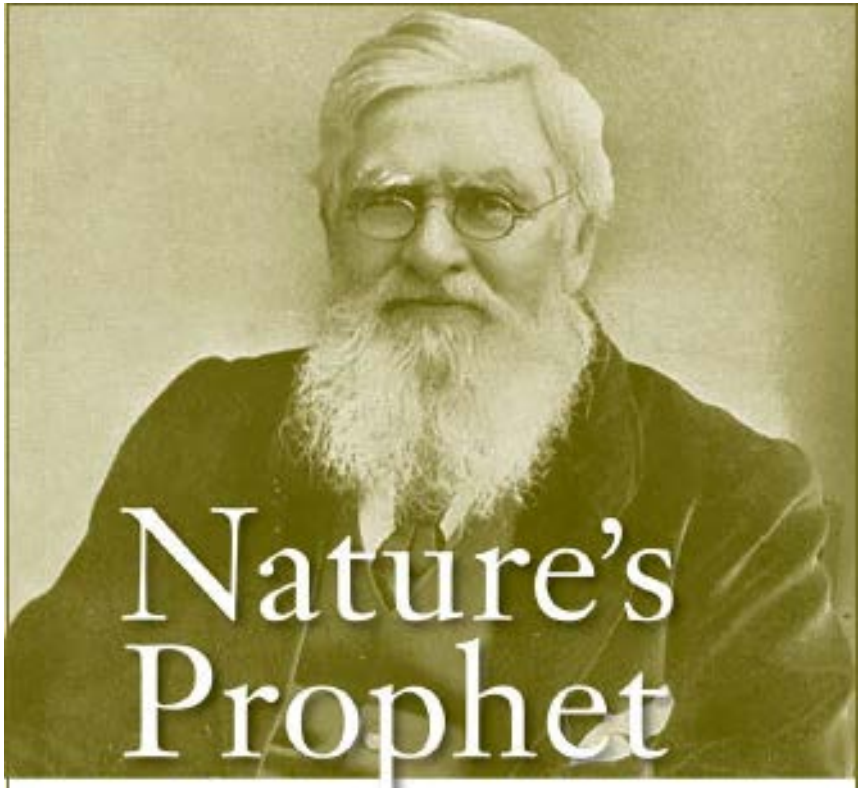

Nature's Prophet

ALFRED RUSSEL WALLACE and His Evolution from Natural Selection to Natural Theology

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Frontispiece. Sketch by A. Webster of Alfred Russel Wallace that first appeared in the *Full Report of the International Workers' Congress*, London, July and August 1896; courtesy of the University of Edinburgh, Special Collections, SD 8400.

The old argument from design in Nature, as given by Paley, which formerly seemed to me so conclusive, fails, now that the law of natural selection has been discovered. . . . There seems to be no more design in the variability of organic beings, and in the action of natural selection, than in the course which the wind blows.

—Charles Darwin, *Autobiography*

My contribution is made as a man of science, as a naturalist, as a man who studies his surroundings to see where he is. And the conclusion I reach in my book [*The World of Life*] is this: That everywhere, not here and there, but everywhere, and in the very smallest operations of nature to which human observation has penetrated, there is Purpose and a continual Guidance and Control.

—Alfred Russel Wallace, *New Thoughts on Evolution*

For we know in part, and we prophesy in part. . . . For now we see through a glass, darkly; but then face to face: now I know in part; but then shall I know even as also I am known.

—1 Corinthians 13:9, 12 (KJV)

Preface

The purpose of this book is to place Alfred Russel Wallace within a context that allows him to stand out in bold relief against the other leading biologists of his day, most particularly Charles Darwin. The argument is essentially this: Wallace's understanding of the natural and metaphysical worlds eventually became one—an integrated whole of scientific, social, political, and metaphysical thought—through the latter half of his life, forming a revised natural theology over the moribund special creation of William Paley. While some very good work on Wallace's scientific and social ideas has been done, far less attention has been paid to his natural theology. How Wallace's embrace of spiritualism and libertarian socialist views functioned synergistically with his scientific, moral, and ethical worldviews becomes an important part of the story.

While the focus is clearly on Wallace, he is impossible to discuss without comparing and contrasting him with Darwin. Their association with the theory of natural selection will forever place them on the same page of the history of science, if only, in Wallace's unfortunate case, often as a footnote. Their relationship was complicated by the stratified class structure of Victorian England, and the comparatively lowborn Wallace found himself negotiating a complex lifelong association with wellborn Darwin that varied between that of mentor and protégé, professional colleague, and occasional adversary. Wallace always regarded Darwin highly—even as the *Newton of Natural History*!—and he always considered himself a Darwinian. But, as will be discussed, this is deceptive. For all of Wallace's adulation and praise of Darwin, their differences were many and real.

This forces a careful and critical analysis of their respective views. As the following chapters will make plain, I view Darwin's evolutionary theory as vulnerable from several standpoints. This alone will cause controversy. It

is a sad commentary on today's marketplace of ideas that books critical of Darwin too often become thrown into the heap of Christian subculture literature that views the bible as a scientific textbook dictating a six-thousand-year-old Earth with dinosaurs floating on the ark among Noah's menagerie. Readers who hold that view will not find this book congenial company. On the other hand, serious critics of Darwin without such religious motivations (some to be discussed later) can be found in every generation and in many different disciplines since *Origin of Species* was first published in 1859.[1] At least in part, this book fits within that genre.

Nevertheless, I feel compelled to correct a misconception that might accumulate as the reader proceeds through the chapters that follow; namely, that I have no respect for Darwin or his prodigious accomplishments. This impression would be false. Darwin was a kindly, thoughtful man—especially to Wallace—and a fearless scientist. It is easy to forget with 20/20 hindsight how disturbing Darwin's views were to a generation still steeped in an ideology of biblical special creation. That Darwin was able to overcome his genuine concerns at unveiling a picture of the natural world that made God superfluous, a view that would cause a good portion of his generation to recoil in horror, is a testament to his courage and faithfulness to what he believed to be the truth. It came at a cost and it made him, in Adrian Desmond and James Moore's words, "a tormented evolutionist." Even his wife, Emma, worried over the state of his soul!

Darwin is also to be applauded for his rhetorical skill. As Edward Manier and John Angus Campbell have explained in detail, Darwin had to combine evidence from many different disciplines (some nascent and ill-defined in his day)—geology, geography, biogeography, invertebrate zoology, comparative embryology, anatomy, paleontology, anthropology, and sociology—to establish a new field of inquiry (much of which flew in the face of convention) with its own nomenclature, and he had to present his case convincingly enough to persuade a sufficient portion of his readers to establish his new theory.[2] In this sense, Darwin's achievement was not just theoretical; it was a practical tour de force of argumentation that still has much to teach the student of expository structure. There are few cases in the history of science as impressive as Darwin's constructive rhetorical feat. It shines forth on nearly every page of *Origin*.

Unfortunately, some of this radiance has obscured Wallace and, because of his controversial views on phrenology, spiritualism, land nationalization, vaccination, women's rights, cosmology, and biology, he has been shoved into the dark recesses of what many regard as pseudoscience and crank speculation. Even in his own lifetime the notion emerged that Wallace was a good scientist gone bad. Wallace knew it, and he too had the courage of

his convictions. In his later years, he fought against this marginalized view, an effort that largely remains buried in the primary-source literature. This book is presented in an effort to recall Wallace's alternative vision with sympathy. It asks no more than Wallace himself asked for: not for agreement but simply a fair place in the history of ideas.

Acknowledgments

As with all projects of this kind, assistance from many sources helped bring this project to fruition. A few, however, bear special mention. The idea for this comprehensive treatment was really prompted by my participation in the Second International Conference on Alfred Russel Wallace, held November 7–8, 2013, at the Riverside Majestic Hotel in Kuching, Sarawak, Malaysia. My paper "Alfred Russel Wallace, Nature's Prophet: From Natural Selection to Natural Theology" formed a basis for the present book. Meeting so many Wallace scholars from around the world helped to develop my ideas regarding this most fascinating scientific figure. I sincerely thank Dr. Andrew Alek Tuen for organizing the conference and serving as a congenial host for such an impressive gathering.

I also want to thank Elizabeth Quarmby Lawrence, assistant rare books librarian at the Centre for Research Collections at the Edinburgh University library, for her help in accessing and working with the Wallace Collection described in the bibliography. Her assistance during my visit to this enlightening repository was indispensable in making for a very successful and rewarding research trip.

Closer to home I must extend my thanks to several others. First, appreciation goes to Peggy Balch, a colleague at the University of Alabama at Birmingham. She bore my many Wallace ruminations over the past several years with unflagging support, from direct assistance to her long-suffering equanimity in serving as a sounding board. She was always helpful and encouraging beyond measure. Second, thanks to Beth Motherwell, an acquisitions editor at the University of Alabama Press. Her sustained interest kept me on task and goal-directed. Also, I am extremely thankful for the careful editing of Joanna Jacobs and Dawn Hall. Their diligence and attention to detail, like all good editors, turned a manuscript into a book and

rescued me from myself more than once. Finally, I sincerely thank two peer reviewers for their thorough readings. Their careful and critical suggestions genuinely and appreciably strengthened the manuscript.

Finally, my thanks and deepest appreciation goes to my wife, Dona, who traversed the globe with me as I pursued my passion for Wallace. Not only did she put up with excruciatingly long plane rides, but also her essential work with me on Wallace's personal library enabled us to examine and notate nearly five hundred books in just a couple of weeks. Her companionship and unflagging support was—*as always*—an invaluable source of encouragement.

All these allies notwithstanding, any errors of omission or commission are solely my own. I offer it to the public in the interest of opening up the discussion and bringing to the fore the full range of topics that were so important to this remarkable explorer of worlds material and immaterial—Alfred Russel Wallace was a man at home in *both* magisteria.

Nature's Prophet

Introduction

A Life in Science and the Life Sciences

Despite the notability of Alfred Russel Wallace in his own day, he remains a comparatively obscure figure in the history of biology. Standard college textbooks on the subject barely mention him.[1] It is, therefore, likely that a considerable segment of the reading public needs some introduction to a man inextricably intertwined with the British naturalist who needs no introduction at all—Charles Darwin. Born on January 8, 1823, in Usk, an obscure English-Welsh border town, Wallace had little formal schooling, learned surveying from his brother William, taught himself botany and entomology, and with his newfound beetle collecting friend, Walter Henry Bates (1825–1892), became captivated by the wonders of nature. When he read the anonymous *Vestiges of the Natural History of Creation* in 1845 (now known to have been written by Robert Chambers [1802–1871]), a book that sparked his passion to unlock the secrets of transmutation, he went off with Bates to explore South America from 1848 to 1852. Unfortunately, during his journey home, the ship, *Helen*, loaded with flammable copaiba, balsam, and rubber, caught fire, destroying all his private collections of birds, insects, live animals, notes, sketchbooks, and just about every record of his four years in South America.

Despite his losses Wallace managed to publish two books in 1853 about his time on the South American continent: *Palms of the Amazon and Rio Negro* and *A Narrative of Travels on the Amazon and Rio Negro*. His book on palms was published at his own expense and had a small print run of 250 copies. It received a favorable review in the *Annals and Magazine of Natural History*, but privately, leading scientists like botanist Sir William Jackson Hooker (1785–1865) and fellow explorer-botanist Richard Spruce (1817–1893) were less impressed. His *Narrative* fared little better. Although 750

copies were published, one-third of them remained unsold nearly a decade later.[2]

In 1854 Wallace decided to redeem his earlier failure in South America by traveling to the Malay Archipelago (today known as Maritime Southeast Asia). As Wallace himself put it, there, "I was to begin the eight years of wandering throughout the Malay Archipelago, which constituted the central and controlling incident of my life."[3] It was "central and controlling" because during this expedition (ca. March 25, 1858), Wallace sent Darwin a remarkable letter, "On the Tendency of Varieties to Depart from the Original Type." Darwin, sitting comfortably at Down House with his voyage on the HMS *Beagle* long behind him and his epoch-making evolutionary theory still languishing in manuscript, received the letter on June 18 and was stunned: "I never saw a more striking coincidence," he wrote Charles Lyell on June 8, "if Wallace had my M.S. sketch written out in 1842 he could not have made a better short abstract! Even his terms now stand as Heads of my Chapters."[4]

What should he do? Do nothing and Darwin risked being preempted by Wallace; release his own version without mention of the letter, which Wallace had sent from Ternate in the Malay Archipelago, and risk being called out by Wallace for plagiarism. After some mutual consultation among Darwin and his confidants Charles Lyell (1797–1875) and Joseph Hooker (1814–1879), the three decided to read selections of Darwin's work along with Wallace's letter at the next meeting of the Linnean Society. Thus, on July 1, 1858, the modern theory of descent with modification by means of natural selection was first unveiled. Of course, on the other side of the earth, it was impossible to consult with Wallace in advance. When he *did* learn of what transpired, Wallace was elated. In the highly stratified class system of Victorian England, Wallace, a man of modest birth and modest means, was given an opportunity of a lifetime—entrance to the elite circles of British society through one of the most prestigious scientific organizations in London. Writing home, Wallace declared, "This ensures me acquaintance of these [important and influential] men on my return home."[5] Interestingly, as if to emphasize his satisfaction with the way his theory was presented and to allay any concerns that he might have felt otherwise, Wallace added in the later abridged version of his autobiography, "Of course I not only approved, but felt that they had given me more honour and credit than I deserved, by putting my sudden intuition—hastily written and immediately sent off for the opinion of Darwin and Lyell—on the same level with the prolonged labours of Darwin."[6]

Wallace's debut at the Linnean Society meeting transformed the wandering naturalist into an important figure within British science. Until then

Wallace was known among collectors as little more than a "specimen haggler," and even then largely through his intermediary for those sales, Samuel Stevens (1817–1899); and while his earlier Sarawak Law paper caught the attention of a few, it was by and large ignored by Darwin.[7] The Linnean Society reading of Wallace's paper was significant. In fact, the association with Darwin's theory of natural selection tended to make Wallace's ideas appear more closely related than they really were, a point that will be addressed in more detail later in this book.

Nevertheless, the unveiling of the modern theory of evolution by means of natural selection was fortuitous for both men. Wallace received the renown he could never have achieved on his own, and Darwin now had the impetus to finally release his ideas to the public, which he did in November 1859 with *Origin of Species*. It transformed both their lives. On a personal level Wallace and Darwin remained cordial throughout their lives, and Darwin was so appreciative of his younger colleague's magnanimity that he even led a successful campaign to obtain a government pension of £200 per year for Wallace in recognition of his service to science and the nation.[8]

By the time of Darwin's death on April 19, 1882, Wallace had done much to earn the pension awarded him. His years traversing Maritime Southeast Asia from March 1854 to March 1862 are chronicled in *The Malay Archipelago* (1869), one of the few scientific travel narratives in continuous print to this day.[9] This masterpiece, regarded by many as perhaps the greatest work of its kind in the English language, influenced the literary work of such notables as Joseph Conrad (1857–1924) and Somerset Maugham (1874–1965).[10] His *Geographical Distribution of Animals* (two volumes, 1869) has earned him the title "father of modern biogeography," and a professional award in that field bears his name.[11] Ever sensitive to the interplay of climate, geography, and the nature and diversity of biological life, Wallace wrote *Tropical Nature* (1878) to clarify and dispel many erroneous ideas that had grown up around what really composed the characteristics of the tropical zones as distinguished from the temperate zones.[12] Although ostensibly written to address Darwin's assertions concerning coloration in animals "explained" by his theory of sexual selection, it has perhaps been more significantly identified as anticipating Rachel Carson's *Silent Spring* in its concern for the fragility of tropical habitats and the intrusions of European civilization on them.[13] Wallace's pathbreaking book on island ecosystems, *Island Life* (1880), was dedicated to Joseph Hooker. Darwin considered this the best of all his books, and it likely served as the catalyst for the senior naturalist's petition for Wallace's pension.[14]

This is no more than a highlight of Wallace's scholarship and life. Altogether he published twenty-two books, more than five hundred scientific

articles, and many others on a range of social, political, cultural, and metaphysical topics.[15] By the time of his death at the age of ninety, Wallace had amassed an impressive array of awards: Medal of the Royal Society (1868); the Société de Géographie's Gold Medal (1870); the Founder's Medal of the Royal Geographical Society (1892); Gold Medal of the Linnean Society of London (1892); election to the Royal Society (1893); the Copley Medal of the Royal Society (1908); and the Order of Merit (1908) to name a few.

Wallace's Reputation in the Darwinian Era

But these accolades beg the question touched on earlier, why is Wallace today a comparatively little-known figure next to Darwin? The literature is replete with examples—*Darwin's Moon*, *In Darwin's Shadow*, Darwin's "neglected double," Darwin's "eclipse" of Wallace—all suggestive of a subordinate status in the annals of history.[16] Michael Ruse has called him "a brilliant scientist" but "a crazy enthusiast for any silly idea floating by."[17] In comparing Darwin's "single-minded devotion to his scientific cause," Andrew Berry praised Wallace's scientific accomplishments and brilliance but concluded that his "scattershot embrace of every needy underdog under the sun smacks of dilettantism."[18]

But was Wallace a "crazy" crank? Was Wallace an undisciplined "dilettante" bemused by every fringe belief he encountered? These dubious distinctions undoubtedly stem from his interest in such heterodox ideas as phrenology, spiritualism, socialism, land nationalization, opposition to vaccination, and women's liberation. While some of these commitments can be seen inchoately early on in Wallace's life, most become overtly clarified in his later years. This book, however, seeks to put these dismissive views of Wallace to the test by seriously investigating Wallace's interests in such unorthodox—even unpopular and heretical—ideas in some detail. All of them emanate from his concepts of nature, human nature, evolution, and worlds seen and unseen. As such, this book is not a biography; it is an intellectual history of Wallace's independent thinking on the conjunctions and ramifications of evolution to the human condition, to the nature of the world and cosmos, and its theological implications.

Others have gone before in this effort to examine Wallace's beliefs, but most have only dealt with a particular aspect such as his commitments to various causes and philosophies, and where more comprehensive treatments have been offered, little unanimity exists on the nature of Wallace's views on these issues or even the paths and influences by which he came to acquire them.[19] Of these, however, the best is Martin Fichman's *An Elusive*

Victorian. Fichman understands that Wallace's later works and ideas "were not the eccentric musings of a declining mind but powerful syntheses of late-nineteenth/early twentieth-century intellectual currents. They incorporated and influenced the thoughts and activities of members of elite and popular cultures on both sides of the Atlantic."[20] Yet even Fichman, who sees Wallace and his American colleague William James (1842–1910) in a similar light, considers such unorthodox figures as "elusive" because "their wide-ranging thoughts and activities defied neat categorization."[21] This book will suggest otherwise.

Here a different view is offered. Wallace, as much as James, can be categorized broadly as an adamant opponent of *scientism*, most broadly defined as the view that science and its methods are all-sufficient in describing and explaining everything from human behavior to cosmic reality. A few words of explanation are in order here. In Wallace's day this would have been known as *scientific materialism*,[22] famously (for some infamously) explicated by John Tyndall (1820–1893).[23] Tyndall unquestionably believed in the primacy of science. While he acknowledged the areas of sentiment, morality, values, and religion, he relegated them into decidedly subordinate epistemological roles. Today we would view Tyndall's scientific materialism as a form of ontological scientism, what Mark Stenmark has described as the more ambitious view "that the only reality that exists is the one science has access to."[24] John Dupré aptly described it as a kind of "metascientific essentialism."[25] Tyndall exemplified these ideas, including a tendency of leading science toward boundary transgression into philosophical and metaphysical realms.[26]

Rather than contrasting Wallace with Tyndall's scientism, it might be more instructive to see him more positively as a theistic pluralist closely allied to the ideas of John Elof Boodin (1869–1950).[27] Although there is no indication that Boodin was influenced by Wallace in any way or conversely that Wallace was aware of Boodin, Boodin's "manifest propensity for speculative daring," his clear call for a reintroduction of teleology into our understanding of the natural world and evolution in particular, his pragmatic pluralism (rejecting reductionist monism and Cartesian dualism), and his conceptualization of God in terms of "personality, creative intelligence, creative beauty, creative goodness, and creative love," all coincide rather compellingly with Wallace.[28] Science was vitally important to both men, but more as a means of creative orchestration rather than as a mandated prescription. The philosopher Andrew Reck has said that "Boodin had sought to accomplish . . . the synthesis of pragmatic methods in theory of knowledge, with empirical scientific results and procedures, to produce a systematic, synoptic metaphysics in which human life is both understood

and idealized."[29] Wallace's project was quite similar and no less ambitious. This will be unpacked in the subsequent chapters. There were—and are—others with a Wallacean vision. These "kindred spirits" past and present will be discussed in chapters 6 and 7.

This contextualization of Wallace's intellectual life needs to be seen as a journey in stark contrast with his more famous associate, Charles Darwin. While Darwin's journey has been described as one from natural theology to natural selection,[30] Wallace's might be regarded as one from natural selection to natural theology. Herein lies Wallace's "crime"—an offense against the zeitgeist of a new emergent era of modern thought ushered in by Darwinian evolution, one that rejected creationism and natural theology, anthropocentrism, Platonic essentialism, and teleology.[31] In one way or another, Wallace embraced all of these, and he paid a professional price for it.

Many of Wallace's detractors (then and now), believing that science is defined by the lawlike operations of the physical world it observes and measures, have argued that it must perforce be governed by methodological naturalism (that is, the notion that scientists must invoke only natural processes via unbroken natural laws in nonteleological ways). But, as we shall see, it was by no means clear to Wallace (or many of his colleagues) that a natural law resided strictly in the empirical world of normal experience forming a sharp epistemic boundary. To them, methodological naturalism became the operative companion not to scientific practice but to philosophical positivism, the belief increasingly common among nineteenth-century men of science who viewed the scientific project as the discovery and elucidation of laws operating through purely natural or secondary causes primarily using mechanistic or materialistic causes to the exclusion of any and all supernatural and/or teleological factors.[32] Many have long known that Darwin's theory expressed "an ideology of positivism" that had its own "implicit metaphysics . . . that *all* events are part of an inviolable web of natural, even material, causation."[33] This should not be surprising since the influence of David Hume (1711–1776) and Auguste Comte (1798–1857) on Darwin's thought has long been known.[34] Thus, the central question underlying Wallace's apostasy from Darwinian evolution was in many ways not scientific at all, but rather philosophical and metaphysical.

One need not go to Christian theologians to find critiques of the positivistic materialism implicit in Darwin's theory. The philosopher-sociologist Max Horkheimer (1895–1973) questioned materialism for "trying to explain everything spiritual, and especially consciousness and reason, as pure illusion (in contradiction to the most instinctive thrust of reason itself) or

as trying to derive the spiritual from material process with the aid of artificial hypotheses and questionable appeals to future scientific discovery."[35] He attacked Darwinism for its diminution of reason in subservience to the operations of natural selection and its running "roughshod over the 'useless spiritual.'"[36] Indeed the assumptions embodied in Darwinian and neo-Darwinian accounts of nature and especially of the unique nature of humanity have been questioned since they were first proposed more than 150 years ago. Even while Darwin continued to push his pen at Down House, complaints could be heard. One French correspondent, for example, exclaimed, "Will there not be found in British science a man of eminence to fight the battle of good sense and of the facts, against the monstrous imagination of Darwin?"[37] There were. Men like William Whewell (1794–1866), John Herschel (1792–1871), and St. George Mivart (1827–1900) all had their own complaints against the theory. It is a fascinating irony that Wallace, who defended Darwin against all of them, ultimately stepped up to answer the Frenchman Paul Janet's plea himself.

But was Wallace a Darwinian? It surely wasn't the concept of what was then known as "transmutation" or evolution that formed the dividing line for these men. Mivart was not only a proponent of the idea, more so than Whewell or Herschel's special creationism, but also so was Darwin's close confidant and advisor Charles Lyell, who held a more nuanced view that evolution occurred gradually over time but required some larger force beyond to make it work. So it surely was not the mere concept of evolution that formed a distinct intellectual boundary. Doren Recker's question—How *do* we recognize a Darwinian?—is an important one.[38] There are probably two main factors: (1) a commonly held constellation of beliefs, and (2) sociological issues. Both are fluid and malleable. For example, Asa Gray (1810–1888) always rejected Darwin's belief that his theory rendered God perhaps not absent but surely superfluous to the process; instead, he loudly touted Darwinian theory in America, but recast it in a theistic form. Thus, Gray could be seen as a Darwinian *in spite* of his insistent theism largely for the very public promotional boost he gave to the theory. With Gray the weight of the sociological impetus he offered for Darwinian evolution counters any theistic amendments he may have gratuitously added on his own. He was, taken altogether, a Darwinian theist. On the opposite side of the coin Mivart may be excluded as a Darwinian. Here again social context matters, although for different reasons. Mivart had similar religious leanings to Gray, and in some ways Mivart seemed to understand and appreciate certain aspects of Darwinian theory even better than Gray, but his savage public attack on Darwin's *Origin of Species* and *Descent of Man* preclude his admission into Darwin's camp then and now.[39]

Wallace is a more complex case. Wallace certainly defended natural selection, and his book *Darwinism: An Exposition of the Theory of Natural Selection with Some of Its Applications* (1889) would suggest that he considered himself a Darwinian or at least sufficiently associated with Darwinian evolution to serve as its spokesman after its namesake's death. In fact, at one point Wallace insisted, "I have always advocated [natural selection] unreservedly; while in extending this principle to almost every kind and degree of coloration, and in maintaining the power of natural selection to increase the infertility of hybrid unions, I have considerably extended its range. Hence it is that some of my critics declare that I am more Darwinian than Darwin himself, and in this, I admit, they are not far wrong."[40] But Wallace had other ideas about Darwinism, and such a statement needs to be taken in context with his other views, most notably the overall limitations Wallace placed on natural selection in explaining certain aspects of nature (the origin of life and consciousness), the special attributes of humans, and in natural selection as a force in the elimination of the unfit. When, in the April 1869 issue of the *Quarterly Review*, Wallace called on "an Overruling Intelligence to explain the special moral and mental attributes of man,"[41] the split between the two naturalists was open and irrevocable. They were too gentlemanly and fair-minded to let it destroy their friendship, but it was clear to all that Wallace's intellectual trajectory was away from Darwin not toward him.

For all of Wallace's vocal support of Darwin's *Origin of Species* and natural selection in general he was considered an "outsider" by Darwin's inner circle, the X Club led by his "bulldog defender" Thomas Henry Huxley (1825–1895).[42] Wallace, whose defection would not be forgiven, and Lyell, who persistently called for some higher power at work in evolution, were *not* on the club's invitation list. In spite of Wallace's status as codiscoverer of the theory of natural selection and his outwardly congenial relationship with Darwin, his call for some higher intelligence in explaining humankind was heresy to the Darwinian faithful. Huxley revealed the ideological nature of his campaign for Darwin with unusual frankness when he privately told Mivart, "One cannot go on running with the hare and hunting with the hounds."[43] Huxley's "hounds" were not pursuing the "hare" of evolution as such—were that the case Mivart would have not been in such conflict—they were pursuing the "hare" of creationism or anything that even hinted at higher teleological explanation. In that sense Wallace always would share more with Mivart than Huxley. His own persistent embrace of the term notwithstanding, Wallace cannot be considered a Darwinian. This book will explain why.

Wallace's Greatest Journey

Wallace took a journey Darwin could not follow; he went from natural selection to natural theology, and it is this journey that this book seeks to retrace. Wallace's heresy is not simply rooted in his spiritualism, socialism, or radical feminism alone—although each in their own ways played their part and each were logical outgrowths of Wallace's mature evolutionary theory—his heresy was that his ideas when taken together ultimately smacked of creationism. It did not look like William Paley's special magic wand brand of interventionist creationism, nor was it festooned with images of Nature's perfection with happy bees flitting about idyllic gardens; it was rooted within aspects of the natural world and in certain "contrivances" of nature suggestive of an artificer on a cosmic scale. While not dependent on Christian theology, neither did it negate it.

Wallace's formulation of evolution was quite incompatible with Darwin's. Wallace's theory might be called *intelligent evolution*, a theory of common descent based on natural selection strictly bounded by the principle of utility (that is, the idea that no organ, attribute, or morphological feature of an organism will be developed and retained unless it affords it a survival advantage) within a larger teleological and theistic context.[44] This would appear to be the basic reason for Wallace's fall from grace, a fall experienced among his colleagues in his own day and carried forward to today. As such, Wallace's intelligent evolution forms a central leitmotif for the chapters that follow.

If Darwinism were merely just another scientific theory, none of this would have occurred. Wallace would likely have received one of the highest academic posts in the land and been carried triumphantly on the shoulders of adoring students on campus grounds (as indeed the students at Edinburgh University did when penicillin's discoverer, Alexander Fleming, was appointed vice-chancellor in 1952). There were no such encomiums for Wallace. Exactly *why* has to do with the nature of Darwinian evolution. Daniel Dennett—himself an enthusiastic Darwinist—bespoke its essence in calling it a "universal acid" that is "so corrosive that it will eat through *anything!*" That, according to Dennett, is Darwin's "dangerous idea," an idea that cuts through and eats away just about every traditional concept and leaves in its wake a new and revolutionized world that has been irrevocably transformed.[45] Far from fearing such an acid, Dennett invites us into this *Deus sive Natura*; a Nature of the numinous with the Tree of Life in all its resplendent glory. "I could not pray to it," concludes Dennett, "but I can stand in affirmation of its magnificence. This world is sacred."[46]

Others are less convinced and would stand Dennett's argument on its head. R. H. Barfield (1895–1977) believed that Darwinism sought nothing less than absolute hegemony in the modern world:

> To justify this claim it must show that biology—or the whole field of living things—can be brought under its sway. That is to say it must be able to account for the origin of life and evolution subsequent to this origin, up to and including man himself, with all his special attributes. Failure in any part of this vast field will throw doubt on the whole of the realms over which it has established itself with such marked success, and this is the reason why Darwinism has been so welcomed by scientists and the world in general.
>
> In fact in the attempt to eliminate the idea of the "creation" in its religious sense—a word that nineteenth-century materialism could not stomach, and that today has become almost a "dirty" word in the collective psyche of our age—wishful thinking pounced on Darwin's *Origin of Species* as a veritable windfall; it became, we might almost say, the bible of the negation of God or spirit in nature.[47]

This was Wallace's "crime"—he became a *creationist*. So intimately associated with aspects of the very theory that sought to deny it, Wallace developed his own unique version of creationist evolution. Eschewing the natural theology of William Paley (1743–1805) and its overt Christian doctrine, Wallace crafted a refurbished natural theology, at once progressive and teleological. Wallace's formulations were broad and wide-ranging, so much so that they could accommodate any of the Abrahamic religions, though Wallace was not himself a religious man. It was Wallace's greatest journey, an intellectual odyssey that began among the Indians of South America and the natives of Maritime Southeast Asia and concluded after more than ninety years on the planet he found so fascinating.

In the final analysis, this may tell us more about that nature of our science than about Wallace. Sherrie Lyons has offered a historical analysis of those Victorians who lived on the margins of science. For her, men (Wallace among them) who took the route less traveled into those uncharted waters known as spiritualism and teleology may have attempted to understand the deep meanings of human life and existence, but such inquiry, according to her, "is not a fruitful one for furthering the advance of knowledge."[48] But this is more of a philosophical position than a factual assertion. It might be argued that this is a deliberate misunderstanding of Lyons's meaning. If what is meant by fruitful are those theories that produce new investigation and hypotheses, then her preemptive exclusion of Wallace's—and others—

interests in these areas is precisely the point. Why must spiritualistic and/or teleological hypotheses be ruled out of court as fruitful? This is investigated further in chapter 7. But for now, it is worth asking, must intellectual advance be measured solely by naturalistic assumptions? Are fruitful ideas simply those that conform best to the reigning paradigms? We should note Arthur Koestler's warning, issued even before Thomas Kuhn's, that science is neither cumulative nor linear: "The philosophy of nature evolved by occasional leaps and bounds alternating with delusional pursuits, *culs-de-sac*, regressions, periods of blindness, and amnesia. The great discoveries which determined its course were sometimes the unexpected by-products of a chase after quite different hares[!]. At other times, the process of discovery consisted merely in the cleaning away of the rubbish that blocked the path, or in the rearranging of existing items of knowledge in a different pattern. The mad clockwork of epicycles was kept going for two thousand years; and Europe knew less geometry in the fifteenth century than in Archimedes' time."[49]

This is not to say that heterodoxy has its own privilege; it does not. But teleology, the nature of human personality, qualia and consciousness, even evolution and evolutionary progress—all issues central to Wallace—are not settled questions even today. As one reviewer replied to Lyons, one cannot propose to take "Victorian science on its own terms" on the one hand and at the same time pass "judgment on both her historical actors and the historical record."[50] The error here is not only found in the presentism about what counts as science and scientific inquiry, it is also rooted in the premature assumption that science has settled more questions than it really has. To fairly assess Wallace we must abandon such preconceptions.

Plan of the Book

The purpose of this book is to trace in some detail the course of Wallace's *intellectual* journey. It was by far his most adventurous and profound. Chapter 1, "Wallace on Man," describes how he embarked on his scientific and philosophical expedition; his description came in a paper he read before the Anthropological Society of London on March 1, 1864. Although no one recognized it at the time, this intellectual journey would form the source of Wallace's fundamental break with Darwin; that is, his belief in the inability of natural selection to account for the special attributes of human beings. Chapter 2, "The Spirit of Science," examines the new climate of scientific inquiry ushered in by Darwin's theory. Much more than just a scientific theory, Darwinian evolution had its own baggage; its assumptions and philosophical commitments are unpacked and assessed within their historical

contexts. It is shown that Darwin's implicit reliance on chance explains the central divide between the two naturalists. In chapter 3, "Darwin's Heretic," Wallace makes his profound challenge to Darwinian doctrine open and unequivocal in the *Quarterly Review* article mentioned earlier. Darwin was appalled, but Wallace never retreated and continued to elaborate and develop his own evolutionary alternative, intelligent evolution. Chapter 4, "The Science of Spirit," looks at the sources of his theistic evolutionary ideas, many of which came from Emanuel Swedenborg (1688–1772), Robert Owen (1771–1858), and Edward Bellamy (1850–1898). Wallace's natural theology is laid out in three major books published late in his life—*Man's Place in the Universe* (1903), *The World of Life* (1910), and *Social Environment and Moral Progress* (1913)—each of which are reviewed and examined in some detail to round out the chapter. In chapter 5, "Wallace's Integrated World," the notion of "two Wallaces"—Wallace the scientist and prescient evolutionist versus Wallace the spiritualist and heterodox contrarian—is examined and exposed as a mythology perpetrated by George J. Romanes (1848–1894) and unfortunately carried forward in subsequent generations. This chapter presents Wallace's scientific and metaphysical contributions in a less disjunctive and dissected manner. Chapter 6, "Divided Legacy," looks at those today who have attempted to place Wallace's ideas within the context of various philosophical systems. The parade of philosophical ideas associated or compatible with Wallace is rather stunning and has not been covered comprehensively in the Wallace literature to date. Those ideas include process philosophy, scientism, the Gaia hypothesis, and cybernetic final cause. These will each be examined in some detail. We will also see that despite the multifarious perspectives on Wallace, when his ideas are placed properly within a coherent natural theology, a rather noble lineage of kindred spirits have converged to carry the Wallacean vision forward well into the twentieth century. Some of the century's best and brightest have argued that far from representing a collection of quaint but antiquated notions about the nature of humans and the cosmos, the teleological universe and our special place in it are still very plausible—indeed likely—meanings for existence.

Chapter 7, "Wallace Today," reviews Wallace's current status and position. Wallace's ideas are still very much alive among available options in explaining the deep questions that have captured the attentions of some of the greatest minds in human history. The central question this book addresses is not whether Wallace was "right" or "wrong," but if a major historical figure of Wallace's stature deserves a thorough examination of *all* his ideas (not just the ones we agree with or are comfortable with), and if

so, are those ideas still relevant today? This book has been written with the conviction that the answer to both is yes.

But while this may complete our journey with Wallace's intellectual odyssey, there is a broader implication to be drawn. In the epilogue, "Wallace and the Historian's Craft," Wallace is recast within a more appropriate historical framework. It is argued that the conventional methodology of reexamining and interpreting the primary resources and placing them within a thoroughly critiqued historiography is inadequate to the task. It is, of course, indispensable as a starting point, but it does not go far enough. It is not a question of methodology but of mindset. This fresh historical mindset is offered in the perceptive analyses of Owen Barfield (1898–1997) and John Lukacs (b. 1924). In so doing Wallace is seen not simply as an abstract Victorian figure but as a live *participant* in the past. This concept of participation *in* history and *with* history, so integral to the ideas of Barfield and Lukacs, eschews notions of objectivity and subjectivity in favor of participative honesty. In this way, perhaps we may avoid looking at Wallace—and others like him—with such a jaundiced eye.

1

Wallace on Man

A Match Lit in the Vapor of Controversy

Wallace established himself in the anthropological community with a controversial address delivered before the Anthropological Society of London on March 1, 1864, "The Origin of Human Races and the Antiquity of Man Deduced from the Theory of 'Natural Selection.'"[1] The field at this time was mired in controversy and contention over long-standing arguments between the polygenists (proponents of multiple origins of human races) and monogenists (proponents of a single origin of human races). The question was simple enough: were the races of the human species departures from a single basic type or from several types?[2] Representative polygenists could be found among Southern apologists for the institution of slavery in ethnologically inclined physicians like Josiah Clark Nott (1804–1873) of Mobile, Alabama, and Samuel A. Cartwright (1793–1863) of Natchez, Mississippi. Separate racial origins suggested separate physical and mental characteristics, and the proponents of "states' rights medicine" calculated differences—real or imagined—with meticulous care. Nothing escaped their notice, from cranial size and brains to blood and skin color. Nott and Cartwright confirmed "scientifically" what every Southerner "knew" intuitively: blacks were inherently inferior.[3] Others, like the former slave and leading abolitionist Frederick Douglass (1818–1895), argued for monogenism, equating black equally with the unity of all mankind, and the American Lutheran minister and ornithologist Rev. John Bachman (1790–1874) argued the monogenist case on biblical grounds.

Such firmly held commitments were mirrored in England where polygenism found congenial company among an imperialist Britain at the height of empire. The camps were divided between the Ethnological Society of London (ESL), founded in 1843 by Richard King (1811?–1876), Ernst Dieffenbach (1811–1855), James Cowles Prichard (1876–1848), and

others. The Anthropological Society of London (ASL) had recently broken away from the ESL on the initiatives of Charles Carter Blake (1840–1897) and James Hunt (1833–1869), both of whom were staunch pro-Southern, pro-slavery apologists. The rhetoric of the ASL was openly racist, but in some measure, it merely reflected the reigning views of British elites at the time. William Gladstone (1809–1898) was openly pro-Confederate, and although Benjamin Disraeli (1804–1881) was more reticent to take a position, he fully expected Southern victory and declared what most believed when he said, "Race implies difference, difference implies superiority, and superiority leads to predominance."[4] Nevertheless, Hunt's polemical tone against Darwinian evolution irked some of Darwin's strongest supporters. Huxley despised Hunt and considered him unfit for the ASL.[5] Jeremy Vetter has accurately characterized the differences between the two organizations, each having its own social composition and political ideology, "with the upstart ASL being led by marginalized conservatives and the older ESL being increasingly dominated by professionalizing liberals."[6]

It is within this volatile and politically charged atmosphere that Wallace delivered his paper "The Origin of Human Races and the Antiquity of Man." It was like a match lit in the vapor of controversy. Wallace began by stating his purpose in reconciling the two views "to eliminate the error and retain the truth in each" by upholding the theory of common descent by means of natural selection. He then sought to explain how by slow gradual change, in Lyell's true uniformitarian style, animals changed form. Admitting the powerful action on animals in preserving those with selective advantages and eliminating those less fit in the struggle for life, Wallace pointed out that humans were different from animals in several important respects. *Homo sapiens* were "social and sympathetic," they preserved and protected the weak and sick and had a division of labor completely absent among any others in the animal kingdom. These attributes, as they slowly accumulated, would have been preserved by natural selection because "such qualities would be for the well-being of man; would guard him against external enemies, against internal dissensions, and against the effects of inclement seasons and impending famine, more surely than could any merely physical modification."[7] Locating the origin of hominids in deep history (perhaps as early as the Eocene or Miocene epochs) as "a single homogeneous race," Wallace ingeniously argued that physical differences of stature, hair, and skin color would have occurred due to differences in climate and geography as they overspread the world "still subject, like the rest of the organic world, to the action of 'natural selection,' which would retain his physical form and constitution in harmony with the surrounding universe."[8] But the issue, as Wallace suggested, was exactly when *do* we

call a man a *man*. If we measure a human by intellectual capacity, Wallace suggested, it could be argued that there were indeed many original distinct origins of man; if, on the other hand, humans were gauged by their form and structure alone then a common origin for all could be argued.[9] It was a question less of fact than of perspective.

Then Wallace marked out his special position. The unique "social and sympathetic" capacities arising from an advanced mental development set humans apart and freed them from the tyranny of natural selection. The ability to clothe and shelter each other, to act in concert as a cohesive society, to hunt collectively, to domesticate animals, to cultivate the land, not only released humanity from the vicissitudes of nature but also gave them a measure of control over it. Wallace went so far as to exclaim, "we may admit that even those who claim for him a position as an order, a class, or a sub-kingdom by himself, have some reason on their side."[10] Somewhat surprisingly, he reiterated this claim by calling on Richard Owen (1804–1892), Darwin's leading critic and champion creationist: "We can thus understand how it is that, judging from the head and brain, Professor Owen places man in a distinct subclass of mammalia, while, as regards the rest of his body, there is the closest anatomical resemblance to that of the anthropoid apes."[11] Wallace ended on a progressivist utopian note, claiming that the development of man's "higher nature" would "convert this earth . . . into as bright a paradise as ever haunted the dreams of seer or poet."[12] Like most Victorians of the period, however, Wallace did not think all were equally equipped to do so, and within the paper lurks the assumption of racial hierarchies. Wallace casts a Eurocentric vision in which "all the great invasions and displacements of races have been from North to South, rather than the reverse; and we have no record of there ever having existed, any more than there exists to-day, a solitary instance of an indigenous intertropical civilisation."[13]

The audience was largely unimpressed. Luke Burke (?–1885) objected to the naturalistic implications of the paper and, alluding to William Paley's watchmaker argument for design, complained that changes within a single animal according to "organic law" was one thing, but to insist on transformations across individuals and species was something else, "you might as well say that a change in one part of a watch would superinduce the change in another. Yes, if the change was made by the watchmaker."[14] Referring to Wallace's claim that the special mental attributes of humans were an effect of natural selection, he complained, "Surely a non-intelligent cause cannot produce an intelligent effect." George Witt (1804–1869) complained that Wallace had wasted the society's time with such metaphysical ramblings. James Hunt (1833–1869), president and cofounder of the society, was even

more strident. Hunt charged Wallace with "philosophic speculation" and dismissed the "Darwinian hypothesis" as merely "a question to be proved." He even demanded that Wallace withdraw his claim of natural selection's "inherent power."[15] Wallace refused and held his ground on all points.

More broadly, this new position staked out in the ASL paper received a mixed reception. Although Hooker was quite taken with the essay, calling it "a very great move in advance," he worried that Wallace might be signaling an abandonment of Darwin's cause in allying with Owen. Would it just be a matter of time before he announced common cause with the creationists? Wallace reassured Hooker by stating he didn't completely agree with Owen and then merely reiterated his position, hedging a bit by saying that human beings were a distinct family but part of the order that includes the great apes.[16] Wallace was eager to get Darwin's reaction and wrote him on May 10, "I send you now my little contribution to the theory of the origin of man. I hope you will be able to agree with me. If you are able, I shall be glad to have your criticisms."[17] At first Darwin delayed in replying, then he offered a measured response: "But now for your Man paper, about which I should like to write more than I can. The great leading idea is quite new to me, viz. that during late ages the mind will have been modified more than the body. . . . The latter part of the paper I can designate only as grand and most eloquently done. I have shown your paper to two or three persons who have been here, and they have been equally struck with it." Then he added, "I rather differ on the rank under the classificatory point of view which you assign to Man: I do not think any character simply in excess ought ever to be used for the higher division. Ants would not be separated from other hymen-opterous insects, however high the instinct of the one and however low the instincts of the other."[18]

Joel Schwartz believes Wallace's paper was perceived as weakening the case for natural selection and represented to some degree a distancing of himself from Darwin.[19] It is hard to see otherwise. Darwin rejected Wallace's special classification of mankind, and Hooker thought it might warn of hypostasy. But there was no open break, and Wallace defended himself to the apparent satisfaction of both. Lyell, a less ardent Darwin follower, thought highly of Wallace's anthropological effort, only questioning the age of humans dating as ancient as the Miocene epoch. Lyell had already written on this subject and was more sympathetic to Wallace's view of a distinct separation of man and beast. To him, there was nothing in natural selection requiring an assumption of absolute human/animal continuity. The development of a species of such "transcendent genius" without precedence was worthy of notice and suggested that special "breaks" must have occurred in human "psychical" development.[20] Schwartz suggests that

perhaps Wallace's paper may have served as a catalyst for Darwin's *Descent of Man*, a proposition for which there seems to be some circumstantial evidence. In any case, there is little question that he was moving away from Darwin on this key issue of *Homo sapiens* and evolution.[21]

One enthusiastic endorsement of Wallace's views came from a young, twenty-two-year-old William James (1842–1910). James applauded him for his "important contribution towards the clearing up of the great controversy of the Monogenists and the Polygenists." Extrapolating long passages from the paper, James called the ideas expressed therein "most reasonable, indeed obvious." He then left the reader with a fertile question: "Why may there not now be lying on the surface of things, and only waiting for the eye to see it, some principle as fertile as Natural Selection, or more so, to make up for its insufficiency (if insufficiency there be) in accounting for all organic change?"[22] Darwin's answer was sexual selection, a subsidiary theory that Wallace always found unconvincing, at least in reference to animals. Wallace would look deeper, and in so doing Fichman is right in concluding that "James could clearly read a great deal more into Wallace's 1864 essay than the theoretical resolution of the anthropologists' racial controversy."[23] Wallace and James would meet again and find other common causes.

The Racial Debate in a Larger Context

In the end, the monogenist-polygenist controversy was more polemical than scientific. Speculations about when to call an early hominid a "man" were irrelevant, at least to this discussion. Darwin had always been reticent to discuss the applications of his theory to human beings, but his *Descent of Man* (1871) gave a complete account. For the old monogenist-polygenist debate, Darwin pointed out the futility of determining on the basis of such infinitesimal change from one generation to the next the point at which a "man" arrived on the earth: "But this is a matter of very little importance. So, again, it is almost a matter of indifference whether the so-called races of man are thus designated, or are ranked as species or sub-species; but the latter term appears the more appropriate. Finally, we may conclude that when the principle of evolution is accepted, as it surely will be before long, the dispute between the monogenists and the polygenists will die a silent and unobserved death."[24]

He was right on one level, but not the racism that lurked within it. Writing to the American archaeologist Ephraim Squier (1821–1888) in the summer of 1860, Nott weighed in on *Origin*, somewhat gleefully declaring, "the man [Darwin] is clearly crazy, but it is a capital dig into the

parsons—it stirs up Creation and much good comes out of such thorough discussions." By 1866 Nott could accept Darwin's theory since the theory suggested to him that the races of man "if not distinct species, are at least *permanent varieties*." In any event, elevating blacks to a position of equality with white society, Nott argued in an open letter from the ASL to Freedmen's Bureau chief O. O. Howard, was sheer folly since such racial interaction would only serve to degrade blacks as they inevitably fell into corruption and vice.[25]

Similarly, the American progressive reformer Charles Loring Brace (1826–1890), who proudly claimed to have read *Origin of Species* thirteen times, was a vocal opponent of slavery and ardent supporter of Darwin. But, as historian George M. Fredrickson has pointed out, Brace made "the Darwinian case for differentiation of the races by natural selection . . . [and] ended up with a view of racial differences which was far from egalitarian in its implications."[26] Fredrickson explains that Brace's pioneering attempt to establish a Darwinist ethnology in opposition to the polygenists had elements of antislavery humanitarianism, but more importantly simply demonstrated that the polygenists' hierarchical assumptions could be justified under a Darwinian framework, perhaps better.[27]

Huxley certainly saw no equality among men. In the wake of Union victory and the final abolition of slavery, Huxley delivered a harsh and rather self-serving verdict in May 1865. "It may be quite true that some negroes are better than some whites," he admitted, "but no rational man, cognizant of the facts, believes that the average negro is the equal, still less the superior, of the average white man. And if this be, it is simply incredible that, when all his disabilities are removed, and our prognathous relative has a fair field and no favour, as well as no oppressor, he will be able to compete successfully with this bigger-brained and smaller-jawed rival, in a contest that is to be carried on by thought and not by bites."[28] Huxley confidently believed that emancipation meant eventual extermination of African Americans by the sheer selective pressures of nature—natural extermination of the less fit. But the war had served a purpose. "The white man may wash his hands of it," he concluded, "and the Caucasian conscience be void of reproach for evermore."[29]

Even Darwin didn't completely escape the racism of imperial Britain. While it is true that Darwin was always opposed to slavery (as was Wallace), he, like his "bulldog defender," accepted simplistic assumptions about cranial size, mental capacities, and racial characteristics. For example, in *Descent of Man* the craniometry of Paul Broca (1824–1880) is referenced approvingly. While Darwin was careful to avoid the implication that "the intellect of any two animals or of any two men can be accurately gauged

by the cubic contents of their skulls," he seemed to give accumulated aggregate craniometric data some evidentiary weight. "The belief that there exists in man some close relation between the size of the brain and the development of the intellectual faculties," wrote Darwin, "is supported by the comparison of skulls of savage and civilized races, of ancient and modern people, and by the analogy of the whole vertebrate series." Citing the work of physician-craniologist Joseph Barnard Davis (1801–1881), who had amassed a collection of crania of some 1,700 specimens, Darwin noted that Europeans had a cranial capacity of 92.3, Americans 87.5, Asiatics 87.1, and Australians 81.9 cubic inches.[30] Desmond and Moore have argued that Darwin passionately believed in the brotherhood of man, but that didn't necessarily translate into an *equality* of mankind. Darwin wound up no different from the rest of his generation and even served as the intellectual legitimizer of racism under the guise of "science."[31]

Homo sapiens—A Question of Taxonomy?

It is also worth noting that Darwin's sole objection to Wallace's paper on man was to his classification of man apart from the animal kingdom. This is the conceptual crack that would soon break open into a seismic rift. But Darwin's example of ants and instinct not warranting separate classification among hymenoptera is revealing. Darwin clearly failed to grasp the magnitude of difference that Wallace was suggesting. Mental capacities of the kind Wallace was speaking were more than mere instincts; they demarcated, for Wallace, a whole different order of being. Darwin would continue to think broadly about *instinct* in animals and humans, a word that appears more than 240 times his *Descent of Man*.

Lyell's reaction was different. With his *Geological Evidences of the Antiquity of Man* (1863) recently published, he read Wallace's paper with care and protested only against so early an estimate of man's arrival as the Miocene epoch, a broad period ranging from 23 to about 5.3 million years ago, named by Lyell himself. Based on available archaeological evidence, he thought it safer to keep the estimate much more recent, stating "the age of man, though preglacial, would be so modern in the great geological calendar . . . that he would scarcely date so far back as the commencement of the post-pliocene period [around 11,000 years ago]."[32] Wallace replied that his estimate was only offered as a possibility, not a necessity. But Wallace's suggestion that humans indeed might warrant a distinctive classification in taxonomic rank had already been assented to by Lyell.[33] Quoting the Archbishop of Canterbury, John Sumner, approvingly, he noted, "But if a comparison were to be drawn [between humans and apes], it should be tak-

en, not from the upright form, which is by no means confined to mankind, nor even from the vague term reason, which cannot always be accurately separated from instinct, but from that power of progressive and improvable reason, which is Man's peculiar and exclusive endowment."[34]

More interesting was the effect Lyell would have on Wallace. When Lyell concluded his *Geological Evidences* by suggesting that nature "may be the material embodiment of a preconcerted arrangement," and that "the perpetual adaptation of the organic world to new conditions [vis-à-vis transmutation] leaves the argument in favour of design, and therefore of a designer, as valid as ever," he struck a theme that would form a compass point for Wallace. Indeed, Wallace would become profoundly influenced by Lyell's final conclusion that the long succession of life over geological time from lower to higher forms up to humanity and its tremendous intellectual capacities proved the "ever-increasing dominion of mind over matter."[35] The influence Lyell had on Wallace is hard to overestimate. The younger Wallace viewed Lyell as a mentor and father figure; Lyell, in return, seemed always to appreciate his protégé's keen intellect and daring views.[36] Lyell—whom historian Daniel Boorstin has called "the statesman in the new parliament of science"—had taught Darwin and Wallace about the nature of change through slow and gradual geological forces (what William Whewell called uniformitarianism), was now instructing them in the nature of man. Darwin would have none of it, but Wallace sat in rapt attention.

All this lay in Wallace's future. For now, it must be said that in this early stage of his career during the 1860s, Wallace mirrored a Victorian racial calculus that assumed a hierarchy of races based on arbitrary measures of cranial size and social development. Accounts of his early travels in South America and Maritime Southeast Asia are full of references to "higher" and "lower" tribes and peoples, although one must guard against the presentist reading of "savage" as a term of denigration. In nearly all Anglo-European accounts of foreign travels, "savage" is generally used simply as a descriptor for those in a natural state of existence uninfluenced by Western customs and habits. Despite certain proclivities common to all white travelers and explorers in exotic lands, Wallace demonstrated a keen interest in native peoples from the beginning and took great pains to examine details of their social customs, language, religious ideas, music, and art. One finds, for example, a detailed discussion of indigenous South American Indians in chapter seventeen of his *Narrative*, "On the Aborigines of the Amazon," which includes illustrations of their "domestic articles" and curious early "Amazonian picture-writings" on the rocks of the Uaupés River region that even the locals couldn't explain. Interestingly, Wallace was sensitive to

the degrading influences of the "prejudices of civilization" on native populations.[37] In fact, Wallace praised the Indians of the Amazon River Basin as peaceable, hardworking, and skillful craftsmen. But he bemoaned their inevitable degradation as they were exposed to the "refuse of Brazilian society" and were thus estranged from their good and noble characteristics and left only with civilization's vices.[38]

This carried over on his travels in the Malay Archipelago. In one of his first letters home, Wallace wrote from Borneo in May 1855:

> The more I see of uncivilized people, the better I think of human nature on the whole, and the essential differences between civilized and savage man seem to disappear. Here we are, two Europeans [himself and his assistant Charles Allen], surrounded by a population of Chinese, Malays, and Dyaks. The Chinese are generally considered, and with some amount of truth, to be thieves, liars, and reckless of human life, and these Chinese are coolies of the lowest and least educated class, though they can all read and write. The Malays are invariably described as being barbarous and bloodthirsty; and the Dyaks have only recently ceased to think head-taking a necessity of their existence. We are two days' journey from Sarawak, where, though the government is nominally European, it only exists with the consent and by the support of the native population. Yet I can safely say that in any part of Europe where the same opportunities for crime and disturbance existed, things would not go so smoothly as they do here. We sleep with open doors, and go about constantly unarmed; one or two petty robberies and a little fighting have occurred among the Chinese, but the great majority of them are quiet, honest, decent sort of people.[39]

Scholars are fond of quoting the first sentence, often ignoring what follows. But Wallace's comments are interesting and revealing and form a sound basis for comparative analysis with his most obvious peer, Charles Darwin. Although he clearly succumbed to racial stereotyping, Wallace demonstrated an appreciation of the moral strengths of character shown by the peoples with whom he was living. This more nuanced and indeed sympathetic reaction to non-Western peoples is rarely paralleled among Wallace's Anglo-European colleagues, and Darwin is no exception. Contrast Wallace's comments from Borneo with Darwin's horrified account of the natives he encountered at Tierra del Fuego on Christmas Day, 1832: "These poor wretches were stunted in their growth, their hideous faces bedaubed with white paint, their skins filthy and greasy, their hair entan-

gled, their voices discordant, and their gestures violent. Viewing such men, one can hardly make one's self believe that they are fellow-creatures, and inhabitants of the same world. It is a common subject of conjecture what pleasure in life some of the lower animals can enjoy: how much more reasonably the same question may be asked with respect to these barbarians!"[40]

Wallace as Anthropologist

There might be a temptation to simply see Wallace's appreciation of native virtues as succumbing to the "noble savage" myth often attributed to Rousseau. But Wallace's experiences with indigenous peoples didn't come from the salons of Paris, Wallace actually *lived* with indigenous populations for extended periods of time. Unlike Darwin, Wallace had no HMS *Beagle* following him along the way. In a very real sense the *Beagle* kept Darwin tethered to civilization with Captain FitzRoy (1805–1865) as his guide. Wallace was truly on his own, often having to hire out boats and crews for transportation or sometimes improvising on his own. Wallace understood the importance of his long and intimate contact with native peoples. Late in 1859, riding high on the news that his Ternate paper had been read before the Linnean Society, he wrote a letter from Batchian (today known as Bachan Island in the Moluccas) to his old school chum George Silk: "I am convinced no man can be a good ethnologist who does not travel, and not travel merely, but reside, as I do, months and years with each race, becoming well acquainted with their average physiognomy and their character."[41]

Moreover, early on in his Maritime Southeast Asian travels, while at Sarawak in Borneo, Wallace met and hired a young Malay boy, Ali. Ali was bright and versatile. He taught Wallace the language of the natives, cooked for him, and eventually helped Wallace in his collecting pursuits. Ali became Wallace's indispensable guide, liaison with the Malaysian people, interpreter, boatman, and general assistant. Much more than a mere "servant boy," Wallace described Ali as the "faithful companion of almost all my journeyings among the islands of the far East."[42] Years later, Harvard zoologist Thomas Barbour (1884–1946) met "Ali Wallace" as an old man while traveling in the Dutch East Indies in 1907. A letter and photograph of Ali to Wallace set the now-elderly naturalist to reminiscing about how Ali had saved his life and nursed him back to health during a severe bout of malaria. It would seem likely that the impact of this lasting friendship had a permanent effect on Wallace's understanding of and appreciation for indigenous people.[43]

Wallace's interactions with natives were, therefore, intimate and very personal; Darwin's were comparatively fleeting and transitory. Thus, we

might give Darwin a bit of a pass if he failed to acquire Wallace's appreciation of such people. On the other hand, Paul Johnson has called Darwin "a poor anthropologist."[44] Regarding the Fuegans, he charges Darwin with being impressionistic, gullible, and superficial. Contrary to Darwin's claims, they were not cannibals, brutal and contentious, or bereft of cultural attainments. Lucas Bridges, son of the Fuegan Anglican missionary Thomas Bridges (1842–1898), was born among them and became a member of their tribe. His understanding of the Fuegan culture contradicts all of Darwin's assertions, and American explorer and author Charles Wellington Furlong (1874–1967) chided the naturalist's lack of distinction between the Haush and Onu people and his misconstruing the tribal red ocher worn by these people as mere filth.[45] Darwin's depiction of the Maoris of New Zealand was equally flawed, even to the point of making sweeping conclusions regarding their "rigid inflexibility" on the basis of their expressions alone.

Anthropologist Kathleen Bolling Lowrey has noted that Wallace's more kindly and insightful attitude toward indigenous peoples is "a genuine common thread running through his field journals and later ruminations on human evolution."[46] Wallace, for example, marveled at the "great carvers and painters" in "such a very low state of civilization" as he found among the natives in Dorey (a harbor village in western New Guinea, today a city known as Manokwari). "If these people are not savages," he wrote, "where shall we find any? Yet they all have a decided love for the fine arts, and spend their leisure time in executing works whose good taste and elegance would often be admired in our schools of design!" As if to put their work on display for all to see, a carved pottery tool (now in the British Museum) is illustrated proximately to his comments.

Furthermore, Wallace refused to ascribe to the notion, common among his generation of Anglo imperialists, that the ability of one nation or group to dominate or even eliminate another moved along a neat path toward superiority. In looking over the tropical splendor of Java he was "led to ponder on the strange law of progress, which looks so like retrogression, and which in so many distant parts of the world has exterminated or driven out a highly artistic and constructive race, to make room for one which, as far as we can judge, is very far inferior."[47] Far from simply measuring civility and sophistication with an Anglo-European yardstick, Wallace noted, "There is in fact almost as much difference between the various races of savage as of civilized peoples, and we may safely affirm that the better specimens of the former are much superior to the lower examples of the latter class."[48] Wallace's appreciation of native cultures reached its peak expression toward the end of his *Malay Archipelago*. Here he often found humans living in "a perfect social state," unspoiled by the corruptions of

competition, greed, pecuniary self-interest, class strife, abject poverty, and exploitation common to his English homeland. It is no wonder that an anthropologist today, like Lowrey, finds Wallace's anthropology more in keeping with the contemporary science of humanity with which she is familiar. Even Lyons, who as we have seen was otherwise critical of Wallace's forays into the nether worlds of spiritualism and teleological evolution, has observed that he "seemed remarkably free of the racism and stereotyping of indigenous people that characterized the thinking of Darwin and virtually everyone else at the time. Rather, he displayed a sympathy and understanding of these cultures that was far ahead of his time."[49] In this sense Wallace is a very modern figure.

Wallace would revisit the prehistoric origins of human beings after his attention-getting paper before the ASL. In 1871, the same year Darwin released his evolutionary applications on human beings with *Descent of Man*, Wallace published a revised version in a collection of essays, *Contributions to the Theory of Natural Selection*, with "The Development of Human Races under the Law of Natural Selection." Here the old ASL paper was reprised "with a few important alterations and additions."[50] As previously mentioned, Wallace shocked Darwin in the April 1869 issue of the *Quarterly Review* when he suggested that "an Overruling Intelligence" was responsible for the special intellectual capacities of humans; Wallace now, in an elaborative essay appearing in that same volume, declared "that a superior intelligence has guided the development of man in a definite direction."[51] Because this is so intimately bound up with Wallace's break with Darwin, detailed discussion will be postponed to chapter 3.

Suffice it to say that a lot of things had changed since 1864 when the officer for the British Association for the Advancement of Science (BAAS), often simply referred to as the British Association, Cambridge University physiologist Michael Foster, informed Wallace that he had been unanimously elected president of the Biological Section of the BAAS for its meeting in 1876. The specific occasion for his comments on humankind came from the fact that he also had charge of the Anthropology Department. The invitation is interesting especially given the fact that Wallace's break from Darwin and his powerful X Club associates led by Huxley was well known. Apparently going from explaining *Homo sapiens* to expounding on *Homo divinus* was not, at least in 1876, sufficient grounds for expulsion from the scientific community. Wallace knew better than to actually reach this far into what many regarded as idle metaphysical speculation at the association meeting, however.

Wallace's BAAS address has been accurately described as "eloquent and thought-provoking."[52] But it nonetheless showed his obstreperous streak.

In a veiled reply to Darwin's *Descent of Man*, in which humans were seen as different from animals in degree but not kind, Wallace warned "men of science" that they had gone from a state "(so few years ago [since the publication of *Origin* in 1859]) of total ignorance as to the mode of origin of all living things, to a claim to almost complete knowledge of the whole progress of the universe, from the first speck of living protoplasm to the highest development of the human intellect."[53] Wallace had no doubt that humans derived from some apelike hominid form but cautioned against making too much of the fact, and in particular from seeing too much of the ape in the present anatomy of man. For example, Wallace scoffed at "travelers" and naturalists who claimed that native peoples had prehensile toes because of their propensity for picking things up with their feet and their generally having better foot dexterity than whites. Wallace pointed out that indigenous people exhibit this quality only because they live barefoot on a daily basis. The ability to use their feet came from upbringing, observation, and habit and no inherent morphological or anatomical feature in the foot itself.[54] He hinted that man's origins might be "due, in part, to distinct and higher agencies than such as have affected their development," and he cautioned against the hubris of suggesting that "in somewhat less than twenty years, we have passed from complete ignorance to almost perfect knowledge on two such vast and complex subjects as the Origin of Species and the Antiquity of Man."[55] Wallace had nothing but praise for the Down House patriarch, and both were too gentlemanly to show anything but mutual respect, but the BAAS address showed how far apart the two men had grown.

Wallace continued to expand his views on the nature of humankind and its place in nature. But the 1864 paper, "The Origin of Human Races," was a point of embarkation for Wallace's greatest journey. The natural theology toward which he headed always used humanity as its North Star, a reliable and never faltering point of navigation, but eventually expanded to form a comprehensive cosmological and biological world with spiritual, social, and political implications.

It was an intellectual odyssey that had costs, however. Wallace's excursions into spiritualism, socialism, and a distinctly teleological evolution marginalized him from a scientific community made up of men with their own vision. It is hard to characterize the ideas and ideals of such a diverse group, but it can generally be described as holding to the professionalization and elevation of science at its core. Led by members of Huxley's X Club who eagerly accepted the mantle of leadership as the high priests of a new secular caste, its central tenet was a positivistic faith in the power of science to redeem society from centuries of benighted myths and

superstitions. The X Club's mouthpiece was *Nature*, founded by Norman Lockyer in 1869. Its philosophy was heralded in Huxley's quotation of Goethe: "NATURE! We are surrounded and embraced by her: powerless to separate ourselves from her, and powerless to penetrate beyond her." By the 1890s a new generation replaced the X Club, and *Nature* continued to serve as the mouthpiece for the triumphant order. No wonder that Janet Browne has said, "Far more than any other science journal, *Nature* was conceived, born, and raised to serve polemical purpose."[56]

Nature then became in many ways the propaganda arm not of science but of *scientism*. It was perhaps expressed most dramatically in the summer of 1874 at the forty-fourth meeting of the BAAS when John Tyndall, and fellow X-Club party disciple, delivered his famous (some thought infamous) "Belfast Address": "The impregnable position of science may be described in a few words. We claim, and we shall wrest, from theology the entire domain of cosmological theory. All schemes and systems which thus infringe upon the domain of science must, *in so far as they do this*, submit to its control, and relinquish all thought of controlling it."[57]

But Wallace was not interested in such presumptuous polemics, and Tyndall's scientistic saber rattling was ill-suited to his purposes. In order to understand them we must go back to the origin of modern evolutionary theory, for this is what would mark what Wallace called, "the central and controlling incident" of his life. The theory was not an aberration of the era but rather the epitome of it. The temper of the times was *inquiry* and *analysis* of nature and the cosmos. Wallace, who embodied the age, called it "the wonderful century," and Darwin would have agreed. To know both men requires knowing something of their era.

2
The Spirit of Science

The Larger Milieu of Victorian England

It really began with the founding of the British Association when it met at York in September 1831. David Brewster (1781–1868), of the Yorkshire Philosophical Society, proposed the founding of the association when he noted that, flush with victory at Waterloo and at the height of its imperial powers, the nation largely ignored its men of science. "There is not a single philosopher," Brewster complained, "who enjoys a pension, or an allowance, or a sinecure, capable of supporting him and his family in the humblest of circumstances."[1] Brewster and his colleagues at the society wanted greater recognition for what was then known primarily as "natural philosophy" conducted by "natural philosophers." The shift toward a new name—*science*—suggested a rethinking of the entire enterprise. No longer an amateurish pursuit of Anglican vicars dabbling in geology or puttering in their country gardens and botanizing the countryside, the goal of the BAAS was transformative.

It came out more expressly at its third meeting on June 24, 1833, when Samuel Taylor Coleridge (1772–1833), old beyond his years from the ravages of opium addiction, rose to call on the members to eschew the term "natural philosophers." William Whewell replied in agreement, "if philosophers [is] too wide and lofty a term, by analogy with *artist*, we may form *scientist*."[2] Under this new label, "the scientist" became one who put his or her investigations to the practical service of human betterment. Given its broad altruistic aims, the BAAS saw this new scientific age as one in which the government had an active responsibility to support research and to recognize those who labored on its behalf. In their collective revision the natural philosopher was transformed into a professional scientist support-

ed by the academy and a collegial network of fellow practitioners. By the 1860s, when, as we have seen, Wallace was so intimately connected with the association, it was a veritable who's who of scientific endeavor—the so-called parliament of science. It is hard to overestimate the importance of the association in preparing the way for the theories Darwin and Wallace would found. It transformed it into a very public sort of endeavor. Rather than the old, stodgy Royal Society that few of its 740-odd members cared to even attend or its brother across the channel where the Royal Academy of Sciences of France held its few hundred members hostage with forced attendance, the association drew thousands. Nouveau riche merchants and manufacturers mingled with old-moneyed gentry and titled nobility to learn from scientists of the latest theories and developments of the day. More importantly, they brought their wives and daughters. The BAAS became a place to see and *be seen*, a true social event in the fullest sense of the term.[3]

So the whole question of the birth of modern evolutionary theory by the mid-nineteenth century must take into account the forces behind it, and the BAAS was the embodiment of a generation ebullient over the prospects of unlocking nature's secrets. The British Association was, if nothing else, an organization of ideas, and a rapidly industrializing Victorian-Edwardian England provided the perfect infrastructure for their transmission and exchange. During this period, the number of book titles published rose from slightly under 3,000 in 1840 to over four times that the year of Wallace's death.[4] The numbers of magazines of all kinds—from serious to frivolous—were soaring as well, from under 400 in 1864 to nearly 2,000 by 1903.[5] The publishing industry was fueled by inquiring minds filling pages with their ideas, an inquisitive public eager to read them, and an industrial England ready to print them.

It was a secularizing public as well. In 1864 about half of all magazines were religious in nature; by 1903 only about 21 percent were religious. But this process, while clearly discernable in the second half of the century, was working on the British people well before that. Clerics nationwide were distressed when the 1851 Census revealed that of a nation of nearly eighteen million people, only 10,212,446 were churchgoers; 43.03 percent stayed home.[6] This has often been dubbed the British people's "crisis of faith," but aside from some jeremiad poetry by men like Matthew Arnold (1822–1888) and Gerard Manley Hopkins (1844–1889), and a few worried clergymen, there seemed little concern nationwide over the secular advance.

Many things besides God had caught Britain's attention. Britain was stretching its imperial arms with an expanding transportation system of global proportions. Indeed, it was a nation percolating with movement, na-

tionally and internationally—one naturally suited to natural history. Under the Union Jack, voyages of scientific discovery were taking place on every ocean, while closer to home beachcombers searched the coast for seaside curiosities, and bug hunters, bird-watchers, and botanizers combed the countryside with their nets, telescopes, magnifying glasses, dredges, knives, vials, maps, and compasses. Nothing seemed to escape their notice—skies were watched and celestial bodies recorded, tides were calculated, rocks and strata were studied, plants were classified and cataloged, and exotic animals were stuffed for museums or captured as curiosities for zoological gardens and the more modest penny menageries proliferating across the English landscape. Everyone seemed to be taking the pulse of Mother Earth and her cosmic placenta. This was the infrastructure on which ideas grew and prospered; along with it a vibrant communications network (especially a global British mail system unparalleled in reliability and efficiency) kept everyone in constant contact. Darwin and Wallace were the beneficiaries of the age, and their theories were logical consequences of it.

Darwin and Wallace: The Theories Unveiled

Although Wallace initiated his voyage toward natural theology in 1864, it will be helpful to understand something of the two theories that were first presented to members of the Linnean Society. As already mentioned, this occurred at a hastily gathered meeting of the society on July 1, 1858.

A few points about this meeting are worth bearing in mind. First, the meeting was being held "at the empty end of the scientific season"[7] and during the height of the "Great Stink"[8] of London and consequently was poorly attended. Many had simply left the city for more healthful environs. Second, the audience actually heard more of Wallace than Darwin; the Ternate letter comprised slightly over 4,100 words compared to around 2,800 words in the excerpts of Darwin's 1844 sketch and his 1857 letter to Asa Gray.[9] While Darwin's priority was made perfectly clear in the introduction, it didn't seem to matter much since the general effect on the attendees was negligible, so negligible in fact that society president Thomas Bell could infamously remark that the year "has not, indeed, been marked by any of those striking discoveries which at once revolutionize, so to speak, the department of science on which they bear."[10]

This begs the question: why *was* the impression left on the society so small? For one thing, the structure and agenda of the meeting did not lend itself to retaining a lasting memory of any of the proceedings. Less than thirty fellows, one associate, and two guests (if more attended they were not recorded in the minutes) had their senses dulled with a litany of admin-

istrative proceedings that included the recording of library gifts and electing a vice president to replace the recently deceased Robert Brown. Then the scientific portion began with the reading of the Darwin-Wallace papers followed by five papers held over from the previous meeting that had been canceled due to the death of Brown. The final paper was to be presented by the newly elected vice president, George Bentham, but was mercifully withdrawn. Bell, who presided over the meeting, did not call for remarks for such speculative ideas as those presented in absentia by Darwin and Wallace. Most of the attendees, conservative and orthodox zoologists and botanists, were "mortally tired or bored by the Darwin-Wallace papers."[11]

But Richard England has suggested that the lackluster response to these papers had deeper roots than mere disinterest borne of fatigue.[12] For England, most of the naturalists at the meeting could connect the views of speciation and variation Darwin and Wallace expressed within existing debates without any truly revolutionary implications. Neither author, in England's words, "did much more than outline a hypothetical mechanism for describing how varieties, or new species, could arise from an original type."[13] Although Wallace's description of the mechanism is clearer and less equivocal than Darwin's, the audience that evening heard ideas that were cast as "imperfect" and perhaps blunted by Wallace's more direct attack on Lamarck. Rev. Arthur Hussey (1794–1862) thought Darwin's theory reached so far back into geological time that it carried him into conjectural regions he had "no inclination to wander."[14] Entomologist Thomas Boyd (1829–1912) found Wallace's letter baffling; it seemed to him to be like "Science sitting down at the feet of Imagination."[15] Rev. Henry Baker Tristram (1822–1906), an ornithologist of some note who would actually apply the principle of natural selection to certain features of north African desert larks, did not associate Wallace's paper with transmutation but rather considered it an attempt "to understand the relationship between varieties and species, and to strike against the 'species-mongers' who confessed them."[16] Tristram made it quite clear that he did not "presume to limit Creative Power" in the establishment of emergent species nor "to doubt the creation of many species by the simple exercise of Almighty volition."[17] Thus, Tristram's use of natural selection was hardly revolutionary but rather a tool used in the seemingly interminable argument between species "splitters" and "lumpers." Tristram's reaction to Wallace's paper was interesting and something to which we shall have occasion to return.

Despite the poor impression made by the Darwin-Wallace theory, it is worth examining both in some detail because similarities and differences are more easily teased out from these seminal works. By such a comparative analysis the degree to which each naturalist's theory can be called "identi-

cal" can be truly measured. It can also point at least in part to the dramatically different trajectories that each would take over time.

Darwin first outlined his views in a brief essay written in 1842 strictly for his own use. A couple of years later he produced an 1844 sketch of about 50,000 words that included instructions to his wife, Emma, that in the event of his death (Darwin suffered from a variety of distressing ailments) the manuscript should be published with numerous suggestions for editors. Joseph Hooker eventually won out as editor as he was "by far the best man to edit my Species volume."[18] The latter effort was far from the harmonious world of William Paley. It starts with a state of nature "at war, one organism with another, or with external nature."[19] Deferring to the Malthusian pressures of geometric population growth against arithmetic growth of food supply, Darwin observed that adaptation in the struggle for subsistence would leave some species and their offspring "a better *chance* of surviving." Darwin asked, what example in the real world do we have of this? Breeders, he insisted. This work of selection has expanded over many years and generations, Darwin argued, and has produced discernible effects. Just look what the famed breeder Robert Bakewell (1725–1795) was able to accomplish in a few years with cattle and sheep by what he claimed was "the identical principle of selection."[20] The idea offered here is that nature can do in many years what breeders can do in a few.

The theme was again picked up and reiterated with renewed enthusiasm in Darwin's letter to Gray. Darwin suggested that there must have been at some "remote period" some sort of "unconscious selection" of those animals humans found most useful and a culling of those that departed from their desired type. He continued to press home his point that with nature we have "unlimited time" with "an unerring power at work in *Natural Selection*" that always "selects exclusively for the good of each organic being," and those features will thus retain those slight variations "profitable to some part of their economy."[21] Why are we not more aware of the process as it unfolds? Darwin offered three explanations that he would revisit in his *Origin*: first, the changes are all very slow and gradual; second, only a very few individuals are undergoing change at any given time; and third, "the extreme imperfection of the geological record" obscures and even erases many earlier forms from view.[22]

Wallace's paper "On the Tendency of Varieties to Depart Indefinitely from the Original Type" was next (see the appendix in this book for the complete text). In at least one sense, their arguments were the same: there were no "original" and "permanently invariable" species, since species give rise to varieties and it is on this variability that natural selection acts. Using the same Malthusian model that Darwin employed, Wallace sketched out

"a struggle for existence, in which the weakest and least perfectly organized must always succumb. Now it is clear," he added, "that what takes place among the individual of a species must also occur among the several allied species of a group."[23] Darwin would have clearly seen much of his own theory in this. There were other similarities too: where Wallace saw checks on population, Darwin saw the action of selection; where Wallace discussed geological change, Darwin referred to environmental change; Wallace talked about branching divergence, Darwin used a branching tree analogy; both reached back into deep geological time. For both, slowly accumulating selective pressures based on environmental changes and variations in the available food supply would ultimately result in sustained changes in populations. Indeed, James T. Costa has noted that Darwin's distress stemmed from seeing so much of his theory of natural selection in the Ternate letter even though Wallace didn't explicitly use that term—both understood "the deductive core mechanism at the heart of the evolutionary process"—namely, that natural selection presented "the idea of abundant, undirected, and heritable variation, tremendous population growth potential" that gave rise to a nonrandom struggle for species survival, the success of which depended on competitive advantage leading to sustainable reproductive population growth dependent on "chance variations."[24]

Wallace and Darwin on Natural Selection—More Different Than Similar?

But closer inspection reveals differences, and Wallace and Darwin scholars have long noted these.[25] Only three need to be discussed here. The first is that Wallace seemed to see evolutionary change in terms of group dynamics playing out in a spatiotemporal demographic, whereas Darwin focused on individual competition and adaptation. Peter J. Bowler has noted this difference, but Michael Bulmer has pointed out that Wallace was as cognizant of individual variation as Darwin.[26] Indeed, Melinda B. Fagan has observed that the concept of abundance links the individual to the group level so that "continuance of the species and the keeping up of the average number of individuals" are essentially the same thing.[27] In this sense, the individual/group contrasts between Darwin and Wallace amount more to differences of emphasis than argument. It should come as little surprise that Wallace, who as a young man trained as a surveyor with his brother and performed a government tax-assessment survey in Wales, had a keen appreciation of land/animal interactive dynamics and the power of geography to shape species. To Wallace biogeography was just one aspect—albeit an important one—of the larger evolutionary scenario.

While it is quite true that Darwin also had a keen interest in biogeography, as demonstrated in chapters 11 and 12 of *Origin*, neither he nor Wallace invented the topic. The first was probably Aristotle who asked, how are organisms distributed throughout the world? He believed that an organism's form was determined by climate and its geography; for Aristotle, plants and animals (like landscapes) were the products of their particular localities. Georges-Louis Leclerc, Comte de Buffon (1707–1788) was the first to offer an explanation for biological distribution patterns worldwide, but it was Augustin Pyramus de Candolle (1788–1841) who gave a complete systematic analysis of geographic plant distribution in his *Essai élémentaire de geographie botanique* (1820). But, as mentioned at the beginning of this book, it was Wallace's two-volume *Geographical Distribution of Animals* (1876) that earned him preeminence in the field. Biogeography became a distinct discipline when Wallace masterfully and demonstrably laid out a comprehensive biogeography by "incorporating evolution, ecology, geology and glaciology into the grand task of explaining the geographical distribution and diversification of taxa and biotas on a dynamic earth."[28]

Another difference is harder to put aside. It relates to the effects of natural selection. While Darwin tended to see it as a building process, Wallace viewed it more in terms of its power to subtract. Darwin talked about utility providing a better chance of survival for the species and how "selection acts only by the accumulation of slight or great variations." Wallace said, "whatever be the average number of individuals existing in any given country, *twice that number must perish annually*." Moreover, Wallace likened natural selection to "that of the centrifugal governor of the steam engine, which checks and corrects any irregularities almost before they become evident; and in like manner no unbalanced deficiency in the animal kingdom can ever reach any conspicuous magnitude, because it would make itself felt at the very first step, by rendering existence difficult and extinction almost sure soon to follow." Thus, Wallace is alluding to natural selection's power of maintaining stasis.[29] While a governor is simply a regulating device on a machine or engine, it should be emphasized that it is essentially a *negative* feedback device. Later on, Wallace would make this much clearer. In a letter to Darwin of July 2, 1866, he indicated that natural selection "does not so much select special variations as exterminate the most unfavourable ones."[30] Wallace's repeated references to natural selection in this way leave little doubt that he viewed it largely as a force of elimination and with time apparently increasingly so.[31]

In doing so Wallace was making an important amendment to the theory of natural selection, and it caught the attention of British ethologist and psychologist C. Lloyd Morgan (1852–1936). In a paper read before the

Bristol Naturalist's Society on April 5, 1888, Morgan agreed with Wallace's criticism of "natural selection" as too metaphorical, whereas Herbert Spencer's "survival of the fittest" was "the plain expression of the fact."[32] The "sting" of Wallace's criticism, as Morgan put it, was in pointing out "that Nature does not so much select special varieties as exterminate the most unfavorable ones." Morgan regarded this as a perfectly valid argument, and as a consequence suggested a term that never caught on, "natural elimination." This did not, of course, mean that selection was no longer operative. But, as Morgan saw it, "selection involves intelligence; or, since it may be objected that selection is in some cases instinctive, let us rather say, involves the mind-element, or the element of consciousness."[33] In this sense even unconscious selection—the act of preserving the most valued of a flock, pack, or herd and destroying or letting the less desirable die out with no intension of altering the breed—was something of a misnomer since true selective weeding was still in play.

More importantly, this kind of argument makes Wallace's emphasis on elimination less mysterious. The "mindful"—even teleological—element as Morgan described was clearly the implication of this direction of thinking. Morgan declared, "We are still quite in the dark about origins. Elimination originates nothing; it merely crowds out failures. Selection originates nothing; the favourable varieties must be there ere they can be chosen out for survival."[34] But something else was also going on. Both Wallace and Morgan were revealing their wariness of Lamarckianism. As Morgan put it, "Under selection, the favourable variations will be chosen out; the unfavourable and the neutral may go. Under elimination, the unfavourable disappear; the favourable and the neutral remain."[35] Under such a scenario only Lamarckianism could explain the existence of neutral traits. But if natural elimination was really the most prevalent evolutionary force, then an alternative explanation for the existence of neutral traits could be offered. This, coupled with the inability to find any discernable mechanism to explain the inheritance of acquired characteristics, recommended the abandonment of Lamarckianism.

A more obvious difference with Darwin was Wallace's argument against domestic breeding as analogous to the operations of nature. Wallace knew that a recurring point the species fixists made was that the experience of breeders of domestic animals proved that the varieties produced by them were unstable, either reverting to their original form or varying only within a certain and determined limit. By analogy species must in this scenario be fixed. Wallace rejected this. His reasoning was simple and straightforward. Animals in a state of nature were subject to natural forces—the vagaries of climate, competition for scarce resources, and reproductive challenges

called on *all* of its capacities for cunning, physical prowess, sight, smell, and hearing for survival and prosperity. Domestic breeds were the product of *conscious* selection; they were cared for, sheltered, fed, and carefully bred with foresight toward an intentional end (a pigeon more stunning in appearance, a fatter pig, a stronger horse, and so on). He also explained that domestic breeders had a subverting or corrupting influence on the principle of utility. Indeed "those [features] which would decidedly render a wild animal unable to compete with its fellows and continue its existence are no disadvantage whatever in a state of domesticity. Our quickly fattening pigs, short-legged sheep, pouter pigeons, and poodle dogs could never have come into existence in a state of nature, because the very first step towards such inferior forms would have led to the rapid extinction of the race; still less could they now exist in competition with their wild allies."[36]

Darwin, on the other hand, thought his argument from domestic breeding turned the tables on the fixists. As we have seen, Darwin suggested this in his 1844 sketch and in his later 1857 letter to Asa Gray. This formed a key part of Darwin's presentation. In fact, Jean Gayon has remarked that Darwin's domestic analogy was not merely a pedagogical tool or an interesting sidebar, it was critical in demonstrating empirical evidence for what he regarded as the intricate relationship between variation, heredity, and species modification.[37]

On balance, what is a fair assessment of the two theories as Wallace and Darwin presented them in 1858? Calling Wallace's essay "brevity and brilliance," Fichman considers Wallace's "the more impressive contribution."[38] Darwin himself told Wallace apologetically that his extracts were never intended for publication (ignoring the fact that Wallace's letter wasn't either), and he thought his Ternate letter was far better.[39] However, that has not been the general consensus. Gayon believes that the superiority of Darwin's extracts is apparent on first reading. Even just prior to the neo-Darwinian synthesis, during the nadir—what Bowler, borrowing from Julian Huxley (1887–1975), has called "the eclipse" of Darwinian theory—historian of science George Sarton (1884–1956) called Darwin "a deeper and more systematic thinker."[40]

In order to come to terms with the varying impressions Darwin's and Wallace's respective theories left, it may be helpful to look more deeply into where both diverged most; namely, the role of domestic breeding as an analogy for natural selection. It is important because it reveals how each man dealt with teleology differently since the process of blind "selection" in nature would seem an important distinction to the intentional selection of breeders. Gayon has argued that Darwin's domestic breeding argument held two advantages: first, it showed that large-scale hereditary

modification was possible; and second, it demonstrated that the selection of accumulated variations was possible.[41] Bowler explains how "artificial" and natural selections were analogous:

> He [Darwin] realized that in a domesticated population there is always a fund of apparently purposeless and undirected variation among individual organisms. Although convinced that the degree of variability was artificially enhanced under domestication, Darwin, nevertheless, accepted that there must be some equivalent variability in every wild population. The analogy with artificial selection then allowed him to depict natural selection as a parallel process in which a few variant individuals, in this case with characters useful to the species rather than to the breeder, survive and reproduce. Those with harmful characters are eliminated by the struggle for existence, just as the breeder will not permit any animal to reproduce if it does not have the characters he wants. It was the breeders who taught Darwin that variation is not directed toward some preordained goals, allowing him to build on his existing conviction that adaptive evolution must be an open-ended, branching process.[42]

Interestingly, Darwin had initially thought of domestic breeding in the same way as Wallace. Early in 1838 Darwin asked zoologist William Yarrell (1784–1856) somewhat rhetorically whether or not breeders were violating nature by "picking varieties" in a way that was "unnatural," creating "monsters."[43] By year's end he thought occasional variants would appear by *chance* with selection retaining those bearing the most utility. Now he was thinking of Nature as a "supreme selector" liberated from a designing Creator with natural and artificial selection being the most "beautiful part of my theory."[44]

But precisely how did Darwin intend to use this analogy? Probably the most straightforward answer comes from Jiri Syrovatka, who recognizes "the analogy as a heuristic method, where on the basis of similarity of one or more known objects we make a judgement in this similarity about other previously unknown object or more objects. The analogous survey is principally a language expression."[45] In Darwin's case the "known objects" are domestic breeds; these, in turn, supposedly suggest similarities with "previously unknown objects" in natural selection. Moreover, according to Syrovatka, the analogy must be "under the control of the rules of logic and the rules of language." Those rules of logic are largely inferential and need not be excluded from the heuristic value of the analogy.[46] These form the foundational boundaries for Darwin's analogy to be effective.

Darwin's work on domestic breeds and his artificial selection analogy presents a multiplicity of issues. For one thing, in what sense can chance *select*? Furthermore, in Bowler's description, how certain can one be that the intentional selection of variables such as a fatter pig, stronger horse, larger and more prolific egg-laying chicken, or more milk-producing cow on the farm and homestead can be a true *equivalent* for the so-called selection of variables bestowing survival advantage in the wild? Would a fatter pig in the wild be more prone to predation? Is a stronger horse always nature's calling or is speed? Would a general increase in egg productivity or larger eggs be conducive to survival of the flock under such increased population pressures? Why expend more physical resources on producing milk when it is not needed to maintain the offspring of the herd? These are more than just rhetorical questions; they go to the heart of why Wallace never thought the analogy worked. A breeder's selection criteria were *not* those of nature and, therefore, not analogous. Darwin, it seems, was trying to have it both ways: a Creator-free nature transmutated into a *selecting* Nature governed by *chance*. Despite these problems, the general historical verdict on Darwin's use of artificial selection has been positive. Peter Bowler believes it demonstrates that Darwin's "basic conception of selection was sounder" than Wallace's; L. T. Evans argues that Darwin's domestication analogy provided a basis for experimental technique and verification with regard to species variation; and Mary M. Bartley maintains the significance of Darwin's work on domestic breeds provided an important window into understanding heredity.[47]

More recently, however, Bert Theunissen at Utrecht University has examined the analogy between artificial selection of domestic breeds and natural selection and called for a reassessment.[48] For all of Darwin's careful study of domestic breeding techniques, Theunissen points out that the work of breeder John Saunders Sebright (1767–1846) did not provide data from which Darwin could build his analogy. Inbreeding and outcrossing were key ingredients to Sebright, and while he could draw a parallel between artificial and natural selection, the latter form did not explain species change but rather species constancy. Darwin indicated in *Origin* that small, imperceptible differences through persistent selection represented the principal method breeders used to create new varieties, but the actual history of domestic breeding practices were more diverse and complex than he suggested.[49] Furthermore, Darwin's experience with pigeon breeding was extremely limited. He purchased his first bird in May 1855 and by September 1858 had dispensed with all of them. This was too brief a time to determine whether or not artificial selection could establish new and

stable varieties. Darwin, in haste and with difficulty in sifting through a mass of contradictory literature, failed to give due consideration to crossing in the creation of Shorthorn cattle, Flemish and Friesian horses, and New Lancaster and Southdown sheep.

The minister-naturalist John Duns (1820–1909), author of the two-volume *Biblical Natural Science* (1863–66), challenged Darwin's "favourite pigeon argument" on the basis of twenty years' observation of pigeon breeding. "Has man's intelligence gone out in seeking variation by selection only?" he asked. Crossbreeding was used in pigeon breeding "to an extent which is destructive of the conclusions from Mr. Darwin's 'facts.'" He concluded that "cross-breeding, and breeding in-and-in, *under man's watchful care and discriminating intelligence* [emphasis added], can alone give the key to variation."[50] Darwin's only reply was to call Duns's remarks "clever."

In Germany, a professor of natural history at the University of Heidelberg, Heinrich Bronn (1800–1862), translated *Origin* a year after its publication. Bronn added sentences, deleted others, and appended a critical review of the book's strengths and weaknesses; hence, his work was more of an interpolation than a translation. Bronn had some serious questions regarding Darwin's theory and approach, not the least of which was the domestic breeding analogy. The analogy only demonstrated the production of new varieties, not species, he argued. But the analogy was unnecessary for Bronn. Species diversification was a matter of necessity since those without selective advantages would perish, and, more importantly, Darwin undermined his own argument by calling on a comparison with human artifice.[51]

Nearly one hundred years after the first edition of *Origin*, anthropologist Loren Eiseley (1907–1977) called Darwin's persistent use of the artificial selection analogy "a peculiar fact." While breeders may be able to produce stunning results in horses, pigs, fowl, and flowers, Eiseley noted it "is not actually in itself the road to the endless biological deviation which is evolution. There is great irony in this," he concluded, "for more than almost any other single factor, domestic breeding had been used as an argument for the reality of evolution."[52]

French zoologist Pierre-Paul Grassé (1895–1985) also questioned the value of artificial selection as an analogy for evolution: "In spite of the intense pressure generated by artificial selection (eliminating any parent not answering the criteria of choice) over whole millennia, no new species are born. A comparative study of sera, hemoglobins, blood proteins, interfertility, etc. proves that the strains remain within the same specific definition. This is not a matter of opinion or subjective classification, but a measur-

able reality. The fact is that selection gives tangible form to and gathers together all the varieties a genome is capable of producing, but does not constitute an innovative evolutionary process."[53]

Grassé nearly echoed Wallace in stating, "it is quite clear that dogs selected and kept by man in a domesticated state remain within the boundaries of the species. Tame animals that have reverted to the wild state lose the characteristics produced by mutations and fairly quickly resume the original type. They get rid of the man-selected characteristics. This demonstrates, as we knew before, that artificial selection and natural selection do not work in the same way."

Grassé could say "as we knew before" because this fact was well known for years. Even in Wallace's day Dutch botanist and pioneer geneticist Hugo de Vries (1848–1935) remarked, "If we remember that in Darwin's time the feature, breeding ability, enjoyed a far more general appreciation than at present, and that Darwin must have given it full consideration, it becomes clear at once that this old, but recently revived principle, is not adequate to support the current comparison between artificial and natural selection."[54] The selection of existing species to form new breeds was in an evolutionary sense somewhat trivial for de Vries, causing him to exclaim, "Natural selection may explain survival of the fittest, but it cannot explain arrival of the fittest."[55]

But perhaps Darwin never intended his alleged analogy to demonstrate the efficacy of selection.[56] According to this reading Darwin was simply making a heuristic comparison showing how domestic breeding could help in the understanding of natural selection, and to say that the only reason artificial selection failed to demonstrate speciation is its comparative brevity to natural selection is to miss Darwin's point. For Darwin, so the argument goes, the differences between the two forms of selection were well understood, and artificial selection was never presented as equivalent to natural selection.

But a careful reading of the primary documentation supporting this view seems lacking. In fact, it does appear to be an argument from analogy intended to demonstrate how artificial selection can reveal speciation, the only limiting factor being the relative power of natural selection over that of the breeder and time. As early as the summer of 1837, Darwin took note of the fact that "Falkland rabbits may have been [reading Lesson and Garnot] an example of domesticated animals having become a separate species."[57] If he was not interested in showing speciation between the two, why would he have bothered to take notice? The distinguishing feature of *time* seems also to be in evidence when he says in that same Notebook, "As

man has not had time to form good species, so cannot the domesticated animals with him!"[58] Time and power are conjoined in Notebook E when he somewhat exuberantly declares, "It is a beautiful part of my theory that domesticated races of organics are made by precisely same means as species—but latter far more perfectly & infinitely slower. No domesticated animal is perfectly adapted to external conditions."[59]

Much later, in the 1842 sketch, when Darwin was still considering a divine intelligence working through intermediate causes, he compared the domestic creations of the gardener with the powerful effect of natural selection over time by arguing, "Who, seeing how plants vary in garden, what blind foolish man has done in a few years, will deny an all-seeing being ['daily and hourly scrutinizing'] in thousands of years could effect (if the Creator chose to do so), either by his own direct foresight or by intermediate means [i.e., natural selection],—which will represent the creator of this universe."[60] When Darwin finally completed *Origin*, he had made the twin factors of power and time even more explicit: "As man can produce and certainly has produced a great result by his methodical and unconscious means of selection, what may not nature effect? Man can act only on external and visible characters: nature cares nothing for appearances, except in so far as they may be useful to any being. She can act on every internal organ, on every shade of constitutional difference, on the whole machinery of life. Man selects only for his own good; Nature only for that of the being which she tends. . . . How fleeting are the wishes and efforts of man! how short his time! and consequently how poor will his products be, compared with those accumulated by nature during whole geological periods."[61]

This analogy is retained in Darwin's *Variation of Animals and Plants under Domestication*. "The principle of natural selection may be looked at as a mere hypothesis," he writes early on, "but rendered in some degree probable by what we positively know of the variability of organic beings in a state of nature,—by what we positively know of the struggle for existence, and the consequent almost inevitable preservation of favourable variations,—and from the analogical formation of domestic races."[62] Somewhat astonishingly, Darwin tries to bolster his argument in *Variation* by referencing Wallace's Ternate paper, saying, "It has often been argued that no light is thrown on the changes which natural species are believed to undergo from the admitted changes of domestic races, as the latter are said to be mere temporary productions, always reverting, as soon as they become feral, to their pristine form. This argument has been well combated by Mr. Wallace."[63] But this is precisely what Wallace did *not* combat; it was one of his

basic disagreements with Darwin and would remain so throughout his life (see one of the essays reproduced in the appendix in this book, "On the Tendency of Varieties to Depart Indefinitely from the Original Type").

A modern interpretation of Darwin's analogy is defended by biologist David Reznick over Wallace's objections by referring to feral animals. The feral dog, he argues, does not return to a wolf.[64] But Wallace never said they would revert to their common ancestor; he said they would "lose those extreme qualities which would never be called into action, and in a few generations would revert to a common type, which must be that in which the various powers and faculties are so proportioned to each other as to be best adapted to procure food and secure safety—that which by the full exercise of every part of his organization the animal can alone continue to live." That is to say, they would forfeit those domestic eccentricities developed by the breeder and revert to a wilder type capable of meeting its needs for survival in the wild. Reznick seems to concede the point, because a bit later he admits, "Domestic animals rapidly evolve, or die out, when they are released back into the wild because they have been released from the shielding influences of humans' care and are once again subject to natural selection."[65] This was *precisely* Wallace's original objection to Darwin's analogy.

Given the problematic nature of Darwin's artificial selection analogy, it is presumptuous to dismiss Wallace's misgivings about its value in explaining natural selection. Whatever its relative strengths or weaknesses may be, both men achieved something important. Despite the drowsy reception accorded the Darwin-Wallace papers at the Linnean Society, the arguments in each presaged a true revolution in biology and science. No one knew it yet, but Darwin was about to show *everyone* exactly how revolutionary it was, and Wallace stood shoulder to shoulder with his colleague ready to defend it.

Darwin's *Origin* and Wallace's Decade of Defense, 1859–69

Darwin published his "long argument" *On the Origin of Species by Means of Natural Selection; or, The Preservation of Favoured Races in the Struggle for Life* with John Murray of London on November 24, 1859, with an initial print run of 1,000 copies. But Murray's "sale dinner" courting agents and bookdealers caused him to raise the print run to 1,250 with orders placed for 250 more than the number available.[66] It was an auspicious start that captured the attention of England's intelligentsia and upper crust. Historian Thomas F. Glick believes the rapid diffusion of knowledge about the book and its overall popularity was a product of the small but tightly and

intimately connected society in which it was discussed and shared. It was an English educated elite that was self-sustaining and cliquish like no other, allowing ideas to percolate and disseminate with remarkable speed and intensity.[67]

Origin became something of a fad among the London swells, and one suspects that some of the dinner chatter was carried on by devotees who had not read it with much care or at all. Historian Gertrude Himmelfarb has said, "It was less the weight of the facts than the weight of the argument that was impressive. The reasoning was so subtle and complex as to flatter and disarm all but the most wary intelligence."[68] Most just bought a copy and acquiesced. Harriette Martineau (1802–1876) was *not* one of these. This half-deaf radical freethinker, old flame to Darwin's older brother Erasmus (1804–1881), described as a "one-woman advertising agency," was swept off her feet by *Origin*. "What a book it is!" she exclaimed to George Holyoake, "overthrowing (if true) revealed Religion on the one hand & Natural (as far as Final Causes & Design are concerned) on the other. The range & mass of knowledge take one's breath away."[69] *Origin* was well suited to the secular and humanistic tastes of Martineau, who had earlier translated Auguste Comte's *Cours de philosophie positive*, and whose positivist progressivism made her one of England's most outspoken atheists. Most were not as scandalously committed but wanted to convey to polite society that they were at least "in the know."

Yet Darwin's *Origin* was not an atheistic work. Asa Gray and Rev. Charles Kingsley (1819–1875) both became ardent Darwinian theists. Darwin was especially pleased with these endorsements, even underwriting the publication costs of Gray's *Natural Selection Not Inconsistent with Natural Theology* (1861), an extended theological defense emanating from his three-part series in the *Atlantic Monthly*. Darwin quoted Kingsley's endorsement for his second edition as coming from a "celebrated cleric." Both men became lifelong promoters for Darwin. In the summer of 1867, Kingsley wrote enthusiastically to Darwin, "I have been drawn [to Darwinism] . . . because I find everyone talking about it to any one who is supposed to know (or mis-know) anything about it; all showing how men's minds are stirred. I find the best and strongest men coming over."[70]

Other men's minds were "stirred" differently. Two of the Victorian era's greatest scientific figures, William Whewell and John Herschel, thought little of *Origin*. Herschel called natural selection the law of "higgledy-piggledy," and rumor had it that Whewell refused to place a copy of the book in the Trinity College Library.[71] Others were unimpressed as well. Adam Sedgwick, a leading geologist and a fellow of Trinity College, complained that the theory was not inductive, not an argument from facts leading to

general conclusions, and only based on domestication examples drawn from the human artifice of crossbreeding. Everyone admits to varieties, Sedgwick pointed out, poodles are very different from greyhounds, but both are dogs.[72]

It is worth noting that the objections raised here are not religious, they are scientific—based on criticisms of Darwin's argument, logic, and methodology. It has been claimed that Darwin's *Origin* "encoded" Whewell's and Herschel's philosophy of science.[73] It was encoded in the sense that Darwin wanted to make *Origin* as exemplary of these men's models of scientific method and inquiry as possible. There was good reason. Darwin was a graduate of the University of Cambridge—Isaac Newton having been its star—who had met Whewell, a distinguished mathematician and astronomer in his own right, through the good offices of his professor of botany, John Henslow. Darwin stood in awe of Whewell, a sage of science. Soon after sitting for his examination at Cambridge, Darwin, probably on the recommendation of his friend Herschel, was immersed in Whewell's *Preliminary Discourse on the Study of Natural Philosophy* (1831). Both impressed on Darwin the importance of what Newton somewhat cryptically called a *vera causa*, a *true* cause. Herschel stressed empirical evidence based on observation; Whewell, a rationalist, thought that a true cause needed a "consilience of inductions" to be absolutely persuasive. This, in effect, asked for the cause in question to explain many observations across disciplines for a variety of phenomena. The *vera causa* needed bring together diverse phenomena under one explanation.[74] In other words, concilience occurs when there is a convergence of evidence giving a cause strong explanatory power. Darwin was convinced he had found the key to the scientific rigors of Herschel and Whewell with natural selection. Their opinions mattered a great deal to Darwin, as did the opinion of Rev. Adam Sedgwick, who taught him the basics of geology on a three-week study of the field in north Wales in the summer of 1831. In fact, it was Sedgwick who reported on Darwin's progress on the *Beagle* to the Geological Society of London. Sedgwick, a liberal churchman devoted to science and natural theology, did not look any more favorably on Darwin's *Origin* than Herschel and Whewell. After delivering an anonymous tirade against the book in the *Spectator*, Darwin's old mentor told him privately, "You cannot make good rope out of a string of air bubbles."[75] As for Herschel's crack about the law of "higgledy-piggledy," Darwin didn't know quite what he meant but it was surely intended to be contemptuous.[76] The crux of all their complaints was probably summarized best by Herschel, who wrote, "We do not believe that Mr. Darwin means to deny the necessity of . . . intelligent direction. But it does not, so far as we can see, enter into the formula of his law; and without it we are

unable to conceive how the law can have led to the results."[77] Darwin's consilient *vera causa* was too purposeless and blind for this older generation. It is a testament to Darwin's courage and fortitude that even in the face of stiff opposition from those whose opinions he cherished most that he refused to retreat from his position.

If certain noteworthy members of the scientific community failed to follow Asa Gray in their enthusiasm, neither did some of the clergy eagerly follow Kingsley's lead. The Presbyterian theologian Charles Hodge (1797–1878), for example, made fair note of Darwin's allusion to Genesis of the powers of life having been "breathed into a few forms or one" in the concluding lines of *Origin* (amended in his second edition to "breathed by the Creator," a phrase he admitted to Hooker privately that he had regretted[78]), but insisted that Darwin's complete exclusion of design in nature "is virtually a denial of God." After all, charged Hodge, a Creator that establishes the world and all the life that is in it but then abandons the universe to chance and necessity, without purpose, intervention, or guidance is virtually consigned to nonexistence.[79]

Historians have observed that, for the most part, it was the men of science who were most loudly opposed (at least initially) to Darwin's theory; the clergy seemed either silent or accepting of the idea, although often by means of their own idiosyncratic interpretations of the author's "meanings."[80] Although it has already been shown that the Roman Catholic Mivart's opposition to *Origin* was loud and long, the general response of his fellow parishioners was more muted, most regarding it "with a sort of inarticulate horror" worthy only of silence.[81]

But what exactly was all the fuss about? What in *Origin* was so challenging for both science and faith? The best synopsis of the theory is provided in Darwin's summary of his chapter on natural selection:

> If during the long course of ages and under varying conditions of life, organic beings vary at all in the several parts of their organisation, and I think this cannot be disputed; if there be, owing to the high geometrical powers of increase of each species, at some age, season, or year, a severe struggle for life, and this certainly cannot be disputed; then, considering the infinite complexity of the relations of all organic beings to each other and to their conditions of existence, causing an infinite diversity in structure, constitution, and habits, to be advantageous to them, I think it would be a most extraordinary fact if no variation ever had occurred useful to each being's own welfare, in the same way as so many variations have occurred useful to man. But if variations useful to any organic being do occur, assuredly

> individuals thus characterised will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance they will tend to produce offspring similarly characterised. This principle of preservation I have called, for the sake of brevity, Natural Selection, [with the fifth edition in 1869, add "survival of the fittest,"]. . . . Amongst many animals, sexual selection will give its aid to ordinary selection, by assuring to the most vigorous and best adapted males the greatest number of offspring. Sexual selection will also give characters useful to the males alone, in their struggles with other males. . . .
>
> [Natural selection] entails extinction; and how largely extinction has acted in the world's history, geology plainly declares. Natural selection, also, leads to divergence of character; for more living beings can be supported on the same area the more they diverge in structure, habits, and constitution, of which we see proof by looking at the inhabitants of any small spot or at naturalised productions. Therefore during the modification of the descendants of any one species, and during the incessant struggle of all species to increase in numbers, the more diversified these descendants become, the better will be their chance of succeeding in the battle of life. Thus the small differences distinguishing varieties of the same species, will steadily tend to increase till they come to equal the greater differences between species of the same genus, or even of distinct genera.[82]

Where do these variations come from? Furthermore, if survival and preservation are given over to "chance," then what can be said of God's providence? It seemed as if such a view left only four options: an imperfect demiurge, an indifferent deistic god, an impersonal progressive vitalism, or no god or transcendent being at all. Clearly Paley's god was dead and the traditional Judeo-Christian God was in serious condition.

If the general lines of debate surrounding *Origin* had to be characterized, it could be said that the increasingly influential liberal-progressive arm of Christian theologians were rallying around the theory allied with a small but discernable cadre of intellectual elites leading the way toward a new secularized society. Concurrently, a central core of opposition formed with a powerful old guard of naturalists, leery of Darwin's speculations and method, and religious conservatives for whom special creation was as essential as the exegetical absolutes they drew from scripture. But support within the scientific community was on the horizon as Thomas Henry Huxley armed with his "secular sermons" and his followers ordained in a

new professionalized and empowered scientific order used Darwin's theory of evolution as its profession of faith.

This was the complex intellectual climate into which Wallace staked his own position. As the presumptive cofounder of natural selection, he was naturally one of its most ardent defenders from the very beginning. Wallace's first reading of *Origin* came from a copy sent to him on the request of Darwin from his publisher. It arrived on May 18, 1860, while Wallace was collecting in the Maluccas Islands at Amboyna. From his annotations and markings in that volume, now part of the Keynes Collection at the University of Cambridge, it is obvious that he gave it a very thorough study. In general, his comments are either ones of clarification, elucidation, or sometimes approbation.[83] Only in Darwin's domestication analogy are there clear differences of opinion. Wallace is particularly taken with Darwin's challenges to special creation. When Darwin indicated that such a view "makes the work of God a mere mockery and deception," Wallace wrote, "! good."[84] Again, when Darwin wrote that "the view of each organic being and each separate organ having been specially created" makes much in nature "utterly inexplicable," Wallace underlined with "admirable!" in the margin.[85] Darwin concluded, "There is a grandeur in this view of life, with its several powers, having been originally breathed into a few forms or one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved." Alongside this closing sentence, Wallace wrote, "grand!!!"[86]

One of the earliest sustained comments surviving from Wallace's pen is a letter he wrote to his brother-in-law, Thomas Sims, from the island of Timor on March 15, 1861. In it he called Darwin "the *Newton of Natural History*," concluding that the exposition in *Origin* made it "as clear as daylight that the principle of natural selection *must* act in nature" and that "the effects produced by this action *cannot be limited*." Only on the theory of natural selection can "the vast *chaos* of facts . . . fall into beautiful order on the one theory . . . which I think must ultimately force Darwin's views on any and every reflecting mind."[87]

Wallace's enthusiasms notwithstanding, four points are important to remember. First, Wallace's defense is essentially a defense of natural selection, which he equates as synonymous with evolution. In fact, the subsidiary theories Darwin would elaborate on after the initial release of *Origin*; namely, sexual selection and pangenesis, Wallace dismissed. Second, Wallace, as we have seen, would distance himself increasingly from claims of the unbridled explanatory power of natural selection, first with humans

and later with other key aspects of biological and even cosmological development. Third, Wallace's early defense of Darwinian theory was his attempt to really gain acceptance for natural selection in opposition to the view common at the time that only an interventionist divinity operating in a multiplicity of times and circumstances on all species could explain the diversity of life. Thus, Wallace tended to minimize his disagreements with Darwin in an effort to advance what he saw as the central idea of modern evolutionary theory still in the process of acceptance and under siege by powerful spokesmen such as Richard Owen in England and Louis Agassiz (1807–1873) in North America. Finally, as the efforts of Huxley and his cohorts, armed with the powerful literary megaphone of Lockyer's *Nature*, won the battle, Wallace, for reasons that will be explained later, came to be repelled by what he saw as a transition from science to scientism.

The complex landscape of responses to Darwinian evolution were (and even *are*) a reflection of the very real challenges that all this "grandeur" presented to religious belief, and not just Christian but essentially all of the Abrahamic faiths. The upshot of the précis quoted earlier is that the differential death rates based on purely natural selective pressures and teased out by the process of natural selection—or Wallace's preferred Spencerian term, "survival of the fittest"—made Yahweh, God, or Allah seemingly superfluous. Friends and foes of the theory recognize this fact.[88] Nature's apparent indifference to suffering suggested to many only three things: no God, an utterly deistic and impersonal god, or an imperfect demiurge. Whether an orthodox Christian theodicy could be carved out of such apparent "facts" remained to be seen. Darwin recognized these metaphysical challenges and exclaimed to his friend and confidant, Joseph Hooker, "What a book a Devil's Chaplain might write on the clumsy, wasteful, blundering low & horridly cruel works of nature!"[89]

Thus Darwin's theory must be seen within a framework of natural theology. Darwin was the product of the deistic enlightenment, something he no doubt imbued from his father, Robert, who had, in turn, inherited from *his* father, Erasmus. Darwin's public ambiguity on the question of religion places him within a rationalist tradition familiar to the authors who attempted to shore up a faltering natural theology in the *Bridgewater Treatises* (1833–37). Hodge was right: *Origin* did, in fact, suggest a deistic god, but in so doing Darwin, at least publicly, assumed the posture of a natural theologian attempting to recover the deistic rationalism of the Enlightenment. By the 1850s the *Bridgewater Treatise* series had clearly failed. They attributed design to too much in nature, and having no reliable means for distinguishing intelligent from purely natural causes, they often made God much busier than necessary. This was compounded by a naively anthro-

pomorphic view of the Divine Creator whose perfection and goodness presented a world that explained away the problems of pain and evil. It produced a highly sentimentalized view of creation that was demonstrably false.[90] In their efforts to defend the faith, the *Bridgewater Treatises* wound up creating a straw god.[91] *Origin* greeted an audience tired of the old, failed natural theologies, and the "Bilgewater" treatises, as they were increasingly called, left the public awaiting something better.[92]

In this way Darwin could present a welcome alternative to Paley's watchmaker contrivances with his busy and blissful bees and other designed creatures that exclaimed, "It is a happy world after all." So Darwin could write within these shifting sands of natural theology and appeal to a "sanitized materialism" whose metaphysical implications remained unspoken.[93] David Kohn has said quite correctly that Darwin engaged in a "self-conscious revision of teleology" at once "profoundly teleological [progressive change after a fashion] and yet profoundly non-Providential [totally blind and indifferent]."[94]

The Enlightenment deism he derived from his father and grandfather is only a partial source of this curious blend; another part he imbued from long walks as a youth at the University of Edinburgh with Robert Edmond Grant (1793–1874), an expert on aquatic invertebrates sixteen years older than Darwin. This hardened and thorough materialist brought the seventeen-year-old under his spell. Grant exposed the youth to radical transmutationist ideas, a nature bound only by laws of contingency, necessity, and chance.[95] In addition, while at Edinburgh, Darwin joined the Plinian Society in November 1826 and attended all but one of the ensuing nineteen meetings until April 1827. Here young Darwin was exposed to, what was considered at the time, the dangerous, disreputable, and irreligious heresies of "freethinking" materialistic scientism.[96] Darwin dismissed this early period in his life and claimed that Grant left little impression on him, but this seems hard to take at face value. Shortly after the publication of Darwin's *Origin of Species*, Grant published his *Tabular View of the Primary Divisions of the Animal Kingdom* (1861), and in a dedicatory letter reminded his protégé of their common labors nearly forty years earlier "in the same rich field of philosophic inquiry."[97] Grant was clearly *not* referring to aquatic invertebrates. According to Darwin's biographer Janet Browne, "Young Darwin, it now turns out, was well aware of evolutionary views and perfectly capable of grasping the full implications of what Grant had to say."[98] So whether carried in the back or in the forefront of his mind, Darwin long had a template of what materialistic, positivistic science looked like.

But this was not the only possible formulation possible. Other options were available, as in Wallace's defense of the theory of natural selection

on the one hand and his nascent natural theology on the other. He defended evolution in 1867 against George Douglas Campbell (1823–1900), 8th Duke of Argyll's book *The Reign of Law*, which criticized natural selection and instead argued for special creation. Typically, Wallace's famous "Creation by Law" reply to the duke is considered a "closely argued but courteous demolition job," a "trounce of outmoded views," or a "chapter-and-verse . . . razor-sharp review" of the duke's attempt to shore up special creation.[99] But a close reading of Wallace's essay suggests a more nuanced position. First published in the *Quarterly Journal of Science* in its October 1867 issue, Wallace considered his "Creation by Law" reply to the duke important enough to reprint a few years later in his collected essays on natural selection.[100] Wallace simply pointed out that the beauty and diversity of nature did not require "the constant supervision and direct interference of the Creator."[101] Wallace added, "It is simply a question of how [not *if*] the Creator has worked."[102] He believed that some of these teleological confusions were prompted by Darwin's constant use of metaphor in reference to natural selection. Wallace declared, "As a matter of feeling and religion, I hold this to be a far higher conception of the Creator and of the Universe than that which may be called the 'continual interference' hypothesis."[103] Rejecting the duke's insistence on the continual action of a "contriving mind," Wallace asked, "Why are we required to believe in the continual action of such a mind in the region of organic nature? True, the laws at work are more complex, the adjustments more delicate, the appearances of special adaptation more remarkable; but why should we measure the creative mind by our own? Why should we suppose that machine too complicated, to have been designed by the Creator so complete that it would necessarily work out harmonious results?"[104] Wallace felt the duke's call for a Creator's constant intervention was unduly limiting the infinite capacities of an omniscient and omnipresent mind-like force.

Here Wallace was clearly suggesting his own version of design in nature by calling on a front-loading of laws toward purposeful ends. Far from eliminating first and final causes from ultimate consideration, Wallace merely moved teleology to efficient causes operating through lawlike processes. Wallace continually referred to "the Creator" or "creative mind" (twenty times) and "creation" (ten times) throughout the thirty-four-page essay, and much later Wallace would discuss a "creative mind" not in the context of "feeling and religion" but as a matter of science in *The World of Life*. Taken in its entirety the essay was not simply a reply to the duke's neo-Paleyan musings but a prolegomenon for Wallace's larger teleological vision.

But this was clearly a very *un*-Darwinian approach to the question. The

author of *Origin* may have appreciated Wallace's "courage" in taking on the duke and admired "every word" of his "Creation by Law" article, but all of Wallace's references to a Creator and a "creative mind" must have made him uncomfortable since he merely highlighted certain scientific points Wallace had made. Darwin's silence over Wallace's larger metaphysical points was deafening.[105] After all, David Kohn has noted that Darwin's evolution had an enduring lesson: "When we learn to read nature, God is not there. Here Darwin, the last of the natural theologians, is the man who turned out the lights."[106] But Wallace was about to turn them back on. For the cofounders of natural selection, there was trouble ahead.

3
Darwin's Heretic

The Break

The falling-out between Wallace and Darwin came in the April 1869 issue of the *Quarterly Review*, and not surprisingly in a review of Charles Lyell's latest edition of *Principles of Geology* and *Elements of Geology*.[1] After all, *H. sapiens* had made Wallace and Lyell metaphysical soulmates. Wallace made his position unmistakable: natural selection, important as it was in explaining many things regarding the diversification of species, could not explain all aspects of nature, and moreover, where natural selection was limited, some intelligent or mind-like cause was required. He laid this out in a long, thirty-five-page essay review, the last four of which he extended his discussion to Lyell's "very interesting" chapter forty-three of *Principles*, "Origin and Distribution of Man."

Wallace began by suggesting that natural selection cannot account for either sentient life or the "higher intellectual nature of man." While natural selection certainly can and does explain growth, development, and reproduction, it is incapable of extending its explanatory power to consciousness and most certainly not to the special mental and moral capacities of human beings. Moreover, Wallace also insisted that certain aspects of humans' physical attributes are inexplicable by mean of natural selection—the organs permitting speech, the hand, and the comparatively denuded body of *H. sapiens*. Referencing Charles Bell's *Bridgewater Treatise* number four, *The Hand, Its Mechanism and Vital Endowments as Evincing Design* (1833), Wallace considered the hand the tool of all of mankind's higher achievements in the arts and sciences. He went on to marvel at the human form reminiscent of Shakespeare's *Hamlet*: "What a piece of work is a man! How noble in reason! How infinite in faculty! In form, in moving, how express

and admirable! in action how like an angel! In apprehension how like a god!" But, for Wallace, man was no "paragon of animals," both in form and capacities we were a species apart.

Wallace then turns Darwin's domestic breeding analogy against him by pointing out that the modifications humans have made in developing animals for their special purposes demonstrate intelligent goal-directed purpose and design. If we humans can produce these amazing results, why may we not "well imagine a being who had mastered the laws of development of organic forms through past ages, refusing to believe that any new power had been concerned in their production" and treat the idea "that in these few cases a distinct intelligence had directed the action of laws of variation, multiplication, and survival, for his own purposes" scornfully? If we know domestic breeds have been established by human manipulations of the same laws, then surely the possibility that "a Higher Intelligence had guided the same laws for nobler ends" remains alive. Wallace concluded with a bold paragraph that would form the central thesis statement and abstract for a refurbished natural theology that he would spend the rest of his life developing:

> Such, we believe, is the direction in which we shall find the true reconciliation of Science and Theology on this most momentous problem. Let us fearlessly admit that the mind of man (itself the living proof of a supreme mind) is able to trace, and to a considerable extent has traced, the laws by means of which the organic no less than the inorganic world has been developed. But let us not shut our eyes to the evidence that an Overruling Intelligence has watched over the action of those laws, so directing variations and so determining their accumulation, as finally to produce an organization sufficiently perfect to admit of, and even to aid in, the indefinite advancement of our mental and moral nature.

The reaction was predictable. Darwin, who knew trouble was brewing, had written to Wallace in nervous anticipation of his coming bombshell, "I hope you have not murdered too completely your own and my child."[2] Now it was out. Darwin's response was immediate. While he congratulated Wallace on his exposition of natural selection, he was so dismayed by the metaphysical assertions in the *Quarterly* essay that he "should have thought that they had been added by someone else. As you expect," he added, "I differ grievously from you, and I am very sorry for it."[3] In his copy of the article Darwin marked "No, no!" with triple emphatic underlining.[4]

If Darwin thought he would get sympathy from Lyell, he was wrong.

Lyell explained that in his view the intelligent operations of the domestic breeder and horticulturalist demonstrated (indeed by the very analogy) that a "Supreme Intelligence" might guide and direct variation toward some preconceived end. "I rather hail Wallace's suggestion that there may be a Supreme Will and Power which may not abdicate its functions of interference," he told Darwin, "not without wonder, that we should be permitted to give rise to a monstrosity like a pouter pigeon."[5]

At this same time, the anonymous writings of Mivart in the Catholic *Month* pointing out difficulties with natural selection unaided by an "inner force" was making this the spring of Darwin's discontent. Meanwhile the secular press took notice of Wallace's defection and its impact on Darwin's new theory of evolution. "Mr. Wallace's reference . . . to a Creator's will undermines Mr. Darwin's whole hypothesis," cried the *Morning Post*.[6]

How so and in what sense? If the entire question of modern evolutionary theory was simply about the *science* of descent with modification by means of natural selection, then Wallace's essay posed no challenge. After all, he was not opposing common descent, and even Darwin told Wallace that he thought his exposition of natural selection "inimitably good; there never lived a better expounder than you."[7] But Wallace's self-admitted heresy was in his reintroduction of goal-directed *purpose* back into nature. Darwin is generally given credit for introducing natural selection into an evolutionary process that made the need for Wallace's "Overruling Intelligence" superfluous, but perhaps that is not all. Lurking behind this, as Curtis Johnson has argued so compellingly, is Darwin's *real* discovery—the idea of randomness or *chance* in nature.[8] In some ways this idea of chance may be said to be an unknown cause, but, as Johnson thoroughly demonstrates, Darwin's idea was more radical, "By 'unknown cause' he [Darwin] implied in his more private and less guarded moments that the cause of at least some variations is *unknowable*, even in principle. And the reason for the unknowability of such causes is not lack of human understanding but rather a lack of a directing rational agency."[9]

For Darwin, *chance* as "lack of a directing agency" meant there was no real guidance or purpose in nature; Comte had taught Darwin that teleology was a dead idea, a useless relic of the religious past.[10] But Darwin's real challenge was to show how random, chance processes could bring about the intricate order demonstrated in nature. His answer was natural selection. According to Johnson, Darwin's leading contribution of chance in nature as "undesigned" not only set him apart from virtually all his predecessors and contemporaries but also distinguished him as the naturalist who foreshadowed randomness as the basis for the neo-Darwinian paradigm.[11] The development of Darwin's concept of chance in nature occurred very

early—from his Notebooks B and C (from about July 1837 and February 1838 respectively)—long before he had read Malthus.[12] Further, chance did not mean unknown but *unknowable*, and not merely due to the inscrutability of a divine source of causation but because there is no divinity or higher source behind the actual forces of nature.[13] As Darwin presented his views in subsequent editions of *Origin* he often replaced the word "chance" with "spontaneous variation" as code for the same thing. What Darwin did in order to deflect criticism away from his theory's preeminence of chance was to expunge the word from his writing but not its meaning.[14] Increasingly, Darwin used "accidental variation" as a phrase that meant not uncaused but rather not preordained.[15] In his "Old and Useless Notebooks" (1837–40) he suggested that life occurred as the "contingent" result of bits of inorganic matter responding to environmental factors of heat and light coming together by accident. "The effects of Life in the abstract is," he wrote, "matter united by certain laws different from those that govern in the inorganic world; life itself being the *capability* of such matter obeying a certain & peculiar system of movements. . . . In the simplest forms of living beings; namely, *one individual* vegetable, the vital laws act definitely (like chemical laws) as long as certain contingencies are present."[16] The development of life, Darwin continued, represented a movement from matter to form and was "invariable" in being modified by "external accidents" and bearing "a fixed relation to such accidents." The precise *how*, *why*, and *when* of the birth of life was purely accidental. The accidental and contingent origin of life meant that chance now governed all the way down; it permeated organic life in all aspects and at all levels. As Johnson explains, Darwin ushered God out the door "as being superfluous to any account of how life is as it is or how it has come to be as it has. The planet is on its own."[17]

Darwin never went public with his views on the origin of life, and he was always careful to insist it was a question he could not address in any of his public writings. But his private musings make clear that life was a product of chance and necessity only. True, natural selection was distinctly *not* a blind process, but the variations it needed to work *were*, as were the inherent properties of life. One other time, in a revealing letter to Joseph Hooker written on February 1, 1871 (thirty-two years after Darwin's Notebook musings), Darwin tentatively but somewhat hopefully confessed and reiterated his position: "It is often said that all the conditions for the first production of a living organism are now present, which could ever have been present. But if (& oh what a big if) we could conceive in some warm little pond with all sorts of ammonia & phosphoric salts—light, heat, electricity & c present, that a protein compound was chemically formed, ready to undergo still more complex changes, at the present day such mat-

ter would be instantly devoured, or absorbed, which would not have been the case before living creatures were formed."[18]

His "warm little pond" was the private revelation he never publicly confessed, but it explained the "Pentateuchal" regret he had confessed to his old friend Hooker some eight years before (see chapter 5). Thus, if not intended as a secular faith, Darwin's theory effectively served as one. Huxley's "lay sermons" were more than just clever promotions, they pointed the way to a new way of thinking and believing that "if the theology of the present differs from that of the past, it is because the theology of the present has become more scientific than that of the past" by "cherishing the noblest and most human of man's emotions, by worship 'for the most part of the silent sort' at the altar of the Unknown and Unknowable."[19] In this new scientific revolution *Chance* replaced the French Revolution's Goddess of Reason. The English now had their own *Fête de la raison*, and it would be far more enduring.

But Wallace, never one to follow the crowd, refused to go along. He really *had* proposed to open the door to the very thing Darwin sought to exclude. It might have all simmered down, but Wallace wasn't done. One year later he republished ten papers titled *Contributions to the Theory of Natural Selection: A Series of Essays* (1870). They included his famous Sarawak Law paper of February 1855 (for an excerpt, see the appendix in this book) and concluded with an elaboration on his *Quarterly Review* essay review. Released, revised and corrected in a second edition one year later, *Contributions* caused quite a stir.

Wallace the Apostate

"The Limits of Natural Selection as Applied to Man" extended Wallace's developing natural theology emergent as *intelligent evolution*: directed, detectably designed, and purposeful common descent. Wallace's essay, the only one written exclusively for inclusion in *Contributions*, actually did two things: first, and most immediately, it elaborated on the concluding metaphysical lines of Wallace's essay review of Lyell's works; second, it in many ways brought his 1864 paper, "The Origin of Human Races and the Antiquity of Man Deduced from the Theory of 'Natural Selection,'" to its final, logical conclusion.

Wallace began his essay by observing certain constraints incumbent on natural selection. First, it cannot produce absolute perfection, only that sufficient for survival in the struggle for survival. Second, natural section has no capacity to produce any modification harmful to an organism. Third, no morphological feature of an organism will be established and retained un-

less it affords it a survival advantage in nature. At the very least its degree of development would need to be proportionate to its usefulness. Wallace was simply alluding to Darwin's own principle of utility: "Natural selection acts *solely* [emphasis added] through the preservation of variations in some way advantageous, which consequently endure."[20] If, however, features of an organism were manifested beyond that of an organism's advantage in the struggle for survival, it is easy to see Wallace's conclusion, anticipated in his controversial chapter on man in *Darwinism*, in which the development of mental attributes in *Homo sapiens* was "altogether removed from utility in the struggle for life."[21] What could possibly explain their existence? Under such a situation Wallace argued that it would be reasonable to infer that some other law or principle was at work besides natural selection.

Like all his fellow naturalists and anthropologists (including Darwin), craniometry was assumed to be a great indicator of intellectual capacity, but what Wallace marveled at was the degree to which all humans exhibited roughly similar cranial measurements, from the most sophisticated European to the most rudimentary "savage." Indeed, the mental capacity of the "savage" was comparable to that of the most civilized of humans. Moreover, with "his large and well-developed brain he actually possesses an organ disproportionate to his actual requirements—an organ that seems prepared in advance, only to be fully utilized as he progresses in civilization."[22] Wallace then noted the hairless state of the human body and concluded that natural selection could not have produced such a hairless body based on the accumulations of incremental variations derived from his hairy ancestor (which Wallace freely accepted) because such variations would not have been beneficial and useful to our species. Wallace argued that similar difficulties were faced when explaining the human hand and voice.

The mind of man earned Wallace's extended treatment. He acknowledged that justice and benevolence are compatible with natural selection because such attributes would strengthen the social unit and improve its collective chances for survival. Some other mental capabilities were more problematic on the principle of natural selection, however. Wallace duly noted those as the ability to conceptualize space, time, and infinity; artistic abilities; abstract ideas of mathematics and geometry; and the development of morality and conscience. Wallace could not conceive of how these features of the human intellect, present among all peoples in all places, could have arisen "out of accumulated ancestral experiences of utility."

Then, alluding to Darwin's artificial selection analogy, Wallace argued that just as "the unaided productions of nature" would never have produced a Guernsey cow or a London dray horse, how can the special attributes of human beings be explained by reliance on natural selection? The

only explanation was "that in these few cases a controlling intelligence had directed the action of the laws of variation, multiplication, and survival, for his own purposes."[23]

Wallace went on to criticize Huxley's insistence on a physical, material basis of thought and consciousness as "not only incapable of proof, but . . . also . . . inconsistent with accurate conceptions of molecular physics."[24] Since, according to Wallace's presentation, consciousness and thought must be considered "radically distinct" from matter, its obvious presence "in material forms is a proof of the existence of conscious beings, outside of, and independent of, what we term matter."[25] Relying on what Wallace referred to as a "will-force," he concluded that "the whole universe, is not merely dependent on, but actually *is*, the WILL of higher intelligences or of one Supreme Intelligence."[26]

The reactions to Wallace's essay, private and public, were strong and rather predictable. Darwin's reaction actually preceded the release of *Contributions* and came by way of a personal letter to his renegade colleague. In reply to Wallace's notice—that is, warning—of the forthcoming volume, Darwin amplified his earlier displeasure over Wallace's apostasy by exclaiming,

> I am very glad you are going to publish all your papers on Natural Selection: I am sure you are right, and that they will do our cause much good.
>
> But I groan over Man—you write like a metamorphosed (in retrograde direction) naturalist, and you the author of the best paper that ever appeared in the *Anthropological Review*! Eheu! Eheu! Eheu!—Your miserable friend,
>
> C. Darwin.[27]

When the book arrived at Down House a few months later, Darwin expressed his appreciation for Wallace's kind words in the preface; as for the "Limits" essay, Darwin needed to say no more. Wallace's longtime friend and fellow explorer, Richard Spruce, sounded more like London's impassioned Baptist preacher Charles Haddon Spurgeon than a dispassionate scientist when he referred to Wallace's book—and in particular his final essay—as giving evidence of his "backsliding from the Darwinian theory which it contains."[28] Spruce importuned Darwin to reply.

More public was the sharply critical review of Swiss zoologist René-Édouard Claparède (1832–1871) in the French journal *Revue des cours scientifiques*. Claparède accused Wallace of inconsistently claiming that "our brains were made by God" but "our lungs by natural selection," and

that the entire thrust of his argument was "really to exclude the Creator from half His creation, and natural science from half of nature." He further accused Wallace of abandoning science by calling on a "*une Force supérieure*"—a "higher Force" or Deity—making man "God's domestic animal." It prompted Wallace to add a note in the second, revised edition of *Contributions* in reply. Here he clearly distanced himself from any notion of special creation by rejecting first causes in nature. Instead of God acting directly in endowing humankind with unique attributes, Wallace proposed that the action of intelligent selection in the creation of domestic animals was exactly analogous to and warranted the inference of a "directing influence of some higher intelligent beings, acting through natural and universal laws."[29]

Joseph Hooker thought Claparède's criticisms were on the mark, and he told Darwin so.[30] Prominent zoologist Anton Dohrn (1840–1909) was more sympathetic. He admitted the question of the role of parent to offspring instruction, experience, and imitation in the formation of instinct must "remain open," and that Wallace's inquiries had given "a great and healthy impulse" to their investigation. As to the issue of the human mind, Dohrn admitted humans' general ignorance of the "so-called psychical regions of human nature" and that the physiology of thought processes themselves "seems to be as far from a solution as it ever was." As such, Wallace's explanation to account for these "on other than mechanical processes" remains open, and "the last and most metaphysical of his essays admit of being methodologically and consistently carried out." Dohrn welcomed Wallace's future contributions and elaborations in the interest of providing a balanced approach to the subject.[31]

Henry Tristram, who had been among those who heard the Ternate letter as it was originally presented to the Linnean Society, appreciated Wallace's teleological approach. He praised Wallace's essay for his demonstration "that there are many things which natural selection cannot do, and which plainly point to a prescient Intelligence in creation."[32] Tristram also voiced his appreciation for Wallace's *Malay Archipelago* in a lengthy article noting that the peripatetic naturalist's observations of the indigenous peoples he encountered were not simply the views of a "passing stranger," but one who had been living and working among the natives. Here the Dyaks and others he lived with demonstrated moral virtues often superior to those found in the drawing rooms of London or the salons of Paris. Like Wallace himself, Tristram castigated the British colonial system for its failure to fully comprehend and appreciate the moral virtues of the people over whom it ruled, going so far as to say that colonial administrators needed to "allow them [the natives] a larger share of influence in our social

organization. Until they do, our colonial system must remain the opprobrium of Christianity, and the reproach of civilization."[33] In Tristram, Wallace had at least one ally who had been with him from the beginning.

Amid it all Darwin felt prompted to heed Spruce and publish his own extended treatment of his evolutionary theory with specific reference to its applications and implications for man. Just as Wallace was a catalyst for his *Origin*, his contumacious colleague was now goading him into its companion volume, *Descent of Man*. When Wallace wrote Darwin in anticipation of that work, he told him that he considered Claparède's criticisms of his "little heresy" some of the "weakest," and knowing Darwin's views in the matter referred to his forthcoming *Descent of Man* in a rare display of tongue-in-cheek derision, adding, "I look forward with fear & trembling to being crushed under a mountain of facts!"[34]

By 1871, Darwin could fully broach what he was reticent to do twelve years earlier: the application of his theory to *H. sapiens*. *Descent of Man* put the issue front and center. As Hamilton Cravens has put it, "there was not compromise: Darwinian thought demanded a robust secularism, or at least, a highly rigorous compartmentalization of science and religion."[35] Darwin sought to demolish the traditional Christian idea of mankind made in the image of God—*Imago Dei*. This, for Darwin, was nothing more than a "natural prejudice," a form of species "arrogance" with no empirical evidence to support it. With such a notion out of the way, "the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind."[36] With an unusually pronounced impudent sneer at creationists, Darwin declared, "The Simiadæ then branch off into two great stems, the New World and the Old World monkeys; and from the latter, at a remote period, Man, the wonder and glory of the Universe, proceeded. Thus we have given to man a pedigree of prodigious length, but not, it may be said, of noble quality."[37] In fact, Darwin reversed *Imago Dei* into *imago Homo sapiens*: "The idea of a universal and beneficent Creator does not seem to arise in the mind of man until he has been elevated by long-continued culture." Those higher attributes of humankind—morality, altruism, and so on—were, as mentioned earlier, derived from "the social instincts" for the "good of the community."[38] The rest of the book took up the question of sexual selection.

Indeed, nearly all of Darwin's views on human social and intellectual development can be found in his early Notebooks reprised in *Descent*, which can be summarized in four principal characteristics: (1) the gradual development of human attributes out of earlier hominid forms, made man's characteristics essentially the same, but much greater, than the higher beasts; (2) the question of free will was a real one for an evolutionary theo-

ry based on the kinds of inexorable lawlike processes that seemed to make pawns of its objects, although Darwin refused discussing it after 1842; (3) the "moral instinct" derived from its contribution to the group or community and they are selected on that basis; and (4) variation was enumerated and correlated to change over time with the only difference being that "spontaneous variation" became Darwin's synonym for chance.[39] *Descent* no longer discussed chance as a causative factor, but the idea remained as much in force as ever. But none of this reductionism was new to Darwin in 1871; he had settled this for himself at least as early as the spring of 1838 when he declared thought a mere "secretion of the brain."[40]

Wallace was, predictably, *not* "crushed" under Darwin's "mountain of facts." In his review of the book, Wallace replied that since natural selection doesn't produce absolute but only relative perfection, man would never have achieved his level of developmental advance by a mere struggle with animals. Wallace, who understood large-scale population demographics, insisted that social struggle—human against human—would fail to produce such levels of superiority because it would require a vast dispersal of communities over a wide area, and there was little evidence for these requisites. The "correlated advances" of physical and mental attributes could not be accounted for by a single group of apes in a small area. There must be some other cause, and even Darwin himself "gives hints of unknown causes which may have aided the work."[41]

But Darwin's "unknown" causes were most surely not Wallace's—they were really *unknowable chance*. This led to a problem that would vex Darwin for most of his life.

Teleology's Tenacity

Darwin always recognized to some extent the problem of removing all vestiges of intelligent causation out of evolutionary processes. Darwin had to straddle design on the one hand and chance on the other, and to get the necessary building processes woven into his life-expanding and life-diversifying actions of natural selection. He told Asa Gray, "I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance."[42] Darwin could claim victory over special creation, but at what cost? "The old argument from design in Nature, as given by Paley," he wrote in his *Autobiography*, "which formerly seemed to me so conclusive, fails, now that the law of natural selection has been discovered. . . . There seems to be no more design in the variability of organic beings, and in the action of natural selection, than in the course which the wind blows."[43] Arguing for design

out one side of his mouth and for chance out of the other, Darwin seemed always confused, conflicted, or both.

The metaphors he often alluded to didn't help, and he knew it. He admitted to using teleological language when speaking of natural selection but claimed it was no more than astronomers who spoke of gravity controlling planetary movements or agriculturalists making special breeds through their selection. Such "selection" was merely acting on circumstantial variability and not truly purposeful. Admitting to have personified Nature, he clarified that "I mean by nature only the aggregate action and product of many natural laws—and by laws only the ascertained sequence of events."[44]

Darwin struggled with this almost from the beginning. In *Origin* natural selection is depicted as "daily and hourly scrutinizing" and sorting out the "bad" (destructive) and "good" (preservative) in nature and "working" toward the developmental improvement of each organism.[45] But how can the "law of higgledy-piggledy" (to borrow Whewell's phrase) "scrutinize"? Wallace recognized this problem, and in a lengthy letter to Darwin suggested Spencer's "survival of the fittest" as a better, more descriptive term. Wallace believed the sense of selecting was liable to misunderstanding and that Herbert Spencer's "survival of the fittest" would avoid this pitfall. For Wallace, the term simply meant two things: (1) the retention of favorable variations over unfavorable ones, and (2) the resultant change would eliminate the unfit. Wallace urged Darwin to add survival of the fittest to discussions of natural selection or in many cases to replace it altogether.[46] The suggestion detracted from Darwin's domestic breeding analogy, but if it calmed the criticisms he was getting from Richard Owen, John Duns, Heinrich Bronn, Adam Sedgwick, Charles Lyell, the Duke of Argyll, Henry Tristram, and, yes, Wallace himself for not seeing the obvious intentionality in the breeding of domestic stocks, it was worth it.[47] Darwin adopted the phrase in his next book, *The Variation of Animals and Plants under Domestication* in 1868 and then in the fifth edition of *Origin* published one year later.

This appears an odd recommendation coming from Wallace, who seemed to be taking an increasingly teleological view of evolution. But a few observations will make it more understandable. First of all, this letter was written in July 1866, nearly two years before his formal break with Darwin. An even earlier letter is revealing, written when Wallace had barely been back in England four months from his overseas odyssey. He was already wondering about the apparent loss of utility and inutility of certain features of animals and its implications for natural selection. Why did ostrich "wings even become abortive," he asked, "and if they did so before the bird had attained their present gigantic size, strength, and speed, how

could they have maintained their existence?" Wallace cut to the heart of the matter: "how, if they once had flight, could they have lost it, surrounded by swift and powerful carnivora against whom it must have been the only defense?"[48] Darwin's reply is unfortunately given in an incomplete letter, but simply makes reference to swift-running bustards, considered some of largest flying birds known, and doesn't appear to address Wallace's "difficulty."[49] Of course flight could have been lost and become vestigial if an alternate trait—for example, running—was found to have greater utility.

But questions remain. Might it be risky to make utility the only animating principle of natural selection? If flight offered the ancient ostrich his chief selective advantage in the struggle for survival, how was it ever lost? Moreover, should utility in nature be the only feature worth noting in the development of the natural world? Surely these and similar questions were crowding Wallace's mind as he wrote this letter to Darwin. Hereafter the matter seems to have been dropped to no definite conclusion.

These questions about utility in nature were not new to Wallace. Just ten months earlier his Sarawak Law paper showed that he had already worked out a general scheme for descent with modification, though, of course, his mechanism—natural selection—lay well in the future. But in an insightful essay on the habits of the orangutan, an animal he had studied so carefully and even kept as a pet during his time on Borneo, Wallace speculated about the massive canines of these great apes (called "Mias" by the natives). What possible use could they have for an animal that lives largely on fruits and soft vegetables, and that when under attack defends itself not with its teeth but with its powerful arms and legs? The question caused Wallace a series of interesting metaphysical ruminations.

Wallace argued that requiring a utilitarian use for every aspect of plant and animal life ignores certain holistic aspects of nature. If we do not see an immediate need for a particular feature of an organism, why must we feel compelled to invent one? Might not beauty be sufficient in itself? If we could appreciate it, why couldn't a Supreme Creator? Hadn't William Whewell, in his *Plurality of Worlds* (1854) suggested "a general plan" that extended beyond "the special adaptation of each animal . . . subservient to an intelligible purpose of animal life"? Maybe the orangutan could instruct us against our own hubris.[50] Darwin insisted that our sense of being special—our regard for our own intellect—was nothing but a form of arrogance, "our admiration of ourselves."[51] But what if the opposite were true? What if we were merely imposing our insistence that every adaptation *must* have a material and physical use for every animal or plant as an arrogant presumption that all causes are mundane reflections of survival characteristics that *we* attribute to it? Ignoring our special abilities to appreciate

beauty or power in nature implied a certain imposition against the supreme creator that imbued us with those attributes in the first place.

Clearly Wallace was calling on higher than proximate causes in explaining nature. Slotten admits it was "audacious" to come to such a "radical speculation" on the basis of orangutan dentition, but it demonstrates Wallace's keen eye for anomalies in nature and his fearless and unconventional quest for their resolution. Fichman is absolutely correct in insisting that this early essay would mark a lifelong effort "to explore, without prejudice, a wide range of causal agencies in human, as well as nonhuman, evolution."[52] This would ultimately develop into the teleological cosmology culminating in *Man's Place in the Universe* (1903) and *The World of Life* (1910). It is no exaggeration to see this 1856 essay, written in the wake of his Sarawak Law paper the year before and ahead of his famous Ternate letter, as an early creedal statement. It would mark the emergent tenets of his inchoate teleological worldview, which consisted of the following: a nonreductionist, holistic view of nature; an admission of inutility in the plant and animal kingdoms and this given as reasonable evidence of higher and even intelligent causation in nature; a special place for humankind in the appreciation of features beyond mere survival utility such as beauty of form, color, and majesty; and the allowance that all of this may be the intentional expression of a theistic presence or force.

Viewed in this light, we can see why Wallace could admonish Darwin for using deceptively teleological language in reference to a principle that was *by definition* rooted in the organism's utility. It was an imputation of higher causes for proximate causes where none were intended. Much later, Wallace's consistent advocacy of natural selection would develop under the maturation of his natural theology into a more deeply broadened scope and efficacy. But in the 1850s and most of the 1860s these ideas were still tentative. While they were clearly there, they awaited the empowerment of the full force of Wallace's teleological vision. In the end, even natural selection would become slave to his intelligent evolution.

The contrast with Darwin is striking. While Wallace could ultimately resolve—at least to his satisfaction—the more abstruse aspects of the natural world by calling on Mind or mind-like forces, Darwin found himself dogged by the vexing problem of eliminating teleological and metaphysical language from his descriptions of what he insisted were strictly material, law-based processes governed by chance and necessity. The problem was exacerbated by Darwin's seeming inability to see the role of intentionality in analogies unless it was repeatedly pointed out to him, and even then it was more by acquiescence than acceptance. He failed to distinguish design

or forethought of the breeder from the blind processes of natural selection, and shortly after publishing the first edition of *Origin* he thought of another analogy—that of an architect.

This came to him in a letter to Hooker in June 1860. He went public with the architect analogy in *Variation of Animals and Plants under Domestication* in 1868. The introduction of chance into natural selection made many uncomfortable with its theological implications. The adoption of the architect analogy was presumably to deflect and allay these concerns, although it did so by addressing the issue of distinguishing the cause of modification in species demographically and the cause of variation within individuals, which, of course, missed the point of whether or not "higher" powers needed to be called on to do so. Darwin unquestionably wanted to avoid invoking anything of the sort, but it is difficult to see how the addition of an "architect" helped.[53] Darwin noted, "as, in the construction of a building, mere stones or bricks are of little avail without the builder's art, so, in the production of new races, selection has been the presiding power. Fanciers can act by selection on excessively slight individual differences, as well as on those greater differences which are called sports. Selection is followed methodically when the fancier tries to improve and modify a breed according to a prefixed standard of excellence; or he acts unmethodically and unconsciously, by merely trying to rear as good birds as he can, without any wish or intention to alter the breed."[54] But Darwin's preferred *chance* is now sacrificed to design. The breeder's act to simply improve his birds is not a random or chance endeavor; simply calling it "unconscious" doesn't remove the intentionality of the breeder or cancel the design of the "builder's art." By "unconscious" Darwin only meant selection unintended to create a new breed; some intentionality was involved even to maintain the existing form. Breeding the "best" birds unconsciously is either an oxymoronic use of the word *best* or *unconscious*; if breeders were truly unconscious of their selection they would have no concept what the "best" birds were.

Again, Darwin analogizes,

> If our architect succeeded in rearing a noble edifice, using the rough wedge-shaped fragments for the arches [of fallen stones], the longer stones for the lintels, and so forth, we should admire his skill even in a higher degree than if he had used stones shaped for the purpose. So it is with selection, whether applied by man or by nature; for though variability is indispensably necessary, yet, when we look at some highly complex and excellently adapted organism, variability sinks to a quite subordinate position in importance in comparison with

> selection, in the same manner as the shape of each fragment used by our supposed architect is unimportant in comparison with his skill.[55]

Darwin apparently thought that making the raw materials of the architect just randomly fallen pieces of stone was less teleological in implication. But now the analogy had an even greater reliance on an intelligent selector.[56] Like struggling to extricate himself from quicksand, the more Darwin strained against intentionality and design the deeper he got sucked in.

Darwin deals with the obvious question of "an omniscient Creator" by acknowledging on the one hand what he quickly denied on the other. While he admitted that such a Creator "must have foreseen every consequence" of the laws he imposed, he then asserted that it cannot "be reasonably maintained" that there is any design on the Creator's part.[57] For Darwin, this equivocation is not based in confusion but in an effort to blunt criticisms of rank materialism; nonetheless, his emphasis is away from design and on chance variation.[58] Here again Darwin's attempt to fashion a coherent analogy for natural selection only finds itself mired in its own contradiction. To facilitate understanding of a *purposeless* process, *purpose* is repeatedly called on.

Jerry Fodor and Massimo Piattelli-Palmarini capture the essence of Darwin's dilemma when they observe that "what is most problematic . . . is something . . . that Darwin announced frequently in *The Origin of Species*: that *artificial selection* . . . is an appropriate model for *natural* selection. Adaptationists often say that this is just a harmless metaphor, but we're going to argue, to the contrary, that the putative analogy to artificial selection actually bears the whole weight of adaptationism. It's much like the arches and the domes [in the architect analogy]; take the one away and the other collapses."[59] And it is relatively easy to take one away in the comparison because architects [and breeders] have minds and evolutionary processes do not. Unlike deterministic, robotic selection in nature, Darwin's hypothetical breeder or architect does not have a human mind and therefore lacks the capacity to pose and resolve potential problems or speculate about counterfactual solutions or propose what might happen or make informed choices with intentionality and tacit knowing and still maintain a valid comparison.[60] As Wallace tried to point out to Darwin, natural and artificial selections are fundamentally different. This inadvertent dichotomy launched some spirited correspondence battles, first with Lyell and later with Asa Gray.[61]

It might be argued that Darwin's problem in this regard was really a foreshadowing of the meaning of the term Colin Pittendrigh (1918–1996) coined in 1958, *teleonomy*, where biological function and goal-directedness

are treated as purely mechanistic, only giving the appearance of purposive design.[62] It has more recently been given expression by evolutionary biologist Richard Dawkins, who has defined biology as "the study of complicated things that give the appearance of having been designed for a purpose [but, in fact, have not],"[63] although he has rather confusingly and unnecessarily introduced "archeo-purpose" for *apparent purpose* and "neo-purpose" for *intentional purpose*. The use of the term *teleonomy* is controversial, but labeling "purposeful appearing" features of nature as teleonomic simply begs the question. Chance most certainly is *not* purposeful, and in terms of Darwinian evolution it is hard to see how acknowledging the ontological tension resolves it, as if because we can name a disease we have now cured it.

For Wallace there was no contradiction, no tension. It is hard not to see Fichman's "supreme irony" in this. While natural selection was Darwin's *naturalistic* drive train, Wallace found that natural selection opened the door to teleology. Where utility failed, teleology entered. The exaggerated forms that Wallace alluded to in his 1856 essay on the orangutan and the wonderful colors and plumage of some birds were perhaps just beauty for beauty's sake. But Darwin had no room for such a notion. He answered with a subsidiary source of evolutionary change in sexual selection. The peacock's tail became Darwin's favorite example. "Ornaments of all kinds, whether permanently or temporarily gained," he insisted, "are sedulously displayed by the males, and apparently serve to excite, or attract, or charm the females. . . . All naturalists who have closely attended to the habits of birds, whether in a state of nature or under confinement, are unanimously of [the] opinion that the males delight to display their beauty."[64] Wallace rejected this as anthropomorphism. But that was not all. If natural selection were primarily the elimination of the unfit, then existing species could only be culled, not really created. Where was nature's building process?

Wallace's answer was to find causes beyond the empirical and material. Wallace's heresy against Darwin's positivism had been brewing for a long time, but the more immediate explanation for his break came in a letter to his appalled colleague: "My opinions on the subject have been modified solely by the consideration of a series of remarkable phenomena, physical and mental, which I have now had every opportunity of fully testing, and which demonstrate the existence of forces and influences not yet recognised by science."[65] Those "remarkable phenomena" were found in spiritualism, and it sent Wallace on a theistic trajectory triggered by his utilitarian critique of the explanatory capacity of natural selection. Both would combine to form the twin pillars on which his natural theology would be built.

4
The Science of Spirit

Spirits, Science, and the Public Conscience

The phenomena that so captivated Wallace was spiritualism. In some ways it was the most controversial aspect of Wallace's life. Ross Slotten says it was Wallace's "fatal attraction," and he was lured to it like a "moth to a flame."[1] Perhaps, but in the context of Victorian society there seemed to be many noteworthy "moths" flying around a number of different flames as part of the same occultist fire—mediumship, communication with the spirits of the dead; psychometry, the "reading" of "imprinted" material objects; telepathy, mind reading; psychokinesis, the movement of objects telepathically; and other activities referred to as *preternatural* or *paranormal*. By far the most intense interest and activity surrounded mediumship through the discrete collective activity of the séance.

Wallace is often derided for his interest in such "superstitious" and "unscientific" pursuits, but he shared this fascination with some of the era's best and brightest. Perhaps most prominent was the Harvard psychologist and pragmatic philosopher William James. One historian of the spiritualist movement described James as "a humanist at heart, and a contrarian" who "gradually turned away from a mechanistic view of human behavior."[2] But there were others. Nobel laureate Charles Richet (1850–1935), a French physiologist who won the Nobel Prize in 1913 for his work with Paul Portier on anaphylaxis, developed a passion for spiritualism, coined the term "ectoplasm," and championed the strange and unpredictable Italian medium, Eusapia Palladino (1854–1918), whose Warsaw séances (1893–94) became a popular if controversial sensation.[3] Lord Rayleigh (John William Strutt [1842–1919]), winner of the 1904 Nobel Prize for his discovery

of argon gas, dated his interest in spiritualist phenomena from the mid-1870s. His observations of Palladino at Cambridge in the summer of 1895 saw him and his associate, J. J. Thomson, witness billowing curtains in a perfectly closed room that he considered beyond odd.[4] William Crookes (1832–1919), who made important observations in the electrical charges of vacuum tubes leading to Röntgen's discovery of X-rays, became interested in spiritualism in the 1860s. A decade later he investigated famous mediums such Kate Fox (1837–1892), youngest of the three Fox sisters who launched the spiritualism craze in 1848 with "spirit rappings" from their remote hamlet of Hydesville, New York, and Daniel Dunglas Home (1833–1886), perhaps the most famous spiritualist of all, known on both sides of the Atlantic.

There were others, such as Cambridge philosopher and founding president of the Society for Psychical Research (SPR) in 1882 Henry Sidgwick (1838–1900); Frederic W. H. Myers (1843–1901), another SPR founder, and among those to whom Wallace acknowledged indebtedness "for valuable information or useful suggestions in the course of my work"[5]; Columbia professor of ethics and logic James Hervey Hyslop (1854–1920), a believer most noteworthy for his exposures of fraud and imposture, particularly the so-called Patience Worth spirit contact promoted by Pearl Lenore Curran (1883–1937); and noted physicist Oliver Lodge (1851–1940), whose theistic, spiritualistic, and socialistic views coincided so closely with those of Wallace.[6] Perhaps none were so important in leaving a detailed and sympathetic record of the movement than physician-novelist Arthur Conan Doyle (1859–1930), whose two-volume *History of Spiritualism* remains the definitive treatment of spiritualism during the Victorian-Edwardian periods.[7] Wallace knew them all. But something more than the esprit de corps of spiritualism bound these men together. Theirs was a shared epistemological vision that ran counter to the emergent materialistic scientism of the era.

William James, for example, felt that the dismissive attitude on the part of many of his Harvard colleagues was "scandalous" and that while deception was rife among spiritualist, clairvoyants, and the like, he knew of "no source of deception in the investigation of nature which can compare with a fixed belief that certain kinds of phenomenon are impossible."[8] William Crookes has been called "epistemically courageous" for his prominent role in psychical research, his dogged determination in the face of career-damaging opposition, and his vocal stance in its defense.[9] In fact, the scientific elite attacked Crookes with every argument, strategy, and criteria imaginable *except* that of the objective, dispassionate, and impartial quest for

truth proclaimed by their own scientific credo. Wallace received the same treatment. In fact, he spoke for many of his colleagues in asking for a rather modest tolerance on the part of a skeptical public:

> Many people think that when I and others publish accounts of such phenomena, we wish or require our readers to believe them on our testimony. But that is not the case. Neither I nor any other well-instructed spiritualist expects anything of the kind. We write not to convince, but to excite to inquiry. We ask our readers not for belief, but for doubt of their own infallibility on this question; we ask for inquiry and patient experiment before hastily concluding that we are, all of us, mere dupes and idiots as regards a subject to which we have devoted our best mental faculties and powers of observation for many years.[10]

Spiritualism's historian praised Wallace's "great, sweeping, unprejudiced mind," and recognized that the significance of this great naturalist's interest in and support of the movement rested not simply in his prominence within the halls of science, but in his understanding of the "complete religious revolution which lay at the back of these phenomena."[11]

Like the committed scientist that he was, Wallace made his case methodically and systematically. He began by attacking the source of skepticism, David Hume's *An Enquiry concerning Human Understanding*. Anticipating C. S. Lewis's *Miracles* some seventy-three years later, Wallace's reading of Hume was careful and detailed; his personal copy is replete with marginalia, much of which found its way into *Miracles and Modern Spiritualism*.[12] For example, when Hume argued that "no testimony for any kind of miracle has ever amounted to a probability," and that experience is the only thing that gives any authority to human testimony, he wrote on the side of the page, "then how can there be any such thing as absolute impossibility!"[13] Further heavily underscored by Wallace was Hume's statement on that same page that "no human testimony can have such force as to prove a miracle," a claim he undoubtedly found remarkably unfounded.

Wallace also took careful note of Hume's definition of a miracle, which was that a miracle "is a violation of the laws of nature" and that it "is a transgression of a law of nature by a particular volition of the Deity, or by the interposition of some invisible agent."[14] Wallace protested that "both these definitions are bad or imperfect. The first assumes that we know all the laws of nature, that the particular effect could not be produced by some unknown law of nature overcoming a law we do know." Why, he added, must products of intelligence in nature invariably violate natural laws?

Wallace suggested that Hume's assertions about the violation of natural laws are assumed without, in his words, "a shadow of proof."

Wallace then dug deeper into Hume's argument against miracles. Hume insisted that one test for a miracle should be "uniform experience," which he asserted, "amounts to a proof."[15] For example, that a seemingly healthy man should die would not be considered a miracle because it has on occasion occurred, but that a dead man should rise from the grave would clearly be a miracle because, according to Hume, it has never been observed to have occurred. Upon such reasoning Hume built his case for discounting all miracles simply because of their sheer improbability.

Wallace replied,

> This argument is radically fallacious, because if it were sound, no perfectly new fact could ever be proved, since the first and each succeeding witness would be assumed to have universal experience against him. Such a simple fact as the existence of flying fish could never be proved, if Hume's argument is a good one; for the first man who saw and described one, would have the universal experience against him that fish do not fly, or make any approach to flying, and his evidence being rejected, the same argument would apply to the second, and to every subsequent witness; and thus no man at the present day who has not seen a flying fish alive, and actually flying, ought to believe that such things exist.

Wallace then demonstrated how Hume contradicts himself. For example, in one passage Hume proclaims that in all of history no miracle has ever been attested to by a sufficient number of men of good sense, education, and learning. In the next passage Hume admits that the miracles of the then-popular Jansenist healings at the Abbé Paris from 1727 to 1730 were attributed in great number and "*immediately proved upon the spot*, before *judges* of *unquestioned integrity*."[16] But, for Hume, "we may establish it as a maxim, that no human testimony can have such force as to prove a miracle, and make it a just foundation for any such religion." But if we may doubt all human testimony—something Wallace emphatically denied—then all our epistemological certainties could be called into doubt, and the courtrooms that rely on them might as well (by Humean standards) be shut down.

Hume continued to insist that various religions "abound in miracles" and that some are very different, and moreover, that "whatever is different is contrary." So the sheer number of miracles associated with various different, and therefore contrary, faiths undermine or negate the validity of these alleged miracles. Wallace retorted that Hume "confounds the evidence for

the fact [of a miracle] with the theories to account for the fact, and most illogically and unphilosophically argues, that if the theories lead to contradictions, the facts themselves do not exist."[17]

Wallace disagreed with Hume on four points: first, Hume's definition of a miracle was false and merely begged the question; second, his claim that miracles were isolated facts contradicted nearly all of human history and human testimony; third, his evidence of the quality and quantity of testimony in favor of miracles was contradictory; and fourth, his assertion that miracles associated with various opposing religions, religions sometimes at odds doctrinally and philosophically, cancel each other out by their own contradictory claims is false. Why couldn't any given miracle stand apart from whatever religious claims might be made for it?

It should be said that Wallace's principal objections were twofold: first, miracles need not "violate" the laws of nature; and second, Hume's assumption that every miraculous act had to come directly from God in some unmediated sense was unwarranted. Wallace believed that there were an "infinite number of intelligent beings who may exist in the universe between ourselves and the Deity." From a broad historical-theological perspective, this was not merely exchanging Hume's blasphemy for Wallace's heresy. It is worth a reminder that Thomas Aquinas in his *Summa Theologica* (ca. 1265) wrote that he believed God governs many things through His angels, and that this allows for a sharing of the causality inherent in God's nature—the First Cause. Dominican priest Aidan Nichols has noted Wallace's compatibility with Aquinas's teaching "that God governs inferior things through superior ones. . . . The First Cause gives *being*; secondary causes determine it."[18] But perhaps more importantly, the occasion of a miracle and the specific operations behind a miracle are two separate things; uncertainty of operation does not equal negation of the act.

In any case, it is clear that Wallace was unimpressed by Hume's skepticism. He felt Hume's arguments failed the test of logic and posed simplistic—even naive—formulations about religion and religious claims. Insisting on the utmost rationalism, Hume's own argument would stop all rational inquiry in its tracks since no human testimony could ultimately be admitted into the court of inquiry unless it met a test of "uniformity" defined and constructed so as to affirm the very premise in question; namely, that miracles cannot exist.

Wallace argued that a miracle was "any act or event necessarily implying the existence and agency of superhuman Intelligences."[19] Readers can decide for themselves if this sort of definition engages in its own form of question begging, but it most decidedly wasn't, for Wallace, an interference with the laws of nature. In general, Wallace seemed to treat miracles much

in the way as Nehemiah Grew (1641–1712), England's famed philosopher–plant anatomist. Stripping off Grew's theological window dressing, in practical application, Wallace seemed to treat miracles as (in Grew's words), "the extraordinary effect of some unknown power in Nature . . . limited to its circumstances for a suitable end."[20] Miracles were not, for Grew or Wallace, contraventions of natural law, but their closely compatible views of miracles seemed to satisfy their mutual commitments to a teleological world.[21]

The remainder of Wallace's *Miracles* is largely made up of his personal investigations into spirit phenomena with some examination of the major tenets of spiritualist belief. His first direct encounter with spiritualist phenomena occurred at a séance in the home of a friend on July 22, 1865. Here a large table moved so considerably that everyone had to adjust their chairs. Faint tapping could also be heard, and Wallace experienced "a curious vibratory motion" he could feel "up to his elbows." The phenomena continued upwards of two hours and were attested to by all present, including the host, who Wallace described as "a sceptic, a man of science, and a lawyer."[22] As for general spiritualist belief, Wallace largely followed seven principles broadly held by all fellow believers: (1) the fatherhood of God; (2) the brotherhood of man; (3) the ministry of angels (or what Wallace preferred to call "higher intelligences"); (4) the human survival of physical death; (5) personal responsibility; (6) reward or penalty for good or evil deeds (Wallace saw this not as heaven/hell judgment but rather as actions leading toward greater or lesser spiritual progression in the afterlife); and (7) the eternal progress of all souls.[23]

Points one, five, and six need some clarification. First, spiritualism need not entail theism. Yet most spiritualists held to some theistic belief, and particularly those plebian spiritualists not unlike Wallace who were cast under the spell of Robert Owen's brand of socialistic spiritualism. Although sometimes stridently opposed to orthodox Christianity, they more often than not characterized themselves as deists—"secularists-plus"—rejecting the dogmas of formal theology and organized religion in favor of a universalist progression toward higher realms that expressed itself in a blend of individualistic collectivism.[24] These plebian spiritualists reflected what Logie Barrow has called a "triangle of tensions" in nonconformity, secularism, and spiritualism.[25] As for Wallace, spiritualism suggested a deity, but he rejected the idea that it could reveal very much about the nature of that deity. Regarding the dogmas of orthodox religion (Christianity in particular) about God—"His motives" and "His attributes"—Wallace replied: "In the teaching of the 'spirits' there is not a word of all this. They tell us that they commune with higher intelligences than themselves, but of God they

really *know* no more than we do."[26] This is because, according to Wallace, the spiritual continuation of life after death is "a natural continuation of the old one" with no revelatory value in and of itself; there is no immediate transformation of knowledge, "no new mental proclivities, no revolution of the moral nature."[27]

Phrenology (the identification of personality and character traits by cranial bumps) also figured prominently among plebian spiritualists, and Wallace considered the rejection of phrenology by the scientific community among the great failures of the nineteenth century.[28] Introduced to phrenology by reading George Comb's *Constitution of Man* (1828), historian Frank Miller Turner believes that phrenology formed the basis for Wallace's rejection of scientific naturalism.[29] In true phrenological fashion, the mind was hardly a "secretion of brain" as Darwin had suggested, but, in Wallace's view, actually the reverse—the brain was "the organ of the mind."[30] The ontological and epistemological implications here are profound, and in the separation of personality from the body invited by phrenological speculation, Wallace, according to Turner, found his entry into spiritualism.

This was enhanced by the influence of Herbert Spencer (1820–1903). Spencer's *Social Statics* (1851) and its discussion of "fitness" and the molding of human society for adaptation in the social state toward improved "equilibrium" were based on certain principles of phrenological psychology that he had read between his overseas voyages. Wallace was fascinated by Spencer's interest in retaining human society in a proper social state through land nationalization and its admixture of libertarian freedoms and collectivist solutions. In Spencer's words, "whilst the state should protect, it ought do nothing more than protect."[31] Wallace received his public conscience from Robert Owen and Herbert Spencer, a mix of rationalistic and idealistic social ordering that at least appeared to make sense on paper. In the end, however, Spencer would abandon in his later writing this sort of leftist libertarianism, whereas Wallace would increasingly embrace it.[32]

But Wallace added another layer to all this. He was also fascinated by the work of Anton Mesmer (1734–1815), who theorized about the energy transference he called animal magnetism, a precursor to what physician James Braid (1795–1860) referred to as hypnotism. Combined with certain phrenological speculations, this became phreno-mesmerism, which one historian characterized as "positioned halfway between the siren calls of both religion and science."[33] Wallace was naturally drawn to both. During his Leicester years, from 1844 to 1846, he was impressed with the results of his own investigations with phrenological touch and the power of suggestion with subjects in a mesmerized state.[34] The significance of these

experiments in phreno-mesmerism is that they directed him away from methodological naturalism by concluding "that the antecedently incredible may nevertheless be true; and, further, that the accusations of imposture by scientific men should have no weight whatever against the detailed observations and statements of other men, presumably as sane and sensible as their opponents, who had witnessed and tested the phenomena, as I had done myself in the case of some of them." This indeed would prepare Wallace for the spiritual phenomena he would experience twenty years later.

So there were several sources of Wallace's moth-like attraction toward the spiritualist flame—phreno-mesmerism, Owenite plebian spiritualist socialism (a working-class-based call for collectivist solutions based on the spiritualist principles of Robert Owen), and Spencer's *Social Statics* all played their part. But it does serve to make the important point some historians missed, that Wallace's break with Darwin over the teleological question could *not* have been driven by his conversion to spiritualism since all of these occurred prior to his personal experience with spiritualistic phenomena, and as Wallace had discovered with his phreno-mesmeric experiments, it was precisely on personal experience and unimpeachably reliable testimony that scientific conclusions regarding *any* phenomenon must be based.[35]

So what *did* draw Wallace to this strange, preternatural flame? It has been suggested that he was driven to female mediums such as Mrs. Marshal and Miss Nicholl through the influence of his sister and his mother (with whom he lived). This allegedly made him "vulnerable to forces . . . outside the male scientific establishment." More significantly was the unexpected breaking off of his engagement to a young woman (known only as "Miss L"), revealed to him through a letter her father delivered. Supposedly this caused an emotional crisis that drew Wallace to seek the advice and enlightenment of spiritualist mediums.[36] Why exactly this should be so is unclear. Was Wallace the only scientist of Victorian England with a sister and mother, and did every jilted boyfriend rush off to the next séance? This conjecture seems to be based more on psychologizing than actual evidence. Besides, the emotional suffering would soon be over when about that same time Wallace met Annie Mitten. The two married on April 5, 1866, and spent the next forty-seven years together.

A less speculative proposal lies in his years spent exploring and residing with non-Western peoples. Living among native populations subsumed in animistic belief—four years with South American Indians and eight years among the Malay people—formed an important framework for spiritualism. Malays have held to rich traditions of animistic and spiritualistic belief well into the twentieth century.[37] In 1850 Abdullah bin Abdul Kadir, a

Singapore Malay, enumerated at least a dozen different spirits (some good, some bad) for everything from clouds to women and children. Ghosts (*hantu*) lurked everywhere—on land and sea, the sky, the jungle, the home, *everywhere*.[38] While at Lombock, however, Wallace learned from his Portuguese Malaccan assistant, Manuel, that the island was known as a very strange place due to the *scarcity* of ghosts.[39] For an Englishman who had been intimately associated with such a culture, even the most plebian of spiritualists back home must have seemed modestly tame by comparison. Wallace probably reflected on this as he sat with mediums and close friends and associates amid the staid propriety of Victorian domesticity. Unquestionably, the spirits who visited Wallace came to a *prepared mind*. It is no wonder then that in his generously marked and annotated copy of *The Unseen World* (1889) by New Church minister Rev. Thomas Child (1839–1906), Wallace highlighted, "The revelation [of mankind's progression through perverted or restored spiritual states] was not only made through Eastern minds, but was first made *to* them. It is simply our Western tendency [Wallace's underlining] that has given an incrustation of materiality and naturalism to essentially spiritual conceptions metaphorically expressed."[40] Wallace knew both the spirits of the East and the science of the West.

But perhaps Wallace held a disposition toward the teleological and the spiritual almost from the beginning. Indeed, among his first literary efforts at around twenty years of age, Wallace showed a metaphysical side that would presage his later interests in progressive moral development beyond the worldly when he asked revealingly, "can any reflecting mind have a doubt that, by improving to the utmost the nobler faculties of our nature in this world, we shall be the better fitted to enter upon and enjoy whatever new state of being the future may have in store for us?"[41] This was a question Wallace would spend the rest of his life answering.

Wallace found a partial answer in the religious spiritualistic theism of Emanuel Swedenborg (1688–1772), which he was probably introduced to by Robert Owen's son, Robert Dale Owen (1801–1877) in his *Footfalls on the Boundaries of Another World* (1861).[42] Swedenborg, a Swedish scientist-turned-mystic seer, launched a movement with otherworldly visions and his prolific pen.[43] Although it is impossible to encompass the whole Swedenborgian system of thought in so limited a space, in sum it may be said to consist of a theistic cosmology created for the sole purpose of humankind in which spheres of spiritual correspondences exist in a progressive hierarchy. The purpose of this life is to prepare for life on the other side. Based on free will and personal responsibility, departed souls allegedly enter various states of spiritual enlightenment. These "higher" spiritual hierarchies interact with and guide the physical world and humanity toward

improvement. Swedenborgianism differed from orthodox Christianity in the acknowledged central role its founder played in interpreting scripture and in delivering inspired biblical exegesis. It also rejected the idea of a triune godhead and found the sole manifestation of God in Jesus Christ. It took on organized expression in the Church of the New Jerusalem (the so-called New Church movement). But many, like William James's father Henry James Sr. (1811–1882), rejected the notion that Swedenborg would have approved of anything so structured as an ecclesiastical organization.

Wallace was unquestionably influenced by Swedenborgianism, although, like Henry James, he rejected the doctrinaire formalisms of the New Church. Late in life Wallace referred to Swedenborg as that "great philosopher and seer," but he never formally declared himself an adherent of Swedenborg, despite adopting familiar Swedenborgian expressions such as "spiritual influx" and "divine influx."[44] His private reservations were more pronounced. For example, again in his personal copy of *The Unseen World*, by a discussion of hell he scrawled emphatically, "A horrible doctrine!" and at the end of that chapter he wrote: "Spiritualism teaches the eternal progress of all Spirits—intellectual & moral growth & development, a perpetual improvement of the very worst (if there are any such), and as no men created themselves with such innate badness that they cannot possibly become better, this alone is justice [underlining is Wallace's]. The doctrine of Swedenborg is eternal injustice!"[45] Wallace not only rejected the doctrine of damnation, he also denounced the atonement, which be believed abrogated individual responsibility for leading a good and moral life.[46] Nevertheless, Wallace could still find much to praise in the Swedenborgian approach. In response to *Root Principles in Rational and Spiritual Things* by Rev. Thomas Child (1839–1906), Wallace exclaimed, "I very soon found that I had at last found in Mr. Child . . . a man who had thought deeply, who could reason logically, and, perhaps most important of all, could express his ideas in clear and forcible language, and arrange his whole essay in the form of a compact and continuous argument of illustration."[47]

Thus the impact of spiritualism on Wallace led him to reject orthodox notions of the specific intensions and attributes of God, to adhere to strict personal responsibility and reject doctrines of the atonement and eternal damnation. These positions kept Wallace from neat categorization within Swedenborgianism and Christian ranks. But it is important to emphasize that this did not cause him to lapse into a vague deism. The guidance of living humanity by progressively "higher" spirits suggested neither a dispassionate nor a disinterested Supreme Intelligence.

By the time of Wallace's formal break with Darwin in 1869, Wallace's interests remained firmly grounded in mainstream science; it should warrant

more than passing notice that Wallace published his pathbreaking work on biogeography, *The Geographical Distribution of Animals*, in 1876. But he had also imbibed a heady brew of Swedenborgian spiritualism, Owenite spiritual and social heterodoxy, and Spencerian social politics.

Wallace, however, remained his own man. No elixir of ideas could intoxicate him out of seeing his own path toward what he believed to be was sound and true. This was certainly the case with his relationship with Herbert Spencer. For all his earlier admiration of Spencer's collectivist leanings in *Social Statics*, he couldn't follow him down the later path of unbridled competition "red in tooth and claw." Writing to the American progressive scientist-sociologist Lester Ward (1841–1913) on November 21, 1893, Wallace complained of those "blinded" by Spencer's prestige, and he thought *Justice* (part four of Spencer's *Ethics of Social Life* [1891]) was so "weak and illogical as to be absolutely childish."[48] The Spencer of *Justice* was no longer the Spencer of *Social Statics*. Spencer had changed, and indeed so had Wallace.

In fact, Wallace's issues with Spencer ran deeper, and they came to a head in the address of Lord Salisbury (Robert Arthur Talbot Gascoyne-Cecil [1830–1903]) at the sixty-fourth meeting of BAAS at Oxford in August 1894. Simply titled *Evolution: A Retrospect*, Salisbury's real target was the implications of evolution on religion. Noting the "boundless aspiration" of the "enthusiastic votaries" of science the last time the BAAS met in Oxford in 1860, Salisbury cautioned that several "scientific enigmas" remained: the nature and origin of the then-known sixty-four elements, the differences between atoms, the "unsolved riddle" of ether theory in physics, and the action and operation of animal and vegetable life on planet Earth.[49] Great as the advances in science have been generally, and in biology particularly, there is, Salisbury argued, "at present no hope of penetrating the great central mystery"; namely, "the causes and origin of life."[50] Agreeing that Darwin's theory of evolution was a great advance in the human understanding of the diversity of life, Salisbury freely acknowledged the revolution in research methods Darwin established. But, citing Lord Kelvin, he questioned whether there was sufficient time to effect the many transformations from simple to complex life forms. He also quoted August Weismann (1834–1914), the evolutionary biologist who convincingly challenged the Lamarckian notions of the inheritance of acquired characteristics and who elucidated cell mitosis, meiosis, and chromosomes, as admitting that natural selection is to be accepted not because we can explain its every operation and manifestation, but because "it is inconceivable that there could yet be another [mechanism] capable of explaining the adaptation of organisms without assuming the help of a principle of design."[51] Then turning back to

Darwin's own artificial selection analogy, Salisbury pointed out that only with "the intervention of the cattle breeder and the pigeon fancier" by their "action" and "skill" does remarkable change and transformation demonstrably occur. Remove the breeder, and reliance on "pure chance" to effect changes across species, genera, orders, on up to kingdoms becomes problematic.[52] Salisbury thought it "strange" that a scientist of Weismann's caliber should "accept as established a hypothetical process the truth of which he admits he cannot demonstrate in detail." Salisbury warned that science was now prone to accepting conjecture in place of knowledge instead of simply admitting uncertainty and no obtainable empirical proof. Salisbury concluded that the allowable certainty was this, that "overpoweringly strong proofs of intelligent and benevolent design lie around us."[53]

Spencer asked Wallace to respond to Lord Salisbury's design/creationist challenge and "take up the gauntlet he has thrown down."[54] Only Wallace, Spencer importuned, could correct the misconceptions Salisbury voiced. Wallace refused to believe that Salisbury's address had that much effect on the public and even less among his fellow scientists. He let Spencer fight this battle, and he always said he was glad he had done so.[55] But Wallace's reticence to join the fight cost him his relationship with the old philosopher whose early work he had found so engaging. Spencer never wrote to Wallace again.

Wallace didn't seem to care, and, in fact, his vague dismissal of the Salisbury address as of little influence suggests that he essentially agreed with it. By 1894 Darwin had been dead for more than a decade; if anyone was left to defend the Darwinian faith it was Wallace. Yet by the mid-1890s Wallace had left the Darwinian faith in its purest ideological sense; he simply couldn't be bound up in such reductionist methodological naturalism and presumptuous positivism. After all, how could Wallace openly attack Salisbury without going against his own rejection of artificial selection or his own limitations on natural selection? Furthermore, how could he challenge Salisbury's reliance on design and progress without himself abandoning the spiritualist principles of theism, the purposes of intelligent ministry, and eternal progress in nature?

But to some extent this gets ahead of the story. The issues underlying the Salisbury-Spencer-Wallace affair had their sources in the sharpening contours of what was being less frequently referred to as the Darwin-Wallace theory and more commonly called simply Darwinism. Darwin helped fashion it in his *Variation of Animals and Plants under Domestication* (1868), an attempt to answer some of Wallace's objections to his artificial selection analogy; *Descent of Man* (1871), which most controversially brought *H. sapiens* more seamlessly into the animal kingdom, was something else that

Wallace took issue with; one year later Darwin published his sixth and final edition of *Origin*, which included a chapter, "Miscellaneous Objections to the Theory of Natural Selection," in answer to challenges posed by Mivart's *On the Genesis of Species*, an individual with whom Wallace disagreed but ultimately had deep sympathies and personal respect; that same year Darwin wrote *The Expression of the Emotions in Man and Animals* to rebut Charles Bell (1774–1842), who he had heard challenged years ago in the Plinian Society. Bell claimed that humans were divinely endowed with a physiology capable of expressing unique emotion; Darwin wrote to say otherwise. Wallace damned Darwin's effort with faint praise by suggesting that he revealed "a readiness to accept the most marvellous conclusions or interpretations of physiologists on what seem very insufficient grounds."[56] The whole thrust of this work was to emphasize two things: god, if indeed one existed at all, was entirely extraneous to nature; and everything was amenable to wholly naturalistic explanation directed by chance contingent operations. It cannot go unnoticed that Darwin completed his work by examining the action and habits of worms, giving rather poignant irony to Linley Sambourne's satirical cartoon "Man Is but a Worm," caricaturing Darwin's ape-to-man theory. The cartoon was published in late 1881 in the impudent and irreverent *Punch* almanac coincident with the release of Darwin's *The Formation of Vegetable Mould through the Action of Worms*. Darwin was buried in Westminster Abbey not long thereafter on April 26, 1882.

Wallace and Darwin's complex relationship, so symbiotic in some ways (Darwin's gratitude for Wallace's magnanimity in the joint natural selection discovery and Wallace's appreciation for the doors to elite science and society that Darwin's gratitude had opened for the self-taught "specimen haggler") was at an end. Wallace reflected years later that it was "quite really pathetic how much he felt difference of opinion from his friends."[57] But with Darwin now gone, and with the economic independence brought by a £200 per year pension (in today's money, worth about £22,200!) that his old mentor had helped obtain for him, Wallace could clarify his position unencumbered by old debts and unspoken commitments.

Wallace's Trilogy of Natural Theology

Wallace provided this clarification in three books: *Darwinism* (1889), *Man's Place in the Universe* (1903), and *The World of Life* (1910). Here was glimpsed his "unseen world." These works were much more than the mere piecemeal commentaries published in assorted journals, collected works, and reviews issued during Darwin's lifetime. The blending of spiritualism and science that had characterized Wallace's work from his first experience

with the phenomena in 1865 to the release of *Darwinism* formed a backdrop for what was emerging as a provocative natural theology.

Darwinism grew out of a series of lectures Wallace delivered at the invitation of the Lowell Institute in Boston during the fall and winter of 1886.[58] These, in turn, launched an extensive American tour that began with his arrival in New York City on October 23, 1886, and ended August 8, 1887, when he departed on the steamer *Vancouver* for Liverpool.[59] Wallace explained that his reasoning behind developing these lectures into a full-length book was the general reply among his American audiences that his exposition of the theory of evolution was so much clearer than in Darwin's *Origin*. But a second reason for writing it was "to serve as an answer to the many articles and books professing to disprove the theory of natural selection."[60]

Wallace set out his defense with a discussion of species, that he defined relying on the French botanist Candolle, as those individuals bearing close resemblance that can reproduce, and reproduce such as to infer common descent.[61] He then moved on to cover what he regarded as the fundamental basis of natural selection, "the struggle for existence," followed by a lengthy chapter on species variation in a state of nature, complete with fourteen diagrams illustrating the phenomena in various species. He then contrasted this with variation in domestic species. This interesting juxtaposition warrants some extended discussion.

On a cursory examination, it might be concluded that Wallace stepped back from his initial rejection of Darwin's domestic breeding analogy. After all, Wallace concluded that "the evidence as to variation afforded by animals and plants under domestication strikingly accords with that which we have proved to exist in a state of nature."[62] But this statement precedes a long paragraph explaining the vast differences between the two. Wallace pointed out that in creating domestic breeds, utility is not determined by nature but only by the breeders' fancy, often resulting in "monstrosities" the likes of which would *never* be created in nature. Furthermore, his whole argument is the reverse of Darwin's, not from domestication as an analogy for natural selection, but rather from natural selection as analogous for domestication. This means that variations established by artificial selection do not serve as facts establishing the actual operations of natural selection, but exactly the reverse. In fact, from the outset Wallace suggested that one of the primary reasons for writing *Darwinism* was to replace the "weakness" of Darwin's reliance on artificial selection in domesticated animals and cultivated plants and instead endeavor "to secure a firm foundation for the theory [of evolution] in the variations of organisms in a state of nature."[63]

Except for the last chapter, the remainder of the book discusses the evi-

dences for and operations of natural selection. Here Wallace reiterated his rejection of Darwin's sexual selection theory, arguing that natural selection makes it entirely superfluous. He also included a chapter titled "The Geological Evidences of Evolution" dating cellular life from the Cambrian and mammalian species from the Triassic periods, as well as a significant chapter on the geographical distribution of animals. Other ideas Wallace challenged were heredity by Lamarckian notions of use and disuse and Darwin's hereditary theory of pangenesis, a concept "so ponderously complex and difficult that it has met with no general acceptance among physiologists."[64]

In the final chapter, "Darwinism Applied to Man" (see the excerpt in the appendix to this book), Wallace explained his special departures from the strict application of methodological naturalism to the question of evolution. Wallace carefully compared human anatomy with that of other animals and confessed that "we see in the monkey tribe a caricature of humanity" not as remarkably similar but rather as "a kind of distorted copy."[65] Wallace does not question the physical development of humankind from earlier hominid, apelike species at some very early period (perhaps as early as the Pliocene epoch 2.5 million or more years ago). But the *differences* between man and ape capture more of Wallace's attention. Here he outlined, with recurrence to his 1864 paper, the ability of mankind "to adapt himself to much greater changes of conditions by a mental development leading him [unlike animals] to the use of fire, of tools, of clothing, of improved dwellings, of nets and snares, and of agriculture."[66] These developments set man apart, unique in nature and no longer subject to the tyranny of natural selection. Although Darwin argued that man's higher mental faculties were all derived from the lower animals, Wallace believed this to be unsupported by any strong evidence.

The main reason for his departure from Darwin's continuity argument is that the higher attributes of humans could have no functional use, thus the essence of natural selection through the utility of selective advantage can have no impact. Wallace recalled the fine examples of artistic expression and musical abilities he had personally witnessed in South America and the Malay Archipelago, and he asked, along with other mental attributes demonstrated among nearly all peoples at all times such as mathematical ability and abstract reasoning, what possible use would these have in the struggle for survival?

Darwin thought he knew. The abstract abilities in man Wallace found so inexplicable in naturalistic terms, Darwin felt could be explained in the social or community advantages accrued through their development. In his chapter on natural selection (chapter 4 of *Origin*), Darwin alerted his

readers to a secondary source of selection—sexual selection—that he defined as "the struggle between the males for possession of the females; the result is not death to the unsuccessful competitor, but few or no offspring. Sexual selection is, therefore, less rigorous than natural selection."[67] But it was nonetheless important in explaining many features of display and ornament in the animal kingdom—the antlers on a buck, the peacock's tail, the elaborate male plumage of many birds, and so on. Moreover, beyond certain morphological manifestations of this sexual competition, certain behaviors were influenced, such as rutting displays and "love-dances" used to "charm" females. Darwin also believed sexual selection was important to man, and he devoted his entire part III of *Descent* to the importance of sexual selection in man. Here he attributed the development of an array of specialized faculties—music, song, even poetry—to sexual selection.[68]

Wallace never thought sexual competition and choice had much selecting power in nature. He argued that Darwin's insistence that the brightly colored wings of butterflies were developed to attract mates was unsupported by the evidence.[69] Wallace did not deny that sexual selection was "a real power in nature," but he felt Darwin overextended the concept to the detriment of what he regarded as natural selection's far greater power "of constancy and of inevitable result."[70] "The term 'sexual selection,'" Wallace argued, "must . . . be restricted to the direct results of male struggle and combat. This is really a form of natural selection, and is a matter of direct observation; while its results are as clearly deducible as those of any of the other modes in which selection acts."[71]

Wallace compared and contrasted natural and sexual selection and found the latter lacking in explanatory value:

> The law of survival of the fittest has such enormous selecting power because of the overwhelming odds against the less fit. A species which has two or three broods a year, or one large brood, and which lives, say, ten or twenty years, as do many of the vertebrata, produces from 50 to 100 successors of each pair, from which one or two only are selected to take the place of their parents. But in the case of sexual selection, it is a question of probably not more than two or three to one in most species, and in many even less, for there is no evidence and little probability that the number of healthy and competent males that fail to find mates bears any large proportion to those that do find them. Much of the success of particular males must depend on early chance encounters with a mate, while the competition can only be among small groups in each locality. If we add to this the consideration that in almost every case combat, or agility, or bodily

> vigour must have great influence, the part that remains to be played by ornament alone will be very small, even if it were proved, which it is not, that a slight superiority in ornament alone usually determines the choice of a mate.[72]

In this he may well have been right.[73] Instead, Wallace found it in "a spiritual essence or nature, capable of progressive development under favourable circumstances."[74] This special spiritual force or power must have entered the world at three stages: first, in the birth of single-celled life. This could not, according to Wallace, have been merely a product of chemical action since the complexity of growth and reproduction even of primitive life is of an entirely different order than that witnessed by any known naturally occurring chemical processes. The second stage calling on a spiritual force is the appearance of consciousness or sentience. This, to a large extent, separated the vegetable and animal kingdoms. Finally, is "the existence in man of a number of his most characteristic and noblest faculties, those which raise him furthest above the brutes and open up possibilities of almost indefinite advancement."[75] Calling on "the blind eternal forces of the universe" to explain the complexity of life and the nature of humanity a "hopeless and soul-deadening belief," Wallace concluded, "The three distinct stages of progress from the inorganic world of matter and motion up to man, point clearly to an unseen universe—to a world of spirit, to which the world of matter is altogether subordinate."[76] The importance of *Darwinism* from the standpoint of Wallace's developing natural theology is that here he expanded on the role of that spiritual force—the "Overruling Intelligence"—that first marked his break with Darwin's positivistic naturalism. While its influence on the nature and essence of *H. sapiens* is a primary focus, Wallace clearly had extended it to include the origin of life and the distinguishing characteristic of the animal from the plant kingdom—sentience.

What seems puzzling, however, is the title. Why would an author who had long since parted ways not only with Darwin but also with his cadre of X Club warriors choose to title the book *Darwinism*, a work with so many clear departures from its namesake? Herbert Spencer, who at this point was still communicating with Wallace, wondered the same thing. Upon receipt of his complimentary copy of the book, Spencer replied, "I regret that you have used the title 'Darwinism,' for notwithstanding your qualification of its meaning you will, by using it, tend greatly to confirm the erroneous conception almost universally current."[77] That "erroneous conception," of course, was that Wallace's views were synonymous with those of Darwin's. At least one of Wallace's biographers admits the use of the term is "curious"

both "psychologically and semantically."[78] But Wallace was aware of the difference. He told fellow spiritualist James Peebles, "Darwinism may be true as far as it goes, but not be the whole truth. Darwin's laws of natural selection and variation are true laws, which will account for much—perhaps for all—the material organizations of plants and animals. He admits an influx of life from the Creator at first. I think an influx of a higher life occurred when man appeared. He does not think this necessary. This is the real difference between us."[79]

Nevertheless, the more public conflation certainly tended to obscure more than clarify Wallace's position relative to his older more famous colleague, yet Wallace often spoke of biological evolution as equivalent to natural selection. He readily admitted his differences with Darwin on several counts, although he honestly believed that by defending natural selection's importance he was actually restoring Darwin to an earlier, purer position, before biology's patriarch, in Wallace's view, overreacted to criticisms and began to rely on what he believed were the flawed subsidiary theories of pangenesis and sexual selection. As we have seen earlier, he freely confessed to have maintained natural selection's purity of concept in rejecting Darwin's later accretions and, in that sense, called himself more Darwinian than Darwin himself.[80] Wallace's statement, of course, is confusing since as a matter of fact he actually limited natural selection in the areas that, for Darwin and his X Club inner circle, mattered most: the origin of life, the emergence of sentience, and the nature of humankind. The "more Darwinian than Darwin" claim must be seen as Wallace's effort at using the Darwin brand for public relations. But Spencer and nearly everyone else knew how far Wallace had drifted from his senior partner.

Nowhere was that clearer than in his endorsement of Arthur J. Bell's *Why Does Man Exist?* (1890). In some respects it was an unusually unrestrained expression of praise from Wallace. Writing to the author on November 12, 1891, Wallace hailed the book for "its ingenuity, its profundity, its boldness, its logical force and completeness." Vitalistic, it proposed a life force in the "conscious cell." Bell carefully distinguished between chemical and physical laws of nature, which could only be acted *on*, and life that could actually *commence* actions.[81] Wallace told Bell he had been familiar with such ideas before but found his presentation particularly compelling. But he found the manner in which this vitalistic theory was applied to the great metaphysical questions of free will, evil, and the Deity its "crowning glory." Bell proposed a creationist form of intelligent evolution in which "God created that First Life or Soul with certain powers or abilities. One of these was the power to reproduce its like. Each reproduced Life had, like its parent, this power to reproduce its like. Out of the exercise of this

and other powers possessed by Life itself, there arose—by processes of Evolution—all the various kinds of plants and animals which have existed in the past, and those which at present exist."[82] Bell included within his theology and his theodicy a clear note of progressivism, for "God did not cause man to exist for His own benefit, His own pleasure, His own glory,—seeing how great to God is the cost of his existence,—but for man's benefit: that man, by Man's own free action, might make himself good and happy; might learn to know and to love Him more and more for ever."[83] With impassioned enthusiasm Wallace told Bell he would do all in his power to recommend the book to his friends, and he thanked the author for giving him so much to think about. The spiritualist quarterly *Borderland* published this letter in its entirety, leaving little doubt of Wallace's own support for an overtly theistic evolution.[84]

Juxtapose this with Wallace's reply to Francis Ellingwood Abbot (1836–1903), an American freethinker and founder of the Free Religious Association whose ideas were broadcast through his radical weekly voice, *The Index*. Abbot's association comprised a loose collection of lapsed and disaffected Unitarians and sectarians. Eschewing the "outmoded" dogmas of orthodox Christianity, Abbot proclaimed a "free religion" whose only legitimate goal was "an organized Faith in man." When Abbot asked Wallace his opinion of his book, *The Way Out of Agnosticism, or the Philosophy of Free Religion* (1890), he received a tepid response. Taking meticulous notes in his complimentary copy, Wallace wrote back to Abbot telling him that he found the book unlikely to influence many agnostics since "such a very long and elaborate cause of reasoning, founded largely on analogy and hypothesis, is open to dispute at almost every step, and is too ponderously difficult of comprehension to influence any but metaphysical thinkers." Wallace was unimpressed by what he called Abbot's "scientific pantheism" (Abbot himself called this "scientific theism," a "philosophized scientific method" based on a "theory of Universals" that created "only the idea of God"[85]). Wallace rejected such notions of the universe as "an infinite, personal, organic, machine [Wallace's underlining]" because evolution and its attendant corollaries of progress and change "all necessarily imply a beginning." Rather than trumpet the achievement of the author, as he had with Bell, Wallace only offered to lend the book to "a metaphysical friend of mine" (identity unknown) to get his views on it.[86] From that point on Wallace said nothing more of Abbot or his ideas.

Darwin's interesting and revealing relationship with Abbot makes for a striking contrast. Having read Abbot's *Truths for the Times* (1871), a rather doctrinaire tract proclaiming a humanity-centered program of philosophical and educational enlightenment and uplift, Darwin sent the author an

enthusiastic endorsement, telling him that he admired his "truths" "from my inmost heart; and I agree to almost every word." Abbot lost no time in publishing this in *The Index*.[87] Darwin subscribed to Abbot's periodical, and in an effort to bail out the financially ailing *Index*, he and his son, William, sent a large monetary donation "in your noble & determined struggle for free religion."[88] Whatever Darwin's expressions of theological confusion, there is little doubt that Abbot's "free religion" with its emphasis on humanistic uplift and rejection of exegetical absolutes was Darwin's confession of faith. When the election of the National Secular Society's founder and openly atheistic Charles Bradlaugh (1833–1891) to the House of Commons caused a firestorm of controversy in the press, the Darwins thought it best to quietly withdraw their support. Casting their support for Abbot's secular humanism across the Atlantic was one thing, but why risk adverse publicity at home? Nine years of weekly endorsements had been enough.[89]

The two naturalists had surely grown far apart in their worldviews since that summer of 1858. Nevertheless, with Darwin's passing in the spring of 1882, there is every indication that Wallace, the divergent paths he had taken from Darwin notwithstanding, had become the acknowledged spokesman for modern evolutionary theory. When Wallace embarked on his tremendously successful tour of America and Canada, his publicist could bill him as "the most distinguished living naturalist in the world" without fear of false advertising.[90] The evangelist-naturalist world traveler Henry Drummond (1851–1897) referred to Wallace approvingly more than a dozen times in his highly regarded Lowell lectures in 1893.[91] Geologist-paleontologist Henry Fairfield Osborn (1857–1935) called him "one of the leaders of thought in contemporary evolution," and utopian author–Darwin critic Samuel Butler (1835–1902) identified Wallace as "the most authoritative exponent of latter day evolution."[92]

Not all agreed. German biologist, monist philosopher, and Darwinian champion Ernst Haeckel (1834–1919) bemoaned the "diseased imagination" of Wallace's descent into spiritualism and his spiritualistic ideas.[93] Perhaps sensing vulnerability, evolutionary biologist George J. Romanes, Darwin's research assistant during the patriarch's last years and close friend of Huxley, deigned to make himself the heir apparent. In his caustic review of *Darwinism*, Romanes highlighted where Wallace had diverged from Darwin and called it "Wallaceism."[94] Worse still, Romanes later published an even more vituperative review in which he referred to Wallace's "deplorable weakness as a 'philosopher,'" and to "two Wallaces": the Wallace of natural selection, geographical distribution, travel and scientific observation and collection, and the "other Wallace," the Wallace of "spiritualism

and astrology" and radical social causes, in other words, "the Wallace of incapacity and absurdity."[95]

Wallace told Romanes that he had "hit below the belt" and that his review suggesting he had fallen in with astrology was inaccurate and misleading.[96] But Wallace had more. While in Canada, Wallace learned of some private letters from Romanes and his brother to Darwin concerning spiritualism. Wallace revealed his discovery of the letters through a spiritualist third party and thought it ironic that Romanes should castigate him for paranormal interests he himself had voiced some interest in. Wallace tried (to no avail) to get Romanes to publish his correspondence concerning spiritualism and resolve what he regarded as Romanes's hypocrisy on the subject. This was probably more than just a question of the Canadian letters. Wallace had long known of Romanes's interest in spiritualism. Wallace alerted fellow spirit investigator Frederic Myers of his younger colleague's dabbling into the phenomena. Wallace told Myers that Romanes was "an investigator, & I think would be glad of any advice or assistance from one so experienced as yourself. His sister he tells me has great medium power, & if he [should] get any good un-deniable tests he says he will lecture on them at the R.[oyal] Inst '[itutio]n!"[97] But Romanes apparently was never impressed with the empirical evidence for spirit phenomena, a fact that likely irked the fully committed Wallace. When Romanes died on May 24, 1894, the two remained unreconciled.

But Wallace, who never shrank from controversy, was not done. Not satisfied with his answer to Darwin's *Descent of Man* and to Huxley's even earlier *Man's Place in Nature* (1863) in *Darwinism*, Wallace presented his own views of the centrality of humanity. Almost in answer to Huxley, he published *Man's Place in the Universe* (1903). The immediate prompt to writing a book-length study on cosmology came from positive responses to an article published in the *Fortnightly Review* and the *New York Independent*, but Wallace admitted that Methodist minister-physician Henry Simpson Lunn (1859–1939) provided the catalyst for this book in 1896 when he asked him to speak on "Science of the Nineteenth Century." Without this invitation Wallace confessed that "I should not have had my attention so specially directed to great astronomical problems."[98]

The main feature of *Man's Place* is the significance of humans in the grand order of the cosmos. Although the historically misleading term "Copernican Principle" awaited Fred Hoyle's colleague Herman Bondi's invention in 1952, the idea that Earth does not find itself in any unique or privileged position with its concomitant implications for the importance of humans in the universe was in thorough circulation in Wallace's day. Friedrich Nietzsche (1844–1900)—philosopher of the *Übermensch* who

declared God dead—once said, "since Copernicus man has been rolling from the center toward x."[99] Ernst Haeckel, Germany's most ardent Darwinian, had a clear idea of what *x* should be. Looking at the "marvelous progress in a theoretical knowledge of nature" and its "manifold practical application in every branch of civilized life," Haeckel called for a rejection of "the irrational superstitions" of religious belief and "an end of that reactionary system of anthropocentrism" that had so dominated centuries of metaphysical thinking to the detriment of human progress.[100] The philosophical symmetry between Western science's preeminent figures is hard to miss: Copernicus supposedly removed humans from the center of the universe, and Darwin took humans down from the zenith of creation.[101] Wallace stood ready to challenge both.

Curiously, although Wallace made no mention of Haeckel in *Man's Place*, his approach was remarkably similar with a startlingly different conclusion. Wallace made clear that he believed the great advances made in science throughout the nineteenth century affirmed rather than denied the significance of humanity. Referring to William Whewell's *Plurality of Worlds*, a work he called on earlier in his 1856 paper on orangutans, he presented a mixed assessment, on the one hand supporting the idea that the order of the universe suggested "the dignity of man, as conferring a preeminence upon the planet which produced him," yet on the other rejecting its "appeals mainly to religious prejudices" based on the assumption "that every planet and star is a special creation, and that the peculiarities of each were designed for some special purpose."[102] His teleology is more nuanced. For Wallace purpose is not found in individual special creations but rather in the accumulation of conditions necessary for the origination and development of life culminating in human beings. Those conditions, discussed and detailed in chapter after chapter, can be enumerated: (1) the distance of the planet from the sun; (2) the mass of the earth; (3) the obliquity of its ecliptic orbit; (4) the amount and distribution of water compared to land; (5) the surface distribution of both; (6) the permanence of this distribution, probably related to the moon; (7) an atmosphere of sufficient density with the necessary component gases; (8) adequate dust particles in the air; (9) atmospheric electricity; and (10) a strictly controlled and constantly maintained temperature.[103]

These requisite conditions for life, all of which must exist together and be sustained over geologic time, are a product of our close centrality within the limited and finite universe. These material facts indicate that Earth is in all probability the only habitable planet. For Wallace, all this points to a "perfect harmony with this grandeur of design . . . that the material universe needed to produce this cradle of organic life" for "a being destined to

a higher and a permanent existence." The alternative, the notion of multiple inhabited planets, seemed to Wallace utterly improbable and incredible. Wallace must have been thinking of Darwin when he concluded that this idea reduces humans to mere animals, "only, perhaps, a second-rate demon" inhabiting "a third or fourth-rate earth."[104] Thus, Wallace's cosmology suggested a spiritual essence to the universe that receives its summum bonum in *H. sapiens*—a final cause—demonstrated in a myriad of efficient causes.

This book was, as historian Martin Fichman correctly observes, "a deftly constructed argument for evolutionary theism and teleology."[105] Wallace was using what he believed to be the latest findings in the physical sciences to demonstrate the plausibility—indeed the likelihood—of a genuinely spiritual world. Of course, not all agreed, not even his own son, Will. Writing to his nearly thirty-one-year-old son shortly after the release of the first edition, "affectionate Pa" argued, "as to my making too much of man,—of Course that is the whole subject of the book! And I look at it differently from you, because, I know facts about him you neither know or believe yet. If you once het [?] convinced of the facts & teachings of Spiritualism, you will think more as I do [Wallace's underlining]."[106] A few months later Wallace wrote to Will complaining of reviews of *Man's Place* that gave evidence of only cursory reading and inattention to his principal arguments.

But all reviews weren't negative, and Wallace could hardly have complained of the especially long and detailed two-part review by the influential Catholic convert and mathematician-astronomer Francis Wegg-Prosser (1824–1911). He acknowledged Wallace's dissent from the reductionist and positivistic approach of his elder colleague as expressed in *Darwinism*, "But even this," he admitted, "would hardly have prepared us for the powerful argument drawn from the numerous and complex conditions of life upon this Earth, an argument directed no doubt to another conclusion; namely, that this is probably the only habitable world, but indirectly leading on to the almost inevitable inference of a Divine power, originating and influencing the whole course of nature."[107] Wegg-Prosser bemoaned the reluctance of his fellow Christians to embrace the manifest design pointing toward "the truths of natural religion," and while certain knowledge of divine providence may elude us, he emphasized that "we can weigh probabilities, and here my sympathies are with Dr. Wallace." Despite Wallace's own rejection of any organized faith, *Man's Place in the Universe* offered a cosmology broadly compatible with Wegg-Posser's Christian commitments.

This might explain the immense popularity of Wallace's work. It ran through eight so-called cheap editions from 1903 to 1914. A German translation was released shortly after its initial publication, and Caroline

Barbey-Boissier (1847–1918), daughter of the late Swiss botanist Edmond Boissier (1810–1885), was so impressed with this "splendid book" that she indicated interest in executing a French translation of the work, which she completed and published with Schleicher Frères in 1907.[108] The popularity of *Man's Place* launched interest on the part of Chapman and Hall of London, and Dodd, Mead, of New York in an autobiography, which came out two years later in a massive two-volume work titled *My Life*, today the single most important published source on the life and work of Wallace.

After Wallace had developed his teleological biology in *Darwinism* and his complementary cosmology in *Man's Place*, he soon set his pen to completing a grand synthesis with *The World of Life: A Manifestation of Creative Power, Directive Mind, and Ultimate Purpose*. Published in December 1910, it can rightly be considered Wallace's capstone to his teleological trilogy. In many ways, his long journey toward a complete natural theology was realized in this work of more than four hundred pages.

The subtitle serves as a virtual thesis statement for the entire book. Wallace wasted no time in setting forth his argument: using specific examples in the animal kingdom—the bird's feather, metamorphosis in insects, and other "marvelous transformations of the higher insects"—that "they necessarily imply, first, a Creative Power, which so constituted matter as to render these marvels possible; next a directive Mind which is demanded at every step of what we term growth, and often look upon as so simple and natural a process as to require no explanation at all; and, lastly, an ultimate Purpose, in the very existence of the whole vast life-world in all its long course of evolution throughout the eons of geologic time."[109]

In chapter one Wallace broke his silence on Haeckel's monism and Huxley's materialism, both of which he regarded as vague and unsatisfactory. He objected in the most strenuous terms to Haeckel's reduction of the universe to "a monistic mechanical process" and the German's impenetrable arguments and unproven declarations.[110] Wallace revealed his complete disdain for such reductionism, charging Haeckel with "unfounded dogmatism of combined negation and omniscience."[111] Wallace found Haeckel arrogant and wildly speculative.

It is worth noting that Wallace's spiritualist colleague, the noteworthy physicist Oliver Lodge (who had made significant contributions to communications with the use of Herzian waves in telegraphic signaling and other electromagnetic wave demonstrations) had already taken an interest in Haeckel. In *Life and Matter: A Criticism of Professor Haeckel's "Riddle of the Universe,"* Lodge set out to dismantle this monistic presentation. Wallace took a keen interest in this book and made copious notes in his personal copy. Wallace's marginalia show a close reading of Lodge's argument, and

it seems likely that he used some of Lodge's ideas as a basis for his own analysis of Haeckel, conversely avoiding what he believed were some of Lodge's mistakes and weaker points. Overall, however, Wallace's reading of *Life and Matter* was positive.[112]

With Huxley, Wallace was more restrained, but nonetheless critical. Calling Huxley "our greatest philosophical biologist," Wallace went on to criticize Huxley's simplistic notions in his *Physical Basis of Life* (1869). Wallace regarded Huxley's idea that thought and matter were the same properties as the monism he found so disturbing in Haeckel, and the assertion that "thought is the expression of molecular change in protoplasm" seemed to him a begging of the question, and an unsubstantiated claim inconsistent with Huxley's earlier insistence that "life is the cause of organization." If so, Wallace observed that life must be antecedent to organization and can only be conceived as itself incorporeal, more akin with thought and the kind of "directive energy" demonstrated in all living things.[113] Wallace concluded by stating that his method would be very different from Haeckel's monism or Huxley's materialism.

Chapters two through ten give a thorough overview of common descent and evolutionary change along with the evidence that Wallace was convinced supported it. In chapter eleven he insists that organic life cannot be the result of "self-acting agencies" but must come about from some type of "mind-action."[114] In the next chapter Wallace asserts that "Mind" and "Purpose" lie beyond natural phenomena. But it is not monolithic. He proceeds to argue that because the types and degrees of life vary so immensely, the types of directive intelligences or mind must also vary in a kind of cosmic correspondence.

In the chapter "Birds and Insects: As Proofs of an Organising and Directive Life-Principle," Wallace makes an explicit case for design in various aspects of nature. He singles out birds and insects as demonstrable examples of "an organizing and directive life principle." Wallace notes the intelligence of many birds, rivaling that of numerous mammalian counterparts, but it was the bird's feathers that captured his greatest attention. The bird's feather and wing demonstrate, for Wallace, "*a preconceived design* [emphasis added]."[115] Reproducing an image of the intricate makeup of the feather with its detailed interlocking hook-and-eye mechanisms of the barbs and barbules, laterally meeting each other with their smooth surfaces creating a nearly air-tight seal, Wallace concedes to the Darwinists that this example shows the great importance of heredity, but it also presents one of the best examples of what Wallace called "directed power." In short, the bird's feather is *designed*. Wallace was particularly enthusiastic about the design

of the feather because of its microscopic intricacies and its macroscopic beauty—showing before our very eyes marvelous design at both levels.

Wallace believed insect metamorphosis to be another example. He paid special attention to Lepidoptera, whose change from a caterpillar into a mature butterfly he considered truly astonishing. The internal organs, sufficient for its life and growth as a caterpillar, dissolve then transform into "a perfectly different, and a much more highly organized creature." Yet he notes that from the humble beginnings of its larval form, the mature butterfly presents a display of color, pattern, and metallic beauty rivaling that of birds. Even more astonishing, he observed that unlike the bird's feathers, which are essential to its survival, the coloration and patterns of the butterfly are "not functionally essential to the insect's existence." Wallace admitted that certain patterns and colors can have a protective purpose but he viewed the process as "unnecessarily elaborate." Why the whole process in the first place when the organic structure of the caterpillar seemed to answer its needs? For Wallace the butterfly's metamorphosis was inexplicable by the mere principle of utility.

In either the case of the bird's feather or the butterfly, Wallace thought that some other explanation than mere mechanistic processes was required. Building his case from multiple examples—the fine tuning of the universe, the complexity of hemoglobin, and as already reviewed, the feather and metamorphosis of insects—he made his bold declaration in chapter four: "I now uphold the doctrine that not man alone, but the whole World of Life, in almost all its varied manifestations, leads us to the same conclusion—that to afford any rational explanation of its phenomena, we require to postulate the continuous action and guidance of higher intelligences; and further, that these have probably been working towards a single end, the development of intellectual, moral, and spiritual beings."

In chapter sixteen Wallace explains how general adaptations often go beyond the principle of utility, and even the plant kingdom is uniquely suited to man's use. These facts too suggested a teleological world for Wallace. Wallace takes the opportunity to defend against such a view as "unscientific" by pointing out that he deduced design and purpose in nature from some of Darwin's descriptive statements, and, while naturalistic principles may represent certain phenomena, they by no means explain them. Wallace again set his sights on the assertions of Haeckel, this time concerning an alleged unconscious "soul-atom" and similar speculations he called "vague and petty suppositions" that "do not meet the necessities of the problem."[116]

Wallace then addressed two key questions that needed to be answered

for his "World of Life" to be a comprehensive natural theology; namely, the origin of life and the problem of pain and evil in the world. The first of these was, for Wallace, essentially a problem of the cell. Could inorganic matter move to the structure and complexity of primitive first-life forms? This he addressed in his chapter "The Mystery of the Cell." Wallace dismissed the notion that life could have emanated from the mere accretions of protoplasm. Moreover, he attacked Huxley's notion of life as its own organizing power as a useless tautology and referred to Haeckel's speculation of an unconscious "cell-soul" as a mere "verbal suggestion."[117] Force or matter, Wallace insisted, is inadequate to the task of explaining life's origin.

Here Wallace relied on the German evolutionary biologist August Weismann. Weismann's germ plasma theory, the idea that all multicellular organisms consist of germ cells that transmit heritable information, supplanted environmental Lamarckian notions of the inheritance of acquired characteristics, including Darwin's variation on that theme, pangenesis. Weismann explained that hereditary material was contained in chromatic loops or chromosomes, and that the germ-cell formation halved the chromosome number, thus countering the doubling effect of fertilization. Like Wallace, Weismann was a steadfast proponent of natural selection. Romanes dubbed Weismann and Wallace derisively as "neo-Darwinians" (at the time code for so-called panselectionism) for their adamant defense of natural selection. Although often attacked and derided for his position during his lifetime, there is little doubt that Weismann's ideas regarding cellular structure and inheritance were anticipations of the neo-Darwinian synthesis. Ernst Mayr (1904–2005) considered Weismann, after Darwin, the single most important evolutionary thinker of the nineteenth century.[118]

Wallace had referenced Weismann repeatedly in *Darwinism*. While Weismann was a thoroughgoing materialist and advocate for the explanatory power of natural selection, Wallace noted the fact that, according to Weismann, prodigies in mathematics, music, or art "appear suddenly in a family" and "cannot have arisen through natural selection." These talents are not so much hereditary as by-products of the mind generally, which Wallace observed, "hardly accounts for the existence of the highly peculiar human faculties in question."[119]

Reproducing Weismann's diagram of cell division, in his chapter titled "The Mystery of the Cell," Wallace addressed the origin of life by illustrating the profound complexity of the cell. Intricate sequencing of the membranous change, chromatin arrangement, division of the chromatin elements into equal parts, the appearance at opposite poles of centrosomes surrounded by a "sphere of attraction," the arising of delicate fibers or threads that pull the chromosomes with the disappearance of the nuclear

membrane, the chromatin arrangement then becomes fixed, and finally the splitting longitudinally from "forces acting on the rods themselves" with the division completed by the two halves slowly drawn apart to the opposite poles approaching the center of attraction (the centrosome); all this takes place not by force, not by self-organizing power, or by a cell-soul, but by design. It is, in effect, a directed cause. Wallace called the attempts of Haeckel and others to minimize these "marvelous powers" as the mere operations of chemistry "wholly unavailing" and "mere verbal assertions that prove nothing," because they leave "all questions of antecedent purpose, of design in the course of development, or of any organising, directive, or creative mind as the fundamental cause of life and organization . . . altogether ignored."[120]

Could matter and life be eternal? Wallace thought not. Even assuming this theoretical construct riddled with massive problems, eternal life would simply suggest eternal life forces and energies directing and designing an eternity of progress. In essence, if life as exhibited in the progression of *H. sapiens* is an example of what can happen over the course of a comparatively short period of time, imagine what time expanded to infinity could do! For Wallace, the progressive development of biological life was neither a random nor a chance occurrence, and since this progress obviously took place over time, erasing time constraints with a presumed infinity only served to magnify the intent and design of this development.

But where is this progress? Hadn't Darwin removed the pretensions of the natural theologians by noting the pervasive pain and suffering in this world? Wallace answered in chapter nineteen, "Is Nature Cruel?" Wallace notes the materialists' charge that no supreme intelligence would ever have created a world so wracked with pain and misery. Here Wallace invokes the principle of utility again, noting that since "no organ, no sensation, no faculty arises before it is needed, or in a greater degree than it is needed . . . [then] we may be sure that all the earlier forms of life possessed the minimum of sensation required for the purposes of their short existence; that anything approaching to what we term 'pain' was unknown to them."[121] Thirty years later C. S. Lewis would echo this same point.[122] In closing Wallace's theodicy, it should be pointed out that Darwin simply found suffering a by-product of the vicissitudes of materialistic chance and a cause for rejecting providence in nature; for Wallace, used to privation and inured to struggle, pain, adversity, and loss were necessary and sometimes instructive threads woven into the complex fabric of life. They, as much as joy and success, were an integral part of Wallace's personal and metaphysical foundations and served to confirm his conviction that evolution was and is a scientific and philosophical process for human fulfillment and progress.[123]

As his friend and biographer, Rev. James Marchant (1867–1956), put it, "pain is the birth-cry of a soul's advance—the stamp of rank in nature is capacity for pain."[124]

In the final chapter of his *World of Life*, "Infinite Variety the Law of the Universe," Wallace addresses an epistemological question—how knowable is an intelligent First Cause? Darwin despaired of an answer or more accurately answered negatively. Wallace, however, thought that he could provide at least a partially affirmative answer: "I venture to hope that in the present volume, and especially in the last six chapters, I have satisfied most of my readers that the vast life-world, with its myriad forms, each one originating in a single cell, yet growing, by cell division, into such marvels of variety, of use, and of beauty, does absolutely require some non-mechanical mind and power as its efficient cause."[125]

In other words, we may see in the complex and goal-directed efficient causes a higher "Mind which first caused these elements to exist, and then built them up into such marvellous living, moving, self-supporting, and self-reproducing structures."[126] While we may be able to know or comprehend little or nothing of that inscrutable First Cause, we may surely infer its benevolent and omniscient interests in the universe, the earth, humanity, and indeed all living creation. Although Wallace always rejected the dogmatic and doctrinaire structure of organized religion, he closed his manifesto of natural theology with allusions to angelic presences in biblical poetics:

> If there is such an Infinite Being, and if (as our own existence should teach us) His will and purpose is the increase of conscious beings, then we can hardly be the first result of this purpose. We conclude, therefore, that there are now in the universe infinite grades of influence of higher beings upon lower. Holding this opinion, I have suggested that this vast and wonderful universe . . . has ever required and still requires the continuous co-ordinated agency of myriads of such intelligences.
>
> This speculative suggestion, I venture to hope, will appeal to some of my readers as the best approximation we are now able to formulate as to the deeper, the more fundamental causes of matter and force, of life and consciousness, and of Man himself; at his best, already "a little lower than the angels," and, like them, destined to a permanent progressive existence in a World of Spirit.[127]

The World of Life became his "one long argument" in reply to the materialism he saw ascendant on all sides. For Wallace, the divine sanctity

of human life, so vacant in the writings of Charles Darwin, John Tyndall, Thomas Huxley, Ernst Haeckel, and many others, was an evident truth. Moreover, this truth, drawn from the empirical sciences, became the octogenarian's passion, and in numerous interviews and lectures Wallace launched a campaign against the intrusions of materialism he saw running rampant in the opening decades of the twentieth century.

It is, in fact, in an interview prompted by his *World of Life* that Wallace filled in the specifics of his natural theology. In this interview with Harold Begbie for the *Daily Chronicle*, anticipating the release of his grand synthesis of natural theology, he was asked his view of the origin of life: "Well, it is the very simple, plain, and old-fashioned one, that there was at some stage in the history of the earth, after the cooling process, a definite act of creation. Something came from the outside. Power was exercised from without. In a word, life was given to the earth. All the errors of those who have distorted the thesis of evolution into something called, inappropriately enough, Darwinism, have arisen from the supposition that life is a consequence of organisation. This is unthinkable."[128] Wallace emphasized his insistence that the complexities of nature were guided by spiritual entities, and when asked about the precise nature of the entities, he replied, "I believe it to be the guidance of beings superior to us in power and intelligence. Call them spirits, angels, gods, what you will; the name is of no importance."[129] Yet none of this negated evolution, which he reiterated was thoroughly sound and confirmed by numerous scientific discoveries. But the explanatory power of natural selection is limited; it cannot, for example, explain the mystery of beauty or why humans can even appreciate it. What this scientist-turned-metaphysician rejected was not evolution, but materialism, which he called "a most gigantic foolishness." The laws of nature have purpose and behind them is "power and intelligence."

Wallace himself had evolved. The champion of natural selection in nature had become nature's prophet. Neither a futuristic seer nor a spokesman for God, but rather as a *prophētē*, an interpreter much as the Greeks had interpreters for the muses, oracles, and gods. He did not draw a text from his observations of nature through which God openly spoke, but rather became an adept reader of patterns, codes, and clues that he learned to abductively decipher, a *prophētē* who came to a comprehensive design inference.[130]

But leaving it here gives an incomplete view of this complex man. Wallace as scientist and as prophet must be understood within a social context. If evolution was the process by which humanity would achieve progressive physical and spiritual development, then it needed to be realized within

the complex fabric of social constructs and relationships. Wallace's thought was holistic, a complete system in which spiritual realities were manifested scientifically *and* socially.

5
Wallace's Integrated World

The Spiritual and the Social

Romanes did tremendous damage to Wallace's reputation when he created the "two Wallaces" mythology—the scientific, objective, and empirically grounded Wallace and the so-called other Wallace, the gullible and naive Wallace of spirits, ghosts, mysterious rappings, disembodied voices, and a grab bag of heterodox social causes such as land nationalization, women's rights, and opposition to vaccination. This "two Wallaces" hypothesis lurks like a discordant leitmotif in an already too idiosyncratic and cacophonous historiography of Alfred Russel Wallace.[1] As Martin Fichman has pointed out, "There was no 'other Wallace.' He was an integrated personality whose worldview incorporated diverse fields and synthesized them into a comprehensive and compelling framework."[2] Wallace's longtime friend, Oxford's Hope Professor of Zoology Edward Bagnall Poulton (1856–1943), once commented that Wallace was "a continuous whole, whose varied activities influenced one another."[3]

Wallace's spiritualism was more than a philosophical abstraction, it was bound up with social interests as well. This explains Wallace's intense interest in the American writer Edward Bellamy. While the "new socialism" under the direction of Robert Dale Owen never reached 10,000 activists, Bellamy's utopian socialist novel *Looking Backward* sold 400,000 copies. As Owen faded into memory, Wallace praised Bellamy for writing books "that first opened the eyes of great numbers of educated readers to the practicability, the simplicity, and the beauty of socialism."[4] Wallace declared himself a socialist in 1889 after reading *Looking Backward*, which he said, "changed my outlook on the question."[5]

The whole point here is that Wallace's *ideas* evolved. Wallace was orig-

inally drawn to phrenology through Robert Owen and his son by his own predisposition toward certain ideas and concepts he found congenial to his own thinking and by the unmistakable mark they must have made on his young impressionable mind. Wallace's ideas were bolstered by his brother, who attended lectures and "mechanics" sessions with him in the working districts of London. But later in life there is an unmistakable shift from Owenite socialism and phrenology to Swedenborgian religion and then to Bellamite socialism. The social connection between biology and society, for Darwin and Wallace, could be found in Malthusian economic theory, what Wallace called "philosophical biology." Malthus's message in his *Essay on Population* (1798) was that population pressures would always serve as a check on progress. But in Darwin and Wallace's minds Malthusian principles could indeed effect change and species could "progress." Darwin saw Malthusian economics in stark individualistic competitive terms; Wallace saw it more as group demographic struggles for sustainable food supplies. The group could surmount Malthusian constraints on population, and in humans better organization of labor and more equitable distribution of wealth would exploit available resources to the advantage of all. For Wallace, Malthus was a malleable description of natural conditions, not an ineluctable determinant of outcomes. Wallace thought that surely in the human species socialist progress could surmount Malthusian subsistence checks on population by a variety of means, such as late marriage produced by a society more attuned to equality of the sexes, along with higher life expectancy and diminished infant mortality, and that increased educational opportunities for all would have a reducing effect on family size. Greta Jones believes Wallace read Malthus through Owen's eyes; nature seldom fills to complete capacity, as Wallace knew from living among native peoples in South America and Maritime Southeast Asia. In those places, certain areas remained uncultivated or inhabited more for reasons of habit and inherently stationary village life. Thus, Malthusianism was *not* as insurmountable as it might appear.[6]

But in his more mature writing, Wallace viewed Malthusianism through the lens of Edward Bellamy. In "Human Progress" (1890), he referred to "Mr. Bellamy's clear and forcible picture of the society of the future." It was a picture gleaned not from Bellamy's popular *Looking Backward*, but from his lesser-known *Equality* (1897). Here Wallace "found the most complete and thoroughly reasoned exposition, both of the philosophy and the constructive methods of socialism." Bellamy presents two themes that echo Wallace: first, a detailed exposition of Malthusian doctrine (food increases arithmetically while population increases geometrically) that shows that while the basic principle may hold some truth, its warnings of ineluctable

population increase and catastrophe are really just "a prodigious convenience" for maintaining the inequities of the status quo. Second, Bellamy makes clear that the new social order must involve women who are accorded full equality with men and whose material interests are protected by law.[7]

Wallace anticipated *Equality* with an essay titled "Human Selection."[8] To fully understand this significant essay, an essay Wallace regarded as the "most important contribution I have made to the science of sociology and the cause of human progress,"[9] requires some context and juxtaposition with Darwin's views on the impact of sexual selection on humans. As discussed earlier, Darwin—like most of his generation—had decidedly patriarchal views. These expressed themselves in gender divisions in large measure biologically determined (for example, anatomical differences in brain size). Darwin's argument for women's mental inferiority was fundamental to the human component of *Descent*.[10] According to Rosemary Jann, Darwin "depended upon biological continuity to explain the derivation of cultural forms. By shifting his definition of instinctual sexual behavior in animals, he could project a version of the modern patriarchal family back across the border between animal and man."[11] But, as Jann points out, this led to several contradictions. First, males were presumably more powerful than females because of competition against other males for their mates, yet male animals did not necessarily gain the power of sexual selection. A successful suitor can still be rebuffed by a female. Darwin found the lack of evidence for male choice among animals disturbing.[12] Second, Darwin argued that men's intelligence likely derived from their need to protect and defend their family—being a bit more cunning at the hunt, at bit more innovative in tool and dwelling construction, and better at negotiating conflict would all favor increased intelligence—yet he then had to treat women's contributions to the family's subsistence as either matters of mere strength or, in the case of child nurturing and rearing, as matters of subordinate importance in the struggle for survival and mental development. In either case, there seems little parallel with the animal kingdom, and thus Darwin's animal/human continuity argument had to grapple with these looming paradoxes. In any case, "the construction of a biological rationale for gendered behavior required that he project a patriarchal model of the family back into the no-(hu)man's land between biology and culture."[13] This uneasy tension was expressed in ways remarkably reflective of Darwin's own Victorian class consciousness. For example, Darwin believed the women of his generation had "free or almost free choice in marriage," unlike "the barbarous races."[14] For the lower classes (the so-called rustics), sexual behavior was closer to animals, as they quarreled about "a pretty girl . . . like birds at one of their places of assemblage." Yet, male choice

brought about higher degrees of beauty among the upper classes: "Many persons are convinced, as it appears to me with justice, that the members of our aristocracy, including under this term all wealthy families in which primogeniture has long prevailed, from having chosen during many generations from all classes the more beautiful women as their wives, have become handsomer, according to the European standard of beauty, than the middle classes."[15] Jann concludes, "The dynamic of sexual selection and control that originated in Victorian accounts [like that presented in Darwin's *Descent*] has cast a long shadow over modern origin myths, notwithstanding our increase in scientific and ethnological sophistication."[16]

Essentially, Jann explains that Darwin's contradiction was that in human society men dominated, but this was hardly found in the natural world, where female choice largely controlled sexual selection. In order to explain the patriarchy of his own society he arbitrarily bestowed "superior" biological intellectual attributes onto men. Wallace, on the other hand, believed that male dominance in humans was an artificial sociological construction. Once women were "conceded full political and social rights on an equality with man," he argued, "she will be placed in a position of responsibility and power which will render her his superior, since the future moral progress of the race will so largely depend upon her free choice in marriage."[17] In this sense, Wallace had much more in common with twentieth-century anthropologist Ashley Montagu than with Darwin's Victorian rationalizations.[18]

Wallace did not share Darwin's class, and as a consequence many of his social views stood in stark contrast to his older colleague. Moreover, the period in which *Equality* and "Human Selection" were written was a period of intense social and scientific ferment. The state was growing professionally and politically; it was eager to flex its technocratic and elitist muscles, and nowhere was that more evident than in state medicine. It was a challenge that roused Wallace's greatest interests and concerns for the last twenty-three years of his life and found its clearest voice in his medical libertarianism.[19] One of the most nefarious manifestations of state medicine was in *eugenics*. It began as early as 1869 in Francis Galton's *Hereditary Genius*, and then was given a name in his *Inquiries into Human Faculty and Its Development* in 1883. The influence of his cousin's *Origin of Species* was profound, he read it multiple times, and, for Galton, it replaced the old worn-out doctrines of religion with a new "modern scientific" outlook. The careful and intelligent application of modern Darwinian principles—so well documented in *Origin* and confirmed in *Descent*—could now enlist natural selection on behalf of man's improvement with eugenics, from the Greek *eugenes* ("good in stock"). Why not, thought Galton, simply expand

its application in the animal world to include humans? After all, hadn't it been "proved" in Darwin's own domestic breeding analogy?

Here is social Darwinism in its fullest form. This worldview of scientific determinism came to incorporate (among other things) eugenics as one of its prominent "progressive" projects.[20] Some have questioned whether this term deserves the branding of its namesake, but as Darwin's biographers Adrian Desmond and James Moore have indicated, "'Social Darwinism' is often taken to be something extraneous, an ugly concretion added to the pure Darwinian corpus after the event, tarnishing Darwin's image. But his Notebooks make plain that competition, free trade, imperialism, racial extermination, and sexual inequality were written into the equation from the start—'Darwinism' was always intended to explain human history."[21]

This rather astonishing declaration requires some unpacking. Why would such eminent biographers as Desmond and Moore say this? Were Darwin's views as racially charged and suffused with notions of patriarchal imperial expansion as they seem to suggest? Moreover, can these notions be traced back to Darwin's Notebooks as they claim? Darwin's racial views come out most clearly when he observes "savages," a nonpejorative term that in the Victorian era was simply generic for non-Westernized peoples and cultures (it grates only on modern ears). Darwin frequently argued from analogy between animals and humans. As early as Notebook C, written between mid-May and mid-June of 1838, Darwin was seeing parallels between intellect in man and instinct in animals when he wrote, "We see gradation in man's mind in Vertebrate Kingdom in more instincts in rodents than in other animals & again in Man's mind, in different races, being unequally developed."[22] Darwin wanted to know the distinctions between man and beast and in Notebook C referred to his cousin Hensleigh Wedgwood (1803–1891), who believed the chief difference between the human and animal mind (presumably thinking of primates) was "the love of deity & thought of him." This prompted Darwin to reflect on his experience in Tierra del Fuego and remark, "yet how faint in a Fuegan or Australian!"[23]

Although Darwin admitted that humans are all one species and nearly the same, at the same time he was convinced that hereditary differences made significant differences between different peoples and cultures. One entry in the "Old and Useless Notes," written probably in early 1839, he refers to instincts being modified by heredity causing "weakened" parental feelings in Tahitians, "fear of death in Hindoo population," and other influences, presumably hereditary in nature, causing modifications "in many countries, hence national character, love of country, of association & c. stronger in some than others. Hence superiority of Christian over Heathen

race."[24] This was in keeping with an earlier Notebook entry in which he stated that we may all exclaim to be Christians and "Brothers in spirit—all children of one father—yet differences [are] carried a long way."[25]

Did any of this add up to what might be called a racial imperialism ending even in extermination for some? While it was not in Darwin's inherently gentle character to be a jingoistic proponent of British colonial expansion, and such notions grated against his liberal Whig progressivism, he privately admitted to Rev. Charles Kingsley, "It is very true what you say about the higher races of men, when high enough, replacing & clearing off the lower races. In 500 years how the Anglo-Saxon race will have spread & exterminated whole nations; & in consequence how much the human race, viewed as a unit, will have risen in rank."[26] He voiced the same sentiment in a letter to William Graham, "Remember what risks the nations of Europe ran, not so many centuries ago of being overwhelmed by the Turks, and how ridiculous such an idea now is. The more civilised so-called Caucasian races have beaten the Turkish hollow in the struggle for existence. Looking to the world at no very distant date, what an endless number of the lower races will have been eliminated by the higher civilised races throughout the world."[27] For Darwin, racial superiority was "survival of the fittest" put into terms of national expansion and even of human progress.

Notions of gender inequality can be found in Darwin's early writings as well. For example, in Notebook D he remarks, "women recognized inferior intellectually."[28] This rather cryptic statement is more fully amplified in *Descent*, where he notes men's superiority in "inventive genius" and his "absolutely larger" brain.[29] Again, it was his preference to argue by means of analogy, drawn into force now with his idea of sexual selection that prompted a stark delineation of gender disparities:

> With respect to differences of this nature [i.e., in the mental powers] between man and woman, it is probable that sexual selection has played an important part. I am aware that some writers doubt where there is any inherent difference [i.e., Wallace]; but this is at least probable from the analogy of the lower animals which present other secondary sexual characters. No one disputes that the bull differs in disposition from the cow, the wild boar from the sow, the stallion from the mare, and, as is well known to the keepers of menageries, the males of the larger apes from the females. Woman seems to differ from man in mental disposition, chiefly in her greater tenderness and less selfishness; and this holds good even with savages. . . .
>
> The chief distinction in the intellectual powers of the two sexes is shown by man's attaining to a higher eminence, in whatever he takes

> up, than can woman—whether requiring deep thought, reason, or imagination, or merely the use of the senses and hands. If two lists were made of the most eminent men and women in poetry, painting, sculpture, music (inclusive both of composition and performance), history, science, and philosophy, with half a dozen names under each subject, the two lists would not bear comparison.[30]

As for competition and free trade, nearly all of Darwin's biographers acknowledge that he was a product of the Victorian gentry, nearly all of whom subscribed to competition and free trade as matters of fact and faith. He was well-connected with the Wedgwoods, and his own father's investment prowess made him the direct beneficiary of laissez-faire capitalism and Britain's industrial revolution, the rewards of the "prosperous professional family of his birth." Under such circumstances it was easy to be a liberal Whig and class-conscious economic conservative at the same time. This was one of several sources of tension for Darwin, and it expressed itself tellingly in its social applications.[31] Darwin hardly took comfort in these observations. It is, in fact, what made Darwin, for Desmond and Moore, a "tormented evolutionist."

So Desmond and Moore's seemingly startling—even polemical—association of social Darwinism with Darwin's views on competition, free trade, imperialism, racial extermination, and sexual inequality is not without foundation. Of course none of this should elicit the presentist verdict that Darwin was a benighted bigot and chauvinist. He was, however, a man who viewed race and gender through the lens of Victorian notions of empire and the social conventions typical of his class and time. He was—as are we all—bound by the social conventions and attitudes of his time.

But Wallace, we must remember, was not a part of Darwin's class. This made him a very different participant in the social landscape of nineteenth-century England. In many ways he was not subject to the social controls of the gentrified elite, and his long and intimate sojourns with the native peoples of South America and Maritime Southeast Asia made him genuinely multicultural. The differences between Darwin and Wallace should not in any sense be calculated in terms of character but rather in terms of very different experiences.

As such, it is hard to imagine anything more opposed to Wallace's thinking than social Darwinism, and lest anyone think that the influence of Herbert Spencer might hint at social Darwinist ties, it might be worth pausing to consider a stronger Wallace-Spencer link—namely, libertarianism.[32]

Eugenics had a more diffused following that even included committed spiritualists like Madame Blavatsky.[33] Wallace was *not* one of them. But the

medical profession at the time was nearly swept away with the idea. James Alexander Lindsay (1856–1931), fellow of the Royal College of Physicians of Ireland and chair of medicine at Belfast's Royal Victoria Hospital, spoke for the so-called progressive elements of his profession when he delivered "Darwinism and Medicine" at the prestigious Bradshaw Lecture on November 2, 1909. "In the future," Lindsay proclaimed, "one may predict with confidence that the preservation of the purity of the race will be regarded as one of the essential tasks of the art of medicine. The whole question . . . will certainly force itself increasingly upon our attention. It will do so," he added, "with the greater insistence if we realize that the future physical well-being of the race will be determined more by natural selection than by attention to environment, important though this latter factor may be."[34]

Wallace had already voiced his opposition to such autocratic presumptions. In "Human Selection" he thought Galton's proposals of "racial improvement" through "a system of marks of family merit" categorically "ineffective," and when eugenicist and Darwinian publicist Grant Allen (1848–1899) urged an even more aggressive plan, Wallace called it "detestable." The whole purpose of his "Human Selection" article was to show that the proposals of Allen, Galton, and others to manipulate the human race by means of artificial elimination and selection were unscientific and uncalled for. He also wanted to show the Malthusian opponents of social reform that their concerns with overpopulation were "entirely imaginary." Improved social conditions would avert this disaster and divert it to the general betterment of humankind.[35]

Wallace's ire was also raised when the medical profession attempted to enlist the state in enforcing vaccination. The gradual codification of compulsory vaccination in England that has been examined so well by Nadja Durback need not be recounted here,[36] but Wallace's introduction to the antivaccination movement by merchant and fellow spiritualist William Tebb (1830–1917) in the early 1880s prompted an 1885 pamphlet, *Forty-Five Years of Registration Statistics, Proving Vaccination to Be Both Useless and Dangerous*, and another in 1898 titled *Vaccination a Delusion—Its Penal Enforcement a Crime*, which became chapter eighteen of his *Wonderful Century*, complete with foldout diagrams "demonstrating" statistical patterns of smallpox in opposition to the effectiveness of vaccination.

Wallace opposed vaccination for two reasons. First, he believed the science behind its purported efficacy was faulty. It would be presentist, however, to cast Wallace's opposition as benighted and reactionary. Public health biologist Thomas P. Weber has recently pointed out that the evidence marshaled by both sides was based on actuarial statistics rather than inferential statistics that would have been more helpful in settling the

matter had they existed at the time.[37] As it was, neither side could amass the kind of definitive statistical evidence necessary to prove their case. Wallace, and those who stood behind the antivaccination movement, including such noteworthy physicians as microbiologist Edgar Crookshank (1858–1928) and former Cambridge University anatomy instructor Charles Creighton (1847–1927), could and did present strong evidence against the effectiveness of vaccination, never mind mandating it on penalty of fine or incarceration. But a second reason for Wallace's opposition went to the heart of his conviction that solutions to social problems, be they medical or otherwise, would not be solved by state coercion (corrupted as it was by self-interested capitalism) that imposed itself as the arbiter not only of public life but also of domestic life, an area that should be reserved to husband and wife. Furthermore, state-mandated vaccination of all children only formed another heavy weight on women already constrained in their freedoms by a patriarchal society. Thus Wallace could indict the Vaccination Acts "as a gross interference with personal liberty and the sanctity of the home."[38]

Wallace made it clear during the last twenty-three years of his life that only when people voluntarily worked together in a cooperative society shorn of pecuniary self-interest could progressive evolution of the human race—the kind nature intended—be realized. This made the full equality of women not just a laudable goal but a social necessity. Again, in "Human Selection," he made his case for a system of complete social and economic equality for women.[39] Wallace never thought much of sexual selection in the animal kingdom, but he had for a long time separated out the human species as special. Wallace, as mentioned earlier, disagreed with Darwin that women in Victorian England had anything approaching freedom in choosing a husband. Wallace argued that only in "female choice" through free and open marriage unconstrained by the economic necessities and social conventions that Wallace knew prevailed could true progress be made. Wallace was an outspoken supporter not just of women's suffrage but of more radical proposals for gender equality.

Wallace had befriended the noted American feminist Charlotte Perkins Gilman (1860–1930), author of *The Yellow Wallpaper* (1892) and generally acknowledged as the leading voice for women's rights in the progressive era.[40] Her *Women and Economics* (1898), with its call for women's opportunities beyond "the primitive labors of the household," could very nearly have been written by Wallace himself.[41] Wallace and Perkins were both convinced of evolution's progressive powers, and in his final overview of biogeography he chose to reprint Gilman's poem "Similar Cases" in order "to point a moral against those who oppose the possibility of the social advancement of humanity."[42] Some measure of their collegiality can be

gleaned from their correspondence, in which Gilman alerted Wallace of her travel to England in the summer of 1899. Reminding Wallace of the interest he had shown in some of her lectures when she last visited, she indicated a desire to deliver more during her stay. Wallace wrote back: "I was glad to hear that you are in England again to enlighten the benighted Philistines. I have sent your Programme to Mr. Kelly who arranged your lectures here before & he has I presume written to you. If lectures are arranged here I hope you will come & stay with us as before."[43]

Wallace had another important soulmate, Prince Peter Kropotkin (1842–1921). Kropotkin's voluntary socialism free of government coercion or control appealed to Wallace. Wallace's personal library contains two Kropotkin works: *Memoirs of a Revolutionist* (1899), sent to him by museum curator Sydney Cockerell (1867–1937), and *Fields, Factories, and Workshops*. Originally published in 1898, Wallace's copy was an undated "New, Revised, and Enlarged Edition."[44] *Fields, Factories, and Workshops* is regarded by many as Kropotkin's magnum opus. Kropotkin complains that reform could be achieved "were it not for the economical and social causes which prevent any serious reform from being accomplished in *our* miserably organised society," which Wallace underlined with a large exclamation point. In Kropotkin's call for a new largely cooperative socialism it is clear that Wallace meticulously followed the prince's arguments and took careful notes. There is not one line of criticism, surprising from a man not shy about criticizing even individuals with whom he generally agreed. His personal copy of Kropotkin's memoirs is interesting in his close attention to the author's "working out the practical and theoretical aspects of anarchistic [libertarian] socialism," which he highlighted in blue pencil for several pages. The essence of this leftist libertarianism, calling as Kropotkin did "for the development of new forms of production, invention, and organization [through] individual initiative," showed its affinity with evolution, and Wallace took special note by double marking the following passage in *Memoirs of a Revolutionist*: "Moreover, this society will not be crystallized into certain unchangeable forms, but will continually modify its aspect, because it will be a living, evolving organism; no need of government will be felt, because free agreement and federation can take its place in all those functions which governments consider as theirs at the present time, and because, the causes of conflict being reduced in number, those conflicts which may still arise can be submitted to arbitration."

It was surely an idealistic plan, and Wallace, ever the idealist, gave it his complete approval. In a letter thanking Cockerell for Kropotkin's memoirs, Wallace bemoaned the "horrible despotism" subjugating the Russian people, but he hoped that "in the not distant future" and no doubt under the

guidance of enlightened thinkers such as the prince, Russia might become "a real leader among nations."[45] Wallace did not live to see the new despotism to which the Russian people would fall when the Bolsheviks took violent control in the October Revolution of 1917. He would, however, have unquestionably agreed with Kropotkin's comment that "this buries the revolution," and was most assuredly "how the revolution was not to be made—that is, by authoritarian rather than libertarian methods."[46]

Kropotkin's leftist libertarianism and his concept of cooperative, progressive evolution (discussed at length in his memoirs, but spelled out completely in his book, *Mutual Aid: A Factor of Evolution* [1902]) coincided with Wallace's ideas, as had Gilman's. In this later period of Wallace's life, spiritualism became less a public affair for the aging naturalist now living comfortably at Old Orchard in Dorset, a home he had personally designed for himself and his wife, Annie, whose "main charm . . . was a small neglected orchard with old much-gnarled apple, pear, and plum trees."[47] But politics and social causes were an ever-present feature of a man Annie described in February 1913 as "very well and busy, writing as hard as ever" and who "has just passed 90 and feels like 50."[48]

The pleasant bucolic setting of his three-acre estate did not induce the nonagenarian into a lethargic retreat from the marketplace of daily affairs or ideas. Wallace's last two books were *The Revolt of Democracy* and *Social Environment and Moral Progress*. Although *Revolt* was written a few months before *Social Environment*, it was published posthumously, in 1914. Written as an expression of "his heart . . . on fire with love for the toiling masses," its most revealing feature is the biographical sketch prefacing the work by James Marchant. *The World of Life* expressed the natural theology of "the Grand Old Man of British Science." It established "an angelology whereby the vast Divine Mind operated upon and communicated with 'every cell of every living thing that is, or ever has been upon the earth,' . . . a system of spiritual media."[49] Significantly, Wallace's laws of nature did not vex him as they had Darwin since he imbued them with intelligent agency. So much so, in fact, that he insisted even if it would someday be demonstrated that life could be spawned by purely chemical processes, "it would not alter my argument one iota. 'Natural Laws' of such range and power are unthinkable, except as the manifestation of *Universal Mind*."[50]

Since nature's laws were inextricably tied to the teleological forces behind them, evolution was in its very essence progressive, and this is why Wallace's natural theology was always more than a metaphysical abstraction. In order to permit evolution to operate most fully and effectively on humanity, society and all its man-made corruptions of economic rapacity and political oppression needed drastic but voluntary reform. In this sense

Wallace's natural theology represented a larger synthesis of philosophical and socioeconomic ideas hard to encompass in any *one* of his books. But if any could come close it would be his *Social Environment and Moral Progress*, in effect serving as a précis of his natural theology.

This 181-page book summarized Wallace's mature conclusions on science, politics, and the nature of the human condition. If Wallace's Ternate letter read as an "abstract" for Darwin's theory of natural selection, here was the abstract for his life's work. *Social Environment* opens with a discussion of moral character and the observation that although there has been little real advance in human history, "progressive improvement" requires a "selective agency." Much later Wallace presents what that agency is—"free selection in marriage"—which absolutely requires the total economic and social liberation of all women. Wallace returned to his 1864 paper in the *Anthropological Review*, a paper it will be recalled that did subscribe to the common Victorian notion of racial hierarchies. But the Wallace of *Social Environment* was not the Wallace of nearly fifty years previous. Now he claimed that same paper explained the great races of humankind as all "in their best examples they approach very nearly to the same ideal of symmetry and of beauty."[51] Indeed, all peoples everywhere "possess human qualities of the same kind as our own," and in terms of "intelligence and morality" there is "no marked superiority in any race or country."[52]

Unfortunately, these facts had not translated into fair and equitable opportunities or lifestyles for all people, largely due to systemic disparities based on self-interest and oppression. Wallace decried a capitalistic system that provided equity and justice only to those who could afford it and took it as "self-evident that justice ceases to be justice when it has to be paid for."[53] These injustices were exacerbated in the British colonial system. When trouble brewed in South Africa, Wallace was sympathetic to the native population. Although he had no direct knowledge of the South African situation, he knew of colonialism while in Maritime Southeast Asia and had witnessed it at its best and its worst. He decried the degradation of the Polynesians "from contamination by the vices and follies" of British society and considered it "one of the most pathetic" tragedies of the colonial system.[54] Similarly, he had witnessed native tribes in South America interacting with the Portuguese and other Europeans, to their physical and moral detriment.

But there was another injustice lurking closed to home. It was a Mental Deficiency bill targeting the "feeble minded," a measure proposed by England's top eugenicists. As previously mentioned, Wallace had no use for eugenics. He had once angrily told an interviewer that "segregation of

the unfit is a mere excuse for establishing a medical tyranny. And we have had enough of this kind of tyranny already . . . the world does not want the eugenist to set it straight. . . . Eugenics is simply the meddlesome interference of an arrogant scientific priestcraft."[55] He found eugenics "in every way dangerous and detestable" and declared, "I trust that all my readers [of *Social Environment and Moral Progress*] will oppose any legislation on this subject by a chance body of elected persons who are totally unfitted to deal with far less complex problems than this one, and as to which they are sure to bungle disastrously."[56] Despite Wallace's admonitions, the faddish enthusiasms of the scientistic technocrats and their political enablers won out; the measure passed and was not repealed until 1959.

Wallace's strident opposition to eugenics is revealing. Obviously, it grated against his libertarianism and socialism since the interference of elites energized by the false securities of scientism, a scientism premised on ideas he had already pointed out had little empirical support or rational foundation, could only further interfere with an intelligent evolution interested in the progress of the human race. In short, it was an intrusion of the corrupt institutions of man into the sublime intentions of nature. At its heart, eugenics was sacrilege to his natural theology. It interposed itself against that "Divine influx" that raised us above the beasts and sought to create "a new being" with the possibility of "eternal progress."[57] Sterilize the "unfit"? Isolate mental "defectives"? Create lists of medical conditions prohibiting marriage? A body of self-appointed "experts" ratified by a corrupt patriarchal system of economic and social oppression could only bring about corrupt results and prevent real human progress of any kind.

An elderly Wallace once told Marchant, "Leave heredity alone until we have made the environment of every child from conception to death the best possible for its full and free development, and then we can begin to think about the influences of heredity, which may be small." Nurture's tending was paramount over nature's influence. He said to Marchant that "it was unmitigated humbug to talk about hereditary class distinctions being rooted in Nature." As Wallace summarized it, "An individual is, of course, a product of nature and nurture, but it is one-tenth the former and nine-tenths the latter."[58]

This would be Wallace's final declaration, and *Social Environment* reminds one of Martin Luther's angry Ninety-Five Theses indicting the church, only here Wallace was indicting the Victorian and Edwardian society with which he had been so intimately connected. Luther drew his reformist impulse from biblical exegesis drawn to indict a church corrupted by men; Wallace drew his reformist impulse from nature's text also cor-

rupted by men. Both felt something of the prophet's mission; both were concerned for our access to eternity; both were prosecuting the corruption of means to sacred ends. For Luther, the problem was what he saw as a debased church seized by the venal interests of Rome; for Wallace, it was a selfish socioeconomic and political system based on pecuniary gain that subverted an inherently progressive intelligent evolution. Both railed against a world gone wrong, at stake was the very spiritual nature of humanity.

Journey's End

Wallace's long, hard fight was about over. It was time to meet the spirits that had long captured his interest, fascination, and conviction. Although suffering from severe rheumatism and an uncomfortable eczema on his legs, he remained cheerful and optimistic to the end. All setbacks, physical, financial, or otherwise, had a larger purpose for Wallace. November 1 was the last he would spend in his garden. After dinner he felt faint, his doctor was called in, but time had taken its toll. Remaining in bed and slipping in and out of consciousness, the "Grand Old Man of Science" passed away peacefully at nine thirty in the morning of November 7, 1913. Wallace's greatest journey was complete; he had finally found his destination.

Despite public and professional opposition that carried with it certain social and financial costs, Wallace swam against the rising tide of scientism along with the sociopolitical conventions of the day to make his own way. Wallace had always been his own man. He was not buried in Westminster Abbey, preferring the humbler resting spot of the Broadstone cemetery. However, not long afterward Wallace's friend and colleague, professor Edward Poulton, chaired a committee to have Wallace memorialized within the walls of Westminster Abbey. Accordingly, three medallions honoring Joseph Dalton Hooker, Lord Joseph Lister, and Wallace were unveiled in the north aisle of the choir of the Abbey on November 1, 1915. The dean of the Abbey placed Wallace's medallion next to Darwin's, pointing out at the ceremony that their historic connection and their names would forever be "linked in the worlds of thought and science."[59]

True enough, and herein lies the problem. Wallace and Darwin *are* connected by their mutual theories of natural selection to the point of obscuring both. Their generally cordial relations seem ratified by Darwin's petition for Wallace's annual pension. But appearances can be deceiving in the history of science. What are we to make of Wallace's science and its connections to his natural theology? This is a question that could hardly

be asked of Darwin, and herein hangs a tale. Some effort must be made to disentangle these two grand old men of science. By so doing their science and their metaphysical views—and they each had one—may be brought into sharper focus.

Disentangling Wallace from Himself and from Darwin

Taken as a whole, Wallace's contributions to our understanding of biology have improved under more recent reassessments.[60] Professor of plant physiology and evolutionary biology Ulrich Kutschera has pointed out that the respective theories of evolution Darwin and Wallace described were quite different from the beginning despite Darwin's belief to the contrary. As we have already seen, Wallace rejected the analogy of domestic breeds with variation in nature; he emphasized competition of animals in relation to their environment between species with selective advantage over predators and competitors for relative food supplies being crucial; he rejected all forms of Lamarckian use and disuse as an evolutionary mechanism; unlike Darwin, he refused to call on subsidiary natural mechanisms such as pangenesis or sexual selection (except in human sexual selection, which was itself teleological); and Wallace used terms like "adaptation" and "population" in a modern sense.[61] Furthermore, Wallace was one of the seminal proponents of species as a modern concept in biology. Darwin never clearly defined precisely what a species was, but Wallace defined the term in 1865 as follows: "Species are merely those strongly marked races or local forms which, when in contact, do not intermix, and when inhabiting distinct areas are generally believed to have had a separate origin, and to be incapable of producing a fertile hybrid offspring."[62] This is quite close to Ernst Mayr's definition of the "biospecies concept."[63] In fact, Ernst Mayr, perhaps the leading spokesman for the modern neo-Darwinian synthesis, has echoed Wallace's insistence that natural selection is really an eliminative process.[64] His support of Weismann's theory of the "continuity of germ-plasm," apart from the inheritance of acquired characteristics and instead working primarily through natural selection, singles him out as an early neo-Darwinian. Indeed, Wallace was one of the very first to recognize Weissmann's genius.[65] But this is only the "good" Wallace, the "scientific" Wallace.

Here the praise ends. Kutschera simply calls Wallace's spiritualist views and metaphysics "an unfortunate development" of his "old age." George Beccaloni, curator of the Wallace Collection at the Natural History Museum (London), similarly praises Wallace's scientific work, and then apparently forgetting about Wallace's pathbreaking *Geographical Distribution of*

Animals (1876) and his much-praised *Island Life* (1880), states, "It is surely not coincidental that Wallace developed most of his best scientific ideas before his mind was possessed (pun intended) by Spiritualism!"[66] In that same vein, Harvard's evolutionary psychologist Steven Pinker praises Wallace's "prodigious scientific genius" on the one hand only to discount his "creationism, teleology, and spiritualism" as unscientific on the other.[67]

One need not be a scientist to subscribe to the two-Wallace thesis. Science writer and historian Sherrie Lyons, as we have seen, has castigated Wallace for his excursions into metaphysics, seeking to uncover life's deeper mysteries, but praises him for his "first-rate" work in biogeography. Curiously, she dismisses his increasingly "speculative" spiritualistic science, but she explains that his views were understandably pushed to the margins because most people thought he was gullible, uncritical, and was investigating matters and asking questions beyond the bounds of science. Her argument appears to be less a matter of seriously investigating the scientific coherence and philosophical implications of his ideas and more a kind of *ad populum* appeal. Wallace wasn't scientific because so many people said he wasn't scientific.

The "two-Wallace" mythology persists—there is Wallace the laudable scientist, innovative and even prescient, and Wallace the foolish and "deplorable" philosopher and gullible spiritualist given to heterodox causes. A fairer treatment of Wallace demands a closer examination of his metaphysical views. In order to do that it is best to acknowledge that his views evolved and to see where he ended near the conclusion of such a long and fruitful life. In a letter Wallace sent to Marchant shortly before his death, Wallace, the aged but mentally alert naturalist, summarized his views:

> The completely materialistic mind of my youth and early manhood has been slowly moulded into the socialistic, spiritualistic, and *theistic mind* [emphasis added] I now exhibit—a mind which is, as my scientific friends think, so weak and credulous in its declining years, as to believe that fruit and flowers, domestic animals, glorious birds and insects, wool, cotton, sugar and rubber, metals and gems, were all foreseen and foreordained for the education and enjoyment of man. The whole cumulative argument of my "World of Life" is that in its every detail it calls for the agency of a mind . . . enormously above and beyond any human mind . . . whether thus Unknown Reality is a single Being and acts everywhere in the universe as direct creator, organizer, and director or every minutest motion . . . or through "infinite grades of beings," as I suggest, comes to much the same thing.

> Mine seems a more clear and intelligible supposition . . . and it is the teaching of the Bible, of Swedenborg, and of Milton.[68]

The reference to Swedenborg is not surprising, but what are we to make of his mention of Milton? This intriguing reference suggests a connection drawn from Christian premodern theology: the nine heavenly orders described in the celestial hierarchy. Pseudo-Dionysius the Areopagite (circa fifth century) presented the idea of an ordered ranking of angels "whose obedience and ministry God employs to execute all the purposes which he had decreed," and this was taken up by Thomas Aquinas (1225–1274) and numerous divines for over a thousand years.[69] Wallace's mention of Milton is interesting too in this regard since the seventeenth-century poet was one of the last to extensively acknowledge that the angels are "distinguisht and quaterniond into their celestiall Princedomes and Satrapies."[70] In spite of his rejection of organized religion and Christian doctrine, some version of the celestial hierarchy is plainly at work in Wallace's theology.

This is not surprising since Wallace never strayed far from the *scala naturæ*. His closing lines of *The World of Life* harken to Psalms 8 with reference to humanity being made to be "a little lower than the angels," and as he faced the twentieth century he was hoping for "the rise of a truer religion, a purer Christianity."[71] While he rejected what he saw as the Christian church's all-too-frequent episodes of historic cruelty and oppression, he nonetheless felt that on balance, with its inspiring literature and the "glories" of Gothic architecture, it "fully justified its existence as helping us to realize whatever more advanced and purer civilization the immediate future may have in store for us."[72] Wallace was never Christian, but neither was he *anti*-Christian.

The World of Life, his grand statement of natural theology, received a mixed reception. English zoologist Arthur Dendy (1865–1925) thought the book was "eminently unscientific," and that the author "far outsteps the legitimate bounds of science," though the less speculative portions were a "relief."[73] *Nature* rejected its "unbridled speculation" and offered up what amounted to less a review and more a coroner's report on the "twilight of a noble life."[74] In contrast, the *Independent* was impressed. Instead of dismissing Wallace's theistic formulations, it praised "the consummate force" of his presentation as beyond the expectations of a man his age. Convinced of its argument, the reviewer concluded, "Mind is not all matter."[75] Rev. William Spiers, author of numerous biblical studies and *Rambles and Reveries of a Naturalist* (1890), applauded the nonmechanistic approach to life as well as the proposition of a "supreme guiding Power in nature," noting

its appeal to theistic evolution. But Spiers registered his distinct discomfort over Wallace's "certain bizarre suggestions as to the precise mode of creation which will not only expose him to the antagonism of those who hold that all such speculations are beyond the proper province of science, but will also provoke opposition among those to whom he refers as 'the more or less ignorant adherents of dogmatic theology.'" Spiers particularly bemoaned the reliance on spiritual hierarchies in the act of creation and nature's guidance for their "fanciful and occult character,"[76] none of which added even a feather's weight to his argument.

But even the theologians disagreed, and probably no one recognized the compatibility of *The World of Life* with Christian theology more clearly than John Maggens Mello (1836–1915), vicar of Mapperley. Mello, besides his role as a clergyman, was also a geologist, a fellow of the Geological Society, and corresponding secretary of the Victoria Institute. Shortly after the publication of *The World of Life* Mello issued a twenty-one-page booklet titled "The Mystery of Life and Mind with Special Reference to *The World of Life*."[77] The only Wallace scholar to make mention of this interesting little essay is Martin Fichman, who calls it "most pertinent for assessing the impact of his [Wallace's] theistic teleology."[78] Indeed it is.

This is a fascinating synthesis of Christian thought and Wallace's intelligent evolution. Mello first provides a detailed outline of his presentation and seeks to reconcile science with "the same great mysteries" that have confronted philosophers through the centuries. Rejecting chance or fortuitous accident as a reasonable explanation for the complexity of nature, Mello, calling on Wallace and others, concludes that only a mind or mind-like force or power can serve to adequately explain it. If the evolutionary processes of adaptation and fitness achieved nature's present order, chance would fail as an adequate explanation and some "Thought" and "Design" would be required. Referring to examples of complexity in nature used in Wallace's *World of Life* (the detailed intricacies of the bird's feather, the scales on a moth's wing, and even beauty itself), all give empirical evidence of design and purpose in nature.

Mello then shifts to the theological question of Wallace's "delegated powers" in creation with grades of spiritual entities establishing and guiding the cosmos and Earth's natural world. That God is pushed back from an immediate role in this created teleological world did not trouble Mello in the least. He pointed out that scripture makes clear reference to angels or "spiritual intelligences" besides humans, and that Christ himself spoke of the "ministry of angels." If Revelation speaks of the world under sway of angelic powers doing God's work and bidding, why, he asked, should we presume it "incredible that the almighty God may even have made use

of His angels, of those Spiritual Powers, which we know exist, in bringing about the execution of His purpose and design in the creation of the universe" and in its evolution?

Mello offers to reconcile not only science and theology but also more specifically Wallace's spirit-being universe and Christianity, and from a strictly theological standpoint there seems in Mello's analysis no awkward fit with religious orthodoxy. But it seems only fair to Spiers and those like him to offer a few caveats regarding Mello's approach. First and foremost, Mello's effort to see in *The World of Life* a compatible Christian worldview was his and not Wallace's. Wallace certainly did not write the book with that in mind. The Christian might reject a created universe with no Alpha and Omega, no "Word made flesh" (this is the heart of Christian belief), but little argument could be made against the activity of spiritual entities such as Wallace described.

It is important to recognize that Wallace's spirit-filled metaphysic did *not* require *spiritualism*. None of the leading ideas in *Darwinism*, *Man's Place*, or *The World of Life* require or are necessarily premised on the teachings of spiritualism, but it is hard to imagine Wallace writing them without its influence. Ross A. Slotten believes that *The World of Life* is "almost incomprehensible" without some understanding of Swedenborg.[79] Although the Reverend Mello had no need of consulting Swedenborg or the New Church to see angelic powers behind the laws of nature or the operations of an inherently intelligent evolution, Wallace was likely drawn to this view from that source. Furthermore, Wallace's unique place for humans in the *scala naturæ* is amply reflected in scripture (Gen. 1:26–27; Gen. 5:1; Ps. 8:3–6; Ps. 100:3; Isa. 45:12; Heb. 2:7; to name but a few), and the celestial hierarchy has a long tradition in Christian orthodoxy.[80] Wallace's separation of *H. sapiens* from the rest of the animal kingdom has strong connections beyond the naturalist's logical inferences, which are drawn from mental capacities inexplicable by Darwin's principle of utility. Scripturally, the imparting of the "breath of life" into man (Gen. 2:7) comes from the Hebrew word for breath, *nešāmā*; it is *always* used in the Bible for God's breath and is reserved for human beings, *never* for animals.[81] In fact, this "in breathing" imparts a moral conscience to humans (Prov. 20:27), one of the chief attributes that led Wallace to conclude a spiritual "influx" in the human species. Swedenborg was familiar with these references, and Wallace's spirit-guided universe may well have imbued these ideas through Swedenborgian extrapolations.

What about Wallace's obvious view of the earth and the universe as measured in millions or billions of years? Except for those steeped in their own exegetical absolutes, there is nothing that demands a six-day or young-

Earth interpretation of creation.[82] A number of prominent early church fathers ascribed a period of more than twenty-four hours to Genesis's *yôm* (Hebrew for day). Clement of Alexandria (ca. 150–ca. 215), for example, believed that time was created with the rest of creation and therefore the act of creation stood outside of time.[83] Basil the Great (330–379) suggested that creation was not connected to *yôm* but to eternity, and Genesis shows "not so much limits, ends and succession of ages, as distinctions between various states and modes of action."[84] Augustine (354–430), the greatest of the Western church patriarchs, argued that the days of Genesis were not days as we know them.[85] Furthermore, according to Augustine, Genesis unfolded the creation story from the knowledge and perspective of angels. If so, then what is essentially known about creation comes by and through angels, an idea not far from Wallace's.[86] Although there is no indication that Wallace was ever influenced by the famed artist and poet William Blake (1757–1827), Blake's belief in angels' creation with a far distant and far removed God seems close to Wallace's.[87]

Of course this is not to argue that Wallace was in any sense a biblical creationist. But, as will be explained shortly, he *was* a scientific creationist and established—almost certainly without trying—a human-centered cosmology that resonates with much of scripture. The absence of the Trinity and the "Alpha and Omega" keep it from being in any sense Christian cosmology, but that does not mean it is in any sense anti-Christian. His was a theistic cosmology of efficient cause—mediated by a spiritual (that is, angelic) hierarchy leading toward some distant, "Overruling Intelligence" (the First Cause)—instantiated through teleological laws of nature. Complex life forms, unique to Earth, were brought about through intelligent evolutionary processes for the progress and spiritual development of all men and women. *This* was Wallace's natural theology.

In the end, then, perhaps Wallace is not entirely as "elusive" as originally thought. This heterodox contrarian included in his view of life an idea of creation even he regarded as a rather "old-fashioned one." In its simplest most generic form, creationism is simply the intervention of some *intentional* force in the initiation of life; in his own words, "a definite act of creation" took place. As he said, "Something came from the outside. Power was exercised from without. In a word, life was given to the earth." Wallace is surely not arguing for creation on the basis of Genesis or any religious text, rather, in his view, as a matter of logic. He proposed a truly intelligent evolution as opposed to what is often called "theistic evolution," the latter in fact more properly called Darwinian theism.[88] A disentangling of Wallace from Darwin will help clarify the distinction.

The angst Darwin repeatedly felt over God and religion in relation to

his theory emanated from his inability to reconcile a biological theory centered on chance with a providential and benevolent deity; his positivistic, materialistic idea of evolution, rooted as it was in methodological naturalism, ultimately prohibited even the notion of sacred purpose. That this haunted Darwin is clear from his autobiography. He told William Grant that he wanted to believe that the universe was not the result of chance, only to admit in the very next line, "the horrid doubt always arises whether the convictions of man's mind which has been developed from the mind of the lower animals, are of any value or at all trustworthy. Would any one trust in the convictions of a monkey's mind, if there are any convictions in such a mind?"[89]

His efforts to insert even the slightest hint of deity were always mired in confusion. His reference to the Creator's "breath" into one or a few forms of life (obviously not human) should have been regretted not because it was, as he had written privately to Joseph Hooker in 1863, "a Pentateuchal term of creation," but because it was actually a misuse of the term *nešāmā* itself. In the process of such muddled thinking, Darwin seemed to have lost his artistic sense and his ability to experience the numinous. He complained in later life of having lost his love of art and literature, and even "fine scenery" lost its appeal.[90] So chance and species continuity, both consistent convictions of Darwin's, took a toll. Desmond and Moore have called Darwin "a tormented evolutionist" for good reason. Wallace avoided such "soul-deadening" influences.

Darwin, wracked with doubt and uneasy with religion in general, called himself an ambivalent and uncertain agnostic. But when one examines his actual behavior, there is a distinct leaning. His support of Francis Ellingwood Abbot shows his strong sympathy for secular humanism. But greater light is shed on his religious inclinations in a visit made to Down House by that generation's two leading atheists, Edward Aveling (1849–1898) and Ludwig Büchner (1824–1899). Büchner was an influential promoter of Darwinian theory in Germany and was convinced that social Darwinism would apply the best scientific solutions to the ills of his country. The request for an audience with the aged and ill patriarch, now eighty-one and suffering from atherosclerotic cardiovascular disease perhaps exacerbated by years of undiagnosed and untreated Chagas disease,[91] came from Aveling while he and Büchner were attending the Congress of the International Federation of Freethinkers. Emma was appalled at the prospect of opening her home to such unabashed atheists, but Darwin, otherwise a recluse who seldom accepted guests at this stage of his life, agreed to the meeting. They arrived on September 28, 1881.

The visit was fascinating and revealing, an account of which was sub-

sequently published by Aveling.[92] According to Aveling, the subject of religion was broached not by either Büchner or himself but by the old and ailing patriarch. Darwin wanted to know why his guests called themselves atheists. They hedged a bit by saying they were not god "deniers" only not god "asserters." Aveling reported that Darwin agreed with their line of reasoning but preferred the term *agnostic*, to which both replied: "'Agnostic' was but 'Atheist' writ respectable, and 'Atheist' was only 'Agnostic' writ aggressive." But Darwin thought the term was too strong for public consumption and preferred *agnostic*, apparently more on strategic than philosophical grounds. Taking their meeting as a whole, Aveling suggests that Darwin was in essential agreement with both his and Büchner's views, and they left overjoyed "that our Master had cast off the old bonds, and was walking in the large freedom that he has given [through his writings on evolution] to so many of his brothers and sisters." The "Master" would be dead in less than seven months. Interestingly, Darwin's son, Francis, who was also in attendance, admitted later that Aveling's account of the events was largely accurate but that a mere reading might leave the false impression that his father was in more agreement with the reporter than was actually the case. But Francis noted no real disagreement between his father and the two atheists, only some quibbles over terminology. Taken altogether, Francis's effort to distance his father from Aveling's summary of their meeting seems like public relations damage control.[93]

This episode toward the end of Darwin's life is offered to show how far these two naturalists, so intertwined by their mutual association with the theory they spawned, had grown apart in their philosophical and religious views. Thus the theory of descent with modification by means of natural selection did not entail atheism, agnosticism, or theism. The theory was broad enough to encompass a wide metaphysical path. Evolution did not dictate the journey, and the final destinations of each should point to the profound differences in how they navigated those intellectual waters.

Those differences were there from the beginning. They make their appearance not in any theological musings but in their science. The requisite test for discerning purpose and intentionality in nature can be found in their respective views of artificial versus natural selection. Darwin's adamant belief that domestic breeding examples showed natural selection in action was always rejected by Wallace because it amounted to a conflation of intentionality and chance. Many others, like John Duns, Heinrich Bronn, Adam Sedgwick, Charles Lyell, Richard Owen, Asa Gray, and Lord Salisbury, saw it too. Wallace could especially see that artificial selection involved the very processes Darwin sought to exclude from his theory. Darwin's analogy, as we have seen, is poorly developed, drawn, and applied,

failed to make a clear discernment of purpose between the barnyard and breeder's cage and the blind operations of *natural* selection. As eminent biologist Stephen Jay Gould (1941–2002) put it, Darwin's artificial selection analogy was "a dangerous and slippery strategy" because "[Darwin's] nature is not an animal breeder; no preordained purpose regulates the history of life."[94] In the end, it was fatal to his chance-driven theory.

It was fatal in other ways too. Gayon explains: "The use of the domestic analogy was not a pedagogical device. It was methodologically essential; without it, the subtle interrelationship between variation, heredity and modification, so characteristic of the Darwinian hypothesis of selection, would have been nothing more than empty speculation without any empirical content. In fact, it is extremely unlikely that the hypothesis could have been developed without this supporting evidence."[95]

In this way and in others it is important to keep Wallace's evolutionary ideas distinct from Darwin's. Those differences could be found from the beginning at the unveiling of their respective theories at the Linnean Society. When, fearing the worst from his colleague's pending break, Darwin told Wallace, "I hope you have not murdered too completely your own and my child," he was harboring a connection that was too strong from the beginning. Darwin and Wallace were *never* the fathers of identical theories. Darwin's theory was not Wallace's to kill. But Darwin probably saw their respective theories as identical because he needed Wallace as much as Wallace needed him. Darwin as much as admitted that Wallace's letter from Ternate was the catalyst for making his theory public, and as hard as it is to imagine today, rolling out a complete theory of transmutation in the midst of Victorian society was venturing into turbulent seas, a social abyss too dark and deep to descend into alone. Darwin could go public with an intrepid explorer by his side even if he was in absentia. In return Wallace received entrée into the elite circles of English science and society. If ever there was social symbiosis it was between Darwin and Wallace. But that symbiosis did not extend to their science.

So the distinction is clearer now. Wallace's intelligent evolution is intrinsically and inherently theistic. What is often called "theistic evolution" today is actually Darwinian theism, an attempt at a posthumous reconciliation of chance and providence that had so persistently eluded Darwin. It is beyond the scope of this book to examine the challenges and advantages facing those who would seek such reconciliation today. More germane is Wallace's own posthumous legacy, to which we now turn our attention.

6
Divided Legacy

Will the Real Alfred Russel Wallace Please Stand Up?

Some readers will recall that classic TV game show *To Tell the Truth*, with its emcee, Bud Collyer, that ran in the 1950s and '60s. The premise behind the show was to introduce three contestants (usually with an unusual occupation, experience, or life story) and have a panel ask questions aimed at identifying the "correct" individual. After the round of questions each panelist would make his or her guess and Collyer would ask, "Will the *real* ____ please stand up?" The game often ended with gasps and guffaws from both audience and panelists at learning who had been telling the truth and who had been deceiving them.

Something similar has happened in the historiography of Wallace. Wallace is a tough contestant too, because he held many views and championed many causes. In addition, certain deceptions greet the would-be panelist (historian or biographer) who seeks to uncover the *real* Alfred Russel Wallace: the notion that his and Darwin's respective evolutionary theories are identical, Romanes's two-Wallace myth, Wallace's own misleading use of terms like "survival of the fittest" and natural selection as synonymous with the whole of evolution, and "Darwinism" conflated with his own views. Such challenges have launched a variety of ideas concerning Wallace's scientific and metaphysical ideas. As described earlier, Wallace's scientific views have received favorable recent assessments. More confused, however, is the historiography surrounding his metaphysics, and since the goal here is to accurately describe his natural theology, it would seem imperative to survey and examine this complicated landscape.

A few things are easily set aside. To begin with, Wallace was an idealist not a mystic. It is clear from examining his personal library that he was not

convinced by Eastern ideas of reincarnation.[1] He also rejected Theosophy, writing to his longtime friend Mrs. Fisher (Arabella Buckley [1840–1929], Lyell's former secretary) that he thought books on reincarnation and Theosophy were "purely imaginative" and irrational.[2] Pantheism also left him unimpressed because it had what he regarded as Abbot's scientific pantheism.

On the opposite side, neither did he subscribe to any form of scientism as claimed by biographer Michael Shermer. According to Shermer, neither spiritualism nor theism defined Wallace, instead, "the causal vector was in the other direction. Wallace's scientistic worldview forced him to shoehorn his encounters, experiences, and experiments in spiritualism into his larger scientism."[3] But, as mentioned earlier, scientism is by definition the belief that only science can give us access to reality. Wallace completely rejected this idea, saying at one point, "While evolution is a sound hypothesis and every new discovery tends to confirm it, it is not all; it by no means explains everything. It does not explain beauty, for beauty is a spiritual mystery."[4] This is hardly scientism.

Fichman has suggested that taken as a whole Wallace's theistic evolution represents a precursor to modern process theology.[5] There are reasons to question this connection. Process theology (or sometimes process philosophy) was developed in the twentieth century under Charles Hartshorne (1897–2000) and John B. Cobb (b. 1925). The central idea of process theology is one in which God participates in evolution by offering possibilities that can be freely accepted or rejected. As such, the deity is not omnipotent, but rather is limited by the choices made. Its intellectual roots can be found in the process philosophy of Alfred North Whitehead (1861–1947), who acknowledged his tremendous debt to Henri Bergson (1859–1941) for the open novelty and freedom expressed in his *Creative Evolution* (1911).[6] But Wallace told his longtime colleague and friend, Edward Poulton, that although he had not read any of Bergson's work, he thought "vague ideas" such as "an internal development force" in nature were of little real value. He also noted that he didn't think he could read a book that rejected his view of a Supreme Mind working by and through the primal forces of nature in favor of a vague "law of sympathy."[7] There is also a strain of panentheism that runs through process theology that seems counter to Wallace's natural theology. It should be noted that Wallace referred to "directive Mind" in *The World of Life*, not "participative" Mind (although there is much more to be said about participation of a different kind in the epilogue herein).

Far less tenable is the suggestion that Wallace subscribed to a form of the Gaia hypothesis.[8] The Gaia hypothesis was first proposed by James Lovelock in 1965. It stands Darwin's theory of evolution on its head by

turning it from species competition to species cooperation and holistic interdependence with synergistic relationships. When Lynn Margulis published her pathbreaking article on the development of eukaryotic cells in 1967, she soon proposed her symbiogenesis theory and joined Lovelock in support of the Gaia hypothesis.[9] The biggest problem with connecting Wallace to the Gaia hypothesis is that Gaia is a self-sustaining and self-regulatory concept. Despite frequent lapses into numinous language about "love" and Mother Earth, Gaia is as positivistic and reductionist as Darwinian evolution. Lovelock has been quite clear on this: "Neither Lynn Margulis nor I ever proposed a teleological hypothesis. Nowhere in our writings do we express the idea that planetary self-regulation is purposeful, or involves foresight or planning by the biota."[10] This makes Gaia about as far from Wallace as one idea could get.

Similar missteps are made by some who have attempted to deny Wallace's theism altogether. Steven J. Dick, for example, correctly notes Wallace's anticipation of the anthropic principle with his fine-tuning argument in *Man's Place* and its human-centered cosmology. Wallace did, in fact, argue for what is known today as the Weak Anthropic Principle (WAP).[11] But Dick goes on to suggest that Wallace is best seen as a precursor to the astronomer-cosmologist Fred Hoyle (1915–2001), described as "a self-proclaimed atheist" who argued for a "natural superintellect," not a conventional God. On one level this may just be a semantic difference that is only a trivial distinction. If not, then such a position seems astonishing given the mountain of evidence offered throughout this book to the contrary. How does Dick support this? He refers to a note Wallace appended to his essay "The Limits of Natural Selection as Applied to Man," in which he affirms "one Supreme Intelligence" as a determining cause of man's origin and the origin of "universal forces and laws," but that he rejects "first causes" and instead called on "some higher intelligent beings, acting through natural and universal laws."[12] But Wallace is only saying here that in the operations of the universe there are no first causes (this coincides with his clear statement in *The World of Life* that biology functions through efficient causes), *not* that there is no First Cause. The hair-splitting distinction between God and "Supreme Intelligence" Dick made is one not even adopted by Wallace. As for Hoyle, he rejected atheism later in life. More will be said about Wallace's influence on Hoyle, but for now suffice it to say that perhaps the twentieth century's greatest astronomer and cosmologist rejected the "crude denial of religion . . . prevalent among so-called rationalists of the late nineteenth century" and insisted that the idea that such an exquisitely designed universe is just here by happenstance was "obtuse."[13]

Finally, and perhaps most remarkable of all, is Charles H. Smith's vari-

ation on Wallace-the-atheist theme. He presents his idea of Wallace's metaphysic in two separate publications, "Wallace's Unfinished Business," *Complexity* (2004), and "Alfred Russel Wallace, Past and Future," *Journal of Biogeography* (2005).[14] Smith insists that Wallace held to a belief in a nature of final causes and, alluding to the anthropic and Gaia hypotheses, "that, philosophically speaking, the 'final causes' concept has produced a gamut of teleological mind-sets. We need not, however," he adds, "adopt the more extreme of these to imagine how a system as described here could find its way to [a] higher level of order." According to Smith, Wallace adhered to a view of spiritualism that strictly obeyed the "laws of nature" and that indeed it was merely an extension of that natural world. Smith suggests Wallace adhered to a modest form of teleology guided by final cause.

This requires a little unpacking. Smith's allusion to "final causes" is a bit mystifying since Wallace makes no mention of final cause in *Darwinism*, *Man's Place*, or *The World of Life*. When Wallace does make mention of causation he refers only to efficient causes. It is also unclear what Smith means by adopting "the more extreme" of various "teleological mind-sets." If he means theism, as he does in his review of Fichman's *Elusive Victorian*,[15] one can hardly explain Wallace's enthusiastic endorsement of Arthur Bell's openly theistic and creationist *Why Does Man Exist?* or his own comment to Marchant concerning his own theistic mind. In fact, *The World of Life* is reduced to an odd allegory or worse, a complete fiction.

A close examination of Smith's claim of Wallace's "modest form of teleology" does not, in fact, reveal teleology at all. It begins when Smith associates Wallace with a variety of protocybernetic speculations. In each of the articles mentioned previously, Smith hints at a "mild form of final cause." After rejecting "the more extreme" teleological views, Smith goes on for the remainder of both articles to describe an evolutionary scenario that is environmentally "mediated" largely by "trial and error" and that there is no adaptive process, only "stochastically accumulated adaptive structures that recapitulate past and present ecological associations and that generate actions eventually playing out in space and time as responses to final causes inherent in the environmental delivery system." Citing Gregory Bateson, Smith eagerly supports the view that Wallace "proposed the first cybernetic model."

But does any of this add up to teleology? Smith just bandies about terms and never explains how one goes from trial (an instance of law) and error (an instance of chance) to teleological biodiversity. Furthermore, all of this occurs within a purely naturalistic context, since elsewhere Smith, apparently reprising Shermer's argument, has characterized Wallace's position "as a rather rigid, all-extending naturalism: at most, as a brand of

scientism."[16] This isn't teleology but rather *teleonomy*. With teleonomy, biology and apparent purpose are actually purely mechanistic. "They are," in Sherman and Deacon's words, "teleological in description only, i.e., merely teleonomic (to use a term invented by Colin Pittendrige to describe the presumably non-teleological but teleology-like processes in organisms and other cybernetic mechanisms, such as thermostats)."[17] Smith presumably wants to shore up his "teleological" system with talk of final cause, but in detailing the operations of his evolutionary scenario, no intentionality, purpose, or foresight—indeed no agency of true planning—requisite for a genuinely teleological system can be found. All of Smith's cybernetic talk doesn't help. Cybernetics is, after all, the study of machines "with conditioned reflexes, machines that can learn, machines that imitate life." It is, in effect, "the science of robots."[18] It is certainly not Wallace's "non-mechanical Mind." In effect, Smith has Wallace's "unfinished business" as a form of biological design without intelligence through cybernetic final cause. This model is an anfractuous distortion of Wallace's views.

Of course, the question here is not whether any of these ideas are right or wrong, but whether Wallace himself gave any evidence for them. Apparently much of the confusion stems from a misreading of Wallace on the laws of nature; for some, natural laws can only be seen as mechanical operations or blind and automatic forces working through chance or necessity. Hopefully by now, enough has been presented in Wallace's own writings and words to make clear that these laws for Wallace were made purposeful through the intentionality of spiritual forces—"Minds"—behind them. Laws are to these spiritual entities what tools are to the builder, made purposeful by the forces behind them. So in the end when the real Wallace finally stands up, he is a theist who developed, by his own admission, an "old-fashioned creation" that expresses itself through innumerable laws (some known, others unknown).

Wallace's Problem

Wallace may have fashioned a natural theology shorn of Paley's Pollyanna nature, and he successfully navigated some difficult—even treacherous—theological waters to land at a compatibilist reconciliation of science and theology. Why, then, didn't Wallace achieve preeminence in biology, a biology under his model no longer vexed by the big ontological, epistemological, and theological questions? Tyndall answered this question. Recall his "Belfast Address": science was to be Science. Science was no longer just a means of inquiry; it was to become *scientism*. Imperial in attitude and carrying with it the authority to co-opt any subsidiary disciplines or fields

of inquiry to its own purposes, scientism would propose to consume all in its path or relegate it to irrelevance. The "Belfast Address" was scientism's manifesto, and it had many adherents in Victorian England, a social and cultural phenomenon still with us today when one considers the tremendous popularity of scientists and science-related public figures like Richard Dawkins, Neil deGrasse Tyson, and Stephen Hawking.

Whether Darwin was a part of this is debatable, but there is little question that the members of Huxley's X Club promoted their brand of evolutionary science with all the enthusiasm of religious zealots. Huxley's "lay sermons" were designed to carry to the masses the spirit if not the words of the "Belfast Address." He attempted unsuccessfully to verify normative theory through scientific methodology.[19] It left him distressed and disgruntled over the world he helped usher in, realizing too late that when chance becomes "Chance" as the primary creator, one winds up with monstrous creatures.[20] Chance was Darwin's hideous "sport." It was impossible even for natural selection through its "perfect adaptation" to solve this problem when its operative results were simply the elimination of the unfit.

Despite its manifest problems, scientism not only took hold of the Victorian mindset, it also transformed science in a profound way. Some of this was quite beneficial, such as the professionalization of science and its more integrated structure within academia. But its impact on concepts of science and scientific inquiry was more problematic. This actually long predated the Victorian era. It came about through a series of incremental historical processes dating from Descartes (1596–1650) on to Rousseau (1712–1778), Hume (1711–1776), Kant (1724–1804), and Hegel (1770–1831) that became increasingly secular and bifurcated between "upper-story" (spiritual life and normative ethics—values) and "lower-story" (nature, laws, necessity, empirical data—facts) magisterial divisions of our "is" from our "ought." Stephen Jay Gould attempted to construct an epistemological nosology that placed moral, ethical, and aesthetic concepts—values—in one "magisterium" and scientific, empirical data—facts—in another.[21] Gould was attempting to address the old "science versus religion" debate by arguing that the two magisteria should not affect one another because they deal with entirely different things. This he referred to as "Non-Overlapping Magisteria" (NOMA). The problem is there is always a tendency for the lower story to consume the upper story into oblivion or at least to push it to the margins of irrelevance. With the separation of upper and lower stories, it became possible to redefine science from an open investigation of the "uniformity of natural causes" in which natural laws assumed a "Law-Giver" into a more reductionist demonstration of the "uniformity of natural causes *in a closed system*."[22]

This "new science" became empowered by the tremendous technological advances of the nineteenth century; it took its throne under Darwin and was crowned when Huxley declared with unbridled confidence that religious faith was at last "now and forever inaccessible to the attacks of the infidel," having finally removed itself from "contact with fact of any kind."[23] But so had scientism. Allying itself with positivism, science vis-à-vis scientism set itself up as above reproach as a new priestly caste, a specially anointed group that could proceed without any checks and balances on its own assumptions. In fact, as Austin L. Hughes has indicated, even natural selection, in its inability to account for humans' intellectual powers other than positing development from lower primate forms, gave no basis for confidence in any scientific assertions. After all, if Darwin was right, how much reliance could anyone put into the convictions of a "monkey's mind"? In effect, Hughes charged that scientism presumes to have resolved questions that science cannot address much less solve.[24] But nevertheless, historically speaking, it served to place science as the new religion of secularism, and would brook no opposition in its canonization.

Wallace utterly rejected this version of science. Wallace could never understand why reliable human testimony was consistently accepted in courts of law among the general citizenry but summarily rejected in the court of scientific inquiry among his colleagues. Just as Wallace rejected dogma in religion, so too did he reject it in science. How far Wallace really was from the ascendant scientific worldview can be seen in a revealing exchange he had with the distinguished botanist and former director of the Kew Gardens, William Turner Thiselton-Dyer (1843–1928). Writing shortly after the publication of his *World of Life*, Wallace thanked Joseph Hooker's son-in-law for his reaction to the book, admitting that he was not surprised at the negative impression left by his metaphysical portions. Wallace affirmed his conviction that natural selection was sufficient to explain the physical development of organisms "from amœba to man," but went on to defend his attempt to address "the basic mysteries of life." He simply couldn't understand why every biologist or other scientist "shirked" this problem.

Thiselton-Dyer agreed with Wallace on the explanatory power of natural selection, accepting it as a "mechanical or scientific" explanation, and insisted that science can only speak to the conscious senses. While he was sympathetic with Wallace's attempt to solve "the riddle of the Universe," he preferred to keep his scientific explanations and his "spiritual craving" separate. As for scientists "shirking" this question, to him this simply was not a problem they were called on to answer. Determinism forced him to conclude that "every event is inevitable."[25] The "new science"—scientism—was all there: legitimate inquiry was strictly observational and empirical;

the lower story was given privilege as acceptable "explanation"; the upper story was cast aside as "craving"; the deeper metaphysical questions of life were not only beyond science, they were all trumped by a law-based determinism that made them irrelevant.

Kindred Spirits Past

But Wallace always had allies, and there have always been rebels to the kind of science just described. While historians and biographers have struggled to identify the real Alfred Russel Wallace, on the other side of that great intellectual divide are those who have directly or indirectly reflected, in one way or another, that same obstreperous spirit. Swimming against the tide of scientism and materialism, these leading thinkers marked their own course following in the path of that explorer who neither feared the unknown nor yielded to the *argumentum ad populum*. Some are kindred spirits simply by virtue of their complementary ideas formed far apart in space and time (something Darwin and Wallace had experienced firsthand); others are more direct, following this great voyager's intellectual and spiritual journey by navigating in the same acknowledged currents.

An example of the former is the aforementioned John Elof Boodin. Boodin was a student and friend of William James, the only real link between him and Wallace. By 1913 the sage of Old Orchard's body could no longer keep up with his vigorous mind. His continued writing seemed impelled by an urgency to ensure that the rich theistic universe he had come to know would not become a mere memory. Then, quite unbeknownst to him, Boodin, a vigorous forty-three-year-old professor residing temporarily in Cambridge, Massachusetts, between jobs at the University of Kansas and what would become his new academic home at Carleton College in Northfield, Minnesota, published an essay with the prescient title "The Reinstatement of Teleology."[26]

With rather remarkable parallels, Boodin presented his teleological metaphysical worldview as if he had shadowed Wallace, and in some ways, he had. Like Wallace, Boodin came from humble beginnings. Wallace learned to appreciate nature as a young surveyor in the Welsh countryside; Boodin as a boy growing up on the family farm in Sweden. But Boodin was a trained philosopher and presented his ideas with a philosopher's precision. Boodin acknowledged the importance of Darwin's contribution to science but insisted it was a limited explanation for the diversity and complexity of life and that natural selection was purely eliminative.[27] Thus, an explanation for life was still pending. Boodin then examined three options for the answer: mechanism (the process is revealed in its previous stages

along with the external conditions and factors influencing them), finalism (causality rests in its anticipated result), and vitalism (the search for a common denominator for the entire process). For Boodin, each had problems. Mechanism is incomplete, and finalism in a sense begs the question: why should the process seek a final form? Given our own human limitations, we must work by and through efficient causes. We can, nonetheless, glimpse the final form, since efficiency requires it to be related to the dynamic process through nature's plasticity in response to the deeper unseen order in which lays the capacity for progress. But perhaps, as Darwinians would argue, there really is no "unseen order" except perhaps that which we subjectively ascribe it. Perhaps chance is sufficient explanation. But to Boodin the physical world of life and the cosmos demanded "a fundamental . . . coherence and unity, while chance, formless happening, is fundamentally irrational—an apotheosis of our ignorance of the *modus operandi* of nature."[28]

Boodin crafted his philosophy in a pluralistic context. He believed that the universe was most probably pluralistic, a "cosmic continuum" that existed on many levels within a hierarchy of orders that were not temporally or conditionally dependent on one another, but exist within an ensemble of factors synergistically interacting with one another. Life, in fact, did not arise as a by-product of chance and necessity but rather as the result of "unique energy patterns" operating teleologically and therefore not blindly.[29] Although Wallace (not a trained philosopher) never verbalized it this way, this was essentially his view. Wallace talked dualistically, as if mind and matter were the two principal ontological categories, but his biological and cosmological formulations were really pluralistic.

Echoing Wallace, Boodin declared, "Nature seems to be, somehow, leading in the direction of human nature," and a process that incorporates the recognition and appreciation of truth and beauty cannot be accidental. Here we have true continuity in the harmonic goal-directedness of the process and human nature. Why should it be unreasonable to demand reasonableness from a world that evolves reason? Nature and evolution demand this kind of continuity, he continued, but the materialist violates this principle by dividing out and removing the higher stages of the process from the previous stages. In other words, the materialist relies on continuity and rational explanation in nature, but when it comes to human nature and the higher ideals peculiar to our species, suddenly *discontinuity* with nature through the irrationality of *chance* is insisted on. Why this should be can only be explained, according to Boodin, as the product of metaphysical prejudice.

If mechanism fails, and final cause is inadequate, what can be said of vitalism? Boodin agreed with Bergson's clarity of explanation in concluding

that the growth and coordinated functions of organic life cannot be the product of simply accidental variations and natural selection. The small, incremental correlative changes accumulating through the ages are constantly adaptive and always harmonious in a way that ensures that survival is impossible to conceive on the basis of chance alone—this was one of Bergson's most valuable insights. He called on *vital impulse*. But this so-called vital impulse—Wallace's ascribed "internal development force"—winds up being as blind as the mechanical processes it seeks to explain. In addition, it runs into the problem "that, like any conception which tries to explain everything, it explains nothing. We still have the diversity of the process, with its direction, to account for. To say that what does happen can happen is self-evident; and that is all vitalism tells us."[30] Boodin had no more use for Bergson than did Wallace. In the final analysis vitalism winds up as a tautology—no explanation at all.

Rather than the inadequate explanatory models then current or those formerly proposed and subsequently abandoned, Boodin called for a "new teleology" based on the conviction borne of the nature's prima facie demonstrations in its own evolutionary processes. Boodin's conviction was "that the universe must lend itself to ideals of simplicity and unity, that those laws which we discover for ourselves in the higher creative activities are relevant to our world, in brief that in a large sense the universe is teleological."[31] Wallace said much the same.

Boodin continued to develop his ideas in numerous publications throughout his life, the most important being *Cosmic Evolution* (1925) and two companion volumes, *Three Interpretations of the Universe* and *God and Creation* (both in 1934). In these works, he continued to expose chance as an inadequate explanation for life and complexity, reiterate the negative eliminative nature of natural selection, emphasize creative adaptation as the efficient cause of evolution, point out that of all philosophies materialism makes the most demand on our credulity, and reject all vitalist alternatives (including panpsychic and pantheistic variations on that theme). Wallace would have agreed.

In addition, like Wallace, Boodin rejected man and animal continuity. For Boodin, this was rooted in his inherent theism. Yes, God is active on all levels of nature, but the lower levels cannot respond to God in kind. "The dog, however loyal," explained Boodin, "cannot share the mind of Newton in kind; he cannot enter into his meaning or understand his unique life."[32] But Boodin's God was not an anthropomorphic deity, neither was He some cosmic magician. He was there but instantiated in all. The whole process of evolution was for Boodin what it had been for Wallace, "a process of spiritualization. Those who look for Spirit and God in the first stuff of

things are looking in the wrong direction."[33] Boodin sought to address with a philosopher's acumen the same question as Wallace. As Boodin put it, echoing Wallace, "the great issue: man's place in the universe."[34] Unlike Darwin, who found his analogies in the breeder's stock, Boodin found his in the orchestration of melodious harmonies. Nature was more like music than mechanism; human personality more like a symphony. Wallace would not have disagreed; even if we could not know the composer, we could at least hear the performance of his spiritual emissaries. Wallace and Boodin attended the same concert.

But Boodin's problem was the same as Wallace's. He was writing in an age of monistic reductionism or of dualistic NOMA. Neither reductionist monist nor dualist was listening to Boodin's song. Even at the height of his career, colleague R. F. Hoernlé (1880–1943) regretted that Boodin was so underappreciated. Hoernlé thought this would change—now a new generation of thinkers was no longer afraid to explore concepts like spirit, mind, purpose, and creation, "sheer heresies to the scientific orthodoxy of their fathers." He underestimated how alike his intellectual climate was to its forbearers. Like Wallace, Boodin receded into obscurity.[35]

But their ideas refused to go quietly. The next place Wallace surfaces is in South Africa with physician-turned-paleontologist Robert Broom (1866–1951).[36] Here the connection with his predecessor's natural theology is more explicit. Although of Scottish descent and birth, Broom became fascinated with the fossil reptiles shown him while in London, so much so that he left for the Karroo region of South Africa where they had been discovered to learn more for himself. Making frequent trips between England and South Africa, he eventually settled in Maquassi about one hundred miles southwest of Johannesburg. He found South Africa a rich storehouse of fossilized remains, and he was thoroughly converted to paleontology. By 1905 he had published nearly fifty papers on the fossil reptiles of South Africa. Karroo was the central location for Broom's early fossil prospecting. Broom turned his attentions to *H. sapiens*' evolution when an ancient human skull was found in the Transvaal region in 1913.

When Raymond Dart (1893–1988) made the discovery of the so-called Taungs ape in 1925, Broom performed a meticulous examination of the specimen and agreed that it was close to the human ancestral line. Working for the Transvaal Museum of Natural History, Broom became intimately involved with the discovery of the first complete *Plesianthropus* skull in 1936. Broom became an influential figure in paleontology and played a prominent role in discussions on the origins and significance of *Australopithecus*. His discovery of an intact skull of a *Plesianthropus* and a crushed pelvis had enough complete features to allow Broom to conclude that it

was "manifestly" the pelvis of a bipedal anthropoid, the first australopithecine so identified. According to Broom's biographer, D. M. S. Watson, this find permitted him to confirm the validity "of one of his boldest conclusions"; namely, that he had been right in identifying this early hominid as close to our ancestral line.[37] While many of Broom's colleagues were searching for fossilized remains of hominids in east and central Asia, his team uncovered numerous specimens of very early origin in the Transvaal region. Broom also dated some of the hominid findings (especially those of the 1940s) from the Pliocene epoch (between 2.58 and 5.3 million years ago), a conclusion that was posthumously confirmed.[38]

When Broom died on April 6, 1951, he left 456 publications and a series of monographs on his *Australopithecus* work published by the Transvaal Museum that converted paleontologists to the so-called Dart-Broom ape-man thesis. Broom influenced a new generation of anthropologists. Sherwood "Sherry" Washburn (1911–2000), the pioneer physical anthropologist and primatologist, called him "a remarkable old man, energetic, difficult, and a great collector. He revived the search for fossil man in South Africa which had been stalled."[39]

But Broom's "ape-man" thesis—the idea that the early fossilized hominid remains were closely related to humans—did not, for Broom, translate into ape-man continuity. He spelled this out in a fascinating book, *The Coming of Man* (1933).[40] Broom rejected Darwinian evolution in favor of a teleological evolution directed toward its ultimate purpose, humankind. Despite claims of an "eclipse" of Darwinian concepts just prior to the neo-Darwinian synthesis in the late 1930s, Broom noted that the Zoological Section of the BAAS in 1931 still found the majority supporting it as the principle factor in evolution.[41] Yet Broom was his own man, and he examined the evidence on what he felt was its own merits. For example, he questioned natural selection as "survival of the fittest." If a fish lays twenty million eggs and all but twenty are eaten by other fish and animals, how are these necessarily the "fittest"?[42] Broom believed that Darwin relied on discredited notions of Lamarckian use and disuse, and that it had been discovered that many characteristics thought to be inherited are not inherited in the least. Also, even if the natural selection of mutations *does* occur, he argued it was hard to see how the effect of such minute changes could have any survival advantage.[43]

Broom instead proposed a view he openly admitted had strong associations with those of Wallace. Evolution had to be under some intelligent direction. He suggested that it was spirit-guided by a hierarchy of agents, some more intelligent than others. While some organisms appeared to be the result of spiritual agents of a rather low order, others gave evidence of

direction by an agent of much higher caliber. He dealt with the problem of evil by suggesting that venomous and predatory beasts and "horrid" animals like the disgusting parasitic wasp, the Ichneumonidae, a creature that Darwin believed made the idea of a "beneficent and omnipotent God" inexplicable, was the result of less than beneficent—perhaps even evil—spirits. Agreeing that the three great Abrahamic faiths were essentially correct in ascribing spiritual power and direction to the universe and all that is in it (including Earth), Broom concluded that millions of years of evolution have not unfolded by chance or blind operations. Evolution did not produce "a large-brained erect walking ape," it produced human personalities brought about by spiritual forces of the highest order. Humanity was indeed the pinnacle of creation for Broom.[44] At the time of this writing, Broom was apparently aware of Wallace's *World of Life* but said he had not seen the book.

Broom's view of the major Abrahamic religions was one of compatibility rather than uncritical embrace. The relationship between science and religion was complex.[45] If the issue was the fact of evolutionary *change*, then religion, according to Broom, had acted as a thought-chocking orthodoxy, opposing reason and the plain scientific evidence open to anyone open-minded enough to see. However, when the *causes* of evolution were considered, religious ideas could be consistent with a legitimately scientific theory of change through time, but it challenged the boundaries of science. Broom followed the much-publicized Scopes trial and considered the threat of fundamentalist religion to the plain scientific *fact* of evolution with alarm. Here the opposition to science came from without. But Broom believed debates raging during his lifetime about the *causes* of evolution threatened science from within, from scientists who rejected out of hand the idea of spiritual agencies. He noted that the essential distinction in evaluating debates over the history of biological life was not science versus religion, it was of dissent versus orthodoxy. The religious were not invariably the enemies of science, the dogmatists were, and this was especially true if they held positions of power. The dogmatic scientific establishment could be as much an enemy of truth as the church.

Wallace, of course, had died twelve years before the Scopes trial, held in Dayton, Tennessee, but it could be argued that Wallace's special creation à la William Paley was Broom's Scopes trial, the imposition of simplistic biblical thinking on scientific progress. Yet Wallace also knew—even experienced—the narrow-minded attitudes exemplified in the scientists of his generation who refused to consider *any* evidence for the spirit communication he and his colleagues so meticulously documented. This is precisely who Wallace had in mind when he wrote, "It is time that the derisive and

unexamining incredulity which has hitherto existed should give way to a less dogmatic and more philosophical spirit, or history will again have to record the melancholy spectacle of men, who should have known better, assuming to limit the discovery of new powers and agencies in the universe, and deciding, without investigation, whether other men's observations are true or false."[46] In this sense, Wallace shared Broom's aversion to dogmatism in *whatever* form it appeared.

Broom was not shy and retiring in his views, especially among colleagues. His presidential address before the Royal Society of South Africa, delivered on July 3, 1933, presented his view of intelligent evolution. He believed that evolution had essentially ceased. The only remaining development in nature was humanity, but this was spiritual rather than physical. Seeing humankind as the aim of creation, à la Wallace, he concluded his controversial address by saying, "Physically man may change very little in the next 10,000,000 years, but mentally and morally it seems possible he may evolve almost into a new being."[47] This divine plan made Broom's science an act of faith.

Broom's views were largely dismissed as heretical speculations, but a few paid attention. Broom's idea that evolution was now solely for the human species struck a receptive chord with Julian Huxley, who attempted to develop his own theory of progressive evolution sans the spirits. When Broom shared his theory of intelligent evolution with the geologist-anthropologist and Oxford authority on Paleolithic man William John Sollas (1849–1936), he got a sympathetic reply: "I read with great pleasure all you say, about Man and some great power—a mind—behind it all. Like you I cannot get away from it. . . . And I see nothing inconsistent with the scientific attitude in this. I don't think it is 'scientific heresy' but I admit that it is so regarded by the general run of scientific workers. There is an 'odium scientificum' quite as virulent as the 'odium theologicum'—not fiercely prosecuted, but contemptuous and disdainful."[48]

The Wallacean vision did not die with Broom. Wallace's spirit also pervaded the University of London Senate House in February 1970 when Nobel laureate Ernst Boris Chain (1906–1979), who along with Howard Florey helped develop penicillin in the early 1940s, presented the Robert Waley Cohen Memorial Lecture.[49] Chain reviewed the great advances made in microbiology and genetics during his lifetime, highlighted the ethical responsibilities of scientists concerning destructive technologies in times of peace, urged greater thoughtful cooperation between scientists and industry, and cautioned against the dangers of establishing an unbridled technocracy. He chided famed molecular biologist Francis Crick (1916–2004) for claiming that it was "ridiculous" to base serious decisions

on religious belief. The construction of ethical codes based purely on science, Chain argued, was always built on "flimsy premises" and bound to mislead. Furthermore, he insisted that there was no reason to privilege scientific theories over the great moral teachers of the ages, and on balance he preferred moral teachers to scientific theories for direction and guidance in such matters.[50]

Then, as if Wallace himself had imbued the genetic advances of the twentieth century, Chain said that it was "inconceivable" that all the many nucleotides of the chromosomes that determine the geno- and phenotypic proteins all lined up in just the right order on their own. Even chance expanded to millions of years was inadequate to that task. Chain called on "directive forces" as an indispensable interpretation of the empirical facts. Then, as if he had torn a page from Wallace's *Darwinism*, Chain announced, "We do not need to be expert zoologists, anatomists or physiologists to recognise that there exist some similarities between apes and man, but surely we are much more interested in the differences than the similarities. Apes, after all, unlike man, have not produced great prophets, philosophers, mathematicians, writers, poets, composers, painters and scientists. They are not inspired by the divine spark which manifests itself so evidently in the spiritual creation of man and which differentiates man from animals."[51]

Perhaps Ernst Chain had a Wallacean perspective on humanity because he had felt the terrible sting of "science"-based ethics with Nazi Germany's "racial hygiene," a product of Darwinian science run amuck.[52] Fearing the rise of Hitler, he left for England with £10 in his pocket. Only after the war did he learn that his mother and sister had been taken to Nazi concentration camps, where they perished.[53] But Chain may have understood the uniqueness of humanity because he possessed so many of its special attributes himself. He spoke five languages fluently, and if Boodin analogized nature with music then he was well suited to understand both. Chain was a gifted pianist who had to choose at an early age between music and science. Humanity is much better for his choice.

It will be recalled that it was the human brain that first caught Wallace's attention as calling for special treatment and explanation. It should, therefore, not be surprising to find a kindred spirit in neurophysiologist John C. Eccles (1903–1997).[54] Eccles was born in Melbourne, Australia, and after graduating from Melbourne University with honors he entered Magdalen College at Oxford in 1925 to study under the generation's leading neurophysiologist, Charles Sherrington (1857–1952). Both would be destined for Nobel Prizes (Sherrington in 1932, shared with Edgar Adrian for their discoveries regarding the functions of neurons; Eccles in 1963, shared with

Alan Hodgkin and Andrew Fielding Huxley [half brother of Aldous and Julian] "for their discoveries concerning the ionic mechanisms involved in excitation and inhibition in the peripheral and central portions of the nerve cell membrane," as stated by the committee).

The Wallacean views of Eccles can be traced to his mentor, Sherrington, who eschewed the materialistic metaphysic then prevailing for a more complex, nuanced approach. Shortly after retiring as Oxford's chair of physiology in 1936, Sherrington received an invitation from Edinburgh University to give a series of Gifford Lectures specifically aimed at what Lord Gifford termed "Natural Theology."[55] Sherrington's response was published as *Man on His Nature* (1941). More than eighty years after the appearance of *Origin*, Sherrington questioned "a certain crudity . . . which crowds all the activities of plant and animal into the one attribute of gross form."[56] Sherrington was perhaps the most qualified scientist of his generation to speak on the nature of the mind. He noted that the materialist conception of thoughts as "the outcome of the brain" leaves the scientist completely bereft of an explanation, "except as a gross correlation in time and space."[57] This was embarrassing for biology because mind is a pervasive feature of life. So what, then, may be left, if not to natural theology, then to its essence? There remained for Sherrington a "residue" of what he called "the non-sensual concept," the immaterial but nonetheless *there*. Standing materialism on its head, he called it

> a residue more precious than any of its mistaken ambitions. A residue valuable beyond expression. . . . A residue which is the source of all of its splendid "realities" as well as of all its dreams. A residue which contains *all* the "values"—for space is irrelevant to "values." In a word the conscious "I," called in the abstract "'mind." And what a residue! Among its contents are those two same concepts . . . creations of thought, embracing between them more than the Universe, for if we call the Universe energy, they embrace mind as well. It may be said this residue, beyond all problematical "reality," *is* the "value" of our world.[58]

Sherrington's biographer, Wilder Penfield, said that he understood the *language* of Nature, that he could integrate her "many accents" until he could finally express them into "the meaning of life, the design of the Creator."[59] It is important to remember that Eccles learned from Nature's linguist, Sherrington.

The starting point for Eccles was Cartesian dualism, and an attempt to reconcile how the res cogitans (things perceived and thought) could com-

munication with res extensa (the material things and objects "out there"). Eccles's preliminary formation is that "mind achieves liaison with the brain by exerting spatio-temporal 'fields of influence' that become effective through this unique detector function of the active cerebral cortex."[60] Mind, being beyond direct detection by any empirical means, might be detectible through the cerebral cortex, for which Eccles points to experiments on psycho-kinetic activity as evidence.[61]

Eccles rejected efforts on the part of materialists to locate neural events in the "higher" functions of the brain presumably in the cerebral cortex. The materialist faithful tell us that we can be assured the details will be filled in when we have a more complete understanding of brain function, perhaps in another hundred years. Eccles called this "promissory materialism."[62] Eccles instead proposed a neural dendron-psychon interaction. He also proposed psychons might not always be linked to neural receptor dendrons, thus creating their own psychon world. These unitary concepts formed the basis for his theory of perception, between dendron activity and psychon experience.[63] The "outer world" (world 1) of our outer sense objects and states interface with the inner sense or psyche (in the brain) through the dendrons to the "liaison brain" (world 2), our subjective experiences and consciousness, and then to world 3, the world of knowledge in the objective sense. The mind communicates with the brain at the level of quantum mechanics—what Eccles called "the microsite hypothesis"—in a dualistic interface, later developed into his theory of dualist-interactionism.

More interestingly is how all this fits into Eccles's larger biological scenario. According to him hominid development was uniquely dependent on the primate ancestry that came before it in its "superbly developed nervous system." This unique synergy of development will never be repeated.[64] Darwin's materialist theory makes animal consciousness an unaccountable anomaly. Eccles called the emergence of consciousness in the higher animals "a skeleton in the cupboard of orthodox evolutionism."[65] Wallace tried to address this problem in chapter 15 of *Darwinism* when he discussed the emergence of sentience in the animal kingdom, insisting that it was not amenable to a naturalistic explanation such as natural selection. Eccles noted Wallace's call for the "direct intervention of Cosmic intelligence" in the development of sentience and human intelligence. Following in Wallace's footsteps, Eccles asserted, "I am constrained to attribute the uniqueness of the Self or Soul to a supernatural spiritual creation."[66] Wallace might have quibbled over the invocation of "supernatural" since he saw "supernatural" and "miracle" as extending into natural laws and nature itself, only perhaps regarded so because of our incomplete knowledge of those laws and forces.[67] But this is more of an argument over semantics; both would

have agreed that the "Self" or "Soul" could not be reduced to the actions of material forces and processes.

Eccles's views were most thoroughly presented in his *Evolution of the Brain* (1989), which was savagely reviewed by Selmer Bringsjord and Joseph A. Daraio.[68] Recalling the comment by William John Sollas that anything beyond scientistic materialism was treated as "contemptuous" and "disdainful," the "odium scientificum" reared its ugly head with Bringsjord and Daraio, who refer to Eccles "spinning his narrative" toward its "ultimate trick" of making its case for dualist interactionism. They quote with disdain Eccles's great pride in sharing with his "old master" Sherrington the belief "that biological evolution is not simply chance and necessity. . . . I can sense with him that evolution may be the instrument of a Purpose, lifting it beyond chance and necessity at least in the transcendence that brought forth human creatures gifted with self-consciousness."[69] Reductionist materialists like Bringsjord and Daraio regard this kind of talk coming from a Nobel laureate as high treason. Even the title of their review attempts to discredit Eccles by casting him with Sollas's "odium theologicum" in the sarcastic tone of its title, "Eccles-iastical Dualism." They regard Eccles's dualist interactionism as "nothing *but* mystery!" in its implication that such incorporeal entities as minds "interact somehow with physical brains." But it is only a mystery if methodological naturalism is true. Here Bringsjord and Daraio cross beyond scientific evidence into philosophical presumption. They are particularly disturbed by the fact that Eccles is using a *prior* mechanism to prepare the neuro system for higher-order functioning; this implies the kind of teleological Mind force reminiscent of Wallace.

Indeed, Bringsjord and Daraio make their charge of heresy by invoking Wallace: "Such an exotic and teleological scheme certainly isn't Darwin's. It is Wallace's." They reject Eccles's argument that evolution is inadequate to explain phenomenal consciousness because it suggests a "sliding toward Wallace" and an explanation that goes "beyond nature toward theism."[70] But there is no reason to peremptorily rule theism out of nature unless, of course, they are conflating their own metaphysical commitment to *naturalism* with nature. Unfortunately, John Eccles died two years before the publication of this review and could not respond, but it is quite likely he might well have answered at least in part, "Guilty as charged!"

Interestingly, Donald Watson and Bernard Williams level a friendlier but perhaps more insightful criticism against the Eccles hypothesis when they question his dualist-interactionism as a path to his theistic teleological world.[71] They regard the Cartesian slip between res cogitans and res extensa as backward looking, still rooted in a physicality ill-suited to resolving the kind of body-spirit interaction Eccles was seeking. They pro-

pose the Theory of Enformed Systems (TES), a holistic theory premised on *enformy*—"a conserved capacity to organize"—in which they claim the notion of "mind" becomes superfluous and yet is empirically testable. The hypothetical test is whether or not "local brain operations are necessary for all mental events" (an essential tenet of "material monism"). They cite several studies demonstrating that there *are*, in fact, nonlocal parapsychological studies showing that "the brain is not necessary for valid empirical data," what physician Larry Dossey has called the existence of a "nonlocal mind."[72] In effect, material monism has been falsified. Through TES there are Singular, Enformed, Living Fields (SELFs) that are existent fields and are themselves *preexistent* that serve as containers of certain "psychophysical identities." Had Eccles simply relied on "nonlocal parapsychology findings" in areas like telepathy, remote viewing, psychokinesis, even mediumship, they contend, "he would have developed a testable scientific theory based upon empirical observation."[73] In effect, Wilson and Williams provide a *more* not less Wallacean solution to the problem that Bringsjord and Daraio note.

If Eccles could see the human brain in Wallacean terms, the cosmos was equally amenable to this expanded vision, and here we must return to astronomer-cosmologist Fred Hoyle. Hoyle is best known as the proponent, along with Herman Bondi and Thomas Gold, of steady state theory in which the universe's expansion and independent continuous creation of matter exist independently in perpetuity. Presented in papers published in 1948, steady state theory fell into disfavor when cosmic background radiation was detected in 1964 and definitively confirmed with the Cosmic Background Explorer (COBE) satellite in 1992. The Big Bang theory consequently took the place of steady state, a term derisively coined by Hoyle. But Hoyle was an astronomer and cosmologist of the first order. He correctly described the processes of the evolution of stars and explained the creation of elements—known today as stellar nucleosynthesis. He was Plumian Professor of Astronomy and Experimental Philosophy at Cambridge from 1958 to 1972, director of the Institute for Theoretical Astronomy from 1967 to 1973, while also holding a professorship at the Royal Institution, London. He also made frequent trips to the United States, where he served on the staffs of the Mount Wilson and Palomar Observatories and held visiting professorships in astrophysics and astronomy at the California Institute of Technology and Cornell University.[74]

Hoyle was personable but opinionated and controversial. Hoyle's many appearances on British television and numerous interviews for the press made him something of a public ambassador for science, much like Carl Sagan in the United States. While some thought Hoyle deserved the No-

bel Prize for stellar nucleosynthesis, 1983's selection committee passed him over in favor of William Fowler because Hoyle had protested Antony Hewish's 1974 Nobel for the codiscovery of pulsars. Hoyle had no problem with the selection of Martin Ryle, but objected to Hewish's inclusion because he felt Jocelyn Bell, who did most of Hewish's actual work, was excluded. This protest probably cost him any further chance for the prize, but it has a certain Wallacean sense of justice about it.[75]

In his youth and early career Hoyle was an atheist. But, as mentioned earlier, he changed his view and became a vocal theist. Like Wallace, he was not Christian, but years of working in the fields of astronomy and cosmology prompted him to declare that the universe is a "put-up job."[76] It stands as the central organizing thesis of his book *The Intelligent Universe* (1983). But Hoyle did not begin with the universe, he began closer to home with life on Earth. Hoyle had been keenly interested in biology as an undergraduate and seriously considered pursuing it in graduate school rather than physics.[77] Even early on he was led to question Darwin's theory because the few billion years of Earth's existence seemed too brief to account for life's such teeming diversity and complexity.

This skepticism never left him. Hoyle began his analysis of *The Intelligent Universe* with an interesting historical review and "the gospel according to Darwin." He noted that Darwin's theory was developed amid England's commercial and industrial revolution, a correlation between Darwin's competitive "survival of the fittest" and the ruthless nineteenth-century socioeconomic environment not lost on many who read it.[78] People steeped in an atmosphere of unbridled competition in which optimal production and product improvement was essential could see Darwin's theory as a perfect depiction of Nature herself. Except everyone forgot—or chose to ignore—one big difference: "Commercial selection works," in Hoyle's words, "only because at the back of it there are human intellects constantly striving to improve the range and quality of their products. Commercial selection is therefore very far from the purposeless affair natural selection is taken to be in biology."[79] In short, the socioeconomic society of Victorian England was analogous in the same way as Darwin's own domestic breeder analogy—namely, both were *intelligent*.

Hoyle also used the idea first proposed by James Clerk Maxwell, "Maxwell's demon," in which hot and cold molecules are spread between two separate compartments connected only by a trap door operated by an imaginary "demon" who opens the door in such a way as to allow all the faster moving hot molecules to pass through the door and move to the other side while all the cold molecules stayed on the other. Maxwell's point was that this could in theory occur but not without the conscious intervention of an

outside "demon." Darwin's theory violates this principle by insisting that the sorting process creating biological diversity can happen at random.[80]

For Hoyle, life was likely spawned from the larger universe itself. Unlike Wallace, he believed there were probably many forms of life—many like us—scattered throughout the universe. But like Wallace he expressed his "faith" as based on "observations of the world around us allied to our reasoning powers" and this "can lead to answers to properly formulated questions, whereas I do not believe that a correct answer can be obtained by instinct, or by passionately wanting such-and-such an outlook to be true." Instead, he asked himself, how long would it take for a blindfolded subject, making one random move per second on a Rubik's Cube, to solve the puzzle? The answer he calculated to be about three hundred times the age of the earth (that is, 300 x 1,350 billion years).[81] Having done so, his conclusion was clear: "The origin of the Universe, like the solution of the Rubik's cube, requires an intelligence."[82]

Regarding humans, Hoyle relied on the same argument as Wallace. Why, if natural selection functions on the basis of utility (survival advantage), do humans exhibit such profound capacities for things that hold no survival advantage? Hoyle's favored example was, not surprisingly, mathematical ability. Hoyle called it "the unexploited intellect," it is "unexploited" in the sense that nature does not use it in the struggle for survival.[83] Rejecting Darwin's "science," Hoyle adopted a very Wallacean natural theology. While admitting that Darwin did "better" by adhering to his reductionist formula among his peers, Hoyle admired Wallace for seeking real solutions to some of science and religion's most intractable problems.

Despite his belief in panspermia, he rejected life from a self-emergent, self-regulated universe and instead argued for a kind of intelligent, guided "cosmic control." "Even after widening the stage for the origin of life from our tiny Earth to the Universe at large," he added, "we must still return to the same problem that opened this book—the vast unlikelihood that life, even on a cosmic scale, arose from non-living matter."[84] Taken altogether, Hoyle's cosmology might be considered a form of panentheism.[85] But this was a difference from Wallace in detail; their science and metaphysics were played in the same harmonious chords that both understood and appreciated.

Hoyle insisted that Darwinism was not so much "science" as it was opportunism. Rejecting the Copernican principle, he ended rather poetically hand in hand with Wallace: "If the Earth is to emerge as a place of added consequence, with man of some relevance in the cosmic scheme, we shall need to dispense entirely with the philosophy of opportunism. While it would be no advantage I believe to return to older religious concepts, we

shall need to understand why it is that the mysterious sanctity described by Wallace persists within us, beckoning us to the Elysian fields, if only we will follow."[86]

Some have indeed followed. In the next chapter, we move beyond Wallace's legacy to his place in today's philosophical and scientific scene. Far from a distant figure from the past, Wallace remains as pertinent today as ever—perhaps even more so.

7
Wallace Today

Kindred Spirits Present

One of Wallace's significant kindred spirits is Anthony O'Hear, professor of philosophy at the University of Buckingham and honorary director of the Royal Institute of Philosophy. According to O'Hear, our "self-conscious agency" gives us uniquely human goals and aspirations in many ways completely inexplicable by any neo-Darwinian account. In fact, self-consciousness suggests "criteria more absolute than the perpetual contingency of the material, physical world, criteria deriving from a world where, according to the religious, absolute truth and absolute goodness exist."[1] In other words, a deeper and more fundamental reality resides behind the empirical world of immediate sense observation. O'Hear defers to philosopher Charles Sanders Peirce (1839–1914), founder of pragmatism and abductive reason (inference to the best explanation), on this point. In fact, Peirce shared Wallace's belief that mere struggle failed to explain the higher human faculties in our morality or our aesthetic sense. Peirce, like Wallace, leaned toward a broadly religious solution to account for these elevated attributes and capacities.[2] "The word 'God,' so 'capitalised' [*sic*] (as we Americans say)," Peirce declared, "is *the* definable proper name, signifying *Ens necessarium*; in my belief Really creator of all three Universes of Experience" (that is, the universe of ideas, the universe of things and facts, and the universe made up of beings with connective power between objects, especially universes).[3]

O'Hear believes Darwinism runs into trouble in trying to associate individual struggle and adaptation to social conditions engendering the common good, what Darwin called "sympathy."[4] While we can find sympathy

in social animals due to the reciprocal behavior it encourages, it is difficult to carry this out from the individual to the group in a broad axiomatic way. This is because an individual's social sympathies cannot outstrip that person's goals for "*my* survival and *my* reproduction," at least in a Darwinian sense. Darwinian theory "cannot invoke as an explanation for the presence of a trait or disposition its *social* effects unless those effects also benefit the individuals involved," since those that are social and nonbeneficial to the individual will be ferreted out by natural selection. Instead, Darwin misleadingly talked about "social instincts and the public good" without any means of accounting for them.[5] Here again the social "good" ran up against the principle of individual utility in the struggle for survival. O'Hear's skepticism regarding Darwinian "social sympathy" had its parallel in Wallace, who witnessed examples of social cooperation even extending to the elderly and infirmed among native peoples in South America and Maritime Southeast Asia that suggested something beyond Darwin's naturalistic explanation.

For O'Hear, our social life is not Darwinian life at all; it goes beyond it.[6] The tremendous speed with which early humans went from largely survival activities—hunting and gathering, reproducing, eating, sleeping, caring for offspring—to complex behaviors of artistic accomplishment, religion, deciphering the natural world, and so on begs for an answer under Darwin's model of slow, incremental change guided only by chance. How can we explain the astonishing rapidity with which humans moved from the wheel to the jet engine? O'Hear believes what he calls "the Kantian universality of aesthetic judgment"—beauty as an objective human fact absent "in the kingdom of non-speaking animals"—suggests something profoundly true about reality and the special nature of *H. sapiens*.[7] O'Hear observes that "from a Darwinian perspective, truth, goodness, and beauty and our care for them are very hard to explain. But they exist, at least in the sense that they condition and direct much of our behavior." Furthermore, they all exist as part of our "social self-consciousness" in ways that are inexplicable by any reductionist Darwinian account. But O'Hear draws a valuable moral from his detailed analysis of the limits of evolutionary explanation: it is that "Darwinism, if applied to our forms of intellectual, moral, and aesthetic life, is indeed a dangerous idea, as Dennett at least recognizes. For even though we and our capacities may have evolved in Darwinian ways, once evolved we and our capacities take off in quite un-Darwinian ways."[8] Wallace said no less.

Another current kindred spirit is physician, commentator, and historian of medicine and science James Le Fanu. A regular contributor to the Unit-

ed Kingdom's *Sunday* and *Daily Telegraph*, Le Fanu is an outspoken critic of Darwinism. Like Wallace before him, Le Fanu looks at humanity and sees insurmountable difficulties in explaining the unique morphology and the special mental attributes we possess by natural selection. Why are we bipedal creatures? How can our enlarged brain with its expanded cranial capacity be explained by Darwinian principles especially when it comes at such a high obstetrical cost? What explains our speech and language? If we are so much like apes and chimps, why do parrots possess a speaking prowess far exceeding those of any primates? These are questions asked or elicited by Le Fanu's intriguing book, *Why Us?* (2009).[9]

Le Fanu notes the sanguine expectations during the 1990s among geneticists and neuroscientists that between mapping the genetic code and the proliferation of sophisticated technological devices such as the computed axial tomography (CAT) scan and the positron-emission tomography (PET) scan that the problem of intractable disease and even the mystery of the human mind might be definitively solved. The Human Genome Project and "the Decade of the Brain" stood poised to unlock nature's deepest secrets. Could it be that Wallace's questions of a century ago would now be answered?

Those high hopes were soon brought down to earth. Suggestions that chimps share 98 percent of their DNA with humans—even without quibbling over how researchers arrived at that number—only raised greater questions about how such vast differences in cognitive abilities could be explained by a mere 2 percent. In fact, this 2 percent difference not only gives instructions for a 300 percent bigger brain but a vastly more versatile and competent mind.[10] As for disease, genetics have proved helpful but not the great panacea the field was originally thought to be. While some progress has been made in identifying genetic markers for disease, their predictive capacity remains relatively poor. As Harvard researchers Peter Kraft and David Hunter have pointed out, "the identified [genetic] variants do not contribute more than a small fraction of the inherited predisposition. Estimates that are based on combinations of the current risk alleles . . . will undergo constant revision as new loci are found. Such estimates are poor predictors of risk, both in absolute terms and in relation to risk estimators that will be available when more of the remaining locus associations are discovered."[11] Moreover, they have discovered that genetically speaking there are a range of complex factors involved in almost any given chronic disease. Genetic predisposition is only one of many contributors to illness—the environment, diet, childhood and collateral pathologies, and multiple genetic pathways—all play their part. Also, genetic risk factors are probabilistic not deterministic. As medical historian Gerald Grob has

concluded, "the deadly truth" is disease will be our persistent if unwanted companion, and to think it can be eliminated with genetic mapping and markers and improved technological devices is probably an overinvestment in promissory materialism.[12]

The sanguine hopes for solving the mystery of the human mind were based on flawed notions drawn from the very science that was supposed to unlock that mystery. Darwin's thought as "secretion of the brain" points to the kind of reductionism that ascribes these incorporeal processes to a physical organ. Le Fanu observes that knowing the intricate structures of the brain and how they function tells us little about what the mind actually is.[13] Knowing every cell and synapse will tell us no more, for example, about the brain than studying the paper, ink, and font composition of Jane Austen's *Pride and Prejudice* will tell us about life, morals, marriage, and society among the early nineteenth-century English gentry. These are necessary to convey the message but they are *not* the message. CAT and PET scans have certainly been helpful medically speaking, but they have contributed little to our understanding of the human mind.

Darwin, who sought to make humankind simply an extension of the natural world, made a fundamental error in assuming that the human mind did not transcend materiality. The concept of the soul was seen for two thousand years as "the animating principle of man's spiritual being, that distinctive person by whose distinctive personality others know him to be."[14] The discarding of the soul has come at significant costs for knowing ourselves and interacting with each other. This turns people into things, an idolatry that has profound consequences for our lives as *participative* creatures in the panoply of human history (see more on this in the epilogue). Quite rightly, Wallace called materialism "soul-deadening."

Le Fanu calls for an entirely revised science consonant with Wallace's natural theology:

> The new paradigm must . . . lead to a renewed interest in and sympathy for religion in its broadest sense, as a means of expressing wonder at the "*mysterium temendum et fascinans*" of the natural world. It is not the least of the ironies of the New Genetics and the Decade of the Brain that they have vindicated the two main impetuses to religious belief—the non-material reality of the human soul and the beauty and diversity of the living world—while confounding the principal tenets of materialism: that Darwin's "reason for everything" explains the natural world and our origins, and that life can be "reduced" to chemical genes, the mind to the physical brain.[15]

The passage of time has not made Wallace some superannuated figure

worthy of our collective amnesia much less our collective derision. In fact, our technologies of discovery have made him more pertinent than ever.

Here the neo-Darwinian might protest by saying that we have indeed advanced far beyond what was known in Wallace's day about the human brain and how our intellect may have come about through our observations of our primate ancestors. Steven Pinker's cognitive niche attempts to answer Wallace's enigma by proposing two hypotheses: first, "a mode of survival characterized by manipulating the environment through causal reasoning and social cooperation"; and second, "the psychological faculties that evolved to prosper in the cognitive niche can be coopted to abstract domains of processes of metaphorical abstraction and productive combination, both vividly manifested in human language."[16]

It sounds promising, but Pinker's narrative soon lapses into trivial discussions of what humans currently do supported by speculations about how certain primordial hominids "might have" done this or "perhaps" had done that. Pinker fills his brief seven-page paper with qualifiers like "may have been," "may serve as," "perhaps," "may connect"—twenty-one in all. He then explains our higher capacities for abstract reasoning by saying just a few early *Homo sapiens* actually did that, most relied on instinct, which still begs the question of why even a few developed these capacities in the first place.

Actually "the cognitive niche" was developed by Tooby and DeVore in 1987 from extrapolations of primate behavior. These are precisely the kinds of Darwinian explanations for the human mind that Johan J. Bolhuis and Clive D. L. Wynne have seriously questioned in a frank and penetrating review article in *Nature* titled "Can Evolution Explain How Minds Work?" Their answer is, not so far. According to Bolhuis and Wynne, "A closer look at many studies reveals, however, that appropriate control conditions have often been lacking, and simpler explanations overlooked in a flurry of anthropomorphic overinterpretation."[17] Skeptical of claims asserting certain cognitive continuities and behavioral affinities between humans and chimps, monkeys, and apes, the authors suggest, "Such findings have cast doubt on the straightforward application of Darwinism to cognition. Some have even called Darwin's idea of continuity a mistake." Bolhuis and Wynne call for release from the "thickets of arbitrary nomenclature" and "naïve evolutionary presuppositions" that obfuscate rather than illuminate our understanding of cognition. Pinker's "cognitive niche" appears to be little more than just another ramble into the "thicket of arbitrary nomenclature."[18]

But Darwin was the original primate/human extrapolator. Darwin's belief in the continuity between human and primate minds stemmed from

his repeated observations of "Jenny," an orangutan in the London Zoo.[19] Noting that Jenny would run and hide when doing something her keeper had told her not to do, Darwin concluded evidence of animal "shame" and "self-consciousness." While this could just as easily have been explained through operant conditioning (that is, Jenny hid because she knew in the past similar behavior resulted in punishment and reprimands from her keeper), Darwin preferred to anthropomorphize Jenny's behavior. Self-reflection, guilt, or embarrassment experienced and even anticipated by humans whenever a larger complex set of mores is strained or broken is unknown in the animal world. These are qualitative not quantitative differences. Orangutan "shame" seems to be just another example of the "anthropomorphic overinterpretation" complained of by Bolhuis and Wynne.

In the end, C. U. M. "Chris" Smith's assessment of "Darwin's Unsolved Problem" is that it remains *unsolved*. He even goes so far as to say, "we may be closer to an understanding of how the living world originated on the surface of this planet . . . but of how it [the human brain] includes qualia, that is phenomenal or sensory consciousness, we are no nearer understanding than Darwin was a century and a half ago."[20] The point is Wallace's enigma remains, and attempts to answer it by Darwinian mechanisms seem little more than another reversion to the "promissory materialism" Eccles complained of more than a quarter century ago.

More recently Tom Wolfe put some literary polish on a question that has raged since Darwin—the nature of speech. Recounting the debate between Noam Chomsky and Daniel L. Everett (speech as organically hardwired into humans or speech as a human artifact), Wolfe concludes that speech is indeed a mnemonic artifact—"the primal artifact"—that forms the fundamental boundary between man and beast.[21] Wallace had noticed the same thing 146 years earlier, except that it was human's "superior intelligence" that created the artifact in the first place that really mattered, and *that*, for Wallace, was utterly inexplicable by any known naturalistic mechanism, including natural selection.[22]

In the final analysis, Wallace's original question regarding the intellect of *H. sapiens* remains as open as ever, except perhaps that Wallace's *answer* to that question may now be more viable than ever. It remains hotly contested in the marketplace of ideas, but to suggest that it has been definitively answered is premature if not presumptuous.

From man's universe inside his head to the universe at large, Wallace can also be found in current cosmology. Astronomer Guillermo Gonzalez and philosopher Jay Richards have essentially updated Wallace's cosmological argument in *Man's Place in the Universe* with their own version, *The Privileged Planet*. Like Wallace, they rely on WAP to present their case that the

fine-tuning of the conditions necessary for human life are the same rare, if not unique, conditions that make possible our knowledge and discovery of it. "With enough persistence," declare Gonzalez and Richards, "the natural world discloses itself to us in ways that we do not, and sometimes cannot, anticipate. Once perceived, the thought creeps up quietly but insistently: *The universe, whatever else it is, is designed for discovery*."[23]

It has already been shown that neither Wallace's teleological cosmology nor his biology require the supernatural or miracles. But what warrant is there to even argue against either. Why posit such a constrained view of nature? Steve Clarke, James Martin Research Fellow at the Institute for Science and Ethics (Oxford), has presented a persuasive case that there is nothing in the historical methodology of science precluding the supernatural.[24] Since naturalists yield to science on all methodological matters, they must also yield on ontological matters, and quoting Michael Rea, Clarke points out that "naturalism, whatever it is, must be compatible with *anything* science might tell us about nature or supernature." Because methodology is at the heart of the naturalist's program, it should reasonably be asked, has methodological naturalism been a *requisite* feature of scientific inquiry throughout history? The answer is no. Paracelsus, Newton, Van Helmont, Stahl, Boyle, and others did not presume methodological naturalism. In fact, the supernatural has been repeatedly invoked to explain scientific phenomena in the past, therefore, a "supernatural induction" cannot be ruled out as a possibility in the future. Science has little to say about the supernatural and does not exclude it from consideration. Clarke insists that proponents of naturalism make a particularly mysterious objection in singling out the supernatural, unless they are attempting to impose their ontological stance on science itself.[25] But since they do this by equating science with methodological naturalism, it is hard not to conclude that in so doing they turn science into a tautological exercise; namely, science must be naturalistic because all science is methodological naturalism.

Steve Fuller, professor of sociology at the University of Warwick, noted that even Huxley concluded that naturalism promoted science *only* after monotheism immunized scientists against the deadening tendencies of naturalism. In this sense, Fuller believes there is a "heuristic function of certain religious beliefs."[26] Thus one might say, to recall Pasteur's phrase, religion and the supernatural favors "the prepared mind" for scientific inquiry. Like Clarke, Fuller sees the history of science as replete with examples of "supernatural" hypotheses in the sense that "the hypothesized entities are not observable in the normal run of experience" but are found in mathematical patterns and equations that suggest a deeper reality.[27] As

we shall see, quantum physics will itself blur the distinctions of natural and supernatural.

If the preceding analyses suggest a continued place for Wallace in philosophy, the neurosciences, and cosmology, what about biology? An interesting critique of Darwinian evolution with perhaps a role for Wallace has been offered by physician-geneticist-biochemist Michael Denton. More than thirty years ago, Denton wrote a book highlighting the accumulating anomalies within the Darwinian paradigm.[28] Although a self-described agnostic, Denton accepts a directed evolutionary process premised on a cosmological fine-tuning argument similar to Gonzalez and Richards. Echoing not only them but also Hoyle and Wallace, Denton declares, "we are led toward life and our own existence via a vast and ever-lengthening chain of apparently biocentric adaptations in the design of the cosmos in which each adaptation seems adjusted with almost infinite precision toward the goal of life."[29] More recently, Denton has updated his analysis. What is interesting is that Wallace has a much larger place in Denton's latest work. Originally there was only passing mention of him, but now Denton has highlighted Wallace's historic role in fashioning an alternative vision of biological life. Denton cites Wallace's favorite example of the intricate complexity of the feather as "one of the adaptive wonders of nature."[30] How can the origin of the feather be explained? Denton observes that when he first wrote *Evolution: A Theory in Crisis*, the reigning explanation for the emergence of the feather was Gerhard Heilmann's "frayed-scale" theory, the idea that reptile scales gradually frayed, developing over time into feathers. Efforts to resurrect the theory have not met with much success, and the general assessment today is that the feather represents an evolutionary novelty having, to quote evolutionary ornithologists Richard Prum and Alan Brush, "no homolog in any antecedent structures."[31]

In addition, Denton refers to "Wallace's enigma"—the recurring challenge to Darwin's human/animal continuity and functionalist narrative in finding a utilitarian purpose in humankind's most advanced and distinctive mental attributes. Denton reviews the current status of our understanding of human evolution to conclude, like Wallace, that the verdict remains the same: "the origin and evolution of our intellectual powers must have involved causal factors beyond natural selection."[32]

For Denton, these represent anomalies within Darwinian evolution that suggest a revamping of our views. Somewhat controversially, Denton has suggested that perhaps the real problem lies in the adherence of the Darwinian evolutionary concept to functional adaptation. As mentioned in chapter 3, Wallace argued as early as 1856 (in his article "On the Habits of

the Uran-Utan of Borneo") that it was "a most erroneous" and "contracted view of the organic world" that every morphological feature of an animal or plant "exists solely for some material and physical use of the individual." He chided his fellow naturalists as "too apt to *imagine*, when they cannot *discover*, a use for everything in nature." What if biological organisms were embodied not in functional adaptations guided by utility but rather in structural forms? In structuralism, as opposed to functionalism, life is undergirded by basic primal forms or Types. Denton, echoing Wallace, states, "not all features of living things are there to serve some adaptive purpose, and many taxa-defining novelties . . . give every appearance of being a-functional 'primal patterns' which have never served any specific adaptive end."[33] Without suggesting that Wallace was in any sense a full-blown evolutionary structuralist, he at least seemed to anticipate Denton's point 160 years earlier.

As previously pointed out, Charles H. Smith's interpretation of Wallace's metaphysical views is problematic, but Smith, a trained biogeographer, does offer an intriguing alternative to standard neo-Darwinian functional adaptation more commensurate with Wallace.[34] Perhaps a more modest formulation of the concept of natural selection points the way. He suggests that Wallace's "elimination of the unfit" may indeed provide a better description of the selection process and help promote a better view of evolutionary change on the larger-scale environmental level. This is not to imply no role for functional explanations for biological change, even Denton admits that demonstrable evolutionary novelty arising from adaptation and small incremental changes shows that "*functionalist accounts are clearly plausible*,"[35] but strict adaptationist critiques such as those offered by Fodor and Piattelli-Palmarini (recall their rather strident criticism of Darwin's artificial selection analogy in chapter 3) are becoming more common.[36] In any case, it might be that a reformulated evolutionary theory explicitly acknowledging a role for large-scale structuralist accounts of biological form with functional adaptations operating at the individual level through Wallace's "elimination of the unfit" might be worth consideration. A larger role for evolutionary structuralism might be more amenable to Wallace's overall worldview. Under such a revised model Denton is right to conclude that "life is no artifact of 'time and chance,' . . . but a predictable and necessary part of the cosmic whole."[37]

The question worth raising at this point is: are these examples really meaningful in terms of Wallace scholarship or are they merely individual, idiosyncratic examples of philosophical and scientific contrarians? Stated differently, is there a larger sea change in our concept of science afoot, one

less materialistic and reductionist, one more open to things like spiritualism? The answer is yes. Recently, some scientists have signed a manifesto calling for a Post-Materialist Science (PMS).[38] A summary of its principal tenets relevant to Wallace include a rejection of materialism and a complete rejection of its attendant reductionism, a rejection of the idea that the mind is nothing but the physical activity of our brains, mind is as important as is the physical world and is, in fact, a primordial aspect of it, it openly encourages systematic investigation of psi phenomena (extrasensory perception, precognition, and psychokinesis), it also encourages controlled laboratory experiments with mediums and is interested in studying near-death experiences. PMS believes that "Mind is fundamental in the universe, i.e., it cannot be derived from matter and reduced to anything more basic." Indeed, "scientists should not be afraid to investigate spirituality and spiritual experiences since they represent a central aspect of human existence." By now it should be clear that Wallace would accept and, in some cases enthusiastically embrace, the PMS agenda.

PMS includes a distinguished list of original signatories, such as University of Arizona neuroscientist Mario Beauregard, University of Arizona psychologist Gary E. Schwartz, noted physician-author-lecturer Larry Dossey, Columbia University professor of psychology and education Lisa Miller, and professor emeritus of psychology at the University of California (Davis) Charles Tart, to name a few. At present the manifesto has been endorsed by more than two hundred scientists from institutes and academic institutions around the world.[39]

These are, in the truest sense of the phrase, Wallace's "kindred spirits" today. Space precludes an examination of each of them, but Gary Schwartz is perhaps closest to Wallace. Dr. Schwartz is director of the Laboratory for Advances in Consciousness and Health at the University of Arizona (formerly the Human Energy Systems Laboratory). In 1999 Schwartz developed and reported on a systemic/feedback memory theory that he suggests predicts and explains a host of controversial phenomena, including, but not limited to, near-death out-of-body experiences and survival of consciousness after physical death. Furthermore, Schwartz has proposed a means of testing spirit communications with a proof-of-concept model in which one deceased person could intentionally bring another deceased person to a medium in what he called "the Double-Deceased research paradigm."[40] It is beyond the scope of this book to explore the controversial aspects of this work; the important point is that Schwartz and his research team are attempting to systematically examine spirit communications under controlled conditions. This, of course, is precisely what Wallace, Crookes,

Richet, Rayleigh, James, Doyle, and others were attempting more than a century ago. Schwartz is answering Wallace's call for "inquiry and patient experiment."

More broadly, Schwartz and William L. Simon have proposed the G.O.D. (Guiding Organizing Designing) process.[41] This is really a potentially paradigmatic concept, a way of understanding humanity, nature, and the cosmos. Schwartz is careful to point out that he is not a mystical cabalist or numerologist nor is he advocating any particular religious faith. He argues that he is attempting to examine and test the G.O.D. process against available data. Thus far his studies would suggest the G.O.D. process is more plausible and consilient (in the Whewellian sense) than chance as an explanation for many phenomena relating to human nature, mind-body interactions, time and space, and so on. More recently he has added an interest in what Carl Jung called synchronicities, or meaningful coincidences, to his research agenda. He has reported the substance of his work in *Spirituality in Clinical Practice*, a practice-oriented journal of the American Psychological Association.[42]

Most relevant to the Wallace connection is his view of "intelligent evolution," a term he uses very close to the description Wallace offered in *The World of Life*. Schwartz does not believe that randomness or chance can explain the emergence of order and complexity in nature, and the fact that we live in a universe where order and complexity are ubiquitous suggests that a G.O.D. process is involved. According to Schwartz, this hypothesis has never been systematically and formally researched except perhaps in some manner by Emanuel Swedenborg, a name quite familiar to Wallace. Schwartz might have added Wallace too. According to Schwartz, the failure of chance as an explanation for the natural world leads him to conclude that "all evolution, from the micro to the macro, must involve the expression of some sort of intelligent evolution."[43] Wallace said no less when he declared "that everywhere, not here and there, but everywhere, and in the very smallest operations of nature to which human observation has penetrated, there is Purpose and a continual Guidance and Control."[44]

Of course PMS offers a different view of science than the nineteenth-century version of reductionist naturalism offered up by the Darwinian paradigm. Researcher and biologist Rupert Sheldrake, a signatory of the post-materialist manifesto, had previously presented a detailed critique of the modern scientific paradigm with its inherent commitments to materialism by asking, why shouldn't science simply be an open process of inquiry rather than a belief system? He goes on to challenge ten fundamental statements of current scientific faith: (1) everything is mechanical; (2) all matter is unconscious; (3) the total amount of matter and energy is

always the same; (4) the laws of nature are fixed; (5) nature is purposeless; (6) all biological inheritance is material; (7) minds are nothing more than activities, "secretions" of the brain; (8) memories are material trances in the brain and are extinguished at death; (9) unexplained phenomena like telepathy are imaginary; and (10) mechanistic medicine is the only solution to ill health.[45] We need not pursue Sheldrake's answers to these ten articles of faith, only to say, as Wallace did more than a century ago, only a free, open, and honest investigation of each will yield useful results and true scientific advance.

Although there are obvious and important differences, certain affinities with Sheldrake can be seen in Wallace's *Miracles and Modern Spiritualism*: "spheres" of space and "sympathetic organisation" are discussed in ways broadly commensurate with Sheldrake's fields.[46] Furthermore, Wallace always insisted that spiritualism confirmed no specific religion or creed; instead, it gave evidence of a significant immaterial reality that affected and interacted with human beings. Wallace rejected the idea that psychic phenomena were "super" or "un" natural. They are, for Wallace, an integral part of the natural world. Sheldrake agrees, insisting, "Psychic phenomena are normal in the sense that they are common. . . . But because these experiences do not fit in with the materialist mind-in-brain theory, they are classified as paranormal, literally meaning 'beyond the normal.' In this sense, 'normal' is defined not by what actually happens, but by the assumptions of materialists."[47] Wallace would have agreed. He cared no more for the term "supernatural" than Sheldrake does for the term "paranormal."

Sheldrake has called for a radical and dramatic redefining of science in terms that are less constraining and less encumbered with certain materialistic reductionist assumptions. Well over a century earlier Wallace asked for the same: "Science may be defined as knowledge of the universe in which we live—full and systematised knowledge leading to the discovery of laws and the comprehension of causes. The true student of science neglects nothing and despises nothing that may widen and deepen his knowledge of nature, and if he is wise as well as learned he will hesitate before he applies the term 'impossible' [or 'unscientific'] to any facts which are widely believed and have been repeatedly observed by men as intelligent and honest as himself."[48]

How little things have changed. Wallace always argued that "spiritualism . . . has added greatly to our knowledge of man's nature, by demonstrating the existence of individual minds indistinguishable from those of human beings, yet separate from any human body. It has made us acquainted with forms of matter of which materialistic science has no cognizance." Sheldrake's rich career exemplifies a Wallacean attitude toward

psychic phenomena, and more importantly, to scientific inquiry. In the sometimes-strident debates over the nature of science, its legitimate areas of investigation and its epistemic boundaries, there can be little doubt that for all their differences over detail, Sheldrake and Wallace would sit at the same side of the table. Given their respective views it is hard not to see them as genuinely kindred spirits.

There is one more such "spirit" worth mentioning. It is Giuseppe Damiani at the Institute of Molecular Genetics of the Italian National Research Council. He has suggested that Wallace's "mind-action directed processes" in biology could be confirmed by rethinking and dramatically extending the evolutionary synthesis to include quantum mechanics and the complex relationship of syntropy and entropy.[49] Part of that re-visioning of science may even include a complete rethinking of human consciousness as *inherently* teleological and *theologically constituted*.[50]

Lessons Learned?

Wallace's long journey from natural selection to natural theology has surely taught us as much about science as it has about theology. In this study, natural selection's codiscoverer has moved from his popular role as explorer of the exotic world of nature to a guide into the more numinous world of metaphysics and religion. In so doing, a few things become immediately apparent. First is that evolution has been no bar to faith. Wallace's evolutionary theory was inextricably connected to his natural theology, at once teleological and theistic, and it was broad enough to encompass a wide range of beliefs. Either directly or indirectly it has been reflected among scientists and philosophers holding a range of theistic belief systems to less definable yet nonetheless decidedly nonreductionist worldviews calling on telic forces and principles. Second, despite their inseparable historical conjunction with the theory of natural selection, Darwin's and Wallace's theories were very different from the beginning. From the perspective of tracing out the theistic component in Wallace's thought, the most significant difference was in Darwin's artificial selection analogy of domestic breeders. Wallace's view of this as inappropriate to *natural* selection was also seen by many of his colleagues, and Darwin's struggle to address these differences suggests a real problem with his abductive abilities to ascertain key distinctions between purpose and design on the one hand and chance on the other.

Unfortunately, the version most commonly known and assumed unless specifically stated otherwise is *Darwinian* evolution, and this does indeed have a materialistic foundation. In fact, Darwin's central theme of *chance* as

the defining feature of his theory forced him into the conundrum of explaining complexity and change through time that was inherently building and progressive by means of altogether random and stochastic processes. His success in doing so was less a matter of demonstrable proof and more a matter of interpreting observations and arguments that depended on certain philosophical assumptions.

Nevertheless, the enthroning of chance bolstered by methodological naturalism launched a new kind of science. This leads to the third point. The curious two-Wallace leitmotif running through the historiography of this complex and often prescient naturalist is a product of the "new science" established by Darwin and men like Thomas Henry Huxley, John Tyndall, George Romanes, and other camp followers. This new brand of professionalized science now firmly lodged within academia, with all its metaphysical assumptions, has been Wallace's principle difficulty. Most of his biographers and even some of his most vocal "champions" can tout his scientific achievements, but in those areas that violate the assumptions of Darwin's "new science"—its insistence on randomness and chance as explanatory factors and its reliance on methodological naturalism—Wallace becomes Romanes's "horrible philosopher," Ruse's "crazy enthusiast," Beccaloni's "possessed Spiritualist," Kutschera's "unfortunate" speculator in his dotage, Lyons's "unfruitful" drifter into the "margins" of science. It is often difficult to see the whole Wallace through the lens of the Darwinian paradigm, and when he does emerge in full figure it is usually as a sad and distorted caricature. In order to see Wallace with clarity, a completely new perspective is required. A starting place may be found not among the high priests of scientism but among the Abrahamic faithful. Sam Berry, former professor of genetics at University College London and vice president of the Science and Religion Forum, suggests a possible beginning. Recalling Wallace's emphasis on human uniqueness, Berry asks, "are we nothing but apes or are we more than apes? If we reject the reductionism of 'nothing-but-ape,' we can conveniently call the transformed ape *Homo divinus*, biologically unchanged but spiritually distinct. We are apes, but we are more than apes and it is useful to mark this difference with a change of name."[51] Unfortunately, religious believers themselves have been sidetracked into fruitless arguments about the age of the earth, the validity of common descent, and the "proper" interpretation of Genesis. "Sadly," Berry concludes, "debates about evolution and creation tend to divert efforts away from building a robust and refreshed natural theology. This is a tragic legacy of Darwinism."[52]

But it would be naive to ignore the necessity of a concomitant transformation of science. In order to effect such a transformation, the metaphysical

assumptions currently underlying much of the scientific enterprise need to be addressed, chief among them the recurrent notion surfacing throughout this book, methodological naturalism. Bruce L. Gordon, a philosopher of science and religion, correctly notes that "the effect of Darwin's insertion of it into biology in terms of sowing the seeds of philosophical naturalism cannot be underestimated, in part because the presence of discrete intentional design in the biological realm had been one of the mainstays of natural theology."[53] By making it the modus operandi of science, Darwin turned science into a naturalistic metaphysic thoroughly incompatible with natural theology. It, therefore, makes Schaffer's very point: the upper story will invariable be consumed by the lower. Cambridge University's professor of evolutionary paleobiology, Conway Morris, has suggested that biology zoomed in on short-term observations, which makes neo-Darwinian mechanisms appear to be driven only by Darwin's chance. But biology then zoomed out to take in the more panoramic view of biology over geological time; these mechanisms look more progressive, leading toward a convergent order. Placing lawlike limits on natural selection, Morris points to us as "inevitable humans in a lonely universe."[54] Although obviously not hard evidence for a transcendent intelligence in the universe, it is compatible—even predictive—of a transcendent order instantiated within a Wallacean evolutionary creation.

The question of exactly how that transcendence may work within the natural world cannot be exhaustively explored here, but a possibility has been proposed by noted philosopher Alvin Plantinga. Darwin's "new science" is by now rather threadbare, and Plantinga indicates that quantum mechanics offers a "new picture" of how a transcendent Mind or, some might say, divine action might occur in the world.[55] At the risk of gross oversimplification, Plantinga suggests that such transcendence—call it Mind or God—could work at the quantum level.

Rather than deterministic cause-and-effect laws, quantum mechanics operates on a probabilistic basis. It does so in part through spontaneous wave function collapses that do not have physical causes. In such wave function collapses (that is, described by the Ghirardi-Rimini-Weber theory [1985]) and consequent eigenstates (where the uncertain quantum states now have certain values, named for biophysical chemist Manfred Eigen) there is nothing in the previous state that causes any particular collapse to dictate the particular eigenstate to which it goes. It is, therefore, according to Plantinga, perfectly consonant with this theory that transcendent Mind or God could actually cause that state to result. This "divine collapse-causation" (DCC) means that "God is *always* acting specially, that is, always acting in ways that go beyond creation and conservation, thus

obviating the problem alleged to lie in his sometimes treating the world in hands-off fashion but other times in a hands-on way."[56] This makes such Mind or God transcendence purposeful and free; moreover, it works to make humans free as well. Here "God's action constitutes a theater or setting for free action on the part of human beings and other persons—principalities, powers, angels, Satan and his minions, whatever. God sets the stage for such free action by causing a world of regularity and predictability; but he causes only some collapse-outcomes, leaving it free to persons [and others] to cause the rest."[57] Under such a scenario Wallace's First Cause stands behind the other spiritual agencies that function freely through efficient causes. The First Cause is not deistically unengaged with its creation in the least.

The real issue, as we have seen in the previous section, is to move beyond materialism as a requisite hallmark of scientific respectability. Indeed, a growing number of scholars from a wide range of disciplines—physics, religious studies, history, mathematics, astronomy, psychology and psychotherapy, philosophy, cognitive and consciousness studies, neurobiology—have begun to follow in Wallace's investigative path and challenge the old materialistic assumptions of what constitutes "good" science.[58] All of them are in agreement with historian of science Michael Grosso, who insists, "Physicalism will continue to fail to account for the full spectrum of human experience; for this reason it is grossly inadequate, and should once and for all be tossed on the ash heap of history."[59]

All of this leads to the final point of Wallace's greatest journey. None of his most important proposals have been falsified; all are live options in the scientific, social, and theological arenas. As such, Wallace deserves reappraisal within this context. We need not speak out of both sides of our mouths, praising him for his theory of natural selection, his clear definition of species, his support of Weismann's theory of the "continuity of germ-plasm," his use of terms like *adaptation* and *population* as concepts in a modern biological sense, his development of biogeography, his delineation of island ecosystems, and his appreciation of fragile ecological balance and the environment, and at the same time damn him for his spiritualism, his teleology, his belief in an uncoerced fully cooperative society, and his conviction that humans are special and sacred beings. While his social views on vaccination and land nationalization may be dated, we should hardly dismiss his view—unusual in the Victorian age—that *all* peoples were and are innately equal or that society would be fundamentally improved by the full equality of all men *and* women.[60] If we are unsettled by his socialism we should remember that it was distinctly libertarian, and if the individualism implicit in this is unnerving it should be recalled that it was always to be

tempered collectively for the greater good of all. Theologically it should be borne in mind that his natural theology kept science compatibly open to appreciate a teleology aimed at the eternal improvement of humankind.

So why is it that we still struggle to understand Wallace? Some of the reasons are rooted in his own history and historiography. But part of it too is the paradigm-blinded tendency to treat evolution as a monolithic idea that begins with Darwin and ends with the neo-Darwinian synthesis. One fairly typical example can be found in Richard DeWitt's *Worldviews: An Introduction to the History and Philosophy of Science*, an overview text unfortunately designed for classroom use. In DeWitt's "concluding thoughts" section, he leaves his readers with this:

> Whereas relativity theory and quantum theory have implications for the sort of universe we live in, evolutionary theory has implications mainly for our place in that universe. If we are to accept the empirical evidence for what it is—and I think we must—then discoveries in evolutionary theory require us to give up the long-held view that humans are special. We have to accept that we are the result of a natural, not supernatural, process, and that rather than being the apex of life, we are instead one type of organism among roughly 10 million currently existing species that, from an evolutionary perspective, all have equal status.[61]

Those who have followed Wallace's journey this far have to know something is amiss here. This doesn't even mean we need to accept every one of Wallace's ideas or those of any of his kindred spirits past or present to realize that DeWitt is assuming a lot of questions have been settled that in fact have not. Whose evolution exactly are we talking about? Why does the special place of human beings in the natural order necessitate the supernatural? But even so, why must the supernatural be peremptorily dismissed? Why do we need to presume human/animal continuity and comparative insignificance in the general order of things? For that matter, why does evolutionary theory have to entail *any* of these implications?

If Wallace and his "kindred spirits" have taught us anything, it is that none of DeWitt's claims need be assumed much less accepted. What DeWitt would have his readers do is simply take it for granted that evolutionary theory means adopting all of Darwin's positivistic assumptions based on his attempted elevation of chance to the status of nature's creator. But, as we have seen, all of this is extremely problematic and has been challenged by some of the best scientists and philosophers of modern times. The whole point of this book has been to prompt us, through the life of

a naturalist so intimately connected with modern evolutionary theory, to examine a bit more critically the kinds of metaphysical assertions made by DeWitt.

Wallace's journey is complete, but ours is not. We can learn from this man only if we will take a look at the *whole* man. With all of his contrarian flaws and impassioned zeal for causes of all kinds, he still has much to teach us about the universe, the world, and ourselves. He has been speaking to us for more than a century; only a very few of us have listened.

Epilogue

Wallace and the Historian's Craft

If we were to recast Wallace as a historical figure, how might we begin? Normally such a process involves delving back into the familiar primary resources and uncovering new ones if possible, objectively reassessing the material gathered, and objectively reinterpreting it within the context of the latest historiography. There are reasons to believe this conventional approach may not work for Alfred Russel Wallace, or, for that matter, *any* historical figure. "Historical thinking accords with the recognition that human knowledge is neither objective nor subjective but personal and participant," writes John Lukacs.[1] The process theorists were wrong—God is not a participant, humanity is. Lukacs exchanges the method of objectivity for the deeper goal of honesty, which is motivated by humility and empathy for its subject. This is not to say there are no objective truths, only that as human beings we can only interact with and interpret other human beings, present or past, as participants, and therefore with a kind of participative honesty. Rather than the "antiseptic separation of the knower from the known," Lukacs prefers the participative approach that brings them closer together.

For Lukacs, the metaphysical framework into which this fits is phenomenological, at once experiential and cognitive. Our centrality in the universe is based less on the operations of the cosmos and more on our perceptions of it, but, of course, Gonzalez and Richards's suggestive question as to why it should be made for our discovery *at all* still obtains. Lukacs proclaims, "we are at the center of the universe," and the honest verdict is that Darwin got it wrong, "the centrality and uniqueness of human beings is a statement not of arrogance but of humility. It is yet another recognition of the inevitable limitations of mankind."[2]

Although Lukacs doesn't specifically mention it, his view undoubtedly comes from the poet-philosopher Owen Barfield, close friend of Christian apologist C. S. Lewis (1898–1963) and member of the donnish Inklings that besides Lewis also included the rich intellect of J. R. R. Tolkien (1892–1973). Lukacs regards Barfield as "surely one of the profoundest and clearest (a rare combination!) thinkers in the twentieth century." Barfield's brilliant work *Saving the Appearances* (1957, second edition 1988) sets forth the essential framework for Lukacs's model of historical inquiry. It is a framework that is helpful for assessing Wallace as a historical figure.

Barfield wrote this book not as a philosophical work but because "the hastily expanded sciences of the nineteenth and twentieth centuries" have affected the nature of humankind and our perceptions of nature. It is, therefore, essentially a work of history. How we think about the world becomes the central theme of the book, and this Barfield divides into *figuration* (sorting out our sense perceptions and converting those representations into "things"), *alpha thinking* (analyzing "things"), and *beta thinking* (contemplation and reflection on "things").[3] But this somewhat solipsistic activity must be meaningfully broadened into *participation*, which is essentially a communal activity that takes place in a social context. Importantly, Barfield recognizes three kinds of participation: *primitive*, *original*, and *final* participation. Primitive participation involves—it deserves the present tense because many indigenous peoples still engage in it—"an extra-sensory link between the percipient and the representations" we no longer possess; original participation involves beta thinking, which primitive participation does not.[4] Final participation involves what might be called a fully experienced and actualized (rather than just intellectualized) human-centered involvement. But, like Lukacs, it is not drawn from the human-centered hubris of conceit but from humility. But while final participation may be a destination point, fundamentally, Barfield is writing to smash the idols. Ever since the scientific revolution humanity has shown its remarkable prowess for alpha thinking, but that soon evolved into a concomitant beta thinking that ended up treating things as completely independent of the humans that were thinking about them. These "things" became ultimates. In fact, Barfield considers such representations not true representations at all but idols. When things take on lives of their own entirely separate and independent of human perception, the phenomena *themselves* become idols.[5] Idols do not participate, they are just *there*—starkly present, cold and dead things—they present themselves *et mortuus est*.

How this happened was one of Barfield's major concerns. It is pertinent here because Wallace's journey from natural selection to natural theology

traversed intellectual waters increasingly mined with such idols. Barfield identified the source of this idolatry that Wallace ironically helped create and protest:

> There is no more striking example than the Darwinian theory of that borrowing from the experimental by the non-experimental sciences. . . . It was found that the appearances on earth so much lack the regularity of the appearances in the sky that no systematic hypothesis will fit them. But astronomy and physics had taught men that the business of science is to find hypotheses to save the appearances. By a hypothesis, then, these earthly appearances must be saved; and saved they were by the hypothesis of—chance variation. Now the concept of chance is precisely what a hypothesis is devised to save us from. Chance, in fact, = no hypothesis. Yet so hypnotic, at this moment in history, was the influence of the idols and of the special mode of thought which had begotten them, that only a few—and their voices soon died away—were troubled by the fact that the impressive vocabulary of technological investigation was actually being used to denote its breakdown; as though, because it is something we can do with ourselves in the water, drowning should be included as one of the different ways of swimming.[6]

Wallace was one of those troubled few, and he voiced his complaints in increasing decibels until his death. The idol worshipers and indeed the idols themselves soon drowned him out. How this occurred has already been discussed. But how was it that Wallace saw what most did not? How did he notice that they had in many ways *become* idols in his own lifetime?

It took, as we have seen, a prophet's imagination to see it. But a naturalist-prophet like Wallace was bound not to be recognized by his colleagues—a prophet is seldom honored among his own. In that sense his was a heroic vision. Yet Wallace's recognition of the idolatry within the science he helped bring about likely was sharpened from his experiences with the indigenous peoples he lived among for more than a decade. There he witnessed firsthand the primitive figuration that forged an "extrasensory link" with the world's representation. This, of course, made him prone to seeing things very differently from his colleagues. Unfortunately, this sent Wallace away from final participation, which in Barfield's words, "is the proper goal of imagination," and instead was a reversion to original participation, itself for Wallace only an intellectualized primitive participation, characteristic of mediumship and the occult.[7] Thus, we can note and learn from Wallace's vision—a vision that surely exceeded his age and even

ours—and at the same time recognize that his was a direction we need not follow.

Nevertheless, *some* form of participation is better than none at all. As pointed out earlier, Wallace's spiritualism was not an intrinsic part of his natural theology, so that one could take it and fashion something more directed toward final participation. How far *any* natural theology can take one toward final participation is a real question that cannot be addressed here. But Barfield struck on something significant when he stated "that all the unity and coherence of nature depends on participation of one kind or another," and if we completely eliminate all vestiges of participation, we will have eliminated nothing less than meaning and coherence from the cosmos.[8]

In the end, the Barfield-Lukacs historical perspective forms a much sounder model with which to analyze and assess Wallace as a historical figure. The participative approach is a historical litmus test between those who would seek *some* productive and constructive interaction with the world they would seek to know better—and it is a comparatively small but noble pedigree—against reductionist idolaters. This is not a distinction between "good" and "bad" but between the more fully aware against the self-deluded—not the "right" versus the "wrong," but the fortunate juxtaposed to the unfortunate.

Having now followed Wallace on his most fascinating journey from natural selection to natural theology, perhaps he is less the "elusive" figure who opened our story. No longer hiding in the mists of Victorian and Edwardian intellectual life, as vague and indefinable as the spirits that so caught his attention, Wallace stands within a long line of philosophers and scientists who have not yielded to the pressures of the reigning scientific and cultural paradigm. They have scratched beneath the surface of reductionist "solutions," "definitive explanations," and just-so stories masquerading as "hard" science to see the metaphysics undergirding them all. Instead, they have cast an alternative vision that echoes Hamlet's admonition, "There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy."

Science can teach us a lot but it cannot teach us how to be human, even though ironically we are often most human when we engage in it. Lukacs reminds us that history is not science but science is part of history.[9] Therefore, history *can* teach us about humanity—and about scientists—and therefore much about being humans *participating* in our world. In that sense some *scientists* can teach us more about ourselves than science itself. Wallace was one of them.

Appendix

The Evolution of Alfred Russel Wallace Three Representative Essays

Wallace's evolving views on evolution are captured in the three representative essays reprinted in this appendix. The first, "On the Law Which Has Regulated the Introduction of New Species," was largely ignored by Darwin, but caught the attention of Charles Lyell, Edward Blyth, and Henry Walter Bates. One historian rendered the best historical verdict in calling it, "the first ever British scientific paper to claim that animals had descended from a common ancestor and then produced closely similar variations which evolved into distinct species."[1] This essay is also referred to simply as the Sarawak Law paper. It was published under the title "On the Law Which Has Regulated the Introduction of New Species" in *Annals and Magazine of Natural History*, 2nd series (1855) 16: 184–96. An excerpt is reproduced here.

The second of Wallace's works reproduced here, "On the Tendency of Varieties to Depart Indefinitely from the Original Type," is the famous letter from Wallace to Darwin outlining Wallace's theory of natural selection. Shocked by the arrival of Wallace's missive, Darwin's panicked assessment was that it was such a perfect abstract of his earliest 1842 manuscript that he could delay publishing his own theory no longer. "On the Tendency of Varieties to Depart Indefinitely from the Original Type" is also known as the Ternate letter because it was very probably written by Wallace on the island of Gilolo and sent to Darwin from Ternate. It was received by Darwin on June 18, 1858, and read before the Linnean Society on July 1, 1858. The version here includes headings not in the original but applied by Wallace in his *Contributions to the Theory of Natural Selection* (1871), 26–44.

The third and final work presented in this appendix is an excerpt of chapter 15 ("Darwinism as Applied to Man") from the second edition of

Darwinism: An Exposition of the Theory of Natural Selection with Some of Its Applications, published by Macmillan in 1889 (445–78). "Darwinism as Applied to Man" is misleading because it expressly rejects Darwin's reductionist formula of animal/human continuity. Here Wallace outlines his call on a higher mind or mind-like power to account for the beginning of life, consciousness in animals as distinguished from plants, and finally *Homo sapiens*.

It should be borne in mind that each essay represents a process of discovery building on previous ideas and concepts. In other words, "Darwinism Applied to Man" should not be seen as a retraction of either the Sarawak Law or Ternate papers.

On the Law Which Has Regulated the Introduction of New Species

Geographical Distribution Dependent on Geologic Changes.

EVERY NATURALIST who has directed his attention to the subject of the geographical distribution of animals and plants, must have been interested in the singular facts which it presents. Many of these facts are quite different from what would have been anticipated, and have hitherto been considered as highly curious, but quite inexplicable. None of the explanations attempted from the time of Linnaeus are now considered at all satisfactory; none of them have given a cause sufficient to account for the facts known at the time, or comprehensive enough to include all the new facts which have since been, and are daily being added. Of late years, however, a great light has been thrown on the subject by geological investigations, which have shown that the present state of the earth and of the organisms now inhabiting it, is but the last stage of a long and uninterrupted series of changes which it has undergone, and consequently, that to endeavour to explain and account for its present condition without any reference to those changes (as has frequently been done) must lead to very imperfect and erroneous conclusions.

The facts proved by geology are briefly these:—That during an immense, but unknown period, the surface of the earth has undergone successive changes; land has sunk beneath the ocean, while fresh land has risen up from it; mountain chains have been elevated; islands have been formed into continents, and continents submerged till they have become islands; and these changes have taken place, not once merely, but perhaps hundreds, perhaps thousands of times:—That all these operations have been more or less continuous, but unequal in their progress, and during the whole se-

ries the organic life of the earth has undergone a corresponding alteration. This alteration also has been gradual, but complete; after a certain interval not a single species existing which had lived at the commencement of the period. This complete renewal of the forms of life also appears to have occurred several times:—That from the last of the geological epochs to the present or historical epoch, the change of organic life has been gradual: the first appearance of animals now existing can in many cases be traced, their numbers gradually increasing in the more recent formations, while other species continually die out and disappear, so that the present condition of the organic world is clearly derived by a natural process of gradual extinction and creation of species from that of the latest geological periods. We may therefore safely infer a like gradation and natural sequence from one geological epoch to another.

Now, taking this as a fair statement of the results of geological inquiry, we see that the present geographical distribution of life upon the earth must be the result of all the previous changes, both of the surface of the earth itself and of its inhabitants. Many causes, no doubt, have operated of which we must ever remain in ignorance, and we may, therefore, expect to find many details very difficult of explanation, and in attempting to give one, must allow ourselves to call into our service geological changes which it is highly probable may have occurred, though we have no direct evidence of their individual operation.

The great increase of our knowledge within the last twenty years, both of the present and past history of the organic world, has accumulated a body of facts which should afford a sufficient foundation for a comprehensive law embracing and explaining them all, and giving a direction to new researches. It is about ten years since the idea of such a law suggested itself to the writer of this essay, and he has since taken every opportunity of testing it by all the newly–ascertained facts with which he has become acquainted, or has been able to observe himself. These have all served to convince him of the correctness of his hypothesis. Fully to enter into such a subject would occupy much space, and it is only in consequence of some views having been lately promulgated, he believes, in a wrong direction, that he now ventures to present his ideas to the public, with only such obvious illustrations of the arguments and results as occur to him in a place far removed from all means of reference and exact information.

A Law deduced from well-known Geographical and Geological Facts.

The following propositions in Organic Geography and Geology give the main facts on which the hypothesis is founded.

Geography

1. Large groups, such as classes and orders, are generally spread over the whole earth, while smaller ones, such as families and genera, are frequently confined to one portion, often to a very limited district.
2. In widely distributed families the genera are often limited in range; in widely distributed genera, well marked groups of species are peculiar to each geographical district.
3. When a group is confined to one district, and is rich in species, it is almost invariably the case that the most closely allied species are found in the same locality or in closely adjoining localities, and that therefore the natural sequence of the species by affinity is also geographical.
4. In countries of a similar climate, but separated by a wide sea or lofty mountains, the families, genera and species of the one are often represented by closely allied families, genera and species peculiar to the other.

Geology

5. The distribution of the organic world in time is very similar to its present distribution in space.
6. Most of the larger and some small groups extend through several geological periods.
7. In each period, however, there are peculiar groups, found nowhere else, and extending through one or several formations.
8. Species of one genus, or genera of one family occurring in the same geological time, are more closely allied than those separated in time.
9. As generally in geography no species or genus occurs in two very distant localities without being also found in intermediate places, so in geology the life of a species or genus has not been interrupted. In other words, no group or species has come into existence twice.
10. The following law may be deduced from these facts:—*Every species has come into existence coincident both in space and time with a pre–existing closely allied species*.

This law agrees with, explains and illustrates all the facts connected with the following branches of the subject:—1st. The system of natural affinities. 2nd. The distribution of animals and plants in space. 3rd. The same in time, including all the phaenomena [*sic*] of representative groups, and those

which Professor Forbes supposed to manifest polarity. 4th. The phaenomena of rudimentary organs. We will briefly endeavour to show its bearing upon each of these.

The Form of a true system of Classification determined by this Law.

If the law above enunciated be true, it follows that the natural series of affinities will also represent the order in which the several species came into existence, each one having had for its immediate antitype a closely allied species existing at the time of its origin. It is evidently possible that two or three distinct species may have had a common antitype, and that each of these may again have become the antitypes from which other closely allied species were created. The effect of this would be, that so long as each species has had but one new species formed on its model, the line of affinities will be simple, and may be represented by placing the several species in direct succession in a straight line. But if two or more species have been independently formed on the plan of a common antitype, then the series of affinities will be compound, and can only be represented by a forked or many branched line. Now, all attempts at a Natural classification and arrangement of organic beings show, that both these plans have obtained in creation. Sometimes the series of affinities can be well represented for a space by a direct progression from species to species or from group to group, but it is generally found impossible so to continue. There constantly occur two or more modifications of an organ or modifications of two distinct organs, leading us on to two distinct series of species, which at length differ so much from each other as to form distinct genera or families. These are the parallel series or representative groups of naturalists, and they often occur in different countries, or are found fossil in different formations. They are said to have an analogy to each other when they are so far removed from their common antitype as to differ in many important points of structure, while they still preserve a family resemblance. We thus see how difficult it is to determine in every case whether a given relation is an analogy or an affinity, for it is evident that as we go back along the parallel or divergent series, towards the common antitype, the analogy which existed between the two groups becomes an affinity. We are also made aware of the difficulty of arriving at a true classification, even in a small and perfect group;—in the actual state of nature it is almost impossible, the species being so numerous and the modifications of form and structure so varied, arising probably from the immense number of species which have served as antitype for the existing species, and thus produced a complicated branching of the lines of affinity, as intricate as the twigs of a gnarled oak

or the vascular system of the human body. Again, if we consider that we have only fragments of this vast system, the stem and main branches being represented by extinct species of which we have no knowledge, while a vast mass of limbs and boughs and minute twigs and scattered leaves is what we have to place in order, and determine the true position each originally occupied with regard to the others, the whole difficulty of the true Natural System of classification becomes apparent to us.

We shall thus find ourselves obliged to reject all those systems of classification which arrange species or groups in circles, as well as those which fix a definite number for the divisions of each group. The latter class have been very generally rejected by naturalists, as contrary to nature, notwithstanding the ability with which they have been advocated; but the circular system of affinities seems to have obtained a deeper hold, many eminent naturalists having to some extent adopted it. We have, however, never been able to find a case in which the circle has been closed by a direct and close affinity. In most cases a palpable analogy has been substituted, in others the affinity is very obscure or altogether doubtful. The complicated branching of the lines of affinities in extensive groups must also afford great facilities for giving a show of probability to any such purely artificial arrangements. Their death-blow was given by the admirable paper of the lamented Mr. Strickland, published in the "Annals of Natural History," in which he so cleverly showed the true synthetical method of discovering the Natural System.

Geographical Distribution of Organisms.

If we now consider the geographical distribution of animals and plants upon the earth, we shall find all the facts beautifully in accordance with, and readily explained by, the present hypothesis. A country having species, genera, and whole families peculiar to it, will be the necessary result of its having been isolated for a long period, sufficient for many series of species to have been created on the type of pre-existing ones, which, as well as many of the earlier-formed species, have become extinct, and thus made the groups appear isolated. If in any case the antitype had an extensive range, two or more groups of species might have been formed, each varying from it in a different manner, and thus producing several representative or analogous groups. The Sylviadae of Europe and the Sylvicolidae of North America, the Heliconidae of South America and the Euploeas of the East, the group of Trogons inhabiting Asia, and that peculiar to South America, are examples that may be accounted for in this manner.

Such phaenomena as are exhibited by the Galapagos Islands, which con-

tain little groups of plants and animals peculiar to themselves, but most nearly allied to those of South America, have not hitherto received any, even a conjectural explanation. The Galapagos are a volcanic group of high antiquity, and have probably never been more closely connected with the continent than they are at present. They must have been first peopled, like other newly-formed [*sic*] islands, by the action of winds and currents, and at a period sufficiently remote to have had the original species die out, and the modified prototypes only remain. In the same way we can account for the separate islands having each their peculiar species, either on the supposition that the same original emigration peopled the whole of the islands with the same species from which differently modified prototypes were created, or that the islands were successively peopled from each other, but that new species have been created in each on the plan of the pre-existing ones. St. Helena is a similar case of a very ancient island having obtained an entirely peculiar, though limited, flora. On the other hand, no example is known of an island which can be proved geologically to be of very recent origin (late in the Tertiary, for instance), and yet possess generic or family groups, or even many species peculiar to itself.

When a range of mountains has attained a great elevation, and has so remained during a long geological period, the species of the two sides at and near their bases will be often very different, representative species of some genera occurring, and even whole genera being peculiar to one side, as is remarkably seen in the case of the Andes and Rocky Mountains. A similar phaenomena occurs when an island has been separated from a continent at a very early period. The shallow sea between the Peninsula of Malacca, Java, Sumatra and Borneo was probably a continent or large island at an early epoch, and may have become submerged as the volcanic ranges of Java and Sumatra were elevated. The organic results we see in the very considerable number of species of animals common to some or all of these countries, while at the same time a number of closely allied representative species exist peculiar to each, showing that a considerable period has elapsed since their separation. The facts of geographical distribution and of geology may thus mutually explain each other in doubtful cases, should the principles here advocated be clearly established.

In all those cases in which an island has been separated from a continent, or raised by volcanic or coralline action from the sea, or in which a mountain-chain has been elevated in a recent geological epoch, the phaenomena of peculiar groups or even of single representative species will not exist. Our own island is an example of this, its separation from the continent being geologically very recent, and we have consequently scarcely a spe-

cies which is peculiar to it; while the Alpine range, one of the most recent mountain elevations, separates faunas and floras which scarcely differ more than may be due to climate and latitude alone.

The series of facts alluded to in Proposition (3), of closely allied species in rich groups being found geographically near each other, is most striking and important. Mr. Lovell Reeve has well exemplified it in his able and interesting paper on the Distribution of the Bulimi. It is also seen in the Hummingbirds and Toucans, little groups of two or three closely allied species being often found in the same or closely adjoining districts, as we have had the good fortune of personally verifying. Fishes give evidence of a similar kind: each great river has its peculiar genera, and in more extensive genera its groups of closely allied species. But it is the same throughout Nature; every class and order of animals will contribute similar facts. Hitherto no attempt has been made to explain these singular phaenomena, or to show how they have arisen. Why are the genera of Palms and of Orchids in almost every case confined to one hemisphere? Why are the closely allied species of brown-backed Trogons all found in the East, and the green-backed in the West? Why are the Macaws and the Cockatoos similarly restricted? Insects furnish a countless number of analogous examples;—the Goliathi of Africa, the Ornithopterae of the Indian Islands, the Heliconidae of South America, the Danaidae of the East, and in all, the most closely allied species found in geographical proximity. The question forces itself upon every thinking mind,—why are these things so? They could not be as they are had no law regulated their creation and dispersion. The law here enunciated not merely explains, but necessitates the facts we see to exist, while the vast and long-continued geological changes of the earth readily account for the exceptions and apparent discrepancies that here and there occur. The writer's object in putting forward his views in the present imperfect manner is to submit them to the test of other minds, and to be made aware of all the facts supposed to be inconsistent with them. As his hypothesis is one which claims acceptance solely as explaining and connecting facts which exist in nature, he expects facts alone to be brought to disprove it, not à priori arguments against its probability.

Geological Distribution of the Forms of Life.

The phaenomena of geological distribution are exactly analogous to those of geography. Closely allied species are found associated in the same beds, and the change from species to species appears to have been as gradual in time as in space. Geology, however, furnishes us with positive proof of the extinction and production of species, though it does not inform us how

either has taken place. The extinction of species, however, offers but little difficulty, and the modus operandi has been well illustrated by Sir C. Lyell in his admirable "principles." Geological changes, however gradual, must occasionally have modified external conditions to such an extent as to have rendered the existence of certain species impossible. The extinction would in most cases be effected by a gradual dying-out, but in some instances there might have been a sudden destruction of a species of limited range. To discover how the extinct species have from time to time been replaced by new ones down to the very latest geological period, is the most difficult, and at the same time the most interesting problem in the natural history of the earth. The present inquiry, which seeks to eliminate from known facts a law which has determined, to a certain degree, what species could and did appear at a given epoch, may, it is hoped, be considered as one step in the right direction towards a complete solution of it.

High Organization of very ancient Animals consistent with this Law.

Much discussion has of late years taken place on the question, whether the succession of life upon the globe has been from a lower to a higher degree of organization. The admitted facts seem to show that there has been a general, but not a detailed progression. Mollusca and Radiata existed before Vertebrata, and the progression from Fishes to Reptiles and Mammalia, and also from the lower mammals to the higher, is indisputable. On the other hand, it is said that the Mollusca and Radiata of the very earliest periods were more highly organized than the great mass of those now existing, and that the very first fishes that have been discovered are by no means the lowest organised of the class. Now it is believed the present hypothesis will harmonize with all these facts, and in a great measure serve to explain them; for though it may appear to some readers essentially a theory of progression, it is in reality only one of gradual change. It is, however, by no means difficult to show that a real progression in the scale of organization is perfectly consistent with all the appearances, and even with apparent retrogression, should such occur.

Returning to the analogy of a branching tree, as the best mode of representing the natural arrangement of species and their successive creation, let us suppose that at an early geological epoch any group (say a class of the Mollusca) has attained to a great richness of species and a high organization. Now let this great branch of allied species, by geological mutations, be completely or partially destroyed. Subsequently a new branch springs from the same trunk, that is to say, new species are successively created, having for their antitypes the same lower organized species which

had served as the antitypes for the former group, but which have survived the modified conditions which destroyed it. This new group being subject to these altered conditions, has modifications of structure and organization given to it, and becomes the representative group of the former one in another geological formation. It may, however, happen, that though later in time, the new series of species may never attain to so high a degree of organization as those preceding it, but in its turn become extinct, and give place to yet another modification from the same root, which may be of higher or lower organization, more or less numerous in species, and more or less varied in form and structure than either of those which preceded it. Again, each of these groups may not have become totally extinct, but may have left a few species, the modified prototypes of which have existed in each succeeding period, a faint memorial of their former grandeur and luxuriance. Thus every case of apparent retrogression may be in reality a progress, though an interrupted one: when some monarch of the forest loses a limb, it may be replaced by a feeble and sickly substitute. The foregoing remarks appear to apply to the case of the Mollusca, which, at a very early period, had reached a high organization and a great development of forms and species in the testaceous Cephalopoda. In each succeeding age modified species and genera replaced the former ones which had become extinct, and as we approach the present aera, but few and small representatives of the group remain, while the Gasteropods and Bivalves have acquired an immense preponderance. In the long series of changes the earth has undergone, the process of peopling it with organic beings has been continually going on, and whenever any of the higher groups have become nearly or quite extinct, the lower forms which have better resisted the modified physical conditions have served as the antitypes on which to found the new races. In this manner alone, it is believed, can the representative groups at successive periods, and the rising and fallings in the scale of organization, be in every case explained.

Rudimentary Organs.

Another important series of facts, quite in accordance with, and even necessary deductions from, the law now developed, are those of rudimentary organs. That these really do exist, and in most cases have no special function in the animal economy, is admitted by the first authorities in comparative anatomy. The minute limbs hidden beneath the skin in many of the snake-like lizards, the anal hooks of the boa constrictor, the complete series of jointed finger-bones in the paddle of the Manatus and whale, are a few of the most familiar instances. In botany a similar class of facts has long been

recognised. Abortive stamens, rudimentary floral envelopes and undeveloped carpels, are of the most frequent occurrence. To every thoughtful naturalist the question must arise, What are these for? What have they to do with the great laws of creation? Do they not teach us something of the system of Nature? If each species has been created independently, and without any necessary relations with pre-existing species, what do these rudiments, these apparent imperfections mean? There must be a cause for them; they must be the necessary results of some great natural law. Now, if, as it has been endeavoured to be shown, the great law which has regulated the peopling of the earth with animal and vegetable life is, that every change shall be gradual; that no new creature shall be formed widely differing from anything before existing; that in this, as in everything else in Nature, there shall be gradation and harmony,—then these rudimentary organs are necessary, and are an essential part of the system of Nature. Ere the higher Vertebrata were formed, for instance, many steps were required, and many organs had to undergo modifications from the rudimental condition in which only they had as yet existed. We still see remaining an antitypal sketch of a wing adapted for flight in the scaly flapper of the penguin, and limbs first concealed beneath the skin, and then weakly protruding from it, were the necessary gradations before others should be formed fully adapted for locomotion. Many more of these modifications should we behold, and more complete series of them, had we a view of all the forms which have ceased to live. The great gaps that exist between fishes, reptiles, birds, and mammals would then, no doubt, be softened down by intermediate groups, and the whole organic world would be seen to be an unbroken and harmonious system.

Conclusion.

It has now been shown, though most briefly and imperfectly, how the law that "Every species has come into existence coincident both in time and space with a pre-existing closely allied species," connects together and renders intelligible a vast number of independent and hitherto unexplained facts. The natural system of arrangement of organic beings, their geographical distribution, their geological sequence, the phaenomena of representative and substituted groups in all their modifications, and the most singular peculiarities of anatomical structure, are all explained and illustrated by it, in perfect accordance with the vast mass of facts which the researches of modern naturalists have brought together, and, it is believed, not materially opposed to any of them. It also claims a superiority over previous hypotheses, on the ground that it not merely explains, but necessitates what exists.

Granted the law, and many of the most important facts in Nature could not have been otherwise, but are almost as necessary deductions from it, as are the elliptic orbits of the planets from the law of gravitation.

On the Tendency of Varieties to Depart Indefinitely from the Original Type

Instability of Varieties supposed to prove the permanent distinctness of Species.

One of the strongest arguments which have been adduced to prove the original and permanent distinctness of species is, that *varieties* produced in a state of domesticity are more or less unstable, and often have a tendency, if left to themselves, to return to the normal form of the parent species; and this instability is considered to be a distinctive peculiarity of all varieties, even of those occurring among wild animals in a state of nature, and to constitute a provision for preserving unchanged the originally created distinct species.

In the absence or scarcity of facts and observations as to *varieties* occurring among wild animals, this argument has had great weight with naturalists, and has led to a very general and somewhat prejudiced belief in the stability of species. Equally general, however, is the belief in what are called "permanent or true varieties,"—races of animals which continually propagate their like, but which differ so slightly (although constantly) from some other race, that the one is considered to be a *variety* of the other. Which is the *variety* and which the original *species*, there is generally no means of determining, except in those rare cases in which the one race has been known to produce an offspring unlike itself and resembling the other. This, however, would seem quite incompatible with the "permanent invariability of species," but the difficulty is overcome by assuming that such varieties have strict limits, and can never again vary further from the original type, although they may return to it, which, from the analogy of the domesticated animals, is considered to be highly probable, if not certainly proved.

It will be observed that this argument rests entirely on the assumption, that *varieties* occurring in a state of nature are in all respects analogous to or even identical with those of domestic animals, and are governed by the same laws as regards their permanence or further variation. But it is the object of the present paper to show that this assumption is altogether false,

that there is a general principle in nature which will cause many *varieties* to survive the parent species, and to give rise to successive variations departing further and further from the original type, and which also produces, in domesticated animals, the tendency of varieties to return to the parent form.

The Struggle for Existence.

The life of wild animals is a struggle for existence. The full exertion of all their faculties and all their energies is required to preserve their own existence and provide for that of their infant offspring. The possibility of procuring food during the least favourable seasons, and of escaping the attacks of their most dangerous enemies, are the primary conditions which determine the existence both of individuals and of entire species. These conditions will also determine the population of a species; and by a careful consideration of all the circumstances we may be enabled to comprehend, and in some degree to explain, what at first sight appears so inexplicable—the excessive abundance of some species, while others closely allied to them are very rare.

The Law of Population of Species.

The general proportion that must obtain between certain groups of animals is readily seen. Large animals cannot be so abundant as small ones; the carnivora must be less numerous than the herbivora; eagles and lions can never be so plentiful as pigeons and antelopes; the wild asses of the Tartarian deserts cannot equal in numbers the horses of the more luxuriant prairies and pampas of America. The greater or less fecundity of an animal is often considered to be one of the chief causes of its abundance or scarcity; but a consideration of the facts will show us that it really has little or nothing to do with the matter. Even the least prolific of animals would increase rapidly if unchecked, whereas it is evident that the animal population of the globe must be stationary, or perhaps, through the influence of man, decreasing. Fluctuations there may be; but permanent increase, except in restricted localities, is almost impossible. For example, our own observation must convince us that birds do not go on increasing every year in a geometrical ratio, as they would do, were there not some powerful check to their natural increase. Very few birds produce less than two young ones each year, while many have six, eight, or ten; four will certainly be below the average; and if we suppose that each pair produce young only four times in their life, that will also be below the average, supposing them not to die either by violence or want of food. Yet at this rate how tremendous

would be the increase in a few years from a single pair! A simple calculation will show that in fifteen years each pair of birds would have increased to nearly ten millions![*] whereas we have no reason to believe that the number of the birds of any country increases at all in fifteen or in one hundred and fifty years. With such powers of increase the population must have reached its limits, and have become stationary, in a very few years after the origin of each species. It is evident, therefore, that each year an immense number of birds must perish—as many in fact as are born; and as on the lowest calculation the progeny are each year twice as numerous as their parents, it follows that, whatever be the average number of individuals existing in any given country, *twice that number must perish annually*,—a striking result, but one which seems at least highly probable, and is perhaps under rather than over the truth. It would therefore appear that, as far as the continuance of the species and the keeping up the average number of individuals are concerned, large broods are superfluous. On the average all above one become food for hawks and kites, wild cats and weasels, or perish of cold and hunger as winter comes on. This is strikingly proved by the case of particular species; for we find that their abundance in individuals bears no relation whatever to their fertility in producing offspring.

Perhaps the most remarkable instance of an immense bird population is that of the passenger pigeon of the United States, which lays only one, or at most two eggs, and is said to rear generally but one young one. Why is this bird so extraordinarily abundant, while others producing two or three times as many young are much less plentiful? The explanation is not difficult. The food most congenial to this species, and on which it thrives best, is abundantly distributed over a very extensive region, offering such differences of soil and climate, that in one part or another of the area the supply never fails. The bird is capable of a very rapid and long-continued flight, so that it can pass without fatigue over the whole of the district it inhabits, and as soon as the supply of food begins to fail in one place is able to discover a fresh feeding-ground. This example strikingly shows us that the procuring a constant supply of wholesome food is almost the sole condition requisite for ensuring the rapid increase of a given species, since neither the limited fecundity, nor the unrestrained attacks of birds of prey and of man are here sufficient to check it. In no other birds are these peculiar circumstances so strikingly combined. Either their food is more liable to failure, or they have not sufficient power of wing to search for it over an extensive area, or

[*] This is underestimated. The number would really amount to more than two thousand millions!

during some season of the year it becomes very scarce, and less wholesome substitutes have to be found; and thus, though more fertile in offspring, they can never increase beyond the supply of food in the least favourable seasons.

Many birds can only exist by migrating, when their food becomes scarce, to regions possessing a milder, or at least a different climate, though, as these migrating birds are seldom excessively abundant, it is evident that the countries they visit are still deficient in a constant and abundant supply of wholesome food. Those whose organization does not permit them to migrate when their food becomes periodically scarce, can never attain a large population. This is probably the reason why woodpeckers are scarce with us, while in the tropics they are among the most abundant of solitary birds. Thus the house sparrow is more abundant than the redbreast, because its food is more constant and plentiful,—seeds of grasses being preserved during the winter, and our farm-yards and stubble-fields furnishing an almost inexhaustible supply. Why, as a general rule, are aquatic, and especially sea birds, very numerous in individuals? Not because they are more prolific than others, generally the contrary; but because their food never fails, the sea-shores and river-banks daily swarming with a fresh supply of small mollusca and crustacea. Exactly the same laws will apply to mammals. Wild cats are prolific and have few enemies; why then are they never as abundant as rabbits? The only intelligible answer is, that their supply of food is more precarious. It appears evident, therefore, that so long as a country remains physically unchanged, the numbers of its animal population cannot materially increase. If one species does so, some others requiring the same kind of food must diminish in proportion. The numbers that die annually must be immense; and as the individual existence of each animal depends upon itself, those that die must be the weakest—the very young, the aged, and the diseased,—while those that prolong their existence can only be the most perfect in health and vigour—those who are best able to obtain food regularly, and avoid their numerous enemies. It is, as we commenced by remarking, "a struggle for existence," in which the weakest and least perfectly organized must always succumb.

The Abundance or Rarity of a Species dependent upon its more or less perfect Adaptation to the Conditions of Existence.

It seems evident that what takes place among the individuals of a species must also occur among the several allied species of a group,—viz. that those which are best adapted to obtain a regular supply of food, and to defend themselves against the attacks of their enemies and the vicissitudes of the seasons, must necessarily obtain and preserve a superiority in population; while those species which from some defect of power or organiza-

tion are the least capable of counteracting the vicissitudes of food, supply, &c., must diminish in numbers, and, in extreme cases, become altogether extinct. Between these extremes the species will present various degrees of capacity for ensuring the means of preserving life; and it is thus we account for the abundance or rarity of species. Our ignorance will generally prevent us from accurately tracing the effects to their causes; but could we become perfectly acquainted with the organization and habits of the various species of animals, and could we measure the capacity of each for performing the different acts necessary to its safety and existence under all the varying circumstances by which it is surrounded, we might be able even to calculate the proportionate abundance of individuals which is the necessary result. If now we have succeeded in establishing these two points—1st, *that the animal population of a country is generally stationary, being kept down by a periodical deficiency of food, and other checks; and, 2nd, that the comparative abundance or scarcity of the individuals of the several species is entirely due to their organization and resulting habits, which, rendering it more difficult to procure a regular supply of food and to provide for their personal safety in some cases than in others, can only be balanced by a difference in the population which have to exist in a given area*—we shall be in a condition to proceed to the consideration of varieties, to which the preceding remarks have a direct and very important application.

Useful Variations will tend to Increase; useless or hurtful Variation to Diminish.

Most or perhaps all the variations from the typical form of a species must have some definite effect, however slight, on the habits or capacities of the individuals. Even a change of colour might, by rendering them more or less distinguishable, affect their safety; a greater or less development of hair might modify their habits. More important changes, such as an increase in the power or dimensions of the limbs or any of the external organs, would more or less affect their mode of procuring food or the range of country which they inhabit. It is also evident that most changes would affect, either favourably or adversely, the powers of prolonging existence. An antelope with shorter or weaker legs must necessarily suffer more from the attacks of the feline carnivora; the passenger pigeon with less powerful wings would sooner or later be affected in its powers of procuring a regular supply of food; and in both cases the result must necessarily be a diminution of the population of the modified species. If, on the other hand, any species should produce a variety having slightly increased powers of preserving existence, that variety must inevitably in time acquire a superiority in numbers. These results must follow as surely as old age, intemperance, or scarcity of food produce an increased mortality. In both cases there may be

many individual exceptions; but on the average the rule will invariably be found to hold good. All varieties will therefore fall into two classes—those which under the same conditions would never reach the population of the parent species, and those which would in time obtain and keep a numerical superiority. Now, let some alteration of physical conditions occur in the district—a long period of drought, a destruction of vegetation by locusts, the irruption of some new carnivorous animal seeking "pastures new"—any change in fact tending to render existence more difficult to the species in question, and tasking its utmost powers to avoid complete extermination; it is evident that, of all the individuals composing the species, those forming the least numerous and most feebly organized variety would suffer first, and, were the pressure severe, must soon become extinct. The same causes continuing in action, the parent species would next suffer, would gradually diminish in numbers, and with a recurrence of similar unfavourable conditions might also become extinct. The superior variety would then alone remain, and on a return to favourable circumstances would rapidly increase in numbers and occupy the place of the extinct species and variety.

Superior Varieties will ultimately Extirpate the original Species.

The *variety* would now have replaced the *species*, of which it would be a more perfectly developed and more highly organized form. It would be in all respects better adapted to secure its safety, and to prolong its individual existence and that of the race. Such a variety *could not* return to the original form; for that form is an inferior one, and could never compete with it for existence. Granted, therefore, a "tendency" to reproduce the original type of the species, still the variety must ever remain preponderant in numbers, and under adverse physical conditions *again alone survive*. But this new, improved, and populous race might itself, in course of time, give rise to new varieties, exhibiting several diverging modifications of form, any of which, tending to increase the facilities for preserving existence, must, by the same general law, in their turn become predominant. Here, then, we have *progression and continued divergence* deduced from the general laws which regulate the existence of animals in a state of nature, and from the undisputed fact that varieties do frequently occur. It is not, however, contended that this result would be invariable; a change of physical conditions in the district might at times materially modify it, rendering the race which had been the most capable of supporting existence under the former conditions now the least so, and even causing the extinction of the newer and, for a time, superior race, while the old or parent species and its first inferior varieties continued to flourish. Variations in unimportant parts might also occur, having no perceptible effect on the life-preserving powers; and the

varieties so furnished might run a course parallel with the parent species, either giving rise to further variations or returning to the former type. All we argue for is, that certain varieties have a tendency to maintain their existence longer than the original species, and this tendency must make itself felt; for though the doctrine of chances or averages can never be trusted to on a limited scale, yet, if applied to high numbers, the results come nearer to what theory demands, and, as we approach to an infinity of examples, become strictly accurate. Now the scale on which nature works is so vast—the numbers of individuals and periods of time with which she deals approach so near to infinity, that any cause, however slight, and however liable to be veiled and counteracted by accidental circumstances, must in the end produce its full legitimate results.

The Partial Reversion of Domesticated Varieties explained.

Let us now turn to domesticated animals, and inquire how varieties produced among them are affected by the principles here enunciated. The essential difference in the condition of wild and domestic animals is this,—that among the former, their well-being and very existence depend upon the full exercise and healthy condition of all their senses and physical powers, whereas, among the latter, these are only partially exercised, and in some cases are absolutely unused. A wild animal has to search, and often to labour, for every mouthful of food—to exercise sight, hearing, and smell in seeking it, and in avoiding dangers, in procuring shelter from the inclemency of the seasons, and in providing for the subsistence and safety of its offspring. There is no muscle of its body that is not called into daily and hourly activity; there is no sense or faculty that is not strengthened by continual exercise. The domestic animal, on the other hand, has food provided for it, is sheltered, and often confined, to guard it against the vicissitudes of the seasons, is carefully secured from the attacks of its natural enemies, and seldom even rears its young without human assistance. Half of its senses and faculties are quite useless; and the other half are but occasionally called into feeble exercise, while even its muscular system is only irregularly called into action.

Now when a variety of such an animal occurs, having increased power or capacity in any organ or sense, such increase is totally useless, is never called into action, and may even exist without the animal ever becoming aware of it. In the wild animal, on the contrary, all its faculties and powers being brought into full action for the necessities of existence, any increase becomes immediately available, is strengthened by exercise, and must even slightly modify the food, the habits, and the whole economy of the race.

It creates as it were a new animal, one of superior powers, and which will necessarily increase in numbers and outlive those inferior to it.

Again, in the domesticated animal all variations have an equal chance of continuance; and those which would decidedly render a wild animal unable to compete with its fellows and continue its existence are no disadvantage whatever in a state of domesticity. Our quickly fattening pigs, short-legged sheep, pouter pigeons, and poodle dogs could never have come into existence in a state of nature, because the very first step towards such inferior forms would have led to the rapid extinction of the race; still less could they now exist in competition with their wild allies. The great speed but slight endurance of the race horse, the unwieldy strength of the ploughman's team, would both be useless in a state of nature. If turned wild on the pampas, such animals would probably soon become extinct, or under favourable circumstances might each lose those extreme qualities which would never be called into action, and in a few generations would revert to a common type, which must be that in which the various powers and faculties are so proportioned to each other as to be best adapted to procure food and secure safety,—that in which by the full exercise of every part of his organization the animal can alone continue to live. Domestic varieties, when turned wild, *must* return to something near the type of the original wild stock, *or become altogether extinct*.*

We see, then, that no inferences as to the permanence of varieties in a state of nature can be deduced from the observation of those occurring among domestic animals. The two are so much opposed to each other in every circumstance of their existence, that what applies to the one is almost sure not to apply to the other. Domestic animals are abnormal, irregular, artificial; they are subject to varieties which never occur and never can occur in a state of nature: their very existence depends altogether on human care; so far are many of them removed from that just proportion of faculties, that true balance of organization, by means of which alone an animal left to its own resources can preserve its existence and continue its race.

Lamarck's Hypothesis very different from that now advanced.

The hypothesis of Lamarck—that progressive changes in species have been produced by the attempts of animals to increase the development of

*That is, they will vary, and the variations which tend to adapt them to the wild state, and therefore approximate them to wild animals, will be preserved. Those animals which do not vary sufficiently will perish.

their own organs, and thus modify their structure and habits—has been repeatedly and easily refuted by all writers on the subject of varieties and species, and it seems to have been considered that when this was done the whole question has been finally settled; but the view here developed renders such an hypothesis quite unnecessary, by showing that similar results must be produced by the action of principles constantly at work in nature. The powerful retractile talons of the falcon- and the cat-tribes have not been produced or increased by the volition of those animals; but among the different varieties which occurred in the earlier and less highly organized forms of these groups, *those always survived longest which had the greatest facilities for seizing their prey*. Neither did the giraffe acquire its long neck by desiring to reach the foliage of the more lofty shrubs, and constantly stretching its neck for the purpose, but because any varieties which occurred among its antitypes with a longer neck than usual *at once secured a fresh range of pasture over the same ground as their shorter-necked companions, and on the first scarcity of food were thereby enabled to outlive them*. Even the peculiar colours of many animals, especially insects, so closely resembling the soil or the leaves or the trunks on which they habitually reside, are explained on the same principle; for though in the course of ages varieties of many tints may have occurred, *yet those races having colours best adapted to concealment from their enemies would inevitably survive the longest*. We have also here an acting cause to account for that balance so often observed in nature,—a deficiency in one set of organs always being compensated by an increased development of some others—powerful wings accompanying weak feet, or great velocity making up for the absence of defensive weapons; for it has been shown that all varieties in which an unbalanced deficiency occurred could not long continue their existence. The action of this principle is exactly like that of the centrifugal governor of the steam engine, which checks and corrects any irregularities almost before they become evident; and in like manner no unbalanced deficiency in the animal kingdom can ever reach any conspicuous magnitude, because it would make itself felt at the very first step, by rendering existence difficult and extinction almost sure soon to follow. An origin such as is here advocated will also agree with the peculiar character of the modifications of form and structure which obtain in organized beings—the many lines of divergence from a central type, the increasing efficiency and power of a particular organ through a succession of allied species, and the remarkable persistence of unimportant parts such as colour, texture of plumage and hair, form of horns or crests, through a series of species differing considerably in more essential characters. It also furnishes us with a reason for that "more spe-

cialized structure" which Professor [Richard] Owen states to be a characteristic of recent compared with extinct forms, and which would evidently be the result of the progressive modification of any organ applied to a special purpose in the animal economy.

Conclusion.

We believe we have now shown that there is a tendency in nature to the continued progression of certain classes of *varieties* further and further from the original type—a progression to which there appears no reason to assign any definite limits—and that the same principle which produces this result in a state of nature will also explain why domestic varieties have a tendency, when they become wild, to revert to the original type. This progression, by minute steps, in various directions, but always checked and balanced by the necessary conditions, subject to which alone existence can be preserved, may, it is believed, be followed out so as to agree with all the phenomena presented by organized beings, their extinction and succession in past ages, and all the extraordinary modifications of form, instinct and habits which they exhibit.

Darwinism Applied to Man

Independent Proof that the Mathematical, Musical, and Artistic Faculties have not been Developed under the Law of Natural Selection.

The law of Natural Selection or the survival of the fittest is, as its name implies, a rigid law, which acts by the life or death of the individuals submitted to its action. From its very nature it can act only on useful or hurtful characteristics, eliminating the latter and keeping up the former to a fairly general level of efficiency. Hence it necessarily follows that the characters developed by its means will be present in all the individuals of a species, and, though varying, will not vary very widely from a common standard. The amount of variation we found, in our third chapter, to be about one-fifth or one-sixth of the mean value—that is, if the mean value were taken at 100, the variations would reach from 80 to 120, or somewhat more, if very large numbers were compared. In accordance with this law we find, that all those characters in man which were certainly essential to him during his early stages of development, exist in all savages with some approach to equality. In the speed of running, in bodily strength, in skill with weapons, in acuteness of vision, or in power of following a trail, all are fairly proficient, and

the differences of endowment do not probably exceed the limits of variation in animals above referred to. So, in animal instinct or intelligence, we find the same general level of development. Every wren makes a fairly good nest like its fellows; every fox has an average amount of the sagacity of its race; while all the higher birds and mammals have the necessary affections and instincts needful for the protection and bringing-up of their offspring.

But in those specially developed faculties of civilised man which we have been considering, the case is very different. They exist only in a small proportion of individuals, while the difference of capacity between these favoured individuals and the average of mankind is enormous. Taking first the mathematical faculty, probably fewer than one in a hundred really possess it, the great bulk of the population having no natural ability for the study, or feeling the slightest interest in it.* And if we attempt to measure the amount of variation in the faculty itself between a first-class mathematician and the ordinary run of people who find any kind of calculation confusing and altogether devoid of interest, it is probable that the former could not be estimated at less than a hundred times the latter, and perhaps a thousand times would more nearly measure the difference between them.

The artistic faculty appears to agree pretty closely with the mathematical in its frequency. The boys and girls who, going beyond the mere conventional designs of children, draw what they *see*, not what they *know* to be the shape of things; who naturally sketch in perspective, because it is thus they see objects; who see, and represent in their sketches, the light and shade as well as the mere outlines of objects; and who can draw recognisable sketches of every one they know, are certainly very few compared with those who are totally incapable of anything of the kind. From some inquiries I have made in schools, and from my own observation, I believe that those who are endowed with this natural artistic talent do not exceed, even if they come up to, one per cent of the whole population.

The variations in the amount of artistic faculty are certainly very great, even if we do not take the extremes. The gradations of power between the ordinary man or woman "who does not draw," and whose attempts at representing any object, animate or inanimate, would be laughable, and the average good artist who, with a few bold strokes, can produce a recognis-

*This is the estimate furnished me by two mathematical masters in one of our great public schools of the proportion of boys who have any special taste or capacity for mathematical studies. Many more, of course, can be drilled into a fair knowledge of elementary mathematics, but only this small portion posses [*sic*] the natural faculty which renders it possible for them ever to rank high as mathematicians, to take any pleasure in it, or to do any original mathematical work.

able and even effective sketch of a landscape, a street, or an animal, are very numerous; and we can hardly measure the difference between them at less than fifty or a hundred fold.

The musical faculty is undoubtedly, in its lower forms, less uncommon than either of the preceding, but it still differs essentially from the necessary or useful faculties in that it is almost entirely wanting in one-half even of civilised men. For every person who draws, as it were instinctively, there are probably five or ten who sing or play without having been taught and from mere innate love and perception of melody and harmony.* On the other hand, there are probably about as many who seem absolutely deficient in musical perception, who take little pleasure in it, who cannot perceive discords or remember tunes, and who could not learn to sing or play with any amount of study. The gradations, too, are here quite as great as in mathematics or pictorial art, and the special faculty of the great musical composer must be reckoned many hundreds or perhaps thousands of times greater than that of the ordinary "unmusical" person above referred to.

It appears then, that, both on account of the limited number of persons gifted with the mathematical, the artistic, or the musical faculty, as well as from the enormous variations in its development, these mental powers differ widely from those which are essential to man, and are, for the most part, common to him and the lower animals; and that they could not, therefore, possibly have been developed in him by means of the law of natural selection.

We have thus shown, by two distinct lines of argument, that faculties are developed in civilised man which, both in their mode of origin, their function, and their variations, are altogether distinct from those other characters and faculties which are essential to him, and which have been brought to their actual state of efficiency by the necessities of his existence. And besides the three which have been specially referred to, there are others which evidently belong to the same class. Such is the metaphysical faculty, which enables us to form abstract conceptions of a kind the most remote from all practical applications, to discuss the ultimate causes of things, the nature and qualities of matter, motion, and force, of space and time, of cause and effect, of will and conscience. Speculations on these abstract and difficult questions are impossible to savages, who seem to have no mental faculty enabling them to grasp the essential ideas or conceptions; yet whenever any race attains to civilisation, and comprises a body of people

*I am informed, however, by a music master in a large school that only about one per cent have real or decided musical talent, corresponding curiously with the estimate of the mathematicians.

who, whether as priests or philosophers, are relieved from the necessity of labour or of taking an active part in war or government, the metaphysical faculty appears to spring suddenly into existence, although, like the other faculties we have referred to, it is always confined to a very limited proportion of the population.

In the same class we may place the peculiar faculty of wit and humour, an altogether natural gift whose development appears to be parallel with that of the other exceptional faculties. Like them, it is almost unknown among savages, but appears more or less frequently as civilisation advances and the interests of life become more numerous and more complex. Like them, too, it is altogether removed from utility in the struggle for life, and appears sporadically in a very small percentage of the population; the majority being, as is well known, totally unable to say a witty thing or make a pun even to save their lives.*

*In the latter part of his essay on Heredity (pp. 91–93 of the volume of Essays), Dr. Weismann refers to this question of the origin of "talents" in man, and, like myself, comes to the conclusion that they could not be developed under the law of natural selection. He says: "It may be objected that, in man, in addition to the instincts inherent in every individual, special individual predispositions are also found, of such a nature that it is impossible they can have arisen by individual variations of the germ-plasm. On the other hand, these predispositions—which we call talents—cannot have arisen through natural selection, because life is in no way dependent on their presence, and there seems to be no way of explaining their origin except by an assumption of the summation of the skill attained by exercise in the course of each single life. In this case, therefore, we seem at first sight to be compelled to accept the transmission of acquired characters." Weismann then goes on to show that the facts do not support this view; that the mathematical, musical, or artistic faculties often appear suddenly in a family whose other members and ancestors were in no way distinguished; and that even when hereditary in families, the talent often appears at its maximum at the commencement or in the middle of the series, not increasing to the end, as it should do if it depended in any way on the transmission of acquired skill. Gauss was not the son of a mathematician, nor Handel of a musician, nor Titian of a painter, and there is no proof of any special talent in the ancestors of these men of genius, who at once developed the most marvellous pre-eminence in their respective talents. And after showing that such great men only appear at certain stages of human development, and that two or more of the special talents are not unfrequently combined in one individual, he concludes thus—"Upon this subject I only wish to add that, in my opinion, talents do not appear to depend upon the improvement of any special mental quality by continued practice, but they are the expression, and to a certain extent the bye-product [*sic*], of the human mind, which is so highly developed in all directions." It will, I think, be admitted that this view hardly accounts for the existence of the highly peculiar human faculties in question.

The Interpretation of the Facts.

The facts now set forth prove the existence of a number of mental faculties which either do not exist at all or exist in a very rudimentary condition in savages, but appear almost suddenly and in perfect development in the higher civilised races. These same faculties are further characterised by their sporadic character, being well developed only in a very small proportion of the community; and by the enormous amount of variation in their development, the higher manifestations of them being many times—perhaps a hundred or a thousand times—stronger than the lower. Each of these characteristics is totally inconsistent with any action of the law of natural selection in the production of the faculties referred to; and the facts, taken in their entirety, compel us to recognise some origin for them wholly distinct from that which has served to account for the animal characteristics—whether bodily or mental—of man.

The special faculties we have been discussing clearly point to the existence in man of something which he has not derived from his animal progenitors—something which we may best refer to as being of a spiritual essence or nature, capable of progressive development under favourable conditions. On the hypothesis of this spiritual nature, superadded to the animal nature of man, we are able to understand much that is otherwise mysterious or unintelligible in regard to him, especially the enormous influence of ideas, principles, and beliefs over his whole life and actions. Thus alone we can understand the constancy of the martyr, the unselfishness of the philanthropist, the devotion of the patriot, the enthusiasm of the artist, and the resolute and persevering search of the scientific worker after nature's secrets. Thus we may perceive that the love of truth, the delight in beauty, the passion for justice, and the thrill of exultation with which we hear of any act of courageous self-sacrifice, are the workings within us of a higher nature which has not been developed by means of the struggle for material existence.

It will, no doubt, be urged that the admitted continuity of man's progress from the brute does not admit of the introduction of new causes, and that we have no evidence of the sudden change of nature which such introduction would bring about. The fallacy as to new causes involving any breach of continuity, or any sudden or abrupt change, in the effects, has already been shown; but we will further point out that there are at least three stages in the development of the organic world when some new cause or power must necessarily have come into action.

The first stage is the change from inorganic to organic, when the earliest vegetable cell, or the living protoplasm out of which it arose, first

appeared. This is often imputed to a mere increase of complexity of chemical compounds; but increase of complexity, with consequent instability, even if we admit that it may have produced protoplasm as a chemical compound, could certainly not have produced *living* protoplasm—protoplasm which has the power of growth and of reproduction, and of that continuous process of development which has resulted in the marvellous variety and complex organisation of the whole vegetable kingdom. There is in all this something quite beyond and apart from chemical changes, however complex; and it has been well said that the first vegetable cell was a new thing in the world, possessing altogether new powers—that of extracting and fixing carbon from the carbon-dioxide of the atmosphere, that of indefinite reproduction, and, still more marvellous, the power of variation and of reproducing those variations till endless complications of structure and varieties of form have been the result. Here, then, we have indications of a new power at work, which we may term *vitality*, since it gives to certain forms of matter all those characters and properties which constitute Life.

The next stage is still more marvellous, still more completely beyond all possibility of explanation by matter, its laws and forces. It is the introduction of sensation or consciousness, constituting the fundamental distinction between the animal and vegetable kingdoms. Here all idea of mere complication of structure producing the result is out of the question. We feel it to be altogether preposterous to assume that at a certain stage of complexity of atomic constitution, and as a necessary result of that complexity alone, an *ego* should start into existence, a thing that *feels*, that is *conscious* of its own existence. Here we have the certainty that something new has arisen, a being whose nascent consciousness has gone on increasing in power and definiteness till it has culminated in the higher animals. No verbal explanation or attempt at explanation—such as the statement that life is the result of the molecular forces of the protoplasm, or that the whole existing organic universe from the amæba up to man was latent in the fire-mist from which the solar system was developed—can afford any mental satisfaction, or help us in any way to a solution of the mystery.

The third stage is, as we have seen, the existence in man of a number of his most characteristic and noblest faculties, those which raise him furthest above the brutes and open up possibilities of almost indefinite advancement. These faculties could not possibly have been developed by means of the same laws which have determined the progressive development of the organic world in general, and also of man's physical organism.*

*For an earlier discussion of this subject, with some wider applications, see Wallace, *Contributions to the Theory of Natural Selection*, chapter 10.

These three distinct stages of progress from the inorganic world of matter and motion up to man, point clearly to an unseen universe—to a world of spirit, to which the world of matter is altogether subordinate. To this spiritual world we may refer the marvellously complex forces which we know as gravitation, cohesion, chemical force, radiant force, and electricity, without which the material universe could not exist for a moment in its present form, and perhaps not at all, since without these forces, and perhaps others which may be termed atomic, it is doubtful whether matter itself could have any existence. And still more surely can we refer to it those progressive manifestations of Life in the vegetable, the animal, and man—which we may classify as unconscious, conscious, and intellectual life,—and which probably depend upon different degrees of spiritual influx. I have already shown that this involves no necessary infraction of the law of continuity in physical or mental evolution; whence it follows that any difficulty we may find in discriminating the inorganic from the organic, the lower vegetable from the lower animal organisms, or the higher animals from the lowest types of man, has no bearing at all upon the question. This is to be decided by showing that a change in essential nature (due, probably, to causes of a higher order than those of the material universe) took place at the several stages of progress which I have indicated; a change which may be none the less real because absolutely imperceptible at its point of origin, as is the change that takes place in the curve in which a body is moving when the application of some new force causes the curve to be slightly altered.

Concluding Remarks.

Those who admit my interpretation of the evidence now adduced—strictly scientific evidence in its appeal to facts which are clearly what ought *not* to be on the materialistic theory—will be able to accept the spiritual nature of man, as not in any way inconsistent with the theory of evolution, but as dependent on those fundamental laws and causes which furnish the very materials for evolution to work with. They will also be relieved from the crushing mental burthen imposed upon those who—maintaining that we, in common with the rest of nature, are but products of the blind eternal forces of the universe, and believing also that the time must come when the sun will lose his heat and all life on the earth necessarily cease—have to contemplate a not very distant future in which all this glorious earth—which for untold millions of years has been slowly developing forms of life and beauty to culminate at last in man—shall be as if it had never existed; who are compelled to suppose that all the slow growths of our race struggling towards a higher life, all the agony of martyrs, all the groans of

victims, all the evil and misery and undeserved suffering of the ages, all the struggles for freedom, all the efforts towards justice, all the aspirations for virtue and the wellbeing of humanity, shall absolutely vanish, and, "like the baseless fabric of a vision, leave not a wrack behind."

As contrasted with this hopeless and soul-deadening belief, we, who accept the existence of a spiritual world, can look upon the universe as a grand consistent whole adapted in all its parts to the development of spiritual beings capable of indefinite life and perfectibility. To us, the whole purpose, the only *raison d'être* of the world—with all its complexities of physical structure, with its grand geological progress, the slow evolution of the vegetable and animal kingdoms, and the ultimate appearance of man—was the development of the human spirit in association with the human body. From the fact that the spirit of man—the man himself—*is* so developed, we may well believe that this is the only, or at least the best, way for its development; and we may even see in what is usually termed "evil" on the earth, one of the most efficient means of its growth. For we know that the noblest faculties of man are strengthened and perfected by struggle and effort; it is by unceasing warfare against physical evils and in the midst of difficulty and danger that energy, courage, self-reliance, and industry have become the common qualities of the northern races; it is by the battle with moral evil in all its hydra-headed forms, that the still nobler qualities of justice and mercy and humanity and self-sacrifice have been steadily increasing in the world. Beings thus trained and strengthened by their surroundings, and possessing latent faculties capable of such noble development, are surely destined for a higher and more permanent existence; and we may confidently believe with our greatest living poet—

> That life is not as idle ore,
> But iron dug from central gloom,
> And heated hot with burning fears,
> And dipt in baths of hissing tears,
> And batter'd with the shocks of doom
> To shape and use.

We thus find that the Darwinian theory, even when carried out to its extreme logical conclusion, not only does not oppose, but lends a decided support to, a belief in the spiritual nature of man. It shows us how man's body may have been developed from that of a lower animal form under the law of natural selection; but it also teaches us that we possess intellectual and moral faculties which could not have been so developed, but must have

had another origin; and for this origin we can only find an adequate cause in the unseen universe of Spirit.

Notes

Preface

1. A partial list, abbreviated for space, includes the following in chronological order: St. George Mivart, *On the Genesis of Species* (1871); Henri Bergson, *Creative Evolution* (1911); Oliver Lodge, *Evolution and Creation* (1926); Jacques Barzun, *Darwin, Marx, Wagner: Critique of a Heritage* (1941); Charles Sherrington, *Man on His Nature* (1941); Gertrude Himmelfarb, *Darwin and the Darwinian Revolution* (1962); *Mathematical Challenges to the Neo-Darwinian Interpretation of Evolution*, edited by Paul S. Moorhead, Martin M. Kaplan, and Pamela Brown, Proceedings of the Wistar Symposium, April 25–26, 1966 (1967); Pierre-P. Grassé, *Evolution of Living Organisms* (1977); Fred Hoyle, *The Intelligent Universe* (1983); Michael Denton, *Evolution: A Theory in Crisis* (1985); R. F. Baum, *Doctors of Modernity: Darwin, Marx, and Freud* (1988); David Stove, *Darwinian Fairytales: Selfish Genes, Errors of Heredity, and Other Fables of Evolution* (1995); Anthony O'Hear, *Beyond Evolution: Human Nature and the Limits of Evolutionary Explanation* (1997); *Alas Poor Darwin: Arguments against Evolutionary Psychology*, edited by Hilary and Steven Rose (2000); Jerry Fodor and Massimo Piattelli-Palmarini, *What Darwin Got Wrong* (2010); Thomas Nagel, *Mind and Cosmos: Why the Neo-Darwinian Conception of Nature Is Almost Certainly False* (2012); and Tom Wolfe, *The Kingdom of Speech* (2016).

2. Edward Manier, "'External Factors' and 'Ideology' in the Earliest Drafts of Darwin's Theory," *Social Studies of Science* 17, no. 4 (November 1987): 581–609; and John Angus Campbell, "Why Was Darwin Believed? Darwin's *Origin* and the Problem of Intellectual Revolution," *Configurations* 11 (2003): 203–37.

Introduction

1. See, for example, Sylvia S. Mader, *Biology*, 7th ed. (New York: McGraw-Hill, 2001), 289, which gives a full-page callout, but mentions only his very early work; Peter H. Raven and George B. Johnson, *Biology*, 6th ed. (New York: McGraw-Hull, 2002), gives a brief paragraph on page 14; and Kenneth A. Mason, Jonathan B. Losos, and Susan R. Singer, *Biology*, 9th ed. (New York: McGraw-Hill, 2011) gives Wallace two sentences on page 10. A book designed to introduce the modern the-

ory of evolution to the general public by Michael Park Allen, *Exploring Evolution* (London: Vivays Publishing, 2012), gives Wallace one sentence on page 59.

2. Ross A. Slotten, *The Heretic in Darwin's Court: The Life of Alfred Russel Wallace* (New York: Columbia University Press, 2004), 96.

3. Alfred Russel Wallace, *My Life: A Record of Events and Opinions*, 2 vols. (New York: Dodd, Mead, 1905), 1: 336.

4. Darwin Correspondence Project, "Letter no. 2294," accessed on February 26, 2016, http://www.darwinproject.ac.uk/DCP-LETT-2294. The claim in Roy Davies, *The Darwin Conspiracy: Origins of a Scientific Crime* (London: Golden Square Books, 2008) that Darwin received the letter two weeks earlier and used the time to make surreptitious amendments to his theory based on Wallace's work has been ably refuted in John van Wyhe and Kees Rookmaaker, "A New Theory to Explain the Receipt of Wallace Ternate Essay by Darwin in 1858," *Biological Journal of the Linnean Society* 105 (January 2012): 249–52.

5. Wallace, *My Life*, 1: 365.

6. Wallace, *My Life: A Record of Events and Opinions*, new ed., condensed and revised (1908; reprinted, [s.l.]: Elibron Classics, 2005), 193.

7. Writing in February 1855, Wallace observed that, "*Every species has come into existence coincident both in space and time with a pre-existing closely allied species*." See excerpt in appendix. The reason it was ignored is debatable. Charles Lyell was impressed with Wallace's paper and urged Darwin to start writing. Edward Blyth (1810–1873), curator of the museum of the Asiatic Society of Bengal in Calcutta, warned Darwin of "Wallace's lucid collation of facts & phenomena." (Quoted in Barbara G. Beddall, "'Notes for Mr. Darwin': Letters to Charles Darwin from Edward Blyth at Calcutta: A Study in the Process of Discovery," *Journal of the History of Biology* 6, no. 1 [1973]: 69–95.) Frank Egerton believes Darwin saw "nothing new" in Wallace's Sarawak Law paper because he had suggested "that existing animals have a relation in form with extinct species" as early as 1839. See his "History of Ecological Systems, Part 42: Victorian Naturalists Abroad—Hooker, Huxley, Wallace," *Bulletin of the Ecological Society of America* 93, no. 2 (2012): 125–59. But this brief and rather vague observation by Darwin was nothing as detailed and systematic as Wallace's article. Darwin should have taken notice. It is hard to dismiss Janet Browne's assessment that "he was not prepared to see the possibility that someone else might be hesitantly circling around before arriving at the same theory. His work, not Wallace's, was primary." See her *Charles Darwin: Voyaging* (Princeton, NJ: Princeton University Press, 1995), 538.

8. Ralph Colp Jr., "'I Will Gladly Do My Best': How Charles Darwin Obtained a Civil List Pension for Alfred Russel Wallace," *Isis* 83, no. 1 (1992): 2–26.

9. There are numerous printings of *The Malay Archipelago*. The most useful is *The Annotated Malay Archipelago*, edited by John van Wyhe (Singapore: NUS Press, 2015). It includes a historical introduction, publication history, travel itineraries, and more than eight hundred informed and scholarly notes. All references are to this edition.

10. Wallace's literary influences are thoroughly covered in Peter Raby, "The 'Finest Butterfly in the World?': Wallace and His Literary Legacy," in *Natural Selection and Beyond: The Intellectual Legacy of Alfred Russel Wallace*, ed. Charles H. Smith and George Beccaloni (New York: Oxford University Press, 2008), 223–34.

11. Brett R. Riddle, "The International Biogeography Society and the Inaugural Alfred Russel Wallace Award," *Journal of Biogeography* 32 (2005): 1507–8.

12. *Tropical Nature and Other Essays* (1878; reprinted, [s.l.]: Elibron Classics, 2004), vii. One of the more interesting features of this book is Wallace's discussion of the early origins of man, which will be addressed in detail in chapter 1.

13. Slotten, *Heretic*, 352. But ecological concerns can be found in *The Malay Archipelago* as well. While on the Aru Islands, for example, he bemoaned the inevitable extinction of the natural beauty of such a remote region at the hands of "civilized men" (see p. 588). Modern-day adventurer Tim Severin repeated Wallace's travels in Maritime Southeast Asia in 1996 aboard the *Alfred Wallace*, a replica of a 14.3-meter (47-foot) prau similar to one that Wallace sailed in. Severin's experience is masterfully interwoven with Wallace's own of 140 years earlier. Had Wallace been with Severin on his voyage he would have been pleased to see the growth and prosperity of the people as well as remaining spots of unspoiled tropical beauty. But the trafficking in rare species and poorly controlled poaching would have disturbed him. Most troubling of all would have been the desecration of Ambon harbor, once bejeweled in a coral garden showcased in crystal clear water; now the coral has been permanently destroyed and the pure water of Wallace's day replaced with "a loathsome brown stew of pollution." See Tim Severin, *The Spice Islands Voyage: The Quest for Alfred Wallace, the Man Who Shared Darwin's Discovery of Evolution* (New York: Carroll and Graf, 1998).

14. Letter from Darwin to Wallace, November 3, 1880, in *Alfred Russel Wallace: Letters and Reminiscences*, edited by James Marchant, 2 vols. (London: Cassell, 1916), 1: 307.

15. Michael Shermer, *In Darwin's Shadow: The Life and Science of Alfred Russel Wallace: A Biographical Study on the Psychology of History* (New York: Oxford University Press, 2002), 15–17.

16. Amabel Williams-Ellis, *Darwin's Moon: A Biography of Alfred Russel Wallace* (London: Blackie, 1966); Jonathan Rose, "Missing Link: Alfred Russel Wallace, Charles Darwin's Neglected Double," *New Yorker*, February 12, 2007, 76–81; Kevin Leonard, "Why Does Charles Darwin Eclipse Alfred Russel Wallace?" BBC News, accessed on February 19, 2016, http://www.bbc.com/news/uk-wales-215490079.

17. Michael Ruse, "The Darwin Industry: A Guide," *Victorian Studies* 39, no. 2 (1996): 217–25, at 228.

18. Andrew Berry, "Alfred Russel Wallace—Natural Selection, Socialism, and Spiritualism," *Current Biology* 23, no. 24 (2013): R1066–R1069, at R1068.

19. For detailed analysis on the influence of phrenology on Wallace, see Frank Miller Turner, *Between Science and Religion: The Reaction to Scientific Naturalism in Late Victorian England* (New Haven, CT: Yale University Press, 1974), 68–103; on spiritualism, see Malcom Jay Kottler, "Alfred Russel Wallace, the Origin of Man, and Spiritualism," *Isis* 65, no. 2 (1974): 145–92; on antivaccination, see Michael A. Flannery, "Alfred Russel Wallace's Medical Libertarianism: State Medicine, Human Progress, and Evolutionary Purpose," *Journal of the History of Medicine and Allied Science* 70 (January 2015): 74–104; on women, see Diane B. Paul, "Wallace, Women, and Eugenics," in Smith and Beccaloni, *Natural Selection and Beyond*, 263–78; and for more comprehensive coverage, see Slotten, *Heretic*; Peter Raby, *Alfred Russel Wallace: A Life* (London: Chatto and Windus, 2001); and Martin Fichman, *An Elu-*

sive Victorian: The Evolution of Alfred Russel Wallace (Chicago: University of Chicago Press, 2004).

20. Fichman, *Elusive Victorian*, 132.

21. Fichman, *Elusive Victorian*, 118.

22. Scientific materialism is the belief that "physical reality, as made available to the natural sciences, is really all there is." See John F. Haught, *Making Sense of Evolution: Darwin, God, and the Drama of Life* (Louisville, KY: John Knox Press, 2010), 48.

23. John Tyndall, "Scope and Limit of Scientific Materialism," in *Fragments of Science for Unscientific People* (New York: Appleton, 1871), 107–22. Thomas Henry Huxley preferred the term *scientific naturalism*, but this was merely his effort to avoid the negative connotations of materialism. Tyndall's original phrase is adopted here as more descriptively accurate of the nature of the argument and its metaphysical commitments. For more on scientific naturalism, see George Levine, "Paradox: The Art of Scientific Naturalism," in *Victorian Scientific Naturalism: Community, Identity, Continuity*, ed. Gowan Dawson and Bernard Lightman (Chicago: University of Chicago Press, 2014), 79–97.

24. There are many different kinds of scientism, but ontological scientism comes closest to Tyndall's scientific materialism. Mikael Stenmark, "What Is Scientism?" *Religious Studies* 33, no. 1 (1997): 15–32.

25. John Dupré, "Materialism, Physicalism, and Scientism," *Philosophical Topics* 16, no. 1 (1988): 31–56, at 53.

26. This aspect of scientism was pointed out long ago by W. H. Werkmister, "Scientism and the Problem of Man," *Philosophy East and West* 9, nos. 1/2 (1959): 20–21). As an example, consider Tyndall's primacy of "natural facts" over all other epistemic sources when he declares, "Again, I say, where the aim is to elevate the mind, to quicken the moral sense, to kindle the fire of religion in the soul, let the affections by all means be invoked; but they must not be permitted to color our reports, or to influence our acceptance of reports of occurrences in external Nature. Testimony as to natural facts is usually worthless when wrapped in this atmosphere of the affections, the most earnest subjective truth being thus rendered perfectly compatible with the most astounding objective error." See his *Fragments of Science*, 51.

27. By *theistic pluralist* I mean simply, as in the *Dictionary of Philosophy*, that "the world contains many kinds of existent, which in their uniqueness cannot be reduced to just one (monism [e.g., Ernst Haeckel]) or two (dualism [e.g., René Descartes])," and that each kind is ultimately under the direct or indirect providence of a supreme mind, entity, or deity. This form of pluralism is distinguished, for example, from Bertrand Russell's logical atomism, which is nontheistic. Charles Peirce, in his view of three Universes to be discussed later, would be another example of a theistic pluralist. See Anthony Flew, *A Dictionary of Philosophy*, 2nd ed. (New York: St. Martin's Press, 1984), 278.

28. Andrew J. Reck, "The Philosophy of John Elof Boodin (1869–1950)," *Review of Metaphysics* 15, no. 1 (1961): 148–73, at 172.

29. Reck, "Philosophy of John Elof Boodin." 150.

30. Francisco J. Ayala, "Darwin's Explanation of Design: From Natural Theology to Natural Selection," *Infection, Genetics, and Evolution* 10 (2010): 840–43.

31. Ernst Mayr, "Darwin's Impact on Modern Thought," *Proceedings of the Amer-*

ican Philosophical Society 139, no. 4 (1995): 317–25. It has been argued that Mayr's analysis is an erroneous reading of history that seeks to create a triumphalist narrative for the neo-Darwinian synthesis. For a detailed discussion, see Ron Amundson, *The Changing Role of the Embryo in Evolutionary Thought: Roots of Evo-Devo* (New York: Cambridge University Press, 2005).

32. This follows the usage of Neal C. Gillespie. Gillespie admits that the term is not perfect, but in order to distinguish it from *naturalism*, which is often regarded simply as any law-based science, thus obscuring the theological implications with which it is often associated. Like Gillespie, I "have found it difficult for stylistic reasons to avoid the occasional use of 'naturalism' in some form as a synonym for 'positivism.'" Forewarned is forearmed. See Gillespie's *Charles Darwin and the Problem of Creation* (Chicago: University Press of Chicago, 1979), 8, 159.

33. Gillespie, *Charles Darwin and the Problem*, 20, 148.

34. William B. Huntley, "David Hume and Charles Darwin," *Journal of the History of Ideas* 33, no. 3 (1972): 457–70; and Silvan S. Schweber, "The Young Darwin and His Cultural Circle," *Journal of the History of Biology* 12, no. 1 (1979): 175–92.

35. Max Horkheimer, *Critical Theory: Selected Essays*, trans. Matthew J. O'Connell et al. (New York: Seabury Press, 1972), 14. Some may object to the term "positivistic materialism" as positivism seeks to eschew all theories and metaphysical positions. However, Horkheimer points out, "Materialism has in common with positivism that it acknowledges as real only what is given in sense experience, and it has done so since its beginnings" (42).

36. Max Horkheimer, *Eclipse of Reason* (1947; new edition, New York: Continuum, 1974), 123–27.

37. Quoted in Paul Janet, *Final Causes*, trans. William Affleck (Edinburgh: T. and T. Clark, 1878), [viii].

38. Doren Recker, "There's More Than One Way to Recognize a Darwinian: Lyell's Darwinism," *Philosophy of Science* 57, no. 3 (1990): 459–78. Although Recker offers some helpful ideas in identifying key players in the development and promotion of Darwinian evolution, his title proves his point. He sees Lyell as a Darwinian, but by his own admission Lyell was never comfortable with the explanatory power of natural selection or with Darwin's naturalistic view of humankind, and both are essential components of Darwinian theory. It seems more accurate to argue that Lyell was a close friend and colleague of Darwin who never became in any meaningful sense a Darwinian.

39. St. George Mivart, *Genesis of Species* (1871; reprinted, [s.l.]: Forgotten Books, 2012); and St. George Mivart, [1871]. "Review of *The Descent of Man*," *Quarterly Review* 131 (July): 47–90. Accessed on January 10, 2016, http://www.darwin-online.org.uk.

40. Wallace, *My Life*, 2: 22.

41. Alfred Russel Wallace, "Review of Lyell's *Principles of Geology* and *Elements of Geology*," *Quarterly Review* 126 (April 1869): 359–94.

42. See Edward Caudill, "The Bishop-Eaters: The Publicity Campaign for Darwin and on the Origin of Species," *Journal of the History of Ideas* 55, no. 3 (1994): 441–60. The X Club roster serves as a good index of leading Darwinists in London insofar as they were *all* ideologically and socially adherents to the essentials of the theory. Besides the leader and organizer Huxley, the list included Joseph Hooker (Darwin's most intimate confidant); John Tyndall, a close friend of Huxley;

George Busk (1807–1886), close friend of Hooker and Linnean Society secretary who read the Darwin-Wallace papers at the unveiling of natural selection; Edward Frankland (1825–1899), a chemist and friend of Tyndall; Herbert Spencer (1820–1903), philosopher and friend of Huxley and Wallace; Thomas Hirst (1830–1892), mathematician and friend of Tyndall who was converted to transmutation upon reading Robert Chambers's *Vestiges*; William Spottiswoode (1825–1883), a mathematician-turned-physicist and president of the Royal Society; and John Lubbock (1834–1913), the well-connected son of Sir John Lubbock, 3rd Baronet, a neighbor of Darwin and a frequent visitor to Down House. While Recker's general framework for identifying a "Darwinian" seems acceptable enough, he ignores the degree to which certain religious and metaphysical commitments became a litmus test for intellectual *and* social alliance with Darwinian theory.

43. St. George Mivart, "Some Reminiscences of Thomas Henry Huxley," *Nineteenth Century* 42 (July–December 1897): 985–98, at 996.

44. Others have used this phrase—e.g., Claire Quinn, *Intelligent Evolution: An Alternate Theory of Evolution* ([s.l.]: CreateSpace, 2015); Joseph Adam Pearson, *Intelligent Evolution* (Dayton, TN: Christ Evangelical Bible Institute, 2016). As we shall see in chapter 7, Schwartz and Simon's grounding in Spiritualism has them use the term in some very similar senses to Wallace. Quinn's treatment is a revisiting of the panspermia theory proposed through the vitalist doctrines of Jöns Jacob Berzelius (1779–1848). Pearson's is a creationist version of change through time rooted in a fundamentalist *sola scriptura* tradition significantly different from Wallace. While Wallace himself never used the phrase, elsewhere I have argued that it best characterizes his evolutionary ideas: see *Alfred Russel Wallace's Theory of Intelligent Evolution: How Wallace's* World of Life *Challenged Darwinism*, ed. with intro. by Michael A. Flannery, rev. ed. (Reisel, TX: Erasmus Press), 2011; and "Alfred Russel Wallace, Nature's Prophet: From Natural Selection to Natural Theology," in *Naturalists, Explorers, and Field Scientists in South-East Asia and Australasia*, ed. I. Das and A. A. Tuen, Topics in Biodiversity and Conservation 15 (Dordrecht: Springer, 2016), 51–70.

45. Daniel C. Dennett, *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (New York: Simon and Schuster, 1995), 63.

46. Dennett, *Darwin's Dangerous Idea*, 520.

47. R. H. Barfield, "Darwinism," in *Evolution of Consciousness: Studies in Polarity*, ed. Shirley Sugerman, A Festschrift in Honor of Owen Barfield (San Rafael, CA: Barfield Press, 1980), 69–82, at 80.

48. Sherrie Lynne Lyons, *Species, Serpents, Spirits, and Skulls: Science at the Margins in the Victorian Age* (Albany: State University of New York Press, 2009), 144.

49. Arthur Koestler, *The Sleepwalkers: A History of Man's Changing Vision of the Universe* (1959; reprinted, London: Arkana, 1989), 523.

50. Sharrona Pearl, "Review of *Species, Serpents, Spirits, and Skulls*, by Sherrie Lynne Lyons," *Victorian Studies* 53, no. 1 (2010): 141–43, at 142.

Chapter 1

1. Published in the *Journal of the Anthropological Society of London* 2 (1864): clviii–clxxxvii.

2. Herbert H. Odom, "Generalizations on Race in Nineteenth-Century Anthropology," *Isis* 58, no. 1 (1967): 4–18, at 6.

3. John Duffy, "States' Rights Medicine," in *Science and Medicine*, ed. James G. Thomas Jr. and Charles Regan Wilson (Chapel Hill: University of North Carolina Press, 2012), 120–23.

4. Quoted in Odum, "Generalizations on Race," 9.

5. There are excellent discussions of the ESL and ASL controversies in the context of Wallace's 1864 paper and its reception in Raby, *Alfred Russel Wallace*, 175–78; Slotten, *Heretic*, 207–15; and Fichman, *Elusive Victorian*, 154–57.

6. Jeremy Vetter, "The Unmaking of an Anthropologist: Wallace Returns from the Field, 1862–1870," *Notes and Records of the Royal Society* 64 (2010): 25–42, at 27.

7. Wallace, "Origin," clxii.

8. Wallace, "Origin," clxv.

9. Wallace, "Origin," clxvi.

10. Wallace, "Origin," clxviii.

11. Wallace, "Origin," clxix.

12. Wallace, "Origin," clxx.

13. Wallace, "Origin," clxiv.

14. Wallace, "Origin," clxx.

15. Wallace, "Origin," clxxx.

16. Raby, *Alfred Russel Wallace*, 178.

17. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 152.

18. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 154.

19. Joel S. Schwartz, "Darwin, Wallace, and the 'Descent of Man,'" *Journal of the History of Biology* 17, no. 2 (1984): 271–89, at 275.

20. Charles Lyell, *The Geological Evidences of the Antiquity of Man* (London: John Murray, 1863), 504.

21. Schwartz, "Darwin, Wallace," 279–80.

22. William James, review of "The Origin of Human Races and the Antiquity of Man," *North American Review* 101, no. 208 (1865): 261–63. The article itself is unsigned, but the original manuscript has been confirmed among James's papers. See Robert D. Richardson, *William James: In the Maelstrom of American Modernism* (Boston: Houghton Mifflin, 2006), 537.

23. Fichman, *Elusive Victorian*, 110.

24. Charles Darwin, *Descent of Man: And Selection in Relation to Sex* (1871; reprinted, New York: Barnes and Noble Books, 2004), 154.

25. John S. Haller Jr., *Outcasts from Evolution: Scientific Attitudes of Racial Inferiority, 1859–1900*, new ed. (Carbondale: Southern Illinois University Press, 1995), 80–81.

26. George M. Fredrickson, *Black Image in the White Mind: The Debate on Afro-American Character and Destiny, 1817–1914* (New York: Harper and Row, 1972), 234.

27. Fredrickson, *Black Image in the White Mind*, 235.

28. Thomas Henry Huxley, *Lay Sermons, Addresses, and Reviews* (London: Macmillan, 1887), 17.

29. Huxley, *Lay Sermons*, 18.

30. Darwin, *Descent of Man*, 42.

31. Adrian Desmond and James Moore, *Darwin's Sacred Cause: How a Hatred of Slavery Shaped Darwin's Views on Human Evolution* (Boston: Houghton Mifflin, 2009), 318. See also Michael A. Flannery, "*Darwin's Sacred Cause* Offers Little New and Nothing of Importance," Discovery Institute, https://www.discovery.org/a/14441.

32. Lyell, *Geological Evidences*, 228.

33. Wallace wasn't questioning the concept of a branching tree as the undergirding concept of Darwin's evolutionary scheme; he apparently accepted it approvingly. See Barbara G. Bedall, "Wallace's Annotated Copy of Darwin's 'Origin of Species,'" *Journal of the History of Biology* 21, no. 2 (1988): 269–89. But that didn't mean that it needed to conform to every notion of how each taxonomic branch had to be configured.

34. Lyell, *Geological Evidences*, 496–97.

35. Lyell, *Geological Evidences*, 506.

36. For an excellent summary of the influence of Lyell upon Wallace and their close relationship, see Slotten, *Heretic*, 217–19.

37. Alfred Russel Wallace, *A Narrative of Travels on the Amazon and Rio Negro: With an Account of the Native Tribes* (London: Reeve, 1853), 476–77. This anthropological material is also reproduced in a second edition with an interesting biographical sketch by G. T. Bettany published in London by Ward, Lock, and Company still available in print, see *A Narrative of Travels on the Amazon and Rio Negro*, 2nd ed. (1889; reprinted, Miami, FL: Hardpress, [2010]), 331–63.

38. Wallace, *Narrative of Travels*, 519.

39. Wallace, *My Life*, 1: 342–43.

40. Charles Darwin, *Voyage of the* Beagle *Round the World* (1837; reprinted, New York: Tess Press, 2005), 199–200.

41. Wallace, *My Life*, 1: 366.

42. Wallace, *My Life*, 383.

43. Fichman, *Elusive Victorian*, 33.

44. Paul Johnson, *Darwin: Portrait of a Genius* (New York: Viking, 2012), 29–30.

45. Charles Wellington Furlong, "The Haush and Ona, Primitive Tribes of Tierra del Fuego," in *Proceedings of the Nineteenth International Congress of Americanists*, ed. F. W. Hodge (Washington, DC: Congress of Americanists, 1917), 432–44.

46. Kathleen Bolling Lowrey, "Alfred Russel Wallace as Ancestor Figure," *Anthropology Today* 26, no. 4 (2010): 18–21, at 19.

47. Wallace, *Malay Archipelago*, 176.

48. Wallace, *Malay Archipelago*, 501–2.

49. Lyons, *Species, Serpents, Spirits, and Skulls*, 119.

50. Wallace, "The Limits of Natural Selection as Applied to Man," in *Contributions to the Theory of Natural Selection: A Series of Essays* (New York: Macmillan, 1871), 332–72, at 359.

51. Wallace, "The Development of Human Races, Under the Law of Natural Selection," in *Contributions*, 359.

52. Slotten, *Heretic*, 326. Address by Alfred Russel Wallace, *Report of the Forty-Sixth Meeting of the British Association for the Advancement of Science* (London: John Murray, 1877), 100–119. The address was republished as chapter 7, "By-Paths in the Domain of Biology," in Wallace's *Tropical Nature and Other Essays* (see introduc-

tion, note 12). The anthropological portion is found in the subsection, "Rise and Progress of Modern Views as the Antiquity and Origin of Man," 280–303.

53. Wallace, *Tropical Nature*, 285.

54. Wallace, *Tropical Nature*, 289.

55. Wallace, *Tropical Nature*, 290, 303. Wallace adopted an interesting rhetorical strategy as he trod on such treacherous ground. Arguing that human origins likely dated back to the Tertiary period, he admitted that little or no evidence for that assertion existed in the anthropological record. If *Homo sapiens* originated at a much later date, as the lack of evidence might suggest, then almost surely some "distinct and higher agencies" would need to be called upon to explain "his mental and moral nature." Since Wallace was already on record as having called upon such "agencies" as well as supporting an especially ancient origin of man, he was essentially saying that the period at which humans might be said to have emerged was beside the point, natural selection was inadequate to explain humans' higher mental attributes either way.

56. Janet Browne, *Charles Darwin: The Power of Place* (Princeton, NJ: Princeton University Press, 2002), 248.

57. John Tyndall, "Address," *Report of the Forty-Fourth Meeting of the British Association for the Advancement of Science* (London: John Murray, 1875), xcv.

Chapter 2

1. *Report of the First and Second Meetings of the British Association for the Advancement of Science, at York in 1831 and Oxford in 1832*, 2nd ed. (London: John Murray, 1835), 17; see also O. J. R. Howarth, *The British Association for the Advancement of Science: A Retrospect, 1831–1921* (London: The Association, 1922), 5.

2. Quoted in Laura J. Snyder, *The Philosophical Breakfast Club: Four Remarkable Friends Who Transformed Science and Changed the World* (New York: Broadway Books, 2011), 3. Snyder gives an engaging history of the formation of the BAAS and the establishment of modern science under impetus of Charles Babbage, John Herschel, William Whewell, and Richard Jones.

3. Snyder, *Philosophical Breakfast Club*, 154.

4. Simon Eliot, *Some Patterns and Trends in British Publishing, 1800–1919*, Occasional Papers of the Bibliographical Society 8 (London: Bibliographical Society, 1994), 7–8.

5. Eliot, *Some Patterns and Trends*, 86.

6. Kenneth O. Morgan, ed., *The Oxford Illustrated History of Britain* (Oxford: Oxford University Press, 1993), 465.

7. Browne, *Power of Place*, 35.

8. Johanna Lemon, "The Great Stink: Cholera and the Thames," City of Westminster Archives. Accessed April 22, 2016, http://www.choleraandthethames.co.uk/cholera-in-london/the-great-stink/.

9. The proceedings have been reproduced with the papers presented in the order given—first extracts from Darwin's 1844 manuscript, then the abstract of a letter from Darwin to the noted American naturalist Asa Gray dated September 5, 1857, and finally Wallace's letter. See George Sarton, compiler, "Discovery of the Theory of Natural Selection," *Isis* 14, no. 1 (1930): [133–54]. Original pagination

from the Linnean publication was retained in the article; all subsequent references are given to this reissue in brackets. Lyell and Hooker arranged the order to leave no doubt as to Darwin's priority. While Darwin appreciated the enthusiasm of his friends in hastily gathering everything together and setting the agenda, his biographer, Janet Browne, has noted that the whole affair was a matter of some embarrassment to him, "Even Darwin winced when he saw the layout some weeks later. He had assumed," she adds, "that his remarks would appear as a kind of appendix or as footnotes to Wallace." See her *Power of Place*, 40.

10. Quoted in Ricardo Guerrero, "The Session That Did Not Shake the World (The Linnean Society, 1st July 1858)," *International Microbiology* 11 (2008): 209–12, at 212.

11. Guerrero, "The Session," 212.

12. Richard England, "Natural Selection before the Origin: Public Reactions of Some Naturalists to the Darwin-Wallace Papers (Thomas Boyd, Arthur Hussey, and Henry Baker Tristram)," *Journal of the History of Biology* 30, no. 2 (1997): 267–90, at 267.

13. England, "Natural Selection before the Origin," 276.

14. England, "Natural Selection before the Origin," 278.

15. England, "Natural Selection before the Origin," 278–79.

16. England, "Natural Selection before the Origin," 286.

17. England, "Natural Selection before the Origin," 285–86.

18. Both sketches are discussed in Bowlby, *Charles Darwin*, 245, 254.

19. Sarton, "Discovery of the Theory of Natural Selection," [138].

20. Sarton, "Discovery of the Theory of Natural Selection," [141].

21. Sarton, "Discovery of the Theory of Natural Selection," [142–44].

22. Sarton, "Discovery of the Theory of Natural Selection," [144].

23. Sarton, "Discovery of the Theory of Natural Selection," [148].

24. James T. Costa, *Wallace, Darwin, and the Origin of Species* (Cambridge, MA: Harvard University Press, 2014), 214. Costa also gives a detailed explication of the Darwin-Wallace papers in chapters 4 and 5. Overall, however, Costa tends to overstress the similarities of the two theories.

25. See Slotten, *Heretic*, 159–60; Fichman, *Elusive Victorian*, 104; Malcolm Jay Kottler, "Charles Darwin and Alfred Russel Wallace: Two Decades of Debate over Natural Selection," in *The Darwinian Heritage: A Centennial Retrospect*, ed. David Kohn (Princeton, NJ: Princeton University Press, 1985), 367–432; Peter J. Bowler, "Alfred Russel Wallace's Concepts of Variation," *Journal of the History of Medicine and Allied Sciences* 31, no. 1 (1976): 17–29; Jean Gayon, *Darwinism's Struggle for Survival: Heredity and the Hypothesis of Natural Selection*, trans. Matthew Cobb (Cambridge: Cambridge University Press, 1998), esp. chapter 1, "Wallace and Darwin: A Disagreement and Its Meaning"; Michael Bulmer, "The Theory of Natural Selection of Alfred Russel Wallace FRS," *Notes and Record of the Royal Society of London* 59, no. 2 (22, 2005): 125–36; Melinda B. Fagan, "Wallace, Darwin, and the Practice of Natural History," *Journal of the History of Biology* 40, no. 4 (2007): 601–35; and Ulrich Kutschera and Uwe Hossfeld, "Alfred Russel Wallace (1823–1913): The Forgotten Co-founder of the Neo-Darwinian Theory of Biological Evolution," *Theory in Biosciences* 132 (2013): 207–14.

26. Bulmer, "Theory of Natural Selection," 132.

27. Fagan, "Wallace, Darwin," 629.

28. Riddle, "International Biogeography Society and the Inaugural Alfred Russel Wallace Award," 1507.

29. Wallace scholar Charles H. Smith has made much of this passage. Noting Gregory Bateson's original suggestion, Smith has supported the notion that Wallace was proposing an early cybernetic model. See Smith's "Wallace's Unfinished Business," *Complexity* 10, no. 2 (2004): 25–32; and "Wallace, Past and Future," *Journal of Biogeography* 32 (2005): 1509–15. Whether or not that is actually the case is open to debate. If anything, Wallace's use of the steam engine governor is more indicative of natural theologians for whom grand analogy between divine and natural contrivances was commonplace. This is not to suggest that the Ternate letter was making a natural theologian's argument, only that even at this early stage he was thinking like one. See my counter to Smith here: "Planetary History, Wallace, and Natural Selection," *Journal of Interdisciplinary History* 43, no. 1 (2012): 63–76, at 71–73.

30. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 171.

31. Charles H. Smith has compiled an impressive list of such quotations on this aspect of Wallace's thinking. See his "Alfred Russel Wallace and the Elimination of the Unfit," *Journal of Biosciences* 37, no. 2 (2012): 203–5.

32. C. Lloyd Morgan, "Elimination and Selection," *Bristol Naturalists Society Proceedings* 5 (1888): 273–85.

33. Morgan, "Elimination and Selection," 283.

34. Morgan, "Elimination and Selection," 284–85.

35. Morgan, "Elimination and Selection," 276.

36. Sarton, "Discovery of the Theory of Natural Selection," [152].

37. Gayon, *Darwin's Struggle for Survival*, 59.

38. Fichman, *Elusive Victorian*, 101, 102.

39. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 135.

40. Sarton, "Discovery of the Theory of Natural Selection," [134]. The question of whether Darwinian theory declined in importance from roughly the 1880s through its reestablishment with the neo-Darwinian synthesis in the late 1930s has lodged itself within historiographical orthodoxy but not without some dissent. The biggest modern proponent has been Peter J. Bowler. See his *Eclipse of Darwinism: Anti-Darwinian Evolution Theories in the Decades around 1900* (Baltimore: Johns Hopkins University Press, 1983); and his "Revisiting the Eclipse of Darwinism," *Journal of the History of Biology* 38, no. 1 (2005): 19–32. But Nicholas Rasmussen gave a tepid response to the eclipse thesis, calling Bowler's approach "old-fashioned history of ideas" and evincing "a deep tendency to explain the past in terms of the present." See his review of *The Eclipse of Darwinism* in the *Quarterly Review of Biology* 68, no. 4 (1993): 564. More recently, Mark A. Largent has leveled some serious criticisms against the term if not the concept in "The So-Called Eclipse of Darwinism," in *Descended from Darwin: Insights into the History of Evolutionary Studies, 1900–1970*, Transactions of the American Philosophical Society, vol. 99, pt. 1 (Philadelphia: American Philosophical Society, 2009): 3–21.

41. Gayon, *Darwin's Struggle for Survival*, 40.

42. Peter J. Bowler, "Darwin's Originality," *Science* 323 (January 9, 2009): 223–26, at 225.

43. Adrian Desmond and James Moore, *Darwin: The Life of a Tormented Evolutionist* (New York: W. W. Norton, 1991), 240–41.

44. Desmond and Moore, *Darwin: The Life*, 273–74.

45. Jiri Syrovatka, "Analogy and Understanding," *Theoria* 15, no. 3 (2000): 435–50.

46. See Ilkka Niiniluoto, "Analogy and Inductive Logic," *Erkenntis* 16, no. 1 (1981): 1–34; and the classic essay by P. R. Wilson, "On the Argument by Analogy," *Philosophy of Science* 31, no. 1 (1964): 34–39.

47. Bowler, "Alfred Russel Wallace's Concepts of Variation," 29; L. T. Evans, "Darwin's Use of the Analogy between Artificial and Natural Selection," *Journal of the History of Biology* 17, no. 1 (1984): 113–40; and Mary M. Bartley, "Darwin and Domestication: Studies on Inheritance," *Journal of the History of Biology* 25, no. 2 (1992): 307–33.

48. Bert Theunissen, "Darwin and His Pigeons: The Analogy Between Artificial and Natural Selection Revisited," *Journal of the History of Biology* 14, no. 2 (2012): 179–212.

49. Theunissen, "Darwin and His Pigeons," 189.

50. Theunissen, "Darwin and His Pigeons," 197.

51. Sander Gliboff, *H. G. Bronn, Ernst Haeckel, and the Origins of German Darwinism: A Study in Translation and Transformation* (Cambridge, MA: MIT Press, 2008), 115, 132.

52. Loren Eiseley, *Darwin's Century: Evolution and the Men Who Discovered It* (1958; reprinted, New York: Barnes and Noble, 2009), 193.

53. Pierre-P. Grasse, *Evolution of Living Organisms: Evidence for a New Theory of Transformation* (New York: Academic Press, 1977), 124–25. Originally published in Paris as *L'evolution du vivant* (1973), 125.

54. Hugo de Vries, *Species and Varieties: Their Origin by Mutation* (Chicago: Open Court, 1905), 825.

55. Vries, *Species and Varieties*, 825–26.

56. This interpretation is suggested in Richard A. Richards, "Darwin and the Inefficacy of Artificial Selection," *Studies in the History and Philosophy of Science* 28, no. 1 (1997): 75–97. Richards insists that Darwin's argument is not an analogy at all but "a series of inductive arguments" made for their heuristic value. But this seems to parse things too finely. As we have seen, there is no reason to treat these as mutually exclusive. Analogies can be heuristic *and* inductive. For an excellent summary of those who acknowledge in various ways the heuristic function of analogy (e.g., Chaim Perelman and L. Olbrechts-Tytecca, Max Black, Mary Hesse, and W. H. Leatherdale), see Heather Broadie Graves, "Marbles, Dimples, Rubber Sheets, and Quantum Wells: The Role of Analogy in the Rhetoric of Science," *Rhetoric Society Quarterly* 28, no. 1 (1998): 25–48.

57. Paul H. Barrett et al., eds., *Charles Darwin's Notebooks, 1836–1844* (London: British Museum (Natural History); New York: Cambridge University Press, 1987), Notebook B, 178.

58. Barrett et al., *Charles Darwin's Notebooks*, Notebook B, 231.

59. Barrett et al., *Charles Darwin's Notebooks*, Notebook E, 416.

60. Charles Darwin, *The Foundations of the* Origin of Species*: Two Essays Written in 1842 and 1844*, ed. Francis Darwin (1909; reprinted, New York: Kraus Reprint, 1969), 6.

61. Charles Darwin, *On the Origin of Species*, edited by Jim Endersby (1859; reprinted, Cambridge: Cambridge University Press, 2009), 72–73. All subsequent

references are to this printing. The only difference in 1872's sixth edition is the addition of an exclamation point after "geological periods," presumably for emphasis.

62. Charles Darwin, *Variation of Animals and Plants under Domestication*, 2nd ed., rev. 2 vols. (New York: D. Appleton, 1883), 1: 9. All subsequent references are to this edition.

63. Darwin, *Variation of Animals and Plants*, 2: 496.

64. David N. Reznick, *The* Origin *Then and Now: An Interpretative Guide to the* Origin of Species (Princeton, NJ: Princeton University Press, 2010), 44–45.

65. Reznick, Origin *Then and Now*, 79.

66. Browne, *Power of Place*, 88–89.

67. Thomas F. Glick, *What about Darwin?* (Baltimore: Johns Hopkins University Press, 2010), xxiii.

68. Gertrude Himmelfarb, *Darwin and the Darwinian Revolution* (1962; reprinted, Chicago: Elephant Paperbacks, 1996), 350.

69. Quoted in Desmond and Moore, *Darwin: The Life*, 153, 486.

70. Charles Kingsley, *Charles Kingsley: His Letters and Memoirs of His Life* (New York: Scribner, Armstrong, 1877), 378.

71. Browne, *Power of Place*, 107.

72. "Objections to Mr. Darwin's Theory of the Origin of Species," *The Spectator*, March 24, 1860, 285–86.

73. Snyder's *Philosophical Breakfast Club* paints too sanguine a picture of Herschel and Whewell's attitude toward *Origin* in her chapter, "Nature Decoded" (312–42). She makes much of the fact that neither Herschel nor Whewell publicly denounced Darwin, but Whewell in particular often adopted a minimalist posture with regard to objectionable ideas. For example, when Robert Chambers anonymously published his transmutationist *Vestiges of the Natural History of Creation* in 1844, Whewell refused to review it in any scholarly journal and didn't even mention it by name in his 1845 pamphlet *Indications of the Creator* even though *Vestiges* was its main target.

74. Michael Ruse, introduction to Reznick, Origin *Then and Now*, 15.

75. Quoted in Browne, *Power of Place*, 106.

76. Browne, *Power of Place*, 107.

77. John Herschel, *Physical Geography*, 2nd ed. (Edinburgh: Adam and Charles Black, 1862), 12.

78. Darwin wrote to Joseph Hooker on March 29, 1863, "But I have long regretted that I truckled to public opinion & used Pentateuchal term of creation, by which I really meant 'appeared' by some wholly unknown process.—It is mere rubbish thinking, at present, of origin of life; one might as well think of origin of matter." Darwin Correspondence Project, "Letter no. 4065," accessed on May 27, 2016, https://www.darwinproject.ac.uk/letter/DCP-LETT-4065.xml. But if Darwin regretted truckling so much, why did he not remove it from his fourth edition published in 1866 up to the sixth and last one published in 1872?

79. Charles Hodge, *What Is Darwinism?* (1874; reprinted: [s.l.]: Bibliobazaar, 2007), 109.

80. James R. Moore, *The Post-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America, 1870–1900* (London: Cambridge University Press, 1979), 89. Other research confirms Moore's assessment. Jerry N. Pittman's analysis of three religious serials in Nova Scotia—

the *Christian Messenger*, the *Wesleyan*, and the *Presbyterian Witness*—suggests that theologians were prepared to accept evolution by committing to a doctrinal policy that God's words and His works could not be in conflict. Nevertheless, they were far from admitting that transmutation had been proven and contended instead over the nature of science and scientific "truth." Even Darwin's law-based universe required a Law giver. See his "Darwinism and Evolution: Three Nova Scotia Religious Newspapers Respond, 1860–1900," *Acadiensis* 22, no. 2 (1993): 40–60. Leading theologian and Darwinian theist Aubrey Moore (1848–1890) attempted a "new teleology" interpreting natural law as the operation of an immanent Logos, paving the way for a neo-Darwinism under a Christian banner. See Richard England, "Natural Selection, Teleology, and the Logos: From Darwin to the Oxford Neo-Darwinists, 1859–1909," *Osiris* 16, Science in Theistic Contexts (2001): 270–87.

81. John Lyon, "Immediate Reactions to Darwin: The English Catholic Press' First Reviews of the 'Origin of the Species,'" *Church History* 41, no. 1 (1972): 78–93.

82. Charles Darwin, *On the Origin of Species*, edited by Jim Endersby (1859; reprinted, Cambridge: Cambridge University Press, 2009), 106–7. James R. Moore has called this passage a distillation of "the essence of Darwinism into less than five hundred words" in his *Post-Darwinian Controversies*, 125.

83. Bedall, "Wallace's Annotated Copy of Darwin's 'Origin of Species,'" 265–89.

84. Bedall, "Wallace's Annotated Copy of Darwin's 'Origin of Species,'" 279.

85. Bedall, "Wallace's Annotated Copy of Darwin's 'Origin of Species,'" 287.

86. Bedall, "Wallace's Annotated Copy of Darwin's 'Origin of Species,'" 288.

87. Bedall, "Wallace's Annotated Copy of Darwin's 'Origin of Species,'" 288–89.

88. See, for example, Edward J. Larson, *Evolution: The Remarkable History of a Scientific Theory* (New York: Modern Library, 2004), 69; David Quammen, *The Reluctant Mr. Darwin* (New York: W. W. Norton, 2006), 208; Browne, *Power of Place*, 250; Thomas Woodward, *Darwin Strikes Back* (Grand Rapids, MI: Baker Books, 2006), 34–35.

89. Quoted in Desmond and Moore, *Darwin: The Life*, 449.

90. Cornelius G. Hunter, *Darwin's Proof: The Triumph of Religion over Science* (Grand Rapids, MI: Brazos Press, 2003), 69.

91. Jonathan R. Tophan, "Beyond the 'Common Context': The Production and Reading of the Bridgewater Treatises," *Isis* 89, no. 2 (1998): 233–62.

92. Desmond and Moore, *Darwin: The Life*, 219.

93. David Kohn, "Darwin's Ambiguity: The Secularization of Biological Meaning," *British Journal for the History of Science* 22, no. 2 (1989): 215–39.

94. Kohn, "Darwin's Ambiguity," 220–21.

95. Desmond and Moore, *Darwin: The Life*, 34. For more on Grant, see Adrian Desmond, "Robert E. Grant: The Social Predicament of a Pre-Darwinian Transmutationist," *Journal of the History of Biology* 17, no. 2 (1984): 189–223.

96. Darwin petitioned for entry into the Plinian Society on November 21, 1826. At that very meeting he heard William Browne, who had proposed the seventeen-year-old Darwin for membership minutes before, deliver a talk countering Charles Bell's *Essays on the Anatomy of Expression* (1806), which insisted that the Creator had endowed the human face with a form and structure uniquely suited to the expression of human emotion. Browne thought it "anatomical chauvinism"

to assume any special difference between animal and human facial anatomy. The next week Darwin heard William Greg, a fellow student and just as iconoclastic as Browne, give a presentation setting out to prove that "the lower animals possess every faculty & propensity of the human mind." On March 27, Browne returned to give an inflammatory lecture on mind and matter. Browne told the astonished students that mind and consciousness were merely the result of brain activity. This was seen as so potentially dangerous that it was struck from the Society's minutes. For a somewhat sanitized rendering of Darwin's activities in the Plinian Society, see J. H. Ashworth, "Charles Darwin as a Student in Edinburgh, 1825–1827," *Proceedings of the Royal Society of Edinburgh* 55 (1935): 97–113. The expunging incident is discussed more fully in Howard E. Gruber, *Darwin on Man: A Psychological Study of Scientific Creativity Together with Darwin's Early and Unpublished Notebooks*, transcribed and annotated by Paul H. Barrett (London: Wildwood House, 1974), 39. The text of the expunged minutes has been reprinted in the appendix of Gruber, *Darwin on Man*, 479. The crux of the issue was the assertion, appalling to English sensibilities at the time, "that mind as far as one individual sense, & consciousness are concerned, is material." A thorough account is also presented in Desmond and Moore, *Darwin: The Life*, 32–38.

97. Robert E. Grant, *Tabular View of the Primary Division of the Animal Kingdom, Intended to Serve as an Outline of an Elementary Course of Recent Zoology* (London: Walton and Maberly, 1861), v.

98. Browne, *Darwin: Voyaging*, 83.

99. Raby, *Alfred Russel Wallace*, 196; Slotten, *Heretic*, 260; Desmond and Moore, *Darwin: The Life*, 546; Browne, *Power of Place*, 308.

100. Alfred Russel Wallace, "Creation by Law," in *Contributions*, 264–302.

101. Wallace, "Creation by Law," 265.

102. Wallace, "Creation by Law," 267–68.

103. Wallace, "Creation by Law," 268.

104. Wallace, "Creation by Law," 280–81.

105. See the letter from Darwin to Wallace, October 12–13, 1867, in Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 189–90.

106. Kohn, "Darwin's Ambiguity," 238.

Chapter 3

1. Art. III, reviews of *Principles of Geology* (10th ed., 1867–68) and *Elements of Geology* (6th ed., 1865) by Sir Charles Lyell, *Quarterly Review* 126, no. 252 (April 1869): 359–94. The following quotes are taken from these sources.

2. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 241.

3. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 242–43.

4. Slotten, *Heretic*, 270.

5. Letter to Darwin dated May 5, 1869. Charles Lyell, *Life, Letters, and Journals of Sir Charles Lyell, Bart*. 2 vols. (London: John Murray, 1881), 2: 442.

6. Quoted in Browne, *Power of Place*, 319.

7. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 242.

8. Curtis Johnson, *Darwin's Dice: The Idea of Chance in the Thought of Charles Darwin* (New York: Oxford University Press, 2015), xiv–xv. Johnson isn't the first

to discuss this. See John C. Greene, *The Death of Adam: Evolution and Its Impact on Western Thought* (New York: New American Library, 1961), esp. chap. 9, "The Triumph of Chance and Change."

9. Johnson, *Darwin's Dice*, xiii. For the broader historiographical impact of Johnson's thesis, see Michael A. Flannery, "Darwin and the End of Providence: The Role of Chance in Evolution," *Metascience* 26, no. 1 (2016): 145–48.

10. For more on Comte's influence on Darwin, Schweber, "Young Darwin and His Cultural Circle," 175–92; and Frank Burch Brown, "The Evolution of Darwin's Theism," *Journal of the History of Biology* 19, no. 1 (1986): 1–45.

11. Johnson, *Darwin's Dice*, 14. Some claim that natural selection is not a random process. But there are other considerations. Evolution today is understood to comprise three components: mutation, random genetic drift, and natural selection. Because natural selection works to preserve beneficial changes (those that afford the organism a selective advantage), it is directional and not random. The other components, however, are random. Since natural selection can only act on what it is given by mutation, which is itself random, evolution is necessarily a chance-driven process. Natural selection depends entirely on the arrival of suitable random mutations before it can select for them. And in populations smaller than those of bacteria, for example, natural selection tends to be overwhelmed by the random process of genetic drift—in which near-neutral mutations (the vast majority of mutations) are preserved and in which those that are lost is basically random. From an email exchange with Dr. Ann Gauger, developmental biologist, August 18, 2016.

12. Johnson, *Darwin's Dice*, 90. Some would disagree. It has been argued, for example, that Darwin's principal explanation of how evolutionary theory worked was teleological, and only now—thanks to the work of Francis Ayala, Harry Binswanger, Michael Ruse, and others—are we "better prepared to appreciate Darwin's accomplishment than were his contemporaries." See James G. Lennox, "Darwin *Was* a Teleologist," *Biology and Philosophy* 8 (1993): 409–21. Lennox supports his claim that Darwin's use of teleology did not need reliance upon divine or vital forces with an appeal to citations of the individuals named, which merely begs the question. More significantly, Lennox seems to rely upon Darwin's use of final cause as implying goal-directedness. But this is mainly found only in Darwin's early writings. In fact, Darwin only uses the term substantively twice in all six editions of *Origin*, once merely as a product of contingency and again in a wholly negative sense. One of most vocal proponents of Darwin's teleological argument has been Robert J. Richards in *The Meaning of Evolution: The Morphological Construction and Ideological Reconstruction of Darwin's Theory* (Chicago: University of Chicago Press, 1992). Richards views Darwin as a recapitulationist ("ontogeny recapitulates phylogeny," in Haeckel's oft-repeated phrase) who constructed his evolutionary theory as progressive along with the teleological implications that this entails. But, as Lynn K. Nyhart has pointed out, "Most nineteenth-century recapitulationists treated embryology as a *model* for species development; that evolution displays progress toward a particular goal is a consequence of this embryological model. For Darwin (and, one might add, Ernst Haeckel), the situation is reversed: the path of embryological development was a *consequence* of a species history that remained open ended and contingent. This difference is fundamental, and Darwin's contemporaries knew it." See Nyhart's review in *Isis* 84, no. 4 (1993): 811–12. For an interesting and thor-

ough discussion of progress and teleology in evolution, see Bernd Rosslenbroich, "The Notion of Progress in Evolutionary Biology—The Unresolved Problem and an Empirical Suggestion," *Biology and Philosophy* 21 (2006): 41–70.

13. Johnson, *Darwin's Dice*, 113.

14. Johnson, *Darwin's Dice*, 138.

15. Johnson, *Darwin's Dice*, 151.

16. Barrett et al., *Charles Darwin's Notebooks*, 611.

17. Johnson, *Darwin's Dice*, 226.

18. Darwin Correspondence Project, "Letter no. 7471," accessed January 1, 2017, http://www.darwinproject.ac.uk/DCP-LETT-7471.

19. Huxley, *Lay Sermons*, 14.

20. Darwin, *Origin*, 92. See also Haim Ofek's clear statement on utility in his *Second Nature: Economic Origins of Human Evolution* (New York: Cambridge University Press, 2001): "The principle of utility *by definition* can produce neither a structure harmful to an organism, nor a structure that is of greater perfection than is necessary for an organism at any given stage in its evolutionary history. Neither overdesign nor forethought are admissible under natural selection. The term *Darwin's principle of utility* was probably coined by Wallace himself (economists who use 'utility' in a slightly difference sense would probably prefer here something like 'parsimony' or 'myopic efficiency'). Darwin implied that a single counter-example to this rule would be fatal to his theory" (32).

21. Alfred Russel Wallace, *Darwinism: An Exposition of the Theory of Natural Selection with Some of Its Applications* (London: Macmillan, 1889), 465, 472.

22. Wallace, "Limits of Natural Selection," *Contributions*, 343.

23. Wallace, "Limits of Natural Selection," *Contributions*, 359.

24. Wallace, "Limits of Natural Selection," *Contributions*, 362.

25. Wallace, "Limits of Natural Selection," *Contributions*, 365.

26. Wallace, "Limits of Natural Selection," *Contributions*, 368.

27. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 251. There is some confusion over this letter. Raby thinks Darwin is responding to proof pages of *Contributions* (see his *Wallace*, 205–6), and Slotten believes Darwin's letter was written in April 1870 in response to Wallace's *Contributions* (see his *Heretic*, 284). But Wallace's previous letter to Darwin written January 22 indicated that the proofs were not those of *Contributions* but those of his paper about to be published in the February 17 issue of *Nature* on "The Measurement of Geological Time." The actual date of Darwin's letter was January 26, 1870, before the release of *Contributions*, and Wallace's letter indicates that he was still working on the manuscript. See also Darwin Correspondence Project, "Letter no. 7086," accessed on May 31, 2016, https://www.darwinproject.ac.uk/letter/DCP-LETT-7086.xml. Darwin's reference to Wallace's "best paper," an obvious reference to his essay, "The Origin of Human Races and the Antiquity of Man," is interesting. Just as Darwin had missed the significance of Wallace's Sarawak Law paper, Darwin now failed to see that Wallace's current position limiting natural selection in the development of *H. sapiens* was a logical extension consistent with his presentation to the Anthropological Society in 1864. He did not make the complete break in that paper, but the direction was clearly there.

28. Quoted in Slotten, *Heretic*, 284.

29. Wallace, *Contributions*, 372–73.

30. Darwin Correspondence Project, "Letter no. 7271," accessed June 1, 2016, https://www.darwinproject.ac.uk/letter/DCP-LETT-7271.xml.

31. See Anton Dohrn's two-part review of Wallace's *Contributions* in *The Academy*, February 15, 1871, 138–40; and *The Academy*, March 1, 1871, 159–60.

32. See H. B. Tristram's review of *Contributions to the Theory of Natural Selection* in *Contemporary Literature* 15 (September 1870): 309–11, at 309.

33. H. B. Tristram, "Mr. Wallace on the Conservation of the Native Races," *Contemporary Review* 16 (March 1871): 537–54.

34. Darwin Correspondence Project, "Letter no. 7269," accessed June 1, 2016, https://www.darwinproject.ac.uk/letter/DCP-LETT-7269.xml.

35. Hamilton Cravens, introduction to Charles Darwin, *Descent of Man* (1871; reprinted, New York: Barnes and Noble Books, 2004), xiii.

36. *Darwin*, *Descent of Man*, 105.

37. Darwin, *Descent of Man*, 141.

38. Darwin, *Descent of Man*, 103.

39. Johnson, *Darwin's Dice*, 206–9.

40. Barrett et al., *Charles Darwin's Notebooks*, 291.

41. Wallace's review of *Descent of Man* in *The Academy*, March 15, 1871, 177–83.

42. Darwin Correspondence Project, "Letter no. 2814," accessed June 4, 2016, https://www.darwinproject.ac.uk/letter/DCP-LETT-2814.xml.

43. Charles Darwin, *The Autobiography of Charles Darwin*, ed. Francis Darwin (1893; reprinted, Amherst, NY: Prometheus Books, 2000), 63.

44. Darwin, *Variation of Animals and Plants*, 1: 6–7.

45. Darwin, *Origin*, 73.

46. The letter was written on July 2, 1866. See Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 170–74.

47. Desmond and Moore, *Darwin: The Life*, 534.

48. The letter is dated August 8, 1862. See Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 145.

49. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 146–47. Darwin's reply letter is dated August 20, 1862, with a notation that, "The last sheet of the letter is missing."

50. A. R. Wallace, "On the Habits of the Orang-Utan of Borneo," *Annals and Magazine of Natural History*, 2nd series, 17, no. 103 (July 1856): 26–32, esp. 30–31.

51. Barrett et al., *Charles Darwin's Notebooks*, 291.

52. Fichman, *Elusive Victorian*, 199.

53. Johnson, *Darwin's Dice*, 143.

54. Darwin, *Variation of Animals and Plants*, 1: 235.

55. Darwin, *Variation of Animals and Plants*, 2: 301.

56. Johnson, *Darwin's Dice*, 147–48.

57. Darwin, *Variation of Animals and Plants*, 2: 515.

58. Johnson, *Darwin's Dice*, 151.

59. Jerry Fodor and Massimo Piattelli-Palmarini, *What Darwin Got Wrong* (New York: Farrar, Straus and Giroux, 2010), 99.

60. Fodor and Piattelli-Palmarini, *What Darwin Got Wrong*, 115.

61. Johnson, *Darwin's Dice*, 139–40, 146–49.

62. This term now has a long and complicated historiography all its own. For an

excellent classic description of its use in biology, see Grace A. de Lagune, "The Role of Teleonomy in Evolution," *Philosophy of Science* 29, no. 2 (1962): 117–31. A good summary review is available in Gerald R. Krieger's "Transmogrifying Teleological Talk?" *History and Philosophy of the Life Sciences* 20, no. 1 (1998): 3–34.

63. Richard Dawkins, *The Blind Watchmaker: Why the Evidence of Evolution Reveals a Universe without Design*, new ed. (New York: W. W. Norton, 2006), 4.

64. Darwin, *Descent of Man*, 352.

65. Letter from Wallace to Darwin dated April 18, 1869. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 245.

Chapter 4

1. Slotten, *Heretic*, 235.

2. Deborah Blum, *Ghost Hunters: William James and the Search for Scientific Proof of Life after Death* (New York: Penguin Books, 2007), 77.

3. Blum, *Ghost Hunters*, 238–39, 289; See also, Nick Lewer, "Charles Richet: Medical Scientist, Innovator, Peace Thinker, and Savant," *Medicine, Conflict, and Survival* 22, no. 2 (2006): 145–58.

4. Blum, *Ghost Hunters*, 202. See also, Peter N. T. Wells, "Lord Rayleigh: John William Strutt, Third Baron Rayleigh," *IEEE* (*Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*) 54, no. 3 (2007): 591–96.

5. Wallace, *My Life*, 2: 34.

6. Lodge eventually developed a very Wallacean version of evolution. See his *Evolution and Creation* (New York: George H. Doren, 1926).

7. For more on Doyle, see Alvin E. Rodin and Jack D. Key, "Arthur Conan Doyle—Physician, Author, and Spiritualist: A Diversified Genius," *Journal of Medical Biography* 2 (1994): 98–102.

8. Quoted in Richardson, *William James*, 264.

9. Ian James Kidd, "Was Sir William Crookes Epistemically Virtuous?" *Studies in History and Philosophy of Biological and Biomedical Sciences* 48 (2014): 67–74.

10. Wallace, *My Life*, 2: 366–67.

11. Arthur Conan Doyle, *The History of Spiritualism*, 2 vols. (1926; reprinted, Cambridge: Cambridge University Press, 2011), 1: 178–79. Deborah Blum has called Wallace "one of the more innovative and productive scientific thinkers of his time." Blum, *Ghost Hunters*, 118–19.

12. Wallace's personal copy of Hume's *Enquiry* was published in London by Edward Truelove, 1863. It is now part of the Alfred Russel Wallace Collection at the Edinburgh University Library, shelfmark SD8618. For more information, see the bibliography.

13. Hume, *Enquiry*, 91.

14. Alfred Russel Wallace, *Miracles and Modern Spiritualism*, 3rd ed. (1895; reprinted, [s.n.]: Forgotten Books, 2011), 4.

15. Wallace, *Miracles and Modern Spiritualism*, 6.

16. Wallace, *Miracles and Modern Spiritualism*, 9.

17. Wallace, *Miracles and Modern Spiritualism*, 13.

18. Aidan Nichols, "The New Atheism and Christian Cosmology," in *The Beauty of God's House: Essays in Honor of Stratford Caldecott*, ed. Francesca Aran Murphy (Eugene, OR: Cascade Books, 2014): 205–19, at 218.

19. Wallace, *Miracles and Modern Spiritualism*, 5.

20. Nehemiah Grew, *Cosmologia Sacra* (London: W. Rogers, S. Smith, and B. Walford, 1701), 196. I offer this only as a matter of practical application and comparison. I have not been able to confirm that Wallace had ever read any of Grew's works, though he may well have been familiar with Grew's botanical work and heard of his philosophical ideas secondhand.

21. On Grew's idea on teleology and vitalism, see Brian Garrett, "Vitalism and Teleology in the Natural Philosophy of Nehemiah Grew (1641–1712)," *British Society for the History of Science* 36, no. 1 (2003): 63–81.

22. Wallace, *Miracles and Modern Spiritualism*, 132–33.

23. Also outlined in Doyle, *History of Spiritualism*, 2: 260–61.

24. Logie Barrow, *Independent Spirits: Spiritualism and English Plebeians, 1850–1910* (London: Routledge and Kegan Paul, 1986), 98.

25. Barrow, *Independent Spirits*, 104.

26. Wallace, *Miracles and Modern Spiritualism*, 123.

27. Wallace, *Miracles and Modern Spiritualism*, 108.

28. See Wallace's chapter on "The Neglect of Phrenology" in *The Wonderful Century* (New York: Dodd, Mead, 1898), 159–93. One runs the risk of presentism in dismissing Wallace's interest in phrenology. In its day phrenology held considerable influence, and while the speculations of Franz Joseph Gall (1758–1828) contained much error, most today generally acknowledge that it is upon "the solid parts of Gall's labours modern neurology is founded." William Cecil Dampier, *A History of Science and Its Relations with Philosophy and Religion*, 3rd ed. (New York: Macmillan, 1946), 275. Donald Simpson argues that Gall and his rebellious associate Johann Spurzheim (1776–1832) "made real contributions to the emergence of modern neuroscience at the end of the nineteenth century" even if they "were right for the wrong reasons." See his "Phrenology and the Neurosciences: Contributions of F. J. Gall and J. G. Spurzheim," *ANZ Journal of Surgery* 75, no. 6 (2005): 475–82, at 481.

29. Turner, *Between Science and Religion*, 73–84.

30. Quoted in Turner, *Between Science and Religion*, 78.

31. Herbert Spencer, *Social Statics; or, The Conditions Essential to Human Happiness Specified, and the First of Them Specified* (American ed., 1865; reprinted, [Ann Arbor]: University of Michigan Scholarly Publishing Office, [n.d.]), 325.

32. On Wallace's "socialist libertarianism," see Charles H. Smith, "Alfred Russel Wallace, Social Planning and Environmental Agenda," *Environmental Conservation* 30, no. 3 (2003): 215–18. A word or two of explanation of this term is in order. Libertarianism as a distinct term was unknown in the Victorian era. In Spencer's and Wallace's day the term "anarchy" was often associated most closely with what would today be termed "libertarianism." But anarchy in current common vernacular—the complete absence of political and social order—of course bears little relationship to libertarianism. One of the earliest and clearest expressions of libertarianism can be found in Charles T. Sprading's *Liberty and the Great Libertarians: An Anthology on Liberty, a Hand-Book on Freedom* (Los Angeles: Self-published (Sprading), 1913).

33. John S. Haller Jr., *Swedenborg, Mesmer, and the Mind/Body Connection: The Roots of Complementary Medicine* (West Chester, PA: Swedenborg Foundation, 2010), 82.

34. Wallace, *My Life*, 1: 234–36.

35. Several historians have claimed Wallace's teleology was based upon his con-

version to spiritualism. See, for example, Kottler, "Alfred Russel Wallace, the Origin of Man, and Spiritualism"; Raby, *Alfred Russel Wallace*; and Turner, *Between Science and Religion*.

36. See James Moore, "Wallace in Wonderland," in Smith and Beccaloni, *Natural Selection and Beyond*, 353–67, 360–62.

37. Elizabeth Allard, "Animistic Beliefs and Rites in the Malay Archipelago," vol. 16, nos. 2–4: 2 (1945): 87–108, no. 3 (1946): 254–74, no. 4 (1946): 337–52; vol. 17, no. 1 (1946): 79–91.

38. For a complete discussion, see A. F. Anthony, *Hantu Hantu: Ghost Belief in Modern Malaya*, Malayan Heritage Series 3 (Singapore: Eastern Universities Press, 1959). *Hantu hantu* literally means ghosts of all kinds.

39. Van Wyhe, *Annotated Malay Archipelago*, 241.

40. Marked on page 89 of his personal copy of Child's *The Unseen World*, Wallace Collection, Edinburgh University Library, shelfmark SD8323.

41. Wallace, *My Life*, 1: 203.

42. Martin Fichman, "Alfred Russel Wallace and Anti-Vaccination in the Late Victorian Cultural Context, 1870–1907," in *Natural Selection and Beyond*, 305–19, at 314. Wallace's heavily annotated copy is part of his collection at the Edinburgh University Library, shelfmark SD8468.

43. The most accessible source of Swedenborg's writings can be found in a series established under the direction of the New Church minister, Rev. John Worcester (1834–1900), by the bequest of Mrs. Lydia Rotch. The "Rotch Editions" were published in Boston by Houghton Mifflin in 1907 and consist of the following: *The Heavenly Arcana* (20 vols.), *Heaven and Hell*, *The Four Doctrines of the New Jerusalem*, *Divine Love and Wisdom*, *Divine Providence*, *The Apocalypse Revealed* (3 vols.), *Marriage Love*, *The True Christian Religion Containing the Universal Theology of the New Church* (3 vols.). Besides Haller's excellent *Swedenborg*, other overviews are available in Cyriel Odhner Sigstedt, *The Swedenborg Epic: The Life and Works of Emanuel Swedenborg* (New York: Bookman Associates, 1952); and Gary Lachman, *Swedenborg: An Introduction to His Life and Ideas* (New York: Penguin Group, 2009).

44. Wallace likely picked this concept up from the Swedenborgian writer Thomas Child. In his copy of *The Unseen World* (see also note 40 in chapter 4) he highlighted on page 10, "Thus we see that thought is influx, and that is one word we have wanted all this while. Emotion and thought are *influx* from that interior, unknown State which we conclude is the source of this world and its powers, both in regard to matter and mind."

45. This is penciled in at the bottom of page 223, the end of "The Nature and Duration of Hell." Underlines are in the original.

46. Wallace, *My Life*, 1: 220–21.

47. Quoted in George Trobridge, *Emanuel Swedenborg: His Life, Teachings, and Influence* (London: Frederick Warne, [1905]), 63–64.

48. Bernhard J. Stern, "Letters of Alfred Russel Wallace to Lester F. Ward," *Scientific Monthly* 40, no. 4 (1935): 375–79, at 378–79.

49. See The Marquess of Salisbury, *Evolution: A Retrospect; The Revised Address Delivered before the British Association for the Advancement of Science, Oxford, 1894* (London: Roxburghe Press, 1894). Salisbury's list of unsolved problems in science is, of course, dated by today's standards. Today there are 119 known elements, and ether theory has long been abandoned in mainstream physics. However, ether the-

ory may be making a comeback. See, "Dark Matter's Rival: Ether Theory Challenges 'Invisible Mass.'" *National Geographic News*, October 28, 2010, http://news.nationalgeographic.com/news/2006/09/060908-dark-matter_2.html, accessed July 3, 2016.

50. Salisbury, *Evolution*, 35, 37.

51. Salisbury, *Evolution*, 49.

52. Salisbury, *Evolution*, 50–53.

53. Salisbury, *Evolution*, 57.

54. Slotten, *Heretic*, 444–46.

55. Wallace claimed that he thought Spencer's reply was "thoroughly well done" (*My Life*, 2: 32), a comment he was able to stand by only because of Spencer's own deficiencies in answering Salisbury. Spencer largely sidestepped Salisbury's main point; namely, that organic evolution required some form of teleology to function and proceed. In defending common descent, Spencer apparently felt that he had answered the challenges posed. See "Herbert Spencer Replies to Lord Salisbury on Evolution," *Public Opinion* 19, no. 23 (December 5, 1895): 742–43.

56. See Wallace's review in *Quarterly Review of Science* 3, no. 37 (1873): 113–17.

57. Wallace, *My Life*, 2: 14.

58. Wallace, *My Life*, 2: 105–6.

59. Martin Fichman, "Alfred Russel Wallace's North American Tour: Transatlantic Evolutionism," *Endeavor* 25, no. 2 (2001): 74–78. See also, Wallace, *My Life*, 2: 105–99.

60. Wallace, *My Life*, 2: 201.

61. Wallace, *Darwinism*, 1–2.

62. Wallace, *Darwinism*, 100.

63. Wallace, *Darwinism*, vi. Based upon this close reading I believe Peter Bowler is correct in his assertion that Wallace *never* accepted Darwin's analogy between artificial and natural selection. See Bowler's *Evolution: The History of an Idea*, 3rd ed. (Berkeley: University of California Press, 2003), 176.

64.Wallace, *Darwinism*, 438.

65. Wallace, *Darwinism*, 450–51.

66. Wallace, *Darwinism*, 457.

67. Darwin, *Origin*, 76.

68. Darwin, *Descent of Man*, 513–19. For further discussion of Darwin's sexual selection, see Malcolm Jay Kottler, "Darwin, Wallace, and the Origin of Sexual Dimorphism," *Proceedings of the American Philosophical Society* 124, no. 3 (1980): 203–26; and Adam G. Jones and Nicholas L. Ratterman, "Mate Choice and Sexual Selection: What Have We Learned since Darwin?" *PNAS* (June 16, 2009): 1001–8.

69. Wallace, *Darwinism*, 274–75.

70. Wallace, *Darwinism*, 283.

71. Wallace, *Darwinism*, 296.

72. Wallace, "Note on Sexual Selection," *Natural Science* (December 1892): 750.

73. Mariko Takahash et al., "Peahens Do Not Prefer Peacocks with More Elaborate Trains," *Animal Behavior* 75, no. 4 (2008): 1209–19. Other recent research has called sexual selection into question—e.g., Michael G. Ritchie, "Sexual Selection and Speciation," *Annual Review of Ecology, Evolution, and Systematics* 38 (2007): 79–102; Joan Roughgarden, "Challenging Darwin's Theory of Sexual Selection," *Daedelus* (Spring 2007): 23–36; and S. A. Ramm et al., "Sexual Selection and the

Rodent Baculum: An Intraspecific Study in the House Mouse (*Mus musculus domesticus*)," *Genetica* 138, no. 1 (2010): 129–37. A variety of fanciful "sexual selection" arguments have even been given for all kinds of things, including for the artifacts of early humans. One example has been challenged in April Nowell and Melanie Lee Chang, "The Case against Sexual Selection as an Explanation of Handaxe Morphology," *Paleo Anthropology* (2009): 77–88. Anthropologist Ashley Montagu (1905–1999) criticized Darwin's sexual selection theory applied to mankind as "mainly anecdotal and of the travelogue variety." Concluding that "it is unlikely that sexual selection can have played a significant role in his [man's] evolution," Montagu removed some of those chapters (particularly those dealing with invertebrates, fishes, reptiles, and birds) in a condensed version of *Descent*. See Darwin, *The Descent of Man*, [edited] with a preface by Ashley Montagu (Norwalk, CT: Easton Press, 1979).

74. Wallace, *Darwinism*, 474.

75. Wallace, *Darwinism*, 475.

76. Wallace, *Darwinism*, 476–77.

77. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 2: 47.

78. Fichman, *Elusive Victorian*, 250.

79. Quoted in Epes Sargent, *The Scientific Basis of Spiritualism* (Boston: Colby and Rich, 1881), 361.

80. Wallace, *My Life*, 2: 22.

81. Arthur John Bell, *Why Does Man Exist?* (London: Wm. Isbister, 1890), 98.

82. Bell, *Why Does Man Exist?*, 392.

83. Bell, *Why Does Man Exist?*, 422.

84. "Why Does Man Exist?" *Borderland* 1, no. 3 (January 1894): 272.

85. See Francis Ellingwood Abbot, "Lectures on Pantheism at the Concord School," *Journal of Speculative Philosophy* 19 (October 1885): 432–33.

86. This four-page letter from Wallace to Abbot, June 12, 1890, is tipped into his personal copy of *The Way Out of Agnosticism*, shelfmark SD8270, Alfred Russel Wallace Collection, Edinburgh University Library. It could be that Abbot was seeking public support from Wallace in his ongoing row with Harvard philosopher Josiah Royce (1855–1916). Abbot disliked Royce since their first meeting at William James's home on January 18, 1884. Royce's dismissive review of Abbot's *Scientific Theism* (1888) as the work of an amateurish incompetent infuriated him. *The Way Out of Agnosticism* reignited the embarrassingly personal feud between both men, but without Wallace's involvement. For details, see John Clendening, *The Life and Thought of Josiah Royce*, rev. ed. (Nashville, TN: Vanderbilt University Press, 1999), 148–50.

87. The published letter is available at http://darwin-online.org.uk/content/frameset?keywords=index%20abbot&pageseq=1&itemID=F1753&viewtype=image. Accessed July 21, 2016. See also Francis E. Abbot, *Truths for the Times*, 2nd ed., Index Tracts, no. 1 (Toledo, OH: Index Association, 1872).

88. Quoted in Desmond and Moore, *Darwin: The Life*, 591.

89. Desmond and Moore, *Darwin: The Life*, 642–43.

90. Slotten, *Heretic*, 382.

91. Published as Henry Drummond, *The Lowell Lectures on the Ascent of Man* (London: Hodder and Stoughton, 1894).

92. Quoted in Fern Elsdon-Baker, "Spirited Dispute: The Secret Split between

Wallace and Romanes," *Endeavor* 32, no. 2 (2008): 75–78, at 75. John van Wyhe has suggested that Wallace never achieved the fame of others such as Charles Lyell, Richard Owen, Louis Agassiz, Thomas Huxley, Joseph Hooker, or Charles Darwin. But the quotations provided here clearly suggest otherwise. Also, a strong counter to van Wyhe's assertion is presented in Charles H. Smith, "Alfred Russel Wallace Notes 5: Just How Well Known *Was* Wallace in His Own Time?" *The Linnean* 30, no. 1 (2014): 27–30.

93. Ernst Haeckel, *The Evolution of Man: A Popular Exposition of the Principle Points of Human Ontogeny and Phylogeny* (London: Kegan Paul, Trench, 1883), 99.

94. George J. Romanes, "Mr. Wallace on Darwinism," *Science* 14, no. 343 (August 30, 1889): 150–55.

95. George J. Romanes, "Darwin's Latest Critics," *Nineteenth Century* 27 (May 1890): 823–32, at 831.

96. George J. Romanes (1890). (WCP3445.2932: Letter to Alfred Russel Wallace, dated July 21, 1890). In: G. W. Beccaloni, ed., Wallace Letters Online, http://www.nhm.ac.uk/research-curation/scientific-resources/collections/library-collections/wallace-letters-online/3445/2932/T/details.html. Accessed July 14, 2016.

97. Alfred Russel Wallace (1881). (WCP1567.1346: Letter to Frederic William Henry Myers, dated January 30, 1881). In: G. W. Beccaloni, ed., Wallace Letters Online, http://www.nhm.ac.uk/research-curation/scientific-resources/collections/library-collections/wallace-letters-online/1567/1346/T/details.html. Accessed July 14, 2016.

98. Wallace, *My Life*, 2: 233.

99. Henry Thomas, *Biographical Encyclopedia of Philosophy* (Garden City, NY: Doubleday, 1965), 185–87; Friedel Weinert, *Copernicus, Darwin, and Freud: Revolution in the History and Philosophy of Science* (Oxford: Wiley-Blackwell, 2009), 50.

100. See Ernst Haeckel, *The Riddle of the Universe*, trans. Joseph McCabe (New York: Harper and Bros., 1901), esp. 1–21.

101. Weinert, *Copernicus, Darwin, and Freud*, 51.

102. Alfred Russel Wallace, *Man's Place in the Universe: A Study of the Results of Scientific Research* (1904; reprinted, [s.l.]: Bibliobazaar, 2011), 16–17.

103. Wallace, *Man's Place*, 310–11. Wallace gives nine of ten as the necessary conditions for life, but oddly leaves out temperature. However, he does discuss the importance of temperature for life earlier on pages 205–8 and 269–70. As such, temperature has been added to the overall list.

104. Wallace, *Man's Place*, 316–17.

105. Fichman, *Elusive Victorian*, 296.

106. Wallace, Alfred Russel (1903). (WCP180.180: Letter to William Greenell [ARW's son] Wallace, dated July 8, 1903). In: G. W. Beccaloni, ed., Wallace Letters Online, http://www.nhm.ac.uk/research-curation/scientific-resources/collections/library-collections/wallace-letters-online/180/180/T/details.html. Accessed June 16, 2016.

107. Part 1 review of *Man's Place in the Universe* in *Dublin Review* 135 (October 1904): 320–44; part 2 in 136 (January 1905): 113–34. For details on Wegg-Prosser, see his obituary. In *Monthly Notices of the Royal Astronomical Society* 72 (February 1912): 258–59.

108. Barbey-Boissier, Caroline (1904). (WCP1335.1114: Letter to Alfred Russel Wallace, dated January 19, 1904). In: G. W. Beccaloni, ed., Wallace Letters On-

line, http://www.nhm.ac.uk/research-curation/scientific-resources/collections/library-collections/wallace-letters-online/1335/1114/T/details.html. Accessed June 20, 2016.

109. Alfred Russel Wallace, *The World of Life: A Manifestation of Creative Power, Directive Mind, and Ultimate Purpose* (London: Chapman and Hall, 1910), vi–vii. See also my summary analyses and edited version in Michael A. Flannery, *Alfred Russel Wallace: A Rediscovered Life* (Seattle, WA: Discovery Institute, 2011), 88–94; and my edited version in *Intelligent Evolution* (see the introduction herein, note 44).

110. Wallace, *World of Life*, 6.

111. Wallace, *World of Life*, 8.

112. Shelfmark SD8428, Oliver Lodge, *Life and Matter: A Criticism of Professor Haeckel's "Riddle of the Universe"* (London: Williams and Norgate, 1905). Wallace Collection, Edinburgh University Library. One passage highlighted in Wallace's personal copy marked "good!" is found on pages 116–17: "if they teach a pantheism which identifies God with nature in this narrow sense; if they hold that mind and what they call matter are so intimately connected that no *transcendence* is possible; that, without the cerebral hemispheres, consciousness and intelligence and emotion and love, and all the higher attributes towards which humanity is slowly advancing, would cease to be; that the term 'soul' signifies 'a sum of plasma-movements in the ganglion cells'; and that the term 'God' is limited to the operation of a known evolutionary process, and can be presented as 'the infinite sum of all natural forces, the sum of all atomic forces and all ether vibrations,' to quote Professor Haeckel" (*Confession of Faith*, 78); "then such philosophers must be content with an audience of uneducated persons, or, if writing as men of science, must hold themselves liable to be opposed by other men of science, who are able, at any rate in their own judgment, to take a wider survey of existence, and to perceive possibilities to which the said narrow and over-definite philosophers were blind."

113. Wallace, *World of Life*, 9.

114. Wallace, *World of Life*, 197.

115. Wallace, *World of Life*, 287.

116. Wallace, *World of Life*, 333.

117. Wallace, *World of Life*, 337.

118. Ernst Mayr, "Weismann and Evolution," *Journal of the History of Biology* 18, no. 3 (1985): 295–329, at 323.

119. Wallace, *Darwinism*, 473.

120. Wallace, *World of Life*, 350.

121. Wallace, *World of Life*, 374–75.

122. Lewis stated, "a great deal of what appears to be animal suffering need not be suffering in any real sense. It may be we who have invented the 'sufferers' by the 'pathetic fallacy' of reading into the beasts a self for which there is no real evidence." See C. S. Lewis, *The Problem of Pain* (1940; reprinted, San Francisco: HarperSanFrancisco, 1996), 137.

123. Fichman, *Elusive Victorian*, 297.

124. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 2: 244.

125. Wallace, *World of Life*, 392.

126. Wallace, *World of Life*, 386.

127. Wallace, *World of Life*, 400.

128. This interview was quickly reprinted with permission by Chapman and Hall

as promotion for *The World of Life*. It is available as full text online at UAB Digital Collections: http://contentdm.mhsl.uab.edu/cdm/ref/collection/ARCHIVES/id/0. Accessed July 19, 2016. It is also available as appendix C in Flannery, *Alfred Russel Wallace: A Rediscovered Life*, 145–52.

129. While some spirit communications were of departed souls—husbands, wives, relatives, friends, acquaintances, colleagues, and so on—some clearly were not. The entities described here are obviously higher spiritual forms. Wallace cited approvingly the report of professor Robert Hare's investigations in 1853 in which he "was compelled to believe that existences not human did communicate with him." See Wallace, *Miracles and Modern Spiritualism*, 90.

130. Flannery, "Alfred Russel Wallace, Nature's Prophet," 51–52.

Chapter 5

1. The idea that Wallace's views were determined by his conversion to spiritualism is found in Kottler, "Alfred Russel Wallace, the Origin of Man, and Spiritualism"; Ross A. Slotten considers Wallace's *World of Life* "incomprehensible" without Swedenborg's influence (see Slotten's *Heretic*, 482–84); and phrenology seems to take center stage in Frank Miller Turner's handling of Wallace in his *Between Science and Religion*, 68–103. These are just a few of the various themes "explaining" Wallace.

2. Fichman, *Elusive Victorian*, 188–89.

3. Quoted in Raby, *Alfred Russel Wallace*, 252.

4. Wallace, *My Life*, 2: 199.

5. Wallace, *My Life*, 2: 285.

6. Greta Jones, "Alfred Russel Wallace, Robert Owen, and the Theory of Natural Selection," *British Journal for the History of Science* 35, no. 1 (2002): 73–96.

7. Edward Bellamy, *Equality* (1897; reprinted, New York: Cosimo Classics, 2007). Bellamy's critique of Malthus is the last section of the book ("The Malthusian Objection," 411–14); Bellamy's new world order for women is outlined in chapter 20, "What the Revolution Did for Women."

8. Alfred Russel Wallace, "Human Selection," *Fortnightly Review*, n.s., 48 (September 1890): 325–37.

9. Wallace, *My Life*, 2: 209.

10. See, for example, Cynthia Eagle Russett, *Sexual Science: Victorian Reconstruction of Womanhood* (Cambridge, MA: Harvard University Press, 1989), especially her chapter 3, "Hairy Men and Beautiful Women."

11. Rosemary Jann, "Darwin and the Anthropologists: Sexual Selection and Its Discontents," *Victorian Studies* 37, no. 2 (1994): 287–306.

12. See letter from Darwin to Wallace, April 30, 1868, in Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 1: 214–15.

13. Jann, "Darwin and the Antropologists," 296.

14. Darwin, *Descent of Man*, 531.

15. Darwin, *Descent of Man*, 531–32.

16. Jann, "Darwin and the Anthropologists," 302.

17. Alfred Russel Wallace, *Social Environment and Moral Progress* (New York: Cassell, 1913), 163.

18. Echoing Bellamy, Montagu argued for a return to a "matrist" society modeled on motherly nurturing, not to create a matriarchal society, but to establish a partnership society. See his *The Natural Superiority of Women*, 5th ed. (Lanham, MD: AltaMira Press, 1999). A version of Montagu's thesis has been reprised in Melvin Konner's *Women after All: Sex, Evolution, and the End of Male Supremacy* (New York: W. W. Norton, 2015).

19. Michael A. Flannery, "Alfred Russel Wallace's Medical Libertarianism: State Medicine, Human Progress, and Evolutionary Purpose," *Journal of the History of Medicine and Allied Sciences* 70, no. 1 (2015): 74–104.

20. For more on social Darwinism, see Mike Hawkins's *Social Darwinism in European and American Thought, 1860–1945: Nature as Model and Nature as Threat* (New York: Palgrave, 1997).

21. Desmond and Moore, *Darwin: The Life*, xxi.

22. Barrett et al., *Charles Darwin's Notebooks*, 299.

23. Barrett et al., *Charles Darwin's Notebooks*, 316. Also in Notebook C, Darwin reflected on his interactions with an orangutan named Jenny in the London Zoo. For Darwin, Jenny's whines were "expressive" and the animal seemingly possessed an "intelligence when spoken [to] as if it understood every word. This he compared to the Fuegans' nakedness and cannibalism, which he wrote "puts on par with monkeys." Barrett et al., *Charles Darwin's Notebooks*, 264.

24. Barrett et al., *Charles Darwin's Notebooks*, 615.

25. Barrett et al., *Charles Darwin's Notebooks*, 308.

26. See Darwin's letter to Kingsley, February 6, 1862. Darwin Correspondence Project, "Letter no. 3439," accessed December 20, 2016.

27. See Darwin's letter to Graham, July 3, 1881. Darwin Correspondence Project, "Letter no. 13230," accessed on December 21, 2016.

28. Barrett et al., *Charles Darwin's Notebooks*, 358.

29. Darwin, *Descent of Man*, 505.

30. Darwin, *Descent of Man*, 511.

31. See, for example, Desmond and Moore, *Darwin: The Life*, 267, 294, 421; Browne, *Voyaging*, 390; John Bowlby, *Charles Darwin: A New Life* (New York: W.W. Norton, 1990), 2, 249; and perhaps most completely and thoroughly in Gertrude Himmelfarb's chapter "Darwinism, Politics, and Society," in her *Darwin and the Darwinian Revolution*, 412–31.

32. See Peter Richards's interesting article, "Herbert Spencer: Social Darwinist or Libertarian Prophet," November 4, 2010. Mises Institute: Austrian Economics, Freedom, and Peace. https://mises.org/library/herbert-spencer-social-darwinist-or-libertarian-prophet. Accessed July 21, 2016. Richards argues that Spencer's alleged social Darwinism was a construction of historian Richard Hofstader, whose leftist bias prompted his effort to associate Spencer with the most objectionable aspects of late nineteenth and early twentieth-century thought. According to Richards, closer examination of Spencer's writings brings his libertarianism into clearer focus.

33. Historian Dorothy Porter believes that eugenics in England never had a large constituency beyond a few "isolated intellectuals" and that "full-blooded eugenics never transcended its narrow basis of support." See her "'Enemies of the Race': Biologism, Environmentalism, and Public Health in Edwardian England,"

Victorian Studies 34, no. 2 (1991): 159–78. But more recent studies have demonstrated that eugenics had a broad and not inconsequential following in the British Isles. See Flannery, "Wallace's Medical Libertarianism," esp. 86–87.

34. James Alexander Lindsay, "Darwinism and Medicine," *British Medical Journal* (November 6, 1909): 1325–31, at 1331.

35. Wallace, *My Life*, 2: 209.

36. Nadja Durbach, *Bodily Matters: The Anti-Vaccination Movement in England, 1853–1907* (Durham, NC: Duke University Press, 2005).

37. Thomas P. Weber, "Alfred Russel Wallace and the Antivaccination Movement in Victorian England," *Emerging Infectious Diseases* 16 (April 2010): 664–68.

38. Wallace, *Wonderful Century*, 315.

39. Wallace, "Human Selection," 335–36.

40. Carol Hymowitz and Michelle Weissman, *A History of Women in America* (New York: Bantam Books, 1978), 222.

41. Excerpted in Diane Ravitch, ed., *The American Reader: Words That Moved a Nation* (New York: HarperPerennial, 1991), 204–6. Most scholars now admit that Gilman gives evidence of eugenic thinking, but her descent was slow and largely reveals itself through her journal *The Forerunner* in 1915 and later, after Wallace's death. See Mary Zeigler, "Eugenic Feminism: Mental Hygiene, the Women's Movement, and the Campaign for Eugenic Legal Reform, 1900–1935," *Harvard Journal of Law and Gender* 31 (2008): 211–35, at 224–28. But in other respects she shared much with Wallace. Like him, she was a follower of Edward Bellamy and joined his Nationalist Party. She also viewed evolution as an ongoing progressive force working toward human improvement and advanced through a telic framework. See Malina Mamigonian, "'Knowing Good and Evil': Charlotte Perkins Gilman's Religion of 'Sound Sociology,'" *Interdisciplinary Literary Studies* 4, no. 2 (2003): 56–83.

42. W. H. Hudson et al., *Harmsworth Natural History: A Complete Survey of the Animal Kingdom*, 3 vols. (London: Carmelite House, 1910–11), 1: 65. Wallace's contributed chapter was his last general overview of biogeography.

43. Wallace, Alfred Russel (1899). (WCP5208.5722: Letter to Charlotte Perkins Stetson [nee Perkins afterw. Gilman], dated June 25, 1899). In: G. W. Beccaloni, ed., Wallace Letters Online, http://www.nhm.ac.uk/research-curation/scientific-resources/collections/library-collections/wallace-letters-online/5208/5722/T/details.html. Accessed June 20, 2016.

44. P. Kropotkin, *Memoirs of a Revolutionist*, with a preface by George Brandes, 2 vols. (London: Smith, Elder, 1899), shelfmark SD8416; and P. Kropotkin, *Fields, Factories, and Workshops or Industry Combined with Agriculture and Brain Work with Manual Work*, new, revised, and enlarged ed. (London: Thomas Nelson and Sons, [1912?]), shelfmark SD8415, Wallace Collection, Edinburgh University Library.

45. Quoted in Fichman, *Elusive Victorian*, 274.

46. Quoted in Jeff Riggenbach, "The Anarchism of Peter Kropotkin," *Mises Daily Articles*, March 4, 2011. Mises Institute: Austrian Economics, Freedom, and Peace, https://mises.org/library/anarchism-peter-kropotkin, Accessed July 24, 2016.

47. George Beccaloni, "Homes Sweet Homes: A Biographical Tour of Wallace's Many Places of Residence," in Smith and Beccaloni, *Natural Selection and Beyond*, 7–43.

48. Quoted in T. D. A. Cockerell, "Recollections of Dr. Alfred Russel Wallace," *Science*, n.s., 38, no. 990 (1913): 871–77.

49. Alfred Russel Wallace, *Revolt of Democracy* (New York: Funk and Wagnalls, 1914), xxxix.

50. Wallace, *Revolt of Democracy*, xxxvi.

51. Wallace, *Social Environment*, 111.

52. Wallace, *Social Environment*, 41, 43.

53. Wallace, *Social Environment*, 73.

54. Alfred Russel Wallace, "The Native Problem in South Africa," *Independent Review* 11, no. 38 (1906): 174–82, at 182.

55. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 2: 245–46.

56. Wallace, *Social Environment*, 143.

57. Wallace, *Social Environment*, 133.

58. James Marchant, *Birth-Rate and Empire* (London: Williams and Norgate, 1917), 101.

59. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 2: 255.

60. See, for example, the following: U. Kutschera, "A Comparative Analysis of the Darwin-Wallace Papers and the Development of the Concept of Natural Selection," *Theory in Biosciences* 122 (2003): 343–59; Melinda B. Fagan, "Wallace, Darwin, and the Practice of Natural History," *Journal of the History of Biology* 40 (2007): 601–35; and David Lloyd, Julian Wimpenny, and Alfred Venables, "Alfred Russel Wallace Deserves Better," *Journal of Biosciences* 35, no. 3 (2010): 339–49.

61. Kutschera, "Comparative Analysis of Wallace-Darwin," 350–51.

62. Quoted in U. Kutschera, "Alfred Russel Wallace (1823–1913): The Forgotten Co-founder of the Neo-Darwinian Theory of Biological Evolution," *Theory in Biosciences* 132 (2013): 207–14. The species concept has been problematic. R. L. Mayden has identified at least twenty-two different species concepts, many incompatible with each other. See his, "A Hierarchy of Species Concepts: The Denouement in the Saga of the Species Problem," in *Species: The Units of Diversity*, ed. M. F. Claridge et al. (New York: Chapman and Hall, 1997), 381–423. Numerous works have sought resolutions to the species problem; one recent example is Richard A. Richards, *The Species Problem: A Philosophical Analysis* (Cambridge: Cambridge University Press, 2010).

63. The biospecies concept relates to groups of interbreeding populations (real or potential) that are reproductively isolated from other such groups. Kutschera, "Alfred Russel Wallace (1823–1913)," 212.

64. Ernst Mayr, *What Evolution Is* (New York: Basic Books, 2001), 117–18.

65. For further discussion of Wallace's interest in Weismann's "panmixia" theory, see Slotten, *Heretic*, 409–11.

66. George Beccaloni, "FAQs, Myths, and Misconceptions," *Alfred Russel Wallace Website*, http://wallacefund.info/faqs-myths-misconceptions, January 14, 2008. Accessed July 16, 2016.

67. Steven Pinker, "The Cognitive Niche: Coevolution of Intelligence, Sociality, and Language," *Proceedings of the National Academy of Sciences* 107, supplement 2 (May 11, 2010): 8993–99.

68. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 2: 181.

69. C. A. Patrides, "Renaissance Thought on the Celestial Hierarchy: The De-

cline of a Tradition," *Journal of the History of Ideas* 20, no. 2 (1959): 155–66, at 155.

70. Quoted in Patrides, "Renaissance Thought," 163.

71. Wallace, *World of Life*, 280.

72. Wallace, *Social Environment*, 131.

73. See review excerpts reprinted in appendix A of Flannery, *Intelligent Evolution*, 209–10.

74. Slotten, *Heretic*, 486.

75. *The Independent* 71, no. 3269 (1911): 203–4.

76. William Spiers, "Dr. Wallace's 'World of Life,'" *London Quarterly Review* 115 (April 1911): 214–27.

77. This appears to be a scarce booklet. The only known copy is in the Wallace Collection, Edinburgh University Library, shelfmark SD8445. It has been reprinted in its entirety in appendix B of Flannery, *Intelligent Evolution*, rev. ed., 217–41.

78. Fichman, *Elusive Victorian*, 320.

79. Slotten, *Heretic*, 482.

80. One reviewer of *The World of Life*, known only as "B.C.A.W.," misread Wallace on this angelic hierarchy, thinking that he rejected the conventional view of angels as messengers and attendants of God as "irrational." But the reviewer failed to read that passage on p. 393 in its entirety, which is as follows: "My first point is, that the organizing mind which actually carries out the development of the life-world need not be infinite in any of its attributes. . . . The apparently gratuitous creation by theologians of a hierarchy of angels and archangels, *with no defined duties but that of attendants and messengers of the Deity* [emphasis added], perhaps increases this antagonism, but it seems to me that both ideas are irrational." The reviewer did not take sufficient notice of the highlighted portion. Wallace is not arguing against the angelic hierarchy per se, only against a hierarchy in which these beings have "no defined duties." It is well established in orthodox Christian theology that the angels proclaim that all of nature is "full of His glory," and that angels are simply one of the ways in which God mediates "His providential supervision and rule" over all history and creation. See R. C. Sproul, *Unseen Realities: Heaven, Hell, Angels, and Demons* (Fearn, Scotland: Christian Focus Publications, 2011), 91, 105. Wallace is really not arguing against orthodoxy here, he is arguing against a caricature of orthodoxy.

81. Allen P. Ross, *Creation and Blessing: A Guide to the Study and Exposition of Genesis* (Grand Rapids, MI: Baker Academic, 1998), 122; the key to the transliteration is on pp. 15–16.

82. For a modern analysis from different scientific and theological perspectives, see J. P. Moreland and John Mark Reynolds, eds., *Three Views on Creation and Evolution* (Grand Rapids, MI: Zondervan, 1999).

83. William A. Dembski, Wayne J. Downs, and Fr. Justin B. A. Frederick, eds., *The Patristic Understanding of Creation: An Anthology of Writings from the Church Fathers on Creation and Design* (Riesel, TX: Erasmus Press, 2008), 57.

84. Dembski, Downs, and Frederick, *Patristic Understanding of Creation*, 302.

85. Dembski, Downs, and Frederick, *Patristic Understanding of Creation*, 430.

86. Msgr. John F. McCarthy, "A Neo-Patristic Return to the First Four Days of Creation: Part III—The Days of Creation According to St. Augustine," *Living Tradition: Organ of the Roman Theological Forum*, July 1993, http://www.rtforum.org/

lt/lt47.html. Accessed July 25, 2016. See also "A Neo-Patristic Return to the First Four Day of Creation: Part IV–The Second Day of Creation, September 1993, http://www.rtforum.org/lt/lt48.html. Accessed July 27, 2016.

87. See Leslie Evans, "Reflections on Gnosticism," Boryanabooks, January 1, 2013, http://boryanabooks.com/?p=2487. Accessed July 27, 2016.

88. The literature is replete with examples. A few of the more important are: Kenneth R. Miller, *Finding Darwin's God: A Scientist's Search for Common Ground between God and Evolution* (New York: Harper Perennial, 1999); Francis Collins, *The Language of God: A Scientist Presents Evidence for Belief* (New York: Free Press, 2006); and Karl W. Giberson, *Saving Darwin: How to Be a Christian and Believe in Evolution* (New York: HarperOne, 2008).

89. Darwin, *Autobiography*, 68.

90. Darwin, *Autobiography*, 54.

91. Sidney Cohen and Philip A. Mackowiak, "Diagnosing Darwin," *Pharos* (Spring 2013): 14–20.

92. Edward B. Aveling, *The Religious Views of Charles Darwin* (London: Freethought Publishing, 1883).

93. See Francis Darwin's note in Darwin, *Autobiography*, 69.

94. Stephen Jay Gould, *Ever since Darwin: Reflections in Natural History* (New York: W. W. Norton, 1977), 40–41.

95. Gayon, *Darwinism's Struggle for Survival*, 59.

Chapter 6

1. Wallace underlined approvingly on page 75 of his copy of the Swedenborgian *Unseen World* that "the development of man is fixed . . . there can be no return on his path. Besides, where is the *need* for such return?" Similarly, his personal copy of the book by J. M. Peebles promoting reincarnation, *The Spirit's Pathway Traced: Did It Pre-Exist and Does It Reincarnate Again Into Mortal Life?* (Battle Creek, MI: Dr. Peebles Institute of Health, 1906), is replete with negative markings and comments. Shelfmark SD8476. Wallace Collections. Edinburgh University Library.

2. See his letter dated April 9, 1897, in Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 2: 205.

3. Shermer, *In Darwin's Shadow*, viii.

4. Interview, "We Are Guarded by Spirits Declares Dr. A. R. Wallace," *New York Times*, October 8, 1911.

5. Fichman argues that in making "God," "the Supreme Being," the "Overruling Intelligence," or what have you, a creative participant in creation, that Wallace's holistic approach to man and the cosmos resonates with process theology's "ecological and evolutionary understanding of nature as a dynamic and open system." See Fichman, *Elusive Victorian*, 284.

6. See Alfred North Whitehead, *Process and Reality*, corrected ed., edited by David Ray Griffin and Donald W. Sherburne (New York: Free Press, 1978). Whitehead makes frequent mention of Bergson, see xii, 33, 41, 82, 107, 114, 209, 220, 280, 321.

7. Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 2: 98.

8. See, for example, Tim Flannery, *Here on Earth: A Natural History of the Planet*

(New York: Atlantic Monthly Press, 2011). I have critiqued Flannery's (not a relative) book in detail; see my essay review, "Planetary History, Wallace, and Natural Selection," *Journal of Interdisciplinary History* 43, no. 1 (2012): 63–76.

9. Margulis's article on the development of eukaryotic cells was published under the name Lynn Sagan as "On the Origin of Mitosing Cells" in the *Journal of Theoretical Biology*. Margulis discussed the relationship between her symbiotic theory and Gaia in *Symbiotic Planet: A New Look at Evolution* (New York: Basic Books, 1998).

10. James E. Lovelock, "Hands Up for the Gaia Hypothesis," *Nature* 344 (March 8, 1990): 100–102.

11. Weinert defines WAP as "the fact that our location in the universe is necessarily privileged to the extent of being compatible with our existence as observers." Furthermore, Weinert writes, "The idea is that the intricate balance [i.e., fine-tuning] between the fundamental physical constants cannot be a cosmic accident. Even the slightest changes in these values would destroy the possibility of human life." See Weinert, *Copernicus, Darwin, and Freud*, 84–85.

12. See Wallace, *Contributions*, 372–372A.

13. Fred Hoyle, *Home Is Where the Wind Blows: Chapters from a Cosmologists Life* (Mill Valley, CA: University Science Books, 1994), 414, 421.

14. "Wallace's Unfinished Business" has been reprinted under the same title in his anthology (edited with George Beccaloni), *Natural Selection and Beyond*, 341–52. I have also critiqued Smith's views in my *Planetary History*, 73–74; *Alfred Russel Wallace's Theory of Intelligent Evolution*, 34–40; and *Alfred Russel Wallace*, 102–5.

15. Charles H. Smith, review of Martin Fichman's *Elusive Victorian*, in *Journal of the History of the Behavioral Sciences* 43, no. 1 (2007): 97–98.

16. Smith, review of Martin Fichman's *Elusive Victorian*, 98.

17. Jeremy Sherman and Terrance W. Deacon, "Teleology for the Perplexed: How Matter Began to Matter," *Zygon: Journal of Religion and Science* 42 (2007): 873–901.

18. Norbert Wiener, *Survey of Cybernetics: A Tribute to Dr. Norbert Wiener*, ed. John Rose (New York: Gordon and Breach, 1969), 4.

19. For more on this, see Harmon Zeigler and Ronald F. Howell, "Comments on the Political Scientism of Thomas Henry Huxley," *Social Science* 39, no. 2 (1964): 79–88.

20. Jacques Barzun, *Darwin-Marx-Wagner: Critique of a Tradition*, 2nd ed. (Chicago: University of Chicago Press, 1981), 64, 68.

21. Stephen Jay Gould, *Rocks of Ages: Science and Religion in the Fullness of Life* (New York: Ballantine, 1999).

22. Francis A. Schaeffer, *Escape from Reason* (Downers Grove, IL: InterVarsity Press, 1968), 36–37. The thesis expressed in Schaeffer's work is elaborated on in the "facts/values dichotomy" discussed in Nancy Pearcey's *Total Truth: Liberating Christianity from Its Cultural Captivity* (Wheaton, IL: Crossway Books, 2005).

23. Quoted in Schaeffer, *Escape from Reason*, 75.

24. Austin L. Hughes, "The Folly of Scientism," *New Atlantis* 37 (Fall 2012): 32–50.

25. See the letter from Wallace to W. T. Thiselton-Dyer, February 8, 1911, and Thiselton-Dyer's reply, February 12, 1911, in Marchant, *Alfred Russel Wallace: Letters and Reminiscences*, 2: 93–98.

26. John E. Boodin, "The Reinstatement of Teleology," *Harvard Theological Review* 6, no. 1 (1913): 76–99. For more on Boodin's relationship with William James, see John Elof Boodin, "William James as I Knew Him," in *William James Remembered*, comp. Linda Simon (Lincoln: University of Nebraska Press, 1996), 204–32. Boodin's biographer says that James became a "veritable father figure." See Charles H. Nelson, *John Elof Boodin: Philosopher-Poet* (New York: Philosophical Library, 1987), 39. Technically, Boodin was on leave from the University of Kansas when he wrote this essay, but he would never return. Nelson describes this as Boodin's "exile" period (see his *John Elof Boodin*, 65).

27. Boodin, "Reinstatement of Teleology," 77.

28. Boodin, "Reinstatement of Teleology," 84.

29. John Elof Boodin, *Cosmic Evolution: Outlines of Cosmic Idealism* (New York: Macmillan, 1925), 32, 33ff.

30. Boodin, "Reinstatement of Teleology," 82.

31. Boodin, "Reinstatement of Teleology," 90.

32. Boodin, *Cosmic Evolution*, 269.

33. John Elof Boodin, *Three Interpretations of the Universe* (New York: Macmillan, 1934), 499.

34. Boodin, *Three Interpretations*, 6.

35. See R. F. Hoernlé's essay review of Boodin's *Three Interpretations of the Universe* in *Mind* 45, no. 178 (1936): 217–29. For more on Boodin's philosophy, see Andrew J. Reck, "The Philosophy of John Elof Boodin (1869–1950)," *Review of Metaphysics* 15, no. 1 (1961): 148–73.

36. A thorough and informative biography is available in D. M. S. Watson, "Robert Broom, 1866–1951," *Obituary Notices of Fellows of the Royal Society* 8, no. 21 (1952): 36–70.

37. Watson, "Robert Broom, 1866–1951," 50.

38. Creighton Gable, "Archaeology in Sub-Saharan Africa, 1800–1960," *International Journal of African Historical Studies* 18, no. 2 (1985): 241–64, at 261.

39. Sherwood L. Washburn, "Evolution of a Teacher," *Annual Review of Anthropology* 12 (1983): 1–24, at 15.

40. Robert Broom, *The Coming of Man: Was It an Accident?* (London: H. F. and G. Witherby, 1933).

41. Broom, *Coming of Man*, 21.

42. Broom, *Coming of Man*, 29.

43. Broom, *Coming of Man*, 195.

44. He presented this most clearly in his conclusion. Broom, *Coming of Man*, 212–27, esp. 220–21.

45. Jesse Richmond, "Design and Dissent: Religion, Authority, and the Scientific Spirit of Robert Broom," *Isis* 100, no. 3 (2009): 485–504. According to Richmond, "Broom maintained an active and sympathetic interest in a wide variety of religious beliefs, practices, and phenomena, often speculating on how they might accord with his evolutionary theory" (503).

46. Wallace, *Miracles and Modern Spiritualism*, 29.

47. Robert Broom, "Evolution—Is There Intelligence Behind It?" *South African Journal of Science* 30 (October 1933): 1–19, at 19.

48. Quoted in Peter J. Bowler, *Reconciling Science and Religion: The Debate in Early Twentieth-Century Britain* (Chicago: University of Chicago Press, 2001), 134.

49. Ernst Boris Chain, "Social Responsibility and the Scientist in Modern Western Society," *Perspectives in Biology and Medicine* 14, no. 3 (1971): 347–69.

50. Chain, "Social Responsibility," 366.

51. Chain, "Social Responsibility," 368.

52. The connection of Nazi racial concepts and Hitler-era science is controversial, but ably and convincingly argued by Richard Weikart, *From Darwin to Hitler: Evolutionary Ethics, Eugenics, and Racism in Germany* (New York: Palgrave, 2004); and *Hitler's Ethic: The Nazi Pursuit of Evolutionary Progress* (New York: Palgrave, 2009). While it was clearly an abuse of Darwinian evolutionary theory, German academics built an intellectual bridge between Darwin's ideas and Nazi ideology. Ernst Haeckel and the German materialist Ludwig Büchner would introduce social Darwinism into Germany. According to Weikart, it was Haeckel and Büchner who suggested "Darwinism as more than merely an evolutionary theory" (*From Darwin to Hitler*, 12). The way to German eugenics was paved by leading intellectuals such as Christian von Ehrenfels (1859–1932), chair of ethical philosophy at the German University of Prague. From 1903 until 1918, Ehrenfels "wrote tirelessly about Darwinian ethics and eugenics" (*From Darwin to Hitler*, 54). By the time of Hitler's rise there were many influences of social Darwinism afoot. Although Hitler could not be considered in any sense a disciple of any of these thinkers, they provided the broth in which his own racially biologized stew was concocted. One important influence was the pan-German nationalist Georg von Schönerer (1842–1921). Hitler considered all of Schönerer's ideas theoretically "correct" (*From Darwin to Hitler*, 219–20). But social Darwinism wasn't just a theory for Schönerer, for him such notions were actualized in a campaign of radical anti-Semitism and jingoistic expansion.

Just as racial hygiene was all the rage in Germany, in the United States eugenics—seen as cutting-edge and progressive—was being championed by social Darwinists like Charles Davenport (1866–1944) and his right-hand man Harry Laughlin (1880–1943). Through their work with the Cold Spring Harbor Laboratory in New York, they launched a powerful movement within the United States to adopt eugenic measures in state after state. Of course this is not to suggest that Davenport and Laughlin were proponents of Nazi atrocities. Neither were the vast majority of their American colleagues. But Laughlin helped write a "Model Sterilization Law" that was used as a model in one of the first legislative acts of Hitler's National Socialist government. In the summer of 1933, a "Law for the Prevention of Genetically Diseased Offspring" was passed using this American precedent. It was the California physician George Dock (1860–1951) who translated the German document for the Human Betterment Foundation. "I think the reference to the California work [in the German law], and the work of the Foundation is a very significant thing," exclaimed Dock. "The matter," he added, "has given me a much better opinion of Mr. Hitler than I had before" (Harry Bruinius, *Better for All the World: The Secret History of Forced Sterilization and America's Quest for Racial Purity* [New York: Alfred A. Knopf, 2006], 273). Likewise, Laughlin noted with some pride, "To one versed in the history of eugenical sterilization in America, the text of the German statute reads almost like the 'American model sterilization law'" (Bruinius, *Better for All the World*, 279). No wonder that in 1936 the Nazi regime awarded Laughlin, under the aegis of the University of Heidelberg, an honorary doctorate for his contributions to "racial hygiene." Cultural historian Klaus Fisch-

er's assessment is correct: "Adolf Hitler's racial image of the world was not simply the product of his own delusion but the result of the findings of 'respectable' science in Germany and in other parts of the world, including the United States." (See Klaus P. Fischer, *The History of an Obsession: German Judeophobia and the Holocaust* [New York: Continuum, 1998], 118.)

53. Biographical information on Chain is available in "Howard Walter Florey and Ernst Boris Chain," Chemical Heritage Foundation, September 11, 2015, www.chemheritage.org/historical-profile/howard-walter-florey-and-ernst-boris-chain, accessed August 10, 2016.

54. Biographical information on John Eccles is available at the official website of the Nobel Prize, www.nobelprize.org/nobel_prizes/medicine/laureates/1963/eccles-bio.html, accessed August 1, 2016.

55. Wilder Penfield, "Sir Charles Sherrington, Poet and Philosopher," *Brain* 40 (1957): 402–10.

56. Charles Sherrington, *Man on His Nature* (New York: Macmillan, 1941), 24.

57. Sherrington, *Man on His Nature*, 290.

58. Sherrington, *Man on His Nature*, 347–48.

59. Penfield, "Sir Charles Sherrington," 410.

60. J. C. Eccles, "Hypotheses Relating to the Brain-Mind Problem," *Nature* 4263 (July 14, 1951): 53–57, at 56.

61. Eccles, "Hypotheses Relating," 57.

62. John Eccles, "A Unitary Hypothesis of Mind-Brain Interaction in the Cerebral Cortex," *Proceedings of the Royal Society of London B: Biological Sciences* 240, no. 1299 (1990): 433–51, at 434.

63. Eccles, "A Unitary Hypothesis," 433–51, at 434.

64. John C. Eccles, *Evolution of the Brain: Creation of the Self* (London: Routledge, 1989), 217.

65. Eccles, *Evolution of the Brain*, 176.

66. Eccles, *Evolution of the Brain*, 237.

67. Wallace, *Miracle and Modern Spiritualism*, 228–29.

68. Selmer Bringsjord and Joseph A. Daraio, "Eccles-iastical Dualism: Review of *Evolution of the Brain: Creation of the Self* by John Eccles," *Journal Psyche* 5 (1999). Available online at http://journalpsyche.org/archive/volume-5–1999/, accessed July 31, 2016.

69. Quoted in the review, but the original source can be found in Eccles, *Evolution of the Brain*, 116.

70. Bringsjord and Daraio, "Eccles-iastical Dualism."

71. Donald E. Watson and Bernard O. Williams, "Eccles' Model of the Self Controlling Its Brain: The Irrelevance of Dualist-Interactionism," *NeuroQuantology* 1 (2003): 119–28.

72. Watson and Williams, "Eccles' Model," 122.

73. Watson and Williams, "Eccles' Model," 126.

74. A very complete and fascinating account of Hoyle's life and career is available in Jane Gregory, *Fred Hoyle's Universe* (Oxford: Oxford University Press, 2005).

75. Gregory, *Fred Hoyle's Universe*, 308–9.

76. Fred Hoyle, "The Universe: Past and Present Reflections," *Engineering & Science* (November 1981): 8–12.

77. Gregory, *Fred Hoyle's Universe*, 45.

78. Historian Oswald Spengler (1880–1936) thought it reeked of the English factory, and William Irwin Thompson observed, "if one lives in an economic system in which the market is red in tooth and claw, it is tempting to think that *laissez faire* and survival of the fittest are part of nature's way." See Spengler quoted in Himmelfarb, *Darwin and the Darwinian Revolution*, 133; and Thompson, *At the Edge of History* (New York: Harper and Row, 1971), 133.

79. Hoyle, *The Intelligent Universe* (New York: Holt, Rinehart and Winston, 1983), 8.

80. Hoyle, *Intelligent Universe*, 37, 48.

81. Hoyle, *Intelligent Universe*, 12.

82. Hoyle, *Intelligent Universe*, 189–90.

83. Hoyle, *Intelligent Universe*, 227–32.

84. Hoyle, *Intelligent Universe*, 242.

85. According to Theodore Walker Jr., of the Southern Methodist University's Perkins School of Theology, Hoyle's panspermia is a requirement of neoclassical panentheism. Walker sees Hoyle as broadly agreeing "with the religious idea of a supremely intelligent Creator-Provider-Sustainer of the universe." See his "'The Relation of Biology to Astronomy' and Theology: Panspermia and Panentheism; Revolutionary Convergences Advanced by Fred Hoyle and Chandra Wickramasinghe," *Journal of Cosmology* 19 (June 2012): 8583–604.

86. Hoyle, *Intelligent Universe*, 251.

Chapter 7

1. Anthony O'Hear, *Beyond Evolution: Human Nature and the Limits of Evolutionary Explanation* (Oxford: Clarendon Press, 1997), 27.

2. O'Hear, *Beyond Evolution*, 80. For more on abductive reasoning, see Daniel J. McKaughan, "From Ugly Duckling to Swan: C. S. Peirce, Abduction, and the Pursuit of Scientific Theories," *Transactions of the Charles S. Peirce Society* 44, no. 3 (2008): 446–68. See also note 58 in this chapter.

3. C. S. Peirce, "A Neglected Argument for the Reality of God," *Hibbert Journal* 7 (July 1909): 90–112. At least in part, Peirce's argument for God is located within logical, rational inquiry defined as *ens necessarium* (a necessary existent being), qualified as creator. But, it could reasonably be asked, is Peirce's conception of God merely an abstract expression or a real *ens necessarium*? Charles Hartshorne points out that "because of Peirce's insistence on the role of experience in our understanding of God, some form of anthropomorphism is to be expected." Nevertheless, Peirce's appreciation for and understanding of the scientific method and the hierarchy of the sciences as witnessed in its taxonomic and classification schemes requires him to formulate God as a rational and pragmatic reality, a giver of a rationally ordered world. According to Vincent G. Potter, "unless God were a reality [for Peirce], a non-fictional ideal, with real living power, all human inquiry would be meaningless. Conversely, once that Ideal is acknowledged, how we behave is affected." See Vincent G. Potter, *Peirce's Philosophical Perspectives*, ed. Vincent M. Colapietro (New York: Fordham University Press, 1996), 198–99.

4. Much work in a neo-Darwinian context has been on the related concept, kin selection, developed by William D. Hamilton in 1964, and the mathematical equation that supposedly describes it, developed by George R. Price (1922–1975) and published as "Selection and Covariance" in *Nature* 227 (August 1, 1970): 520–21.

Under this model genetic relatedness and group selection/sacrifice is supposedly explained in Darwinian terms. But a fair amount of anthropomorphizing of "altruism" in lower species up to primates seems to take place in the process, along with considerable interpolation of "demonstrations" presented in the idealized format of math's abstract grammar. Other problems include the confusion and misuse of probabilistic and statistical models as discussed in Matthijs van Veelen, "On the Use of the Price Equation," *Journal of Theoretical Biology* 237 (2005): 412–26, and the dynamic insufficiency of Price's equation in Matthijs van Veelen et al., "Group Selection and Inclusive Fitness Are *Not* Equivalent: The Price Equation vs. Models and Statistics," *Journal of Theoretical Biology* 299 (2012): 64–80. The fascinating and tragic story of the eccentric founder's equation is told in Oren Harmen, *The Price of Altruism: George Price and the Search for the Origins of Altruism* (New York: W. W. Norton, 2010).

5. O'Hear, *Beyond Evolution*, 137.

6. O'Hear, *Beyond Evolution*, 145.

7. O'Hear, *Beyond Evolution*, 183.

8. O'Hear, *Beyond Evolution*, 214. This is a reference to atheist Daniel C. Dennett's *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (New York: Simon and Schuster, 1995).

9. James Le Fanu, *Why Us? How Science Rediscovered the Mystery of Ourselves* (New York: Pantheon Books, 2009), 57ff.

10. Le Fanu, *Why Us?*, 190.

11. Peter Kraft and David J. Hunter, "Genetic Risk Prediction—Are We There Yet?" *New England Journal of Medicine* (April 16, 2009): 1701–3, at 1703.

12. Gerald R. Grob, *The Deadly Truth: A History of Disease in America* (Cambridge, MA: Harvard University Press, 2002).

13. Le Fanu, *Why Us?*, 18.

14. Le Fanu, *Why Us?*, 151.

15. Le Fanu, *Why Us?*, 258.

16. Pinker, "Cognitive Niche," 8993.

17. Johan J. Bolhuis and Clive D. L. Wynne, "Can Evolution Explain How Minds Work?" *Nature* 458 (April 2009): 832–33, at 832.

18. Bolhuis and Wynne, "Can Evolution Explain," 833.

19. This is discussed in detail in C. U. M. (Chris) Smith, "Darwin's Unsolved Problem: The Place of Consciousness in an Evolutionary World," *Journal of the History of Neurosciences* 19 (2010): 105–20.

20. Smith, "Darwin's Unsolved Problem," 119.

21. Tom Wolfe, *The Kingdom of Speech* (New York: Little, Brown, 2016), 163–64.

22. Wallace, "The Limits of Natural Selection as Applied to Man," in *Contributions*, 358–59. The divine nature of speech was first recognized in Genesis (written from 850 to 445 BCE), in which God's verbal command "God *said* . . ." initiates each act of creation, and in the Gospel of John, "And the *Word* became flesh and dwelt among us" (John 1:14).

23. Guillermo Gonzalez and Jay W. Richards, *The Privileged Planet: How Our Place in the Cosmos Is Designed for Discovery* (Washington, DC: Regnery Publishing, 2004), 311.

24. Steve Clarke, "Naturalism, Science, and the Supernatural," *Sophia* 48 (2009): 127–42.

25. Clarke, "Naturalism, Science, and the Supernatural," 140.

26. Steve Fuller, *Science vs. Religion?* (Cambridge: Polity Press, 2007), 101.

27. Fuller, *Science vs. Religion?*, 102.

28. Michael Denton, *Evolution: A Theory in Crisis* (Bethesda, MD: Adler and Adler, 1985).

29. Michael Denton, *Nature's Destiny: How the Laws of Biology Reveal Purpose in the Universe* (New York: Free Press, 1998), 14.

30. Michael Denton, *Evolution: Still a Theory in Crisis* (Seattle, WA: Discovery Institute Press, 2016), 170.

31. Denton, *Evolution*, 172.

32. Denton, *Evolution*, 197.

33. Denton, *Evolution*, 12. Denton capitalizes the word "Types" in *Evolution: Still A Theory in Crisis*. In so doing he is attempting to show it as a larger ontological reality.

34. Charles H. Smith, "Natural Selection: A Concept in Need of Some Evolution?" *Complexity* 17, no. 3 (2011): 8–17.

35. Denton, *Evolution*, 35.

36. Other examples are offered in Smith's "Natural Selection," 17.

37. Denton, *Evolution*, 15.

38. Mario Beauregard et al., "Manifesto for a Post-Materialist Science," *Explore* 10, no. 5 (2014): 272–74. The following quotes are taken from this source.

39. See the Open Sciences website: http://opensciences.org/about/manifesto-for-a-post-materialist-science.

40. Gary E. Schwartz, *The Sacred Promise: How Science Is Discovering Spirit's Collaboration with Us in Our Daily Lives* (New York: Atria Books, 2011), 75–80.

41. Gary E. Schwartz and William L. Simon, *The G.O.D. Experiments: How Science Is Discovering GOD in Everything, Including Us* (New York: Atria Books, 2006).

42. Gary E. Schwartz, "God, Synchronicity, and Postmaterialist Psychology: Proof-of-Concept Real-Life Evidence," *Spirituality in Clinical Practice* 1, no. 2 (2014): 153–62.

43. Schwartz, "God, Synchronicity," 204.

44. Alfred Russel Wallace, *New Thoughts on Evolution* (London: Chapman and Hall, [1910]), 8. A reissue of an interview by Harold Begbie originally published in the *Daily Chronicle* (London), November 3–4, 1910. See also chapter 4 herein, note 128.

45. Rupert Sheldrake, *Science Set Free: 10 Paths to New Discovery* (New York: Deepak Chopra Books, 2012).

46. Wallace, *Miracles and Modern Spiritualism*, 117. See also, Rupert Sheldrake, *The Presence of the Past: Morphic Resonance and the Memory of Nature*, rev. ed. (Rochester, VT: Park Street Press, 2012), 376–79.

47. Sheldrake, *Science Set Free*, 233.

48. A. R. Wallace, "Modern Spiritualism. Are Its Phenomena in Harmony with Science?" *Sunday Herald* (Boston), April 26, 1885, 809.

49. Giuseppe Damiani, "Corrections to Chance Fluctuations: Quantum Mind in Biological Evolution?" *Rivista di Biologia/Biology Forum* 102 (2009): 419–46.

50. John Panteleimon Manoussakis, "God in the Mind? Religious Phenomena and the Teleology of Consciousness," *Revista Portuguesa de Filosofia* 72, no. 1 (2016): 147–68. If Manoussakis is correct, then teleology is real not because it can

be observed and measured "out there" (res extensa) but because it is universally and innately part of ourselves (res cogitans). Its universality makes it not a subjective creation of humankind but rather an inherent property of our very natures, a real aspect of the anthropic cosmos, a "gift" as it were, of *Imago Dei*. Historian John Lukacs makes a very similar point in his *We at the Center of the Universe* (South Bend, IN: Saint Augustine's Press, 2016). Lukac's intriguing ideas will be explored further in the epilogue.

51. R. J. (Sam) Berry, "Biology since Darwin," in *Darwinism and Natural Theology*, ed. Andrew Robinson (Newcastle, UK: Cambridge Scholars Publishing, 2013), 12–38, at 30.

52. Berry, "Biology since Darwin," 38.

53. Bruce L. Gordon, "The Rise of Naturalism and Its Problematic Role in Science and Culture," in *The Nature of Nature: Examining the Role of Naturalism in Science*, ed. Bruce L. Gordon and William A. Dembski (Wilmington, DE: ISI Books, 2011): 3–61, at 25. For additional analyses, see the papers collected in Jonathan Bartlett and Eric Holloway, eds., *Naturalism and Its Alternatives in Scientific Methodologies: Proceedings of the 2016 Conference on Alternatives to Methodological Naturalism* (Broken Arrow, OK: Blythe Institute Press, 2017).

54. Quoted in Gordon, "Rise of Naturalism," 27.

55. See Alvin Plantinga's chapter, "The New Picture," in his *Where the Conflict Really Lies: Science, Religion, and Naturalism* (New York: Oxford University Press, 2011), esp. 113–21.

56. Plantinga, "New Picture," 116.

57. Plantinga, "New Picture," 120.

58. See the insightful and thought-provoking essays in Edward F. Kelly, Adam Crabtree, and Paul Marshall, eds., *Beyond Physicalism: Toward a Reconciliation of Science and Spirituality* (Lanham, MD: Rowman and Littlefield, 2015). The editors prefer the term "physicalism" to what they call "the modern philosophical descendant of the 'materialism' of previous centuries" because most scientists and philosophers today "subscribe explicitly or implicitly to some version of ontological 'physicalism.'" But in practical application the terms are equivalent. There is an especially insightful essay on Charles Sanders Peirce by Adam Crabtree, "Continuity of Mind: A Peircean Vision," 423–53.

59. Michael Grosso, "The 'Transmission' Model of Mind and Body," in Kelly, Crabtree, and Marshall, *Beyond Physicalism*, 79–113, at 109.

60. Wallace's concept of "innate equality" is best explained as the human brain being "over-engineered" for common capacities. As Andrew Berry explains: "Our brains, he [Wallace] claimed, are over-engineered: through the people he met on his travels, he recognized that even the 'savage' in his mud hut has the potential to play Chopin etudes on the piano, despite the fact that he will never see a piano." See Berry's "Alfred Russel Wallace—Natural Selection, Socialism, and Spiritualism," *Current Biology* 23, no. 24 (2013): R1066–R1069.

61. Richard DeWitt, *Worldviews: An Introduction to the History and Philosophy of Science*, 2nd ed. (Malden, MA: Wiley-Blackwell, 2010), 346–47.

Epilogue

1. John Lukacs, *At the End of an Age* (New Haven, CT: Yale University Press,

2002), 60. See also his *History and the Human Condition* (Wilmington, DE: ISI Books, 2013), 11-13.

2. John Lukacs, "Putting Man before Descartes: Human Knowledge Is Neither Objective nor Subjective; It Is Personal and Participant—Which Places Us at the Center of the Universe," *American Scholar* 78, no. 1 (2009): 18–29, at 27.

3. Owen Barfield, *Saving the Appearances: A Study in Idolatry*, 2nd ed. (Middletown, CT: Wesleyan University Press, 1988), 24–25.

4. Barfield, *Saving the Appearances*, 34, 40–41.

5. Barfield, *Saving the Appearances*, 62.

6. Barfield, *Saving the Appearances*, 64.

7. Barfield, *Saving the Appearances*, 147.

8. Barfield, *Saving the Appearances*, 144.

9. Lukacs, *History and the Human Condition*, 27.

Appendix

1. Iain McCalman, *Darwin's Armada: Four Voyages and the Battle for the Theory of Evolution* (New York: W. W. Norton, 2009), 266.

Bibliography

Archival Sources

Most archival sources relevant to Alfred Russel Wallace are now available online. The most important for this study were "The Darwin Correspondence Project," https://www.darwinproject.ac.uk/, based on the resources at Cambridge, United Kingdom, in the University Library and at the Department for the History and Philosophy of Science, under the direction of Professor James A. Secord. It contains more than eight thousand letters and articles by or about Charles Darwin. Also of importance is "The Alfred Russel Wallace Correspondence Project," http://wallaceletters.info/content/homepage, based at the Natural History Museum, London, under the direction of Dr. George Beccaloni. It includes about five thousand letters relating to Wallace. Another impressive cornucopia of Wallace material is available at Western Kentucky University librarian Charles H. Smith's website, "The Alfred Russel Wallace Page," http://people.wku.edu/charles.smith/index1.htm.

Also extremely valuable for this study were the 470 books that compose Wallace's personal library now housed at the Edinburgh University Library. Wallace heavily marked and annotated many of his books, leaving a fascinating primary record of his thoughts and opinions. Most of these books cover works on spiritualism, socialism, and various related social topics. Twenty-eight volumes include tipped-in correspondence. The provenance and description of this collection is presented in Andrew Grout, "The Other Sides of Alfred Russel Wallace," *The Piper* 41 (Spring 2014): 6–7. Because the value of each volume resides in the annotations contained therein, they have been omitted from the bibliography and can be found in the notes section listed by their full bibliographic citation and shelfmark number.

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