A MOST INTERESTING PROBLEM

A Most Interesting Problem

WHAT DARWIN'S *DESCENT OF MAN* GOT RIGHT AND WRONG ABOUT HUMAN EVOLUTION

EDITED BY
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WITH AN INTRODUCTION
BY JANET BROWNE

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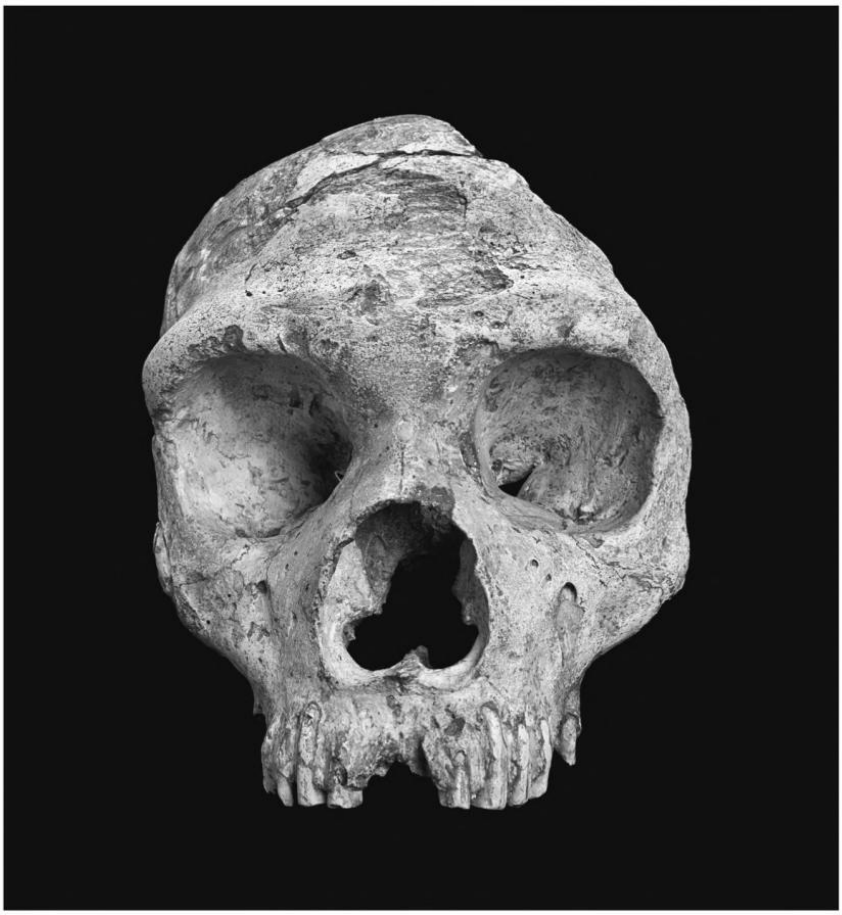

PREFACE. Gibraltar Neanderthal skull.
(© Chris Stringer/The Natural History Museum, London)

It is more likely that Darwin thanked Falconer for coming and apologized for his ill health, which had made him weak, unfocused, and at times depressed. Perhaps in this state, he could not focus on the Gibraltar skull without feeling faint and instead made a few cursory observations before carefully handing it back to Falconer.

Perhaps too it was difficult for Darwin to see the details of the Gibraltar skull that are so compelling to paleoanthropologists today. In 1864, the skull still had not been fully cleaned of its rocky matrix.[5] The details of the nasal cavity, for instance, were obscured by cemented sand. Or

maybe he did study it carefully but recalled Thomas Henry Huxley's observations of the skull from the Feldhofer Cave. Huxley, whom Darwin trusted on matters related to human anatomy and evolution, wrote just a year earlier, in *Evidence as to Man's Place in Nature* (1863), that while the Feldhofer skull was unusual and ancient, it still fit within the range of variation of modern human skulls.

Darwin himself had been thinking quite a bit about variation, the source of variation, and the importance of variation in living populations. After he finished his manuscript on climbing plants, he was to devote himself entirely to the subject and eventually complete *The Variation of Animals and Plants under Domestication* in 1868.

Perhaps with variation on the brain, and Huxley's words echoing in his mind, he could encompass the Gibraltar cranium within the range of variation of modern human skulls. Darwin spent a lot more time studying barnacles, orchids, pigeons, and dogs than humans. Maybe he just hadn't seen enough human skulls to recognize the one from Gibraltar as different.

I imagine Falconer wished Darwin well, thanked Emma, and exited 4 Chester Place Road. Perhaps Darwin turned toward the window and watched his friend walk down Cumberland Place Road toward the park. Falconer's satchel was slung over his shoulder, and he cradled it, and its precious contents, with great care as he walked. Darwin looked past his friend, toward the botanical gardens, and wondered whether the plant tendrils had relaxed their grip on the trellis now that the wind had died down.

Science is done by scientists. Even the very best scientists in the world—in this case, Charles Darwin himself—err. Sometimes these errors are rooted in bias; sometimes they arise from insufficient data to answer the question being asked; sometimes they happen because an illness compromises focus when a friend visits with an ancient fossil skull one summer day in 1864.

Figuring out how the natural world works is not easy. Fossils do not come with labels. It took the discovery of many more fossils in the late nineteenth and early twentieth centuries for scientists to recognize the legitimacy of Neanderthals. Even then, it was not until DNA was ex-

tracted from these old bones that we began to truly understand the role of Neanderthals in human evolution. Today, we still have many unanswered questions about our extinct cousins.

The inner workings of the natural world do not magically reveal themselves; data never speak for themselves. Instead, interpretations of evidence are made by people who breathe meaning into empirically derived facts and figures. And scientific hypotheses are not always self-evident. They are generated in creative minds and tested by emotional, subjective humans behaving as objectively as they can. Science is thus a human endeavor.

Sometimes the humanity of science leads to great insights. But sometimes it leads to a scientist holding the evidence for a human past literally in his hands without recognizing it. That is why science cannot be done in isolation, by a single individual. It is a collective enterprise that unfolds over generations as we test and retest old ideas and develop new ones to make sense of our world. It stagnates when it is done by homogeneous scientists with similar backgrounds and experiences. It outright fails when it is practiced by inflexible individuals clinging desperately to tired ideas. Darwin knew this. "I had," he wrote, "during many years, followed a golden rule, namely that whenever published fact, a new observation of thought came across me, which was opposed to my general results, to make a memorandum of it without fail and at once; for I had found by experience that such facts and thoughts were far more apt to escape from the memory than favourable ones."[6]

While many of us scientists admire Darwin, we do not worship him. He was a brilliant scholar who not only generated new data but could see how his observations were connected under big, overarching ideas with both explanatory and predictive power. He navigated seamlessly between big picture, theory-level thinking and the small, intricate details. In studying orchids, earthworms, and barnacles, he could see both the forest and the trees. But Darwin had flaws, both as a scientist and as a human.

"I look with confidence to the future, to young and rising naturalists, who will be able to view both sides of the question with impartiality," he wrote.[7] The question he referred to, of course, was evolution or, as

he called it, descent with modification. In 1859, in his most famous work, *On the Origin of Species*, Charles Darwin proposed a mechanism for biological evolution: natural selection. "Whilst this planet has gone cycling on,"[8] new generations of young and rising naturalists have indeed tested Darwin's ideas. Evolution by means of natural selection has been supported over and over again. Darwin was right.

Biological evolution is thus one of the most profound and influential scientific theories ever proposed. The implications of evolution are widespread and personal: all life on Earth is related and has changed over time. However, in *Origin*, Darwin made little mention of humans, noting only that "light will be thrown on the origin of man and his history."[9] But Darwin was indeed thinking about humans. He called human origins "the highest and most interesting problem for the naturalist." The title of this book is inspired by that line, which Darwin wrote in a letter to Alfred Russel Wallace on December 22, 1857.[10]

On February 24, 1871, Darwin published his thoughts on the human career in a two-volume compendium, *The Descent of Man, and Selection in Relation to Sex*. He wrote in the introduction, "It has often been asserted that man's origin can never be known: but ignorance more frequently begets confidence than does knowledge: it is those who know little, and not those who know much, who so positively assert that this or that problem will never be solved by science."[11] In other words, Darwin proposed that the origin of humans was knowable.

Yet, at that time, Darwin didn't know about DNA. The entirety of the human fossil record, which now numbers in the thousands of specimens, consisted of just a few Neanderthal bones. These bones were misidentified by most (including, as we proposed earlier, Darwin himself) as just unusual modern humans. Modern primatological studies of our great ape cousins were almost a century away. And scholars were even debating whether different races of humans had descended from different species of primate.

A lot has changed in 150 years.

Darwin was remarkably prophetic in some of his predictions—for example, that the earliest human fossils would be discovered on the African continent. But he was flat out wrong in other areas. That is how

science works. Even the most elegant ideas can wither in the face of new evidence. Darwin did not present infallible statements to be revered in *Descent of Man*. He presented hypotheses to be tested. Some of these ideas have withstood 150 years of scrutiny. Some have not. Thus, *A Most Interesting Problem* is not so much a celebration of Darwin as it is a tribute to how science operates, how scientific ideas are tested, and the role of evidence in helping structure narratives of human origins.

On the 150th anniversary of the publication of *Descent of Man*, we present in these pages a view of where we are in our quest for understanding the origin, biological variation, behavior, and evolution of humans. Charles Darwin and evolution are inextricably linked. As Darwin's biographer Janet Browne, who pens the introduction to our book, has written, there is "much more to Darwin than his theory, and more to the theory than Darwin."[12] But Darwin serves as an appropriate benchmark for revisiting what we know and how we know it, and this anniversary provides an opportunity for self-reflection in our quest for understanding how humans evolved.

This book reviews, chapter by chapter, what Darwin wrote in the first edition of Part 1 and the last three chapters of Part 2 of *Descent*, comparing his words to what we now know 150 years later. The focus of this book is human evolution, and thus most of Part 2 of *Descent*, a detailed treatise on sexual selection, is covered only briefly in *A Most Interesting Problem*.

In 1871, the evidence for human ancestry could be found in comparative anatomical and embryological studies, updated for the reader in Chapter 1 by anatomist Alice Roberts. What we know today about the evolution of the human brain and the origins of morality and sociality are addressed in Chapters 2 and 3 by neuroanatomist Suzana Herculano-Houzel and biological anthropologist Brian Hare. The fossil evidence for our evolutionary history is explored in Chapter 4 by paleoanthropologist Yohannes Haile-Selassie. Bioarchaeologist Kristina Killgrove writes in Chapter 5 about Darwin's misguided conflation of biological and cultural evolution and the resulting rise of social Darwinism. In Chapter 6, paleoanthropologist John Hawks summarizes how molecular genetics has revealed our place in the primate family tree with resolution

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Introduction

Janet Browne

IN *THE DESCENT OF MAN*, Charles Darwin dealt with what he called "the highest & most interesting problem for the naturalist." This volume of essays shows how true these words still remain in the twenty-first century. Published in 1871, *The Descent of Man, and Selection in Relation to Sex** was a comprehensive statement of Darwin's theory of evolution as it applied to human beings and a far-reaching account of the biological phenomenon that he termed sexual selection; in it Darwin described what he knew about human ancestral origins, the physical characteristics of different peoples, the emergence of language and the moral sense, the relations between the sexes in animals and in humans, and a host of similar topics that blurred the boundaries between ourselves and the animal world. His aim was to demonstrate that human beings had gradually evolved from animals and that the differences were only of degree, not kind. His conclusions were bold: "We must acknowledge, as it seems to

* The first edition, numbering 2,500 copies, was published on February 24, 1871. There are two issues of this edition. The first issue can be distinguished by the inclusion of a note about errata. The printer evidently corrected these errata in the second issue, of 2,000 copies, released in March 1871. The book cost one pound four shillings in a standard green binding. Darwin's own copy, however, is dated 1870 and was evidently in his hands direct from the printer in December 1870. Richard Freeman, *The Works of Charles Darwin: An Annotated Bibliographical Handlist*, 2nd ed. (Folkestone, England: Dawson, 1977). *Descent* was the first book from which Darwin gained a financial profit. Publisher John Murray sent Darwin a check for £1,470.

me, that man, with all his noble qualities, with sympathy which feels for the most debased, with benevolence which extends not only to other men but to the humblest living creature, with his god-like intellect which has penetrated into the movements and constitution of the solar system—with all these exalted powers—Man still bears in his bodily frame the indelible stamp of his lowly origin."[1]

It had been a long process that brought Darwin to this point. Twelve years earlier, in *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*, he had cautiously written that if his views were accepted, "light would be thrown on the origins of man and his history."[2] Since that time, controversy about the possibility of a natural origin for all living beings had swept the globe wherever science was seen as a modernizing force. Was Darwin seriously suggesting that the natural world had not been created by any form of divine being? Were the Judaic and Christian stories of Adam and Eve to be jettisoned? Was there convincing evidence for natural selection? And how could such a mechanical process, ultimately based on probabilities, produce the extraordinary adaptations of animals and plants, let alone the moral sense, language, or civilizations of human beings?

These were some of the issues that are now often referred to as the Darwinian controversies over science and religion. In the nineteenth century, frontline issues largely drew on strong antipathy to the idea of human descent from animals. Christian critics objected to losing the central doctrines of the Bible, even though the Genesis story was already mostly seen as an allegory, and believers in other faiths similarly recoiled from giving up the special place of human beings in nature. Yet, the debate spread further than religious controversy. Secular thinkers criticized the theory on practical grounds: Where was the evidence, and how could it work without some teleological organizing principle at its heart? Debates flared over the prospect of science providing answers to questions that had traditionally been the preserve of theologians and philosophers. To many, Darwin's ideas heralded a new form of scientific naturalism that could transform the status of science in the Victorian world.[3] Radicals saw in it the possibility of atheism and the overthrow

of contemporary political hierarchies.[4] Throughout, the puzzle of human diversity and what was then called "racial science" pervaded imperial rhetoric and drew on evolutionary theory for support.

The Descent of Man, and Selection in Relation to Sex was Darwin's carefully considered response to such questions. In its way, this book on humankind was just as memorable as *Origin of Species* and can perhaps be regarded as *Origin*'s missing half. The word "evolution," first used in its modern sense, occurs on page two of the first volume of *Descent*, in the introduction, where Darwin discussed the likelihood of natural scientists accepting the idea of natural selection.[5] Darwin also used the term "survival of the fittest," which he had adopted from Herbert Spencer in 1868.[6] *Descent of Man* was written in the same personal style as *Origin of Species*, with the same courteous modesty, the same clarity, the same inexhaustible piles of evidence, and the same explicit rationalism. Its intellectual breadth was astonishing. And even though the format now seems archaic, the style of reasoning overly anecdotal, and the social views regrettably typical of a nineteenth-century British gentleman, Darwin's central arguments retain, even today, their power to explain aspects of the natural world, as is amply shown in this volume.

Darwin's book was issued in two volumes and contained two parts, as indicated in the title. In Part 1, Darwin gave a systematic account of the connections between humans and animals. He covered comparative anatomy and, at much greater length, the human mental faculties—language, reasoning ability, morality, consciousness, the religious sense, memory, and imagination. Everything that characterized the mind of human beings, Darwin posited, had emerged from animal ancestors, stepwise, by entirely natural processes. In Part 2, Darwin presented his important new concept of sexual selection. He explained how this was different from natural selection and how it worked as a complementary force in evolutionary change. Much of this section was dedicated to establishing what he meant by sexual selection and necessarily included lengthy discussion of the process as discerned in animals. At the end of Part 2, Darwin proposed that sexual selection was instrumental in explaining the origin of what he called human "races" and cultural progress. Here there are fascinating glimpses into Darwin's understanding

of the biological basis of Victorian racial hierarchies, gender relations, and the structure of contemporary civilization.

Born into an Industrial, Colonial Age

Descent of Man shows Darwin at his most Victorian. His life (1809–1882) spanned much of the nineteenth century, and his science reflected the industrial and political transformations for which Britain was then famous.[7] From his childhood, he absorbed the prevailing ideology of industrial and colonial progress. He was born in the British industrial Midlands, in the town of Shrewsbury, to a prosperous medical family. One of his grandfathers was Josiah Wedgwood, the chinaware manufacturer, who was a leading figure in the British industrial revolution and the antislavery movements of the day. Wedgwood transformed the consumer market with his factory-produced chinaware but also participated in developing new manufacturing operations, applying ideas such as the division of labor, and opened up the British transport infrastructure by investing in canals and roads. Much of the financial and social capital on which the family's prosperity rested derived from Josiah Wedgwood's commercial success. Darwin's other grandfather was the prominent physician, liberal thinker, and literary figure Dr. Erasmus Darwin. Erasmus Darwin was a member of the small circle of "improvers," medical men and politically progressive intellectuals, who called themselves the Lunar Society.[8] The Darwin-Wedgwood circle was passionate in its support for abolitionism, and the young Charles Darwin adopted this frame of mind. The family's intellectual pursuits, along with its professional social standing, religious skepticism, high levels of education, commercial acumen, and liberal political views ensured that Charles Darwin always had a place in intellectual British society as well as the prospect of a comfortable financial inheritance, both of which were material factors in his later achievements.

More generally, during Darwin's lifetime, great currents of change were also making their presence felt. In the 1830s, the British nation came as close to political revolution as it ever did, owing to conflict: between landlords and manufacturers, workers against masters, prov-

ince versus metropolis, the hungry and mutinous threatening the commercial-minded and individualistic middle classes. Prime minister Benjamin Disraeli's imagery of two nations, rich and poor, was not overfanciful. The century had opened with warfare. At the end of the century, Britain was again at war, this time in South Africa. By then, imperial expansion and the second industrial revolution—marked by the coming of the railways, significant urbanization, the rise of the middle classes, increasing prosperity, and widespread dissemination of printed texts—was well under way. From the 1850s, a new and varied economy soaked up excess capital, leading to a diversification in the labor force. And in religious terms, although the Protestant (Anglican) faith provided the structure within which most British people operated, the grip of the church was loosening. Dissenting and nonconformist Protestant groups claimed the right to worship in their own manner, to educate the young, to be represented in Parliament, and to take public position and have their views heard. The foundation of a nondenominational University College in London in 1826 marked the opening of higher education to every citizen regardless of creed.

In science, matters were similarly expanding, diversifying, and refocusing. One by one, Victorian thinkers aimed to investigate the world around them without recourse to the Bible's word or the church's doctrinal authority. Religious doubts, secular inclinations, and dissatisfaction with conventional religious doctrines, especially the prevailing system of natural theology, were launched among British intellectuals long before Darwin came on the scene. There was as well rising engagement with science among many different groups of the British public.[9]

By the time Darwin published *Origin of Species*, the nation was witnessing industrial diversification, commercial and professional specialization, religious tension, intense colonial activity, and among the middle classes much talk of national "improvement" and "progress." The self-congratulatory sense of the era was captured by the Great Exhibition of the Works of Industry of All Nations, held in 1851 in central London, in the giant glass exhibition hall dubbed the Crystal Palace.

So why did Darwin deliberately choose to keep humankind out of *Origin of Species*? No doubt he was cautious about stirring up too much

company. This curious relationship was unusual in the history of exploration. It also meant that Darwin's voyage was often a voyage on land. He had no duties on board. He could arrange whenever possible to be dropped off and picked up at various points, and he made several long inland expeditions in South America with hired guides, including a daring trek across the Andes.

Many aspects of the five-year voyage contributed to Darwin's emerging wish to understand the interconnections of living beings, although his visit to the Galápagos archipelago is the focus of most accounts. Retrospectively, however, it can be seen that his encounters with indigenous peoples were also important elements in unsettling his ideas about the stability of the natural world. The most significant of these was his experience with the inhabitants of Tierra del Fuego (Figure I.1). On board the *Beagle* were three individuals who had been taken from Tierra del Fuego to England by Captain FitzRoy on the previous *Beagle* voyage and were now being repatriated to serve in a projected Protestant mission station to be set up in the far south. FitzRoy had educated these three, and they had become relatively anglicized during their enforced stay in London. Darwin was fascinated by the returning Fuegians, especially O'rundel'lico (or Jemmy Button, as FitzRoy renamed him). In his diary, Darwin recounted his naïve amazement that, after so few years in English company, the three on board the ship were now almost another "species of man" from their literal relatives. This encounter encouraged him to think that human beings could be examined in scientific terms, as part of natural history, in the same way as other species. "I could not have believed," he wrote in his *Journal of Researches* after the voyage ended, "how wide was the difference, between savage and civilized man. It is greater than between a wild and domesticated animal, in as much as in man there is a greater power of improvement."[13]

For two decades after he returned from the *Beagle* voyage, Darwin kept notes about human evolution and pondered how best to develop and present his views.[14] Nevertheless, he chose to foreground other themes in the research program he undertook in preparation for publishing and deliberately kept humankind out of *Origin of Species*. He must have felt justified in some way when the storm of controversy erupted

after publication of *Origin* over the possible apish origins of humankind. Such opinions were dramatized in England in 1860, in a public confrontation between the youthful naturalist Thomas Henry Huxley and conservative theologian Samuel Wilberforce, the bishop of Oxford. The confrontation (which was apparently unplanned) occurred at the annual meeting of the British Association for the Advancement of Science and is remembered today for a clever verbal exchange in which Wilberforce supposedly asked Huxley whether it was through his grandfather or his grandmother that he claimed his descent from an ape. Huxley is thought to have replied that he would not be ashamed to have a monkey for his ancestor but would not wish to be connected with a man who used his great intellectual gifts to obscure the truth. No verbatim account of the discussion exists, and there is considerable uncertainty regarding what Huxley and Wilberforce actually said. But the moment quickly came to symbolize the divergent positions that were being taken on human origins, with the Christian church, as represented by the bishop, standing firm on the divine creation of humankind, and science, as represented by Huxley, offering an entirely naturalistic alternative.[15]

So, Darwin bided his time. After *Origin of Species* was published, he threw himself into research projects that illustrated the concept of natural selection in ways that did not relate to human ancestry. He published a careful study of the fertilization of orchids by insects in 1862 that explored coadaptation in depth and an extensive analysis of the variation of animals and plants under domestication in 1868. It is important for us today to recognize Darwin as a superb experimental naturalist. But perhaps these projects also allowed him to evade harder questions, although he always considered such projects as vital supporting evidence for his theory.

Writing *Descent of Man*

Indeed, Darwin might never have published his ideas on humankind if it had not been for changing circumstances brought about by the controversies surrounding *Origin of Species* and the writings of some of his contemporaries on that very issue.

Soon after the publication of *Origin of Species*, three of Darwin's closest scientific friends produced important studies that developed different aspects of evolution as it related to humankind. In 1863, Charles Lyell published the *Antiquity of Man*. In this book, Lyell described the long course of human geological history. Lyell did not have much information to give on actual fossilized humans or prehumans—there were only a few broken parts of crania in collections at that time, and their identification was contested (we now know that they were among the earliest discovered remains of Neanderthals). He focused instead on prehistoric humankind—cavemen and -women. Until then, the paucity of early human artifacts such as worked flints and tools had suggested that humankind was very recent in geological terms, a view that accorded well with the notion that humans had appeared on Earth only when the Bible story started, some 4,000 years ago. Even those who believed in a longer age for the habitable Earth, including those few who believed in non-divine origins for humanity, were sure that human history was relatively short and could be measured in mere thousands of years, not whole geological epochs. The common assumption was that humans appeared only when the planet arrived at its modern state, which was presumed to be after the glacial period—or, for those who believed in the biblical flood, at the point when the floodwaters receded. Lyell pushed the origin of humankind further back, beyond this watery dividing line, into the geological deep past. It was the first significant book after Darwin's *Origin of Species* to shake the contemporary view of humanity.

Then came Thomas Henry Huxley's book, *Evidence as to Man's Place in Nature*, which was published a few weeks after Lyell's. The text showed Huxley at his most argumentative. He used this small volume to continue a scientific dispute with the great anatomist Richard Owen on the anatomical similarities between apes and humans. Partly, too, he used the opportunity to pioneer secular natural history and consolidate his rising position as the main public protagonist for Darwin.[16] Even though Huxley did not fully adopt Darwin's ideas, he defended Darwin's right to propose entirely naturalistic explanations for the living world. In this short, polemical book, Huxley demonstrated how human-

kind must, on all biological grounds, be classified with the apes. The frontispiece (drawn by Benjamin Waterhouse Hawkins) showed five primate skeletons standing in line, each figure leaning slightly forward, ready to evolve into the next. The scale was cleverly adjusted to make the point. From gibbon to orangutan, chimpanzee, gorilla, and human, the implication could not be clearer—humans were the result of a series of physical changes from the apish state. The point was understood by readers but not necessarily accepted. One reviewer observed dryly, "We are not yet obliged to be quite on all-fours with Professor Huxley."[17]

Soon after Huxley was Alfred Russel Wallace, who had formulated the principle of evolution by natural selection independently of Darwin. Wallace wrote two compelling articles on human evolution in the 1860s. In the first, saying what Darwin had stopped short of saying in *Origin*, he argued that natural selection was the primary force in changing apes into people. In the second article, published in the 1869 *Quarterly Review*, Wallace backtracked and declared that natural selection seemed to him insufficient to explain the origin of humankind's extraordinary mental capacities. He agreed with Darwin that natural selection pushed our apish ancestors to the threshold of humanity. But at that point, he thought, physical evolution stopped and something else took over—the power of mind. The human mind alone continued to advance, human societies emerged, and cultural imperatives took over. According to Wallace, not every society developed at the same rate, accounting for what he and his contemporaries considered to be visible differences in cultural status. Darwin was thoroughly taken aback. "I hope you have not murdered too completely your own and my child," he wrote to Wallace in surprise.[18] Darwin's view was that everything that could be considered characteristic of the human condition—language, morality, religious sense, maternal affection, civilization, appreciation of beauty—had emerged in gradual steps from animals. He could not agree with Wallace that some external force—Wallace believed it to be some spiritual power—had made us what we are.

Other publications on human origins were evident too. The creative evolutionism espoused by George Campbell, the Duke of Argyll, was gaining ground. Herbert Spencer's *Principles of Biology* (1864) and

FIGURE 1.2. Darwin's study in his home, Down House, in Kent, United Kingdom. Here Darwin wrote his most famous books, including *Descent of Man* and *Origin of Species*. (Photograph by Jeremy DeSilva)

ranging from horses that knew the way home to ants that defended their property, chimpanzees that used twigs as implements, bowerbirds that admired the beauty of their nests, and household cats and dogs that apparently dreamed of chasing rabbits in their sleep. The domestic nature of Darwin's observations in this area, the large doses of willing anthropomorphism, his evident delight in traditional country pursuits, and the glimpses he provided of the congenial home life of a Victorian gentleman inspired Frances Power Cobbe to deride these accounts as "fairy tales of science," in a review published in 1872.[21] These anecdotes probably went a long way toward softening his readers before he confronted them with the shock of apes in the family tree (Figure I.3).

To explain the emergence of the mind and language of humankind through variation and natural selection was altogether more problematic. Darwin launched straight into an examination of the power of human speech: this was obviously critical for him, since language was integral to all contemporary definitions of being human and was assumed to present an inseparable barrier between animals and humans. Darwin particularly wished to contest the widespread view that the ability to speak indicated God's special gift to humans. The great linguist and scholar Friedrich Max Müller had expressed the view that human language was a divine gift in the magazine *Nature* in 1870. Darwin believed that the ability to speak must have emerged quite differently, arising in a gradual fashion from the social vocalizations of apes and further developing in extremely early human societies through the imitation of natural sounds.[22]

Darwin was similarly daring when dealing with the evolution of religious belief. Drawing on the work of the cultural anthropologist Edward B. Tylor, he mapped out a comparative evolution of the religious sense, proposing that religious belief was ultimately nothing more than an urge to bestow a cause on otherwise inexplicable natural events. He proposed that human dreams occurring in early societies might have given rise to the idea of external gods, as Tylor suggested, or to animism, in which plants and animals seem as if they are imbued with spirits. Darwin suggested that these beliefs could easily grow into a conviction about the existence of one or more gods who directed human affairs. As

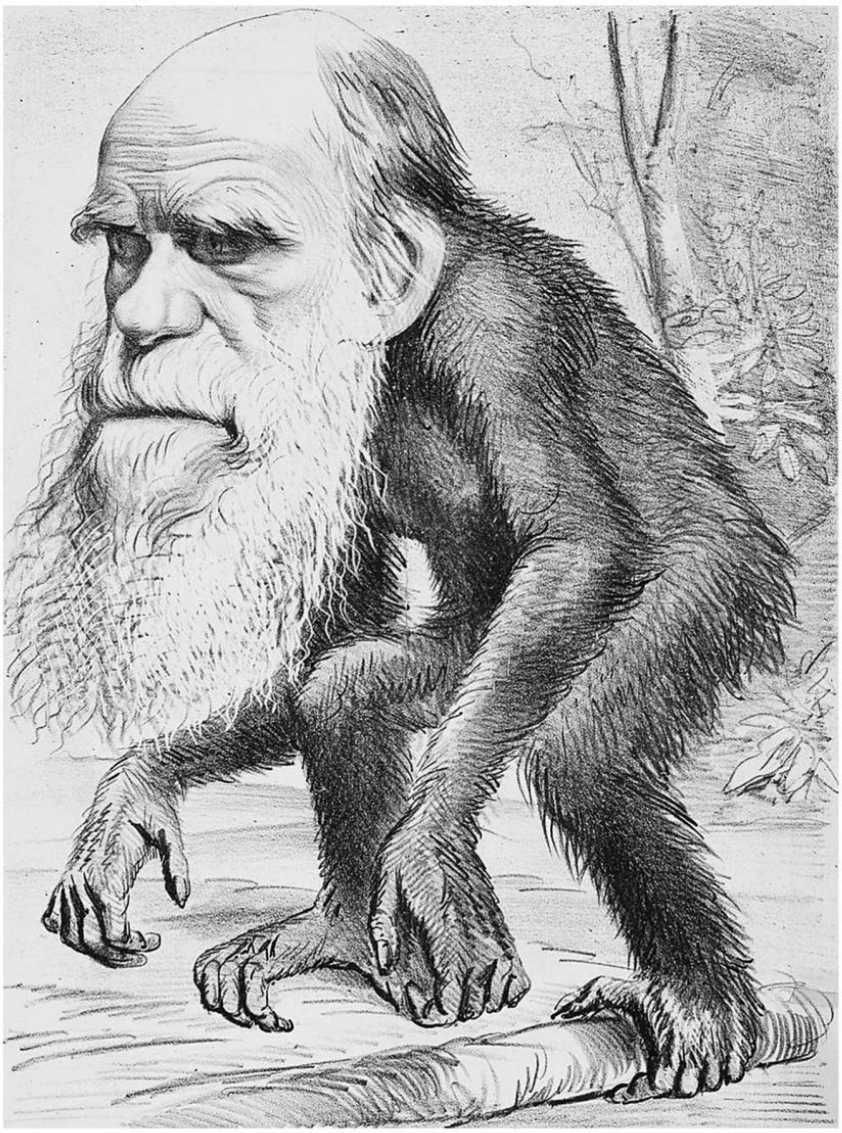

FIGURE 1.3. "A Venerable Orang-Outang." Caricature of Charles Darwin issued after *Descent of Man* was published. (From *The Hornet*, March 22, 1871)

societies advanced in civilization, he said, ethical values would become attached to such ideas. "Strange superstitions and customs" would give way to the "improvement of reason, to science, and our accumulated knowledge." Human beings have a biological need to believe in something "other," he suggested. Audaciously, he compared religious devotion to the "love of a dog for its master."[23]

As for human morality, Darwin pointed out that the concept was only relative. Careful reading in canonical moral philosophy texts and long observational experience with household pets (and no doubt his children as well) told him that living beings had to learn the difference between "good" and "bad" behavior—the knowledge was not innate. Moreover, members of what he called "primitive" societies held a wide range of ideas about acceptable behavior, many of which he knew would horrify contemporary Victorians, such as cannibalism. If honeybees ever became as intelligent as humans, Darwin explained, unmarried females would think it a "sacred duty to kill their brothers, and mothers would strive to kill their fertile daughters; and no one would think of interfering."[24]

Darwin proposed this more for effect than logical necessity, because he went on to argue that higher human values emerged and spread only as human civilization progressed, meaning that duty, self-sacrifice, virtue, altruism, and humanitarianism were acquired fairly late in human history and not equally by all tribes or groups. "How little the old Romans knew of [sympathy] is shewn by their abhorrent gladiatorial exhibitions. The very idea of humanity, as far as I could observe, was new to most of the Gauchos of the Pampas."[25] It is clear that Darwin thought there had been a progressive advance of moral sentiment from the ancient "barbaric" societies described in Victorian history books, such as those of ancient Greece or Rome, to the civilized world of nineteenth-century England that he inhabited. In this manner, he kept the English middling classes to the front of his readers' minds as representative of all that was best. The higher moral values were, for him, self-evidently the values of his own class and nation.

Even the sense of duty was for Darwin biologically based in the social instincts. "The highest stage in moral culture at which we can arrive," he

wrote, "is when we recognise that we ought to control our thoughts."[26] To be sure, Darwin praised the intrinsic nobility of this moral feeling, quoting Immanuel Kant. "Duty! Wondrous thought, that workest neither by fond insinuation, flattery, nor by any threat . . . whence thy original?"[27] Yet as Darwin described it, a female monkey who voluntarily sacrificed herself for her offspring would not only ensure her children's survival but also supply the next generation with the hereditary material (Darwin had no notion of modern genetics or kin selection) that favored such action again. Personally, he declared, he would rather be descended from a heroic little monkey that sacrificed her life in this manner than from a savage "who delights to torture his enemies, offers up bloody sacrifices, practises infanticide without remorse, treats his wives like slaves, knows no decency, and is haunted by the grossest superstitions."[28]

In Part 1, Darwin also discussed fossil intermediaries between ape and human and mapped out (in words) a provisional family tree, in which he took information mostly from fellow evolutionists such as Ernst Haeckel and Thomas Henry Huxley. In truth, Darwin found it difficult to apply an actual evolutionary tree to humans. Briefly, he tracked humans back as far as the Old World monkeys, saying that the human species must have diverged from the original monkey stock considerably earlier than did the anthropoid apes, probably at a point close to now-extinct forms of Lemuridae. He recognized the great apes as humanity's nearest relatives. Darwin knew very little about fossil primates and could name only *Dryopithecus*, the largest fossil ape identified in the deposits of Europe at that time (for the second edition of *Descent of Man*, Darwin asked Huxley to fill this gap with an up-to-date essay about fossil finds). He could only guess at possible reasons for human ancestral forms to have abandoned the trees, lost their hairy covering, and become bipedal.

> The early progenitors of Man were no doubt once covered with hair, both sexes having beards; their ears were pointed and capable of movement; and their bodies were provided with a tail, having the proper muscles. . . . The foot, judging from the condition of the great