce the same overall picture that Darwin put forward (or the same pieces might be assembled into a differently structured theory). Thus, Bowler seems to favor inevitabilism about the elements of evolutionary theory; the pieces are predetermined (the "essentials of Darwinism"), but the skill to assemble the kit just happened to be Darwin's province circa 1859: "Darwin himself was the only naturalist who could have addressed *all the relevant topics* in sufficient detail to force his contemporaries to think again about the question of evolution" (34, my emphasis). But topical relevance is often a function of how the phenomena and questions are conceptualized by scientists.

Expanding the range of motion

The worry that Bowler's argument for contingency (i.e., the way things could have been different) might be masking underlying commitments to inevitability brings us to the limited range of categories used by Bowler to undertake his counterfactual exercise. Bowler jousts with two different "inevitabilist" opponents: anti-realist-inevitabilism (Darwin's theory content, timing, and interpretation are overdetermined by features of its social and institutional milieu) and realist-inevitabilism (successful science latches on to the one true way the world is and therefore Darwin's removal would not ultimately affect evolutionary theory's content or interpretation, though potentially the timing of its appearance). Bowler does not have much time for the first opponent, firing a few scattered shots at it along the way, but he aims for the heart of the second opponent by arguing that discerning genuine historical contingency requires a weakening of realism: "If we soften our commitment to realism, alternative ways of modeling nature become all the more obvious" (13). This yields the soft realist-contingentism position from which Bowler proceeds.

In an illuminating discussion of counterfactual possibilities in the history of genetics, Gregory Radick pulls apart the realist and inevitabilist strands (a point made by others as well), showing that realist-contingentism and anti-realist contingentism are live categories, though their plausibility for different episodes in the history of science varies (Radick 2005). Additionally, John Beatty has shown that at least two different senses of contingency can be teased apart: contingency *upon* the factors available and their timing in a historical chain of causation; and, contingency per se, where the historical chain of causation is inherently unpredictable (Beatty 2006). These additional categories help us to see that Bowler does not observe Radick's distinction (hence his soft realist position) and that his analysis emphasizes contingency *upon*. The timing of Darwin's publishing had an effect on its reception and interpretation, but the effect itself was predictable (i.e., not contingent per se). According to Bowler, one could forecast that the harsh, materialistic form of Darwin's theory would instigate a negative reaction from Christian theology ("the radical challenge to traditional values that Darwin's theory posed" [114]). If history was inherently unpredictable, a counterfactually smoother interface between biology and theology "in a world lacking the selection theory to highlight the materialistic interpretation of evolutionism" (107) would be undermined. It also would mean that you could not count on theory parts being similarly assembled at a later date, even if they were available. And if we take different conceptualizations seriously, as many pluralists do (Kellert et al. 2006), then unpredictability might be enhanced because what the whole package would have looked like is radically underdetermined. Claims of a harmonious blending of natural selection and embryology in a counterfactual Modern Synthesis ring hollow. Bowler's neglect of these possibilities derives from an impoverished set of categories. Our intrinsic curiosity goes unsatisfied; the relevant causal claims are unclear; robust counterfactual dependencies are elusive, hindering explanation; and our capacity to evaluate historical actors is handicapped. Contingency is much more

kaleidoscopic than Bowler allows; counterfactual history is inherently multidimensional (Martin 2013).

Enriching the available categories is pertinent to Bowler's discussion of the implications of Darwin's theory. Frequently there is a presumption that what occurred in the nineteenth century was "the establishment of an evolutionary worldview" (22) and that Darwin's theory was "more materialistic" than Lamarckian alternatives: "Natural selection made the issue of evolutionism far more controversial because it presented the theory in its most materialistic form" (25). Theories may have more or less materialistic forms, and we know certain Darwinian bulldogs wanted many see it one way rather than another, but the case here is complicated by the fact that one of the strongest advocates for a reconciliation of evolution and Christianity came from Asa Gray, who was at pains to advocate for *Darwinian* evolution (and much more than Huxley). It is regularly assumed that Gray cushioned the blow of natural selection by appealing to "variation being led along beneficial lines": "Common descent and dispersal were what mattered to [Gray], and natural selection was only Darwin's supplement to those more important ideas … [Gray] found it necessary to fudge the issue of how new characteristics were actually produced in order to retain a role for design by the Creator" (117–118). But Gray's thinking on variation appears to have evolved over time while he maintained a steadfast commitment to both evolution by natural selection and a version of orthodox Christianity. Thus, his 1874 praise for Darwin's functionalism ("Let us recognize Darwin's great service to Natural Science in bringing back to it Teleology") and 1883 rejection of variation being led along fitness-enhancing lines: "incipient variations are wholly vague and irrespective of ends—are as likely to occur in the direction of unfitness as of eventual fitness to the environment." Bowler is so confident that "those who hope to find purpose in evolution have always found the Lamarckian theory of the inheritance of acquired characteristics more congenial" (207), he retrospectively chides Gray for not adopting Lamarckism (221). While it is true that Gray saw the evolutionary process as purposeful, it did not necessitate "bringing in supplements or alternatives to selection" (215). Gray's argument embraced natural selection: "waste of life and material in organic nature ceases to be utterly inexplicable, because it ceases to be objectless. …[Darwinian teleology] explains the seeming waste as being part and parcel of a great economical process" (Gray 1963, 308, 310). It would seem that historical injury has not been avoided despite Darwinian calisthenics.

Bowler's counterfactual expedition has many merits, and the planks of his central thesis were laid down clearly in earlier publications. I agree that it is essential to emphasize Darwin's uniqueness: "no one else had the kind of career and research opportunities to position them to duplicate all of Darwin work" (36). And Bowler succeeds in expanding the historical imagination, flagging assumptions that lead to disagreements among historians, encouraging us to more vigorously countenance historical contingency, and helping us get at the point of view of historical actors. But the deeper significance of Bowler's book comes from its limitations, which provoke us to rethink the philosophical categories used in counterfactual historical analyses. It is crucial to scrutinize more than theories and not assume there is a single partitioning of relevant theory elements; it is necessary to decouple realism

and inevitabilism, distinguish different kinds of contingency, and examine the consequences of a pluralist outlook on the conceptualizations embedded in scientific models. This is what it really means to be "forced to think more carefully about the complexity of scientific theorizing and its relationship to the wider world" (27). Forty years of Darwinian calisthenics do not guarantee injury-free competition; even an Olympic athlete can pull a hamstring.[1]

Robert J. Richards

What if Charles Darwin, during the Beagle voyage, had been swept overboard and had drown, never to have developed his theory of the descent of species by natural selection, never to have written *On the Origin of Species*? How would the intellectual world of the last half of the nineteenth century have been different? Peter Bowler imagines answers to these questions by constructing a counterfactual history in his provocative new book *Darwin Deleted*. He intends by this history principally "to undermine the claim that the theory of natural selection inspired the various forms of social Darwinism" (6), particularly Nazi biology and the eugenics movement at the turn of the century. Bowler argues that even without Darwin, social Darwinism (under a different name) would yet have flourished. And without the intellectually disruptive phenomenon of Darwinism, religion, in Bowler's parallel history, would have reconciled itself to a more compatible, Lamarckian evolutionism of the sort proposed by Herbert Spencer and Ernst Haeckel. The wars of religion and science would have become minor skirmishes.

Recently in the *Guardian* newspaper, Richard Evans, the distinguished historian of the Hitler regime, dismissed with prejudice counterfactual reconstructions of the First World War (Evans 2014). Most historians would agree with Evans that "'what if' is a waste of time," since constructing the actual course of historical events and giving an explanatory account of those events prove hard enough, even when the evidence is available and abundant. When the evidence of an imagined world can only itself be imagined, the task of retrocasting a reasonable trajectory of events becomes exponentially difficult.

Two specific objections might be lodged against a counterfactual history. Some historians would object in principle to counterfactual considerations. But this objection fails to recognize that in every historical account, in every explanation of decisions taken and events occurring, the historian must, implicitly at least, imagine what the situation would have been like if the explanatory antecedent causes had not occurred. If the historian were to decide that the event of interest would nonetheless take place with the antecedent causes eliminated, then the account would explain nothing. What is taken as the antecedent causes must make a difference in the occurrence of the event of interest, otherwise the explanation fails.

This use of counterfactual thinking, a kind of thinking all historians employ, reminds us of the constructed character of written history—as does Bowler's own

[1] I am grateful to Theo Arabatzis, Mark Borrello, Joe Martin, and Greg Radick for incisive and timely feedback on an earlier draft of this essay.

effort. The historian builds the history of a period from the shards and detritus that remain in the present; the historian constructs a past that has no existence except in the construction itself. And that existence is curious. It is not quite the past experienced by any one individual in the past or even a collection of individuals. The historian can perceive things the individual actors cannot and can detect causes that, at the time, were not noticed by anyone—think of episodes of the condemnation of witches done by individuals completely ignorant of the psychological causes behind the bizarre behavior of those condemned. So Bowler's counterfactual history might appear just another example of the way historians go about their work, just a more obviously constructed instance. Yet, I think it is not, and the problem goes to the second objection to a counterfactual history.

This objection is more serious: in a complex matrix of interacting events, the conceptual addition or elimination of a significant cause must have unpredictable ramifying consequences. The turbulence produced by that butterfly flitting across a river in Argentina could have deleterious consequences for the ratings of municipal bonds in Chicago—at least this is the kind of potential that chaos-theorists discuss. If the cause added or subtracted is magnitudes more powerful than the ripple of a butterfly wing—for example, the deletion of Darwin from the intellectual world of the late nineteenth century—the echoing perturbations must shatter all expectations. Only a couple of ways exist by which to control the explosive potential of a counterfactual insertion or, in this case, deletion. The historian might narrowly define the deleted cause and brand it such that its mark on other events would be obvious and therefore easily excludable from the imagined history; or the historian might assume that the causal lines of interest have an inherent trajectory, goals that would be achieved despite the perturbations produced by extrinsic influences. Bowler employs both of these strategies.

Darwin is usually credited with two significant accomplishments in the *Origin of Species*: a convincing demonstration of the transmutation and descent of species over vast periods of time, "evolution" for short; and advancing a cause by which such evolution could be explained, natural selection. Anyone familiar with mid-nineteenth-century science will grant these as the two, intellectually tremendous results of Darwin's "long argument" in the *Origin*, but will still insist on many other extraordinary aspects of his achievement, for instance, his ingenious theory of moral behavior, which occupies several chapters of the *Descent of Man.* Bowler, however, slims down Darwin's theory specifically to natural selection and argues that without Darwin, natural selection "'ought' to have been discovered" half a century later than it actually was, likely in the collaboration of Karl Pearson and W.F.R. Weldon, given the latter's data and the former's statistical prowess (195–197). In this conjectured instance, natural selection would arise in the course of ordinary research at the beginning of the twentieth century and not 50 years before with the disruptive discovery of natural selection by Darwin, who "pulled off a coup that no one else at the time was in a position to do so" (197).

Bowler, of course, knows that Alfred Russel Wallace is usually credited with independently discovering natural selection, which discovery would seem to open up another ramifying path, a possible detour from the parallel history he has laid out. Wallace's essay "On the Tendency of Varieties to Depart Indefinitely from the

Original Type" caused Darwin severe anxiety when he received it from this obscure naturalist in 1858. He was astounded at the similarities of their views and fearful that his originality had been waylaid. He wrote his friend Lyell that "if Wallace had my MS. Sketch written out in 1842, he could not have made a better short abstract."[2] Bowler maintains that Darwin was wrong about the similarities, and so attempts to restrain the imaginative possibilities of his counterfactual history. He argues that by competition among varieties, Wallace meant not struggle between individuals displaying varietal traits, Darwin's principle, rather, between varietal groups in a kind of "group selection" (62). Bowler would have to say something like this to hold steady along the path: Natural selection was uniquely Darwin's achievement and without the master natural selection would not have played a role in the intellectual landscape of Victorian England. While Wallace's usage of the term "variety" might seem a bit vague to us, he is clear enough that it is individuals who are selected for or against in the struggle for life, for example: "as the individual existence of each animal depends on itself, those that die must be the weakest … while those that prolong their existence can only be the most perfect in health and vigour"; and "the individuals composing the species, those forming the least numerous and most feebly organized variety would suffer first."[3] Vagueness aside, Wallace cannot be proposing group selection because of the very logic of the situation: He does not refer to traits of groups per se, rather to traits common to the individuals composing a group. Were he proposing group selection, the traits would have to be something like flocking in birds or schooling in fish, traits predicated of the group as a group. An individual bird cannot flock. If all individuals of a variety are "feebly organized," then they will be selected against individually one by one. So Darwin's principle was not as improbably contingent as Bowler concludes. And since Wallace and Spencer were friends, they might both have advanced the principle of survival of the fittest, as Spencer rechristened natural selection. But who knows?

Bowler argues that natural selection would not be discovered in this hypothetical history till the turn of the century because in the actual history, not only were Darwin's arguments uniquely disruptive, but "most of his contemporaries found the theory either hard to understand or totally unacceptable" (197). I am not sure about what *ought* to happen in the imagined history, but the claim that in the actual history Darwin's principle was "hard to understand" and "totally unacceptable" to contemporaries—that claim itself seems counterfactual. Huxley, after reading the *Origin*, famously exclaimed to himself: "How extremely stupid not to have thought of that" (Huxley 1900: 183). Both Spencer and Haeckel thought the principle of natural selection did not need any empirical proof because it was an obvious, a priori proposition, like those found in mathematics (Spencer 1864: 445; Haeckel 1868: 133). Moreover, almost every naturalist accepted the principle. What was often doubted was whether it could explain all traits (and not even Darwin believed it could). The Catholic naturalist St. George Jackson Mivart, who advanced his own evolutionary theory in rebuttal to Darwin's, declared that the object of his book *On*

[2] Charles Darwin to Charles Lyell (18 June 1858), in Darwin (1985: 107).

[3] Darwin and Wallace (1858); quotations from Wallace's essay, pp. 56 and 58.

the Genesis of Species was "to maintain the position that 'Natural Selection' acts, and indeed must act, but that still, in order that we may be able to account for the production of known kinds of animals and plants, it requires to be supplemented by the action of some other natural law or laws as yet undiscovered" (Mivart 1871: 17). Mivart's response was quite common. Once the principle of natural selection was hit upon, it seemed obvious and necessary, and thus some inglorious naturalist, someone like Wallace perhaps, might well have led the company of biologists along the same path as was actually taken by Darwin. But who knows?

In deleting Darwin from the Victorian world, Bowler simply removes natural selection from the biological repertoire of the period, leaving all else much the same. The gap, he suggests, would be filled by Lamarckian evolutionism, which would come to dominate the purview of naturalists. But would it? Darwin not only advanced the principle of natural selection, but he also provided powerful and undeniable arguments for evolution, that is, for descent with modification. During the half century before the publication of the *Origin*, only a few naturalists, inclining to the minor (e.g., Robert Grant in England, Geoffroy St.-Hilaire in France), offered flickering avowals of Lamarckism; but those of greater stature did not. Lyell and Huxley in England, Cuvier in France, and von Baer in Germany all rejected Lamarckian evolution with powerful and disdainful dismissals; yet, not long after the appearance of Darwin's book, Lyell and Huxley became evolutionists, von Baer developed his own evolutionary theory, and the French rediscovered Lamarck. Spencer became the "Philosopher of the Doctrine of Development," in Alexander Bain's terms, only after Darwin had scientifically demonstrated the theory.[4] Ernst Haeckel had every opportunity to conceive his morphological work in Lamarckian terms, but did so only after being converted to evolutionary theory by reading the *Origin.* Without Darwin, would most naturalist have converged on Lamarckian transmutation theory after 1859? They certainly had not in the 50 years before the *Origin.* But who knows?

Bowler simply assumes a kind of inherent, progressive development of Lamarckism throughout the later part of the nineteenth century even without Darwin's powerful demonstration of evolution. He proposes that Lamarckian evolutionary theory would have been relaunched in 1844 by the *Vestiges of the Natural History of Creation,* authored anonymously by Robert Chambers, an editor and founder of the famous publishing house (215). As a result of *Vestiges*, Bowler confidently asserts, "scientists would have gradually begun to support evolutionism over the course of the 1860s" (215). Chambers' book certainly achieved popular success, with readers trying to guess who the author might be—even Albert, the Prince Consort, was a candidate. But the scientific men of the period—Adam Sedgwick, Charles Lyell, John Herschel, and Roderick Murchison—savaged what they regarded as the work of a rank amateur. Even Richard Owen, who might be thought to have some sympathy for Chambers' work, wrote a friend: "It is difficult to deal with the Vestiges, for it takes hold of people in proportion to their ignorance and unphilosophical character; so that you can find in them no handle to set them

[4] Alexander Bain to Herbert Spencer (17 November 1863), Athenaeum Collection of Spencer's Correspondence, MS. 791, no. 67, University of London Library.

right by."[5] Though Darwin himself initially evoked critical responses, no one thought of him in the same terms as they did Chambers, whose stock continued its decline through the decades: Huxley's review of the tenth edition of *Vestiges* in 1855 began with a quotation from *Macbeth*: "Time was when the brains were out the man would die" (Huxley 1903). If *Vestiges* simply failed to spark the fortunes of descent theory among scientists before 1859, why would one expect a sudden ignition thereafter? But who knows?

One of Bowler's aims in this counterfactual history was to show that developmental Lamarckism, which assumes an inherently progressive force, would have been friendlier to religion than an evolutionism driven by a principle of combative struggle. "In a world where Spencer and Haeckel were not tempted by the Darwinian alternative, the Lamarckian component of their thought," surmises Bowler, "would be more clearly apparent and its appeal to religious thinkers would be unmistakable" (222). The purring lion would lie down with the starry-eyed lamb. But does Darwin's principle of natural selection per se have much to do with the antagonism between religion and evolutionary science? When Adam Sedgwick railed against an evolutionary work put before the eyes of "glorious maidens," a tract filled with "seductive" language that instructs them "that their Bible is a fable," "that they are the children of apes and the breeders of monsters," a tract that "has annulled all distinction between physical and moral," and that is supported by a "progression and development of a rank, unbending, and degrading materialism"—he was referring, not to the book of his acquaintance, Charles Darwin, or to natural selection, but to the *Vestiges of the Natural History of Creation* and to its progressive teleology, which in Bowler's counterfactual history should have laid the ground for a science less hostile to religion (Sedgwick 1845, quotations from p. 3). By contrast, the American botanist and Presbyterian deacon Asa Gray rendered Darwinian natural-selection theory perfectly compatible with his religion. And Haeckel?—after 1864, when his cherished wife died after six short months of marriage—Haeckel dipped his pen in the ink of vitriolic despair and etched in virtually all his scientific works his complete disdain for the promise of religion; Darwinism became only a tool of his rejection, not a motivation for all-out war against the reviled superstition. Had Ernst Haeckel, rather than Darwin, not lived, then the peace and reconciliation spreading from the likes of Gray might have washed over European and American shores. But who knows?

The last chapter of *Darwin Deleted* tries to satisfy the principal aim of the book: To show that natural-selection theory did not inspire the various forms of social Darwinism, particularly the eugenics movement and Nazi biology during the first few decades of the twentieth century. At this point, however, Bowler's counterfactual history begins to consume itself logically. The imaginary history that eliminated Darwin should play no role in the discussion of social Darwinism, since, as Bowler supposes, by the turn of the century natural-selection theory would have been discovered by the likes of Pearson and Weldon, and thus we are back on the grounds of real history, a history that includes natural selection. The reader is thus left wondering about the point of the counterfactual exercise in the previous

[5] Richard Owen to J. D. Forbes (April 1845), cited by Brooke (1977: 139).

chapters. About this real history, Bowler reasonably contends that it is unlikely that a scientific theory could bear the burden for the horrors of Nazi atrocities, despite what is argued by such critics of evolutionary thought as Richard Weikart, who lays responsibility for Hitler's project at Darwin's feet, and Daniel Gasman, who side steps Darwin to find in Haeckel the chief culprit.[6] But Bowler begs off a deeper historical analysis of Gasman's charge with the faint "I am no expert on German culture and will pass no judgment on this topic" (261). But then, he does pass judgment, a logically troubled one. At the beginning of the chapter, he doubts any scientific theory could have produced Nazi atrocities, but later suggests that Haeckel's directed evolutionism (without the Darwinian component) would have been even more influential and "so it seems reasonable to imagine that the extreme form of scientific racism would also be more powerful" (261). And then what? Drive the Nazi's to even greater atrocities? Yet, he begins with the premise that scientific theories cannot really account for the viciousness of such acts as the Nazis committed. This might be justifiable as poetry—Marianne Moore's imaginary gardens with real toads in them—but as historical analysis it is a logical bramble, the way out of which is not obvious.

Like Gasman, Bowler attempts to exculpate Darwin at the expense of Haeckel. Had he explored just a bit the literature surrounding Haeckel's supposed role in Nazi thinking, he would have discovered that while a few German writers did attempt to recruit the ghost of Haeckel—dead a decade and a half before Hitler came to power—to the Nazi side, along with Johann Wolfgang von Goethe and Alexander von Humboldt, those efforts were officially staunched. The Nazis banned Haeckel's books as representing "the superficial scientific enlightenment of a primitive Darwinism and monism."[7] Evans, I think, is correct. Real history with real evidence is hard enough.

Bowler has carved into a large stone the history of evolutionary theory in the nineteenth century, removed a center part, and then shoved the two ends together, so that it looks just about the same as it did, maybe a bit shorter. That stone is his monument to counterfactual history.

Author's response: Peter J. Bowler

It is quite a challenge to respond to two scholars who approach my book from very different backgrounds and who have very different positions on the value of the counterfactual approach. Alan Love is clearly interested in the potentialities, but has concerns about my effort to construct a hypothetical world without Darwin. Robert Richards seems much more skeptical about the whole approach. Curiously, though,

[6] Bowler, p. 234: "how plausible is the claim that a single theory is responsible for creating so much human suffering?"

[7] Other authors banned by the same edict as "inappropriate for "National Socialist formation and education in the Third Reich" were: traitors such as Albert Einstein, liberal democrats such as Heinrich Mann, and "all Jewish authors no matter what their sphere." See "Richtilinien für die Bestandsprüfung in den Volksbücherreien Sachsens," *Die Bücherei* 2 (1935): 279–80. I have discussed the official policy of the Nazis regarding Haeckelian biology in Richards (2008: 444–448, 504–509).

there are several parallels between the objections they raise—which simplifies my task in responding. I will start by defending my analysis on several of the detailed points they raise and end with a more general discussion of counterfactualism.

Richards alone plays the Wallace card. This is an obvious way to dismiss my alternative history since if Wallace was in a position to step into Darwin's shoes things might have gone on pretty much the same as they did. For this reason, I took some pains to outline the reasons why I do not think Wallace fits the bill, and I believe there is a growing consensus among historians in favor of the view that his thinking ran along very different lines to Darwin's. His more technical papers of the period do not reflect the view that the characters distinguishing local varieties are adaptive, a position he would have to review whatever his model of natural selection. Richards is correct that there are passages in the 1858 paper which seem to endorse an individualist model, but there are others that do not sit very well with the view that this was his primary focus. Most obvious are the sentences I cited in which he speaks of the less well-adapted varieties being driven to extinction—individuals die, they do not become extinct. In a sense, the gradual extinction of a variety or subspecies must take place through a long series of individual deaths, and this point may lie at the heart of the ambiguity which plagues interpretation of the paper. Even in later years, Wallace's refusal to endorse Darwin's analogy with artificial selection or his vision of nature as full of cruelty and suffering makes it clear that any evolutionary worldview he might have developed on his own would have been very different. Who knows what he might have done indeed—but I maintain that we can be pretty certain about what he *wouldn't* have been able to do, both conceptually and in terms of the practical difficulties he would have faced in trying to promote a revolution on his own.

Both reviewers seem unhappy with my assumption that there was a general trend toward a more developmental and naturalistic view of the origin of life in the middle decades of the century. I have to say that I was quite surprised by this response, because in this area we are not dealing with counterfactual history and I am pretty sure that the majority of historians would concur with my own interpretation. In the book I mention briefly the possibility that Darwin's "behind the scenes" activities before 1858 may have had some influence, but I believe that there is enough evidence of a growing sympathy toward what we would call an evolutionary perspective for us to be sure that this would still occur without him. I do not share Love's reading of Van Wyhe (2007)—that paper argues that there were other reasons why Darwin delayed publishing, not that there was no transformation of public attitudes in the 1850s. Richards' point about *Vestiges* being dismissed by the scientists is valid (although Wallace is an important exception). But the thrust of Secord's study of the book's influence (2000) is that over a decade or so it encouraged a sea-change in opinion throughout society that made it less easy for naturalists to maintain open support for a supernatural explanation of origins. Neither reviewer mentions Herbert Spencer, who by the late 1850s was beginning his campaign to promote an evolutionary philosophy that would become immensely influential in the following decade—and which originated without any awareness of Darwin's work.

Both responses also challenge my point based on Darwin's complaint that many readers seem to have found it difficult to understand the concept of natural selection. Love notes Richard Bellon's paper (2011) on the success of Darwin's botanical work in converting some botanists to his point of view. I have to confess that when I read the paper I was quite taken aback, but further reflection led me to the realization that without the theory Darwin would not have done that work, and without him the botanists would have been unlikely to move toward a selection theory by themselves. The botanists obviously did understand the theory, and Richards points to the well-known examples of Huxley and Spencer who thought it was self-evident once it was pointed out to them. So why did Darwin complain about being misunderstood? The widespread assumption that natural selection was a tautology suggests that the idea was actually understood very differently in some quarters. Darwin may also have been referring to readers from outside the scientific community, where there seems to have been a good deal of confusion, for instance with Herbert Spencer's philosophy of evolution through the accumulated effects of self-improvement. This point becomes crucial when we move on to the wider implications of Darwinism.

Staying with the scientists for the time being, both respondents raise problems for my view of how evolutionism might have developed into the twentieth century in the world without Darwin. In effect, they accuse me of constructing an artificial model in which the modern Darwinian synthesis would be created exactly as we know it but under a different name. This was not my intention, and I thought I had made it clear that parallels would emerge only at the most general level. Love is quite right to argue that the specific research programs that would become involved would shape the exact course of development and that these would not be the same as the ones that drove our own science. So the non-Darwinian "modern synthesis" would not be the same as ours—but I do think that it is reasonable to suppose it would embody certain basic similarities. There would be a search for new models of heredity around 1900 because there was an enormous cultural pressure promoting interest in the topic (I see no reason to suppose that the lack of Darwinism would prevent the emergence of something like a eugenics program). This would generate new theories of heredity, not necessarily identical to Mendelism but still embodying a "harder" model of transmission. These in turn would undermine the plausibility of Lamarckism and lead to the recognition that a natural form of selection was an important feature of the evolutionary process. I made it quite clear that this would not occur in exactly the same way as we saw in our own science because the developmental viewpoint would be less likely to be eclipsed so completely. I did not speculate on exactly how the new synthesis would be put together because extending the counterfactual technique this far beyond the point of divergence between the two world-lines becomes increasingly problematic. In particular it is difficult to predict the details of the research programs that would be most active. Perhaps, this lack of specificity is responsible for the impression that I thought things would work out exactly the same, but this was never my position. I will return to this point in my more general comments below because it is relevant to the issue of realism in science.

Moving on to the areas where I argued far more strongly that there would be a difference, let us deal first with the question of religion. Both reviewers urge the case of Asa Gray against my view that the absence of the selection theory would have made the religious objections to evolutionism less crucial. True, Gray saw selection as compatible with his Protestant views and resisted the move toward Lamarckism and self-help. James Moore's classic study (1979) showed that some conservative Protestants saw selection as something that could be fitted into their vision of a world corrupted by sin, but the same study also showed that the clergymen whom Moore (1985) called "Herbert Spencer's henchmen" were far more active. Spencer was seen as a *moral* philosopher—Richards (1987, chapters 6 and 7) played a notable role in promoting this reinterpretation, now widely accepted—and his ideology of progress through the cumulative effects of self-improvement was widely influential. I do not think the example of Gray upsets the claim that in a world without Darwin this Spencerian modification of the Protestant work ethic would have been even more influential. True, conservatives such as Adam Sedgwick had many objections to evolutionism, but natural selection's apparent denial of design was a potent component of their position and without its influence the religious objections would have been less strident. Perhaps the most important point for the counterfactualist is that in a world without Darwin, Gray's suspicion of Spencerianism might have robbed the evolutionary movement of one of its most effective scientific spokesmen. But in the end, I think it is reasonable to argue that the growing support for Spencer would eventually have tipped the balance.

Spencer is, in fact, the elephant in the room studiously ignored by both reviewers. If his absence from their responses on religion is surprising, it is even more puzzling that he does not figure in either's position on the issue of "social Darwinism," where Richards' complaints about my handling of Ernst Haeckel form the major bone of contention. This was easily anticipated, because Richards has been a prominent contributor to the move that has sought to distance Haeckel from the involvement in the rise of Nazism alleged by scholars such as Daniel Gasman and Richard Weikart. One of my main purposes in writing *Darwin Deleted* was to challenge the claim advanced by Weikart and his creationist allies that Darwin was somehow responsible for the horrors of the holocaust. To do this, I threw the emphasis onto the non-Darwinian components that were responsible for creating scientific racism and it is certainly true that this brings Haeckel into focus. Richards and I differ in our views of Haeckel and this inevitably puts us on a collision course. Richards sees Darwin and Haeckel as singing more or less from the same hymn sheet; I see Darwin as far more aware of the open-endedness of evolution, less inclined to see progress as somehow built into the system. This means in turn that there was room for difference in their views on how the human races had evolved.

I certainly did not intend to claim that Haeckel's ideas (rather than Darwin's) were a primary force in the creation of Nazism, indeed I went out of my way to suggest that there were other scientific issues involved, some not connected with evolutionism. Indeed, the whole idea of a scientific theory being primarily responsible for the creation of a major political ideology seems ridiculous. But at the same time I do think that in the late-nineteenth-century context, Haeckel was more

inclined to stress racial differences. Adrian Desmond and James Moore's study of Darwin's opposition to racism (2009) makes this point plain. Haeckel was not one of Darwin's primary targets, but whether or not his views were a direct influence on Nazism they did tend to emphasize the differences between the races. Darwin thought some races were "higher" than others, but insisted that they all shared a common human origin. Haeckel suggested a greater degree of divergence, but it was the anti-Darwinian proponents of parallel evolution who created the most potent images of the human races being independent products of totally separate lines of development. This model of independent evolution duplicated the image of the independent creation of races proposed by more conservative naturalists such as Louis Agassiz (Darwin's real target according to Desmond and Moore). My intention was not to "shift the blame" to Haeckel, whose developmentalism was far less rigid, but I do not accept the view that he can be excused completely from playing a role in the creation of scientific racism. My main point was that in a world without Darwin the element of parallelism favored by the more extreme developmentalists would have had even more force and would have encouraged those who dismissed the "lower" races as being not fully human.

I want now to turn to the wider issue of the potential value of counterfactualism in the history of science. I had hoped that the reviewers might comment more widely on whether the technique might have other applications. Obviously, if you reject counterfactualism in general, you will not see it as having a potential to work in this area. But even if you share my feeling that Darwin did make a crucial difference, you might argue that his situation was exceptional and that other cases where discoveries might have been deflected into a different path will be hard to find. Unfortunately, neither reviewer was inclined to explore the issue in these terms. Richards, indeed, seems hostile to counterfactualism in general, citing Richard Evans, a longstanding opponent of the technique. And although he does not follow up with an extended general critique, his frequent repetition of the mantra "who knows?" suggests that he finds the whole thing too speculative to be worth bothering with.

Love is certainly more sympathetic to counterfactualism, despite his reservations about my own specific example. I hope the responses given above show that I am aware of the dangers as well as the potential advantages of the approach. I do not really want to go into details about the case for counterfactualism, beyond what is already given in the first chapter of my book. Of all the advantages attached to the counterfactualist project, the most important for me is that in the (possibly quite rare) instances it can be applied, it can force us to rethink the validity of connections and causes we had assumed were intrinsic or necessary to the events actually witnessed. Love is quite right to point out that much of my argument could be predicted from my earlier, more straightforward histories, most obviously *The Non-Darwinian Revolution*. I have spent much of my career trying to show that Darwin's theory of natural selection was not the be-all and end-all of nineteenth-century evolutionism. *Darwin Deleted* uses its unconventional hypothesis in order to reach a wider body of readers and persuade them that we need to take the alternatives to selection seriously if we are to understand the rise of the evolutionary world view. Arguing that these rival ideas could have had the power to persuade the world to

take evolutionism seriously in the later nineteenth century even if Darwin had not written the *Origin of Species* is a way of forcing people to take their effect seriously in our own world. Suggesting that their very different implications in the realm of morality (again, clear from their effect in the real world) might have ensured a smoother ride for the theory is an attempt to challenge the widespread assumption that science and religion must inevitably come into conflict in this area. Showing that other factors besides natural selection could have promoted racism and ideologies of national conflict is meant to undermine the plausibility of the claim that Darwinism is somehow responsible for Nazism and the holocaust.

The one issue concerning the implications of the counterfactual approach that I do want to respond to is the question of its implications for realism. Love suggests that I adopt a "soft" version of the realist position, citing p. 13 of my book. The passage to which he refers is one in which I acknowledge that an anti-realist could produce a much wider range of counterfactual scenarios—it was not really meant to define my own position. Following talks given on this topic before the book was written I was occasionally criticized on the grounds that my argument implied that science could go in more or less any direction, independently of the need to map its theories onto the real world. It was precisely for this reason that I decided not to opt for the more extreme versions that one could imagine of how the world without Darwin would have developed. I mention briefly the idea that without him people simply would not have taken much interest in this area of science and other areas, such as physiology, might have received even more attention than they did. Even this does not imply that scientific thinking can flourish independently of the real world, only that human priorities can determine which areas actually do get explored at any one time. But I then went on to argue that such an extreme alternative world-line was implausible because of the overwhelming cultural pressure toward an evolutionary perspective in the mid-nineteenth century.

In the end, I argued that the theory of natural selection would be discovered and applied in the twentieth century, along with other factors we now know to be important, somewhat along the lines we actually witnessed. My intention was precisely to head off any claim that I was implying that natural selection was somehow "just an idea" with no necessary relevance to how the world actually works. I seem to have been hoist with my own petard, because as noted above both reviewers chide me for implying that things would come out exactly the same in the world without Darwin. As I have explained, that was not my intention, and I am sure that the details of any "modern synthesis" would be different—but the concept of natural selection would eventually have come to play a significant role. That is because it does reflect an aspect of how nature actually works. Indeed, I think the situation is more restrictive than many commentators imagine, since as far as I know if we accept that adaptation is an important factor in evolution there are only two ways of explaining it that have ever been proposed: natural selection and the Lamarckian inheritance of acquired characteristics. Back in the 1960s and 1970s many would have said that that left selection as the only game in town, since Lamarckism had been shown to be invalid. Now things seem a little more complex, enough to leave room for some variety in how the scientific world might have put

together its evolutionary thinking, but I accept that some form of selectionism is bound to be an important component.

Accepting that some form of natural selection is a component of the real world does not get us very far; however, when it comes to unpacking how different naturalists envision the process working. When articulated as a working theory, with associated research programs, the basic idea is open to a wide range of interpretations and these have many different implications. I have already accepted that in a world without Darwin the modern synthesis would have been put together in a different way and would reflect the priorities of the scientists involved. More seriously, it would have different moral and ideological implications, and one does not have to be a counterfactualist to recognize that at this level we are dealing with a human construct not a fact of nature. Perhaps this makes me a soft realist—I am not enough of a philosopher to be sure.

Darwin's theory was so shocking because he used it to express a vision of nature as cruel and impersonal, with only the most remote indications of any ultimate purpose. I have already noted that Wallace's rival version was significantly different even when he was interacting with Darwin, and in the absence of the latter's influence we can be pretty certain that his vision would have been even more remote from what we know as Darwinism. Despite his reference to Malthus as a key inspiration in the conception of his 1858 paper, he seldom mentioned Malthus in his later expositions of the theory. These contain few references to an implacable slaughter of all but the best-adapted, an indifference that chimes with his refusal to see the human breeder (who breeds only from his best animals) as a model. Wallace was a socialist and a deeply religious man who ended up writing a book entitled *The World of Life* (1911) which depicted evolution as the unfolding of a divine plan. The architects of the modern synthesis also abandoned the Malthusian image and several of them had moral and even religious agendas that they incorporated into their thinking about evolution. Darwin created a particular model of natural selection, not the only one, and not the one that necessarily reflected the ideology even of his own time and social class (Spencer's self-help progressionism did that far better). It is for that reason that I think it is worth speculating about how things might have developed if circumstances had removed the one person who was in a position to create and promote that model from the scene.

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