ESSAY 28

The German Reception of Darwin's Theory, 1860–1945

Robert J. Richards

When Charles Darwin wrote in the *Origin of Species* (1859, 482) that he looked to the "young and rising naturalists" to heed the message of his book, he likely had in mind individuals like Ernst Haeckel (1834–1919), who responded warmly to the invitation (Haeckel 1862, 1:231–32n) (Fig. 28.1). Haeckel became part of the vanguard of young scientists who plowed through the yielding turf to plant the seed of Darwinism deep into the intellectual soil of Germany. As Haeckel would later observe, the seed flourished in extremely favorable ground. The German mind, he would write (1868), was predisposed to adopt the new theory. The great philosopher Immanuel Kant (1724–1804), for instance, was on the verge of accepting a transmutational view in his Third Critique ([1790] 1957, 538–39), though he stepped gingerly back from the temptation. Johann Wolfgang von Goethe (1749–1832), about the same time, dallied with transmutational ideas, or at least Haeckel would convince Darwin that the Englishman had an illustrious predecessor. Jean-Baptiste de Lamarck's (1744–1829) conceptions had taken hold among several major German thinkers in the first few decades of the nineteenth century in a way they had not in England and France. Among those ready to declare themselves for the new dispensation was Rudolf Virchow (1821–1902), Haeckel's teacher at Würzburg – though, this very political scientist would prove Haeckel's nemesis later in the century. So Haeckel's estimate of the ripeness of German thought was not off the mark. Darwinism took hold in the newly unified land, though not without some struggle; at last, it became the dominant view in the biological sciences. But with its success, did it also foster the malign racist ideology that transfixed Adolf Hitler (1889–1945)?

EVOLUTIONISM BEFORE DARWIN

In his *Critique of the Faculty of Judgment* (*Kritik der Urteilskraft*, [1790] 1957), Kant argued that the naturalist could provide a mechanistic understanding of organisms only up to a point. The researcher could deploy physical laws to explain, for example, the refraction of light rays by the various media of the vertebrate eye; yet the composition and special layout of cornea, lens, and humors so as to focus an image on the retina bespoke a purposeful arrangement. The investigator could ultimately

Figure 28.1. Ernst Haeckel (1834–1919), the author of the "biogenetic law," was Darwin's greatest German supporter, but it is debated how much his thinking was genuinely Darwinian and how much it owed to older traditions that stressed morphology. Permission: Wellcome

Figure 28.2. The great German poet Johann Wolfgang von Goethe (1749–1832) was always interested in science, and by the end of his long life was embracing some form of morphology-based transformism. Permission: Wellcome

construe the operations of the eye only by postulating the *idea* of the whole as the cause of its design; such postulation would imply, at least heuristically, an *intellectus architypus* – an intellect whose ideas were creative. At first Kant rejected any notion of a gradual development of organisms over time; at least he did so when his former student Johann Gottfried Herder (1744–1803) had suggested this possibility in his *Ideas for a Philosophy of the History of Humanity* (*Ideen zur Philosophie des Geschichte der Menschheit,* 1781–84). However, the work of Johann Friedrich Blumenbach (1752–1840) finally convinced Kant that it was conceivable, at the limits of understanding, to unite mechanism with teleology in the explanation of organisms (R. J. Richards 2002b, 229–37). It could be, for instance, that the mechanical deformation of the vertebrate skeleton might produce all the various vertebrate forms. The several osteological patterns did evince purposiveness, but they might have arisen naturally from a resourceful mother earth, as it were, and developed through time under physical forces. Kant cautioned that this possibility yet required the naturalist further to assume that the original seeds themselves had a purposive core. This transformational hypothesis, Kant thought, would be "a daring adventure of reason." He concluded, however, that there was little empirical evidence to support the view and that one would wait in vain for a Newton of the grass blade.

Though Kant had initially rejected the speculations of Herder in harsh and dismissive tones, the Weimar community was more hospitable to such ideas. Charlotte von Stein (1742–1827), Goethe's great love, recalled her friend had imagined that human beings were once fish. Later in the 1820s, in his series *Zur Morphologie* (1817–24), Goethe proposed a scenario in which the giant megatherium, whose fossil remains were unearthed in South America, had been transformed into the modern sloth (R. J. Richards 2002b, 476–86). He argued that the common pattern of bones that underlay the various vertebrate skeletons could have been transformed through interactions with the environment. He consequently supposed that Kant's daring adventure of reason was more than groundless fantasy (Goethe 1989, 98–99) (Fig. 28.2).

Goethe's speculations may have been fueled by the rapid translation into German of Erasmus Darwin's (1731–1802) *Zoonomia, or The Laws of Organic Life* (1794–96), which had a long section proposing the natural transformation of simple creatures, originally created by God, into the variety of living species populating the globe. The number of German biologists succumbing to the transformational hypothesis

increased during the first decades of the nineteenth century as Lamarck's ideas gained traction in Germany, even while they faltered in Britain and France. For instance, in the first volume of his *Zoologie* (1708–14), Friedrich Tiedemann (1781–1861) argued that the paleontological evidence indicated a parallel between human embryological development and the history of no-longer-living organisms.

> From the oldest strata of the earth to the most recent, there appears a graduated series of fossil remains, from the most simply organized animals, the polyps, to the most complex, the mammals. It is evident too that the entire animal kingdom has its evolutionary periods [*Entwickelungsperioden*], similar to the periods which are expressed in individual organisms. (Tiedemann 1808–14, 1:64–65)

The great embryologist Karl Ernst von Baer (1792–1876), however, objected strongly to this hypothesis. He declared in his celebrated *Developmental History of Animals* (*Entwickelungsgeschichte der Thiere*, 1828–37), citing his earlier Latin disputation (1823), that "the law proclaimed by naturalists is foreign to nature, namely 'that the evolution [*Evolutionem*] which each animal undergoes in its earliest period corresponds to the evolution which they believe to be observed in the animal series.'" (von Baer 1828–37, 1:202–3). Von Baer thus rejected the parallel between the embryological "evolution" of an animal and the supposed historical evolution of species. Even before Cuvier's famous lampoon of his colleague Lamarck in the eulogy at his death, von Baer had struck the comic note:

> One gradually learned to think of the different animal forms as evolving [*entwickelt sich*] out of one another – and then shortly to forget that this metamorphosis was only a mode of conception. Fortified by the fact that in the oldest layers of the earth no remains from vertebrates were to be found, naturalists believed they could prove that such unfolding of the different animal forms was historically grounded. They then related with complete seriousness and in detail how such forms arose from one another. Nothing was easier. A fish that swam upon the land wished to go for a walk, but could not use it fins. The fins shrunk in breadth from want of exercise and grew in length. This went on through generations for a couple of centuries. So it is no wonder that out of fins feet have finally emerged. (von Baer 1828–37, 1:200)

Despite the objections of zoologists like von Baer, two strains of evolutionary thought arose in Germany during the first half of the nineteenth century. One followed the direction given by individuals like Tiedemann and developed a naturalistic account of species change. So, for example, Rudolf Virchow (1862, 31) maintained, in a lecture of 1858, that it was scientifically necessary, on the basis of paleontological evidence, to assume the "transmutability of species" (*die Uebergangsfähigkeit von Art in Art*). He was proud to have made that judgment prior to Darwin's publication of the *Origin of Species*. Later he would become less convinced of the scientific probity of evolutionary ideas, especially as applied to human beings. More religiously minded scientist traveled a second path. One such was Heinrich Georg Bronn (1800–62), for whom the paleontological evidence suggested that extinct species had been progressively replaced. The replacement of one species with an improved one, he argued, followed general laws relating the local environment to particular kinds of adaptation. Bronn yet maintained that replacement was not transformation in the Lamarckian sense; he looked to a Divine source for the progressive changes in species over vast periods of time (Rupke 2005). The history of biological thought before the publication of the *Origin of Species* does indicate that the community of German researchers was more predisposed to be receptive to the new theory than naturalists of other nations. Yet the introduction of Darwin's conception also produced hesitation, modification, and objection.

THE *ORIGIN OF SPECIES* AND ITS EARLY ADVOCATES

The *Origin of Species* was published by John Murray in November 1859, with a second, lightly corrected edition in December. Darwin had been contacted by H. G. Bronn with a request to supervise a translation into German. Bronn himself translated the second edition of the book in lightning-fast order. *Über die Entstehung der Arten* appeared in June 1860. The translation was quite adequate, with only a few infelicities (Gliboff 2008, ch. 4). Bronn, however, appended an essay of critical analysis to his translation that set the tone for the German reader. He was quite admiring of Darwin's accomplishment, recognizing in him a naturalist of considerably ability, especially as his ideas moved in the direction of Bronn's own. But he also pointed out the difficulties, especially the notion of lawless variation and the assumption of a spontaneous generation at the beginning of life on earth. The criticism that evoked the most positive response, however, was Bronn's (1860, 503) observation that Darwin showed only that transmutation of species was possible; he had not provided the evidence that it was actual. Bronn, whose main empirical concern had been paleontology, did not fully appreciate the *Origin*'s several conceptual strands that, when woven together, yielded "one long argument" (Darwin 1859, 459). Bronn's request for evidence inspired two ardent disciples: Ernst Haeckel and August Schleicher (1821–68).

Haeckel, who trained as a medical doctor at Würzburg and studied under Virchow, pursued research in marine biology. While he was preparing his prize-winning work on radiolaria, he read Bronn's translation of the *Origin*, and thought his own study of these microscopic marine organisms provided the kind of empirical evidence Darwin's theory required: the relationships of species within families of these creatures bespoke genealogy, and the transitional species between families confirmed it (Haeckel 1862, 1:231–33). Later his three-volume study of sponges provided greater and more

abundant evidence, he believed, of the natural origin of these transformed invertebrates (Haeckel 1872).

Perhaps the most convincing evidence for Darwin's theory came in Haeckel's early study of siphonophores, complex colonial organisms. The research on these creatures occurred while Haeckel and several assistants spent about four months in the Canary Islands during the winter of 1866–67. Just before the trip, Haeckel stopped in England, where he visited an array of naturalists, including Thomas Henry Huxley in London and Darwin at his village of Downe (R. J. Richards 2008, 173–75). The research led to a prize-winning tract *On the Developmental History of Siphonophores* (*Zur Entwickelungsgeschichte der Siphonophoren*, 1869).

Haeckel's experiments and dissections of siphonophores preceded by twenty years the similar experiments by his two students, Wilhelm Roux (1850–1924) and Hans Driesch (1867–1941). In one set of experiments, he followed the development of siphonophore eggs from species of ten different genera. He altered the ambient light, water salinity, temperature, and movement to determine if these disturbances caused alteration in development. The environmental changes did have significant effects on development, causing some embryos apparently to revert to the morphology of ancestor species or to cross over to related species forms. In another set of experiments, he carefully divided the cells of very young embryos into two, three, or four groups to see if the separated cells would continue to develop. Like his students Roux and Driesch, he got independently developing embryos, some continuing their growth for almost a month. The embryonic clones, as we would call them, were complete but usually smaller than normal embryos. These latter experiments, like those of Driesch, showed early embryonic cells to be totipotent. The former set of experiments seemed to reveal the evolutionary history of siphonophores (R. J. Richards 2008, 185–96).

Schleicher, an eminent linguist and Haeckel's colleague at Jena, also took up Bronn's challenge to find evidence for Darwin's theory. He explored the history of language, where linguistic fossils could be found that indicated descent with modification. In 1863 Schleicher published his investigations in a little tract entitled *Darwinian Theory and the Science of Language* (*Die Darwinsche Theorie und die Sprachwissenschaft*), which Darwin himself arranged to have published in English. Schleicher argued that language and mind were two sides of the monistic coin; he maintained that human mental evolution could be gauged by the complexity of language spoken. Haeckel's description of the hierarchy of the various races of mankind was deeply in Schleicher's debt, as was Darwin's own argument for the evolution of human mind in the *Descent of Man* (1871).

Jena was the first significant redoubt for *Darwinismus*. In addition to Haeckel and Schleicher, Carl Gegenbaur (1826–1903) had cast his lot with the new theory, though initially with some hesitation. In the first several volumes of his monograph series *Investigations in the Comparative Anatomy of Vertebrates* (*Untersuchungen zur vergleichenden Anatomie der Wirbelthiere*, 1864, 1865, 1872). Gegenbaur demonstrated the homologous relationships of the vertebrate skeleton but did not mention Darwin's conception (Fig. 28.3). Only in the second edition (1870) of his *Foundations of Comparative Anatomy* (*Grundzüge der vergleichenden Anatomie*) did he proclaim:

Figure 28.3. Carl Gegenbaur (1826–1903), an ardent Darwinian and close collaborator with Ernst Haeckel. Permission: American Philosophical Society

> From the standpoint of descent theory, the "relationship" of organisms has lost its metaphorical meaning. When we meet a demonstrable agreement of organization through precise comparison, this indicates an inherited trait stemming from a common origin. The task becomes to trace, step-by-step, the various paths the organ has followed by reason of acquired adaptation; it no longer suffices to derive each relationship from some remote similarity. (Gegenbaur 1870, 19)

Because of Gegenbaur and Haeckel, the small university at Jena drew some of the next generation's most significant biologists: the "golden" brothers Oscar (1849–1922) and Richard Hertwig (1850–1937), Anton Dohrn (1840–1909), Hermann Fol (1845–92), Eduard Strasburger (1844–1912), Vladimir Kovalevsky (1842–83), and Nikolai Miklucho-Maclay (1846–88). After Gegenbaur's departure from Jena, they

still came to study with Haeckel: Arnold Lang (1855–1914), Richard Semon (1859–1918), Wilhelm Roux (1850–1924), and Hans Driesch (1867–1941). When Gegenbaur moved to Heidelberg in 1873, there quickly formed around him another group of students who would extend his research in evolutionary morphology (Nyhart 1995). Among this number were: Max Fürbringer (1846–1920), Georg Ruge (1852–1919), Friedrich Maurer (1859–1936), Hermann Klaatsch (1863–1916), and Ernst Göppert (1866–1945).

The work of the Jena evolutionists seems to have encouraged their own mentors and teachers to move in Darwin's direction. Rudolf Leukart (1822–98), the great invertebrate morphologist at Giessen, affirmed in a review of Haeckel's *General Morphology of Organisms* (*Generelle Morphologie der Organismen*, 1866) that, while he did not completely agree in all particulars with Haeckel, he was with him on the "main question of descent" (Nyhart 1995, 175n). Haeckel's own teacher at Würzburg, Albert Kölliker (1817–1905), was more restrained in his support. Like many others in Germany and Britain, he became convinced of evolution in the wake of the *Origin of Species* but rejected natural selection as the means by which this occurred. In his 1864 article "On the Darwinian Theory of Creation" ("Ueber die Darwin'sche Schöpfungstheorie"), Kölliker complained of Darwin's "teleological" mode of arguing, contending that the Englishman assumed that all traits of an organism were "the best" and that the general harmony of the organic world derived from natural selection. Kölliker (1864, 184) rather thought a general law, presumably of divine origin, was necessary to explain the "great developmental plan that drove the simplest forms to ever more variable unfolding." Other professional biologists, like the embryologists Wilhelm His (1831–1924), Ludwig Rüttimeyer (1825–95), and Alexander Goette (1840–1922), were ready to accept the notion of the transformation of species but balked at the specific proposals of the Darwinians, especially Haeckel's biogenetic law that ontogeny recapitulated phylogeny.

Though Darwin had assumed that patterns of phylogenetic transformation would be preserved in the sheltered maternal environment of the embryo – which, as he claimed in the *Origin of Species* (1859, 450), would be left as "a picture, more or less obscured, of the common parental form of each great class of animals" – that conception never became the central principle for him that it did for Haeckel. In his many publications and lectures, Haeckel would illustrate the biogenetic law with a comparative analysis of the embryological development of phylogenetically related organisms, showing that at very early stages embryos were quite similar, expressive of the morphology of the common ancestor, and only in later stages did they diverge from shared patterns, just as their ancestors had. Both Haeckel's colleague Gegenbaur and his friend August Weismann (1834–1914) endorsed the biogenetic law (Fig. 28.4).

Weismann became what Darwin's British disciple George Romanes (1848–94) called an "ultra-Darwinian." He parted from Haeckel – and Darwin himself – over the inheritance of

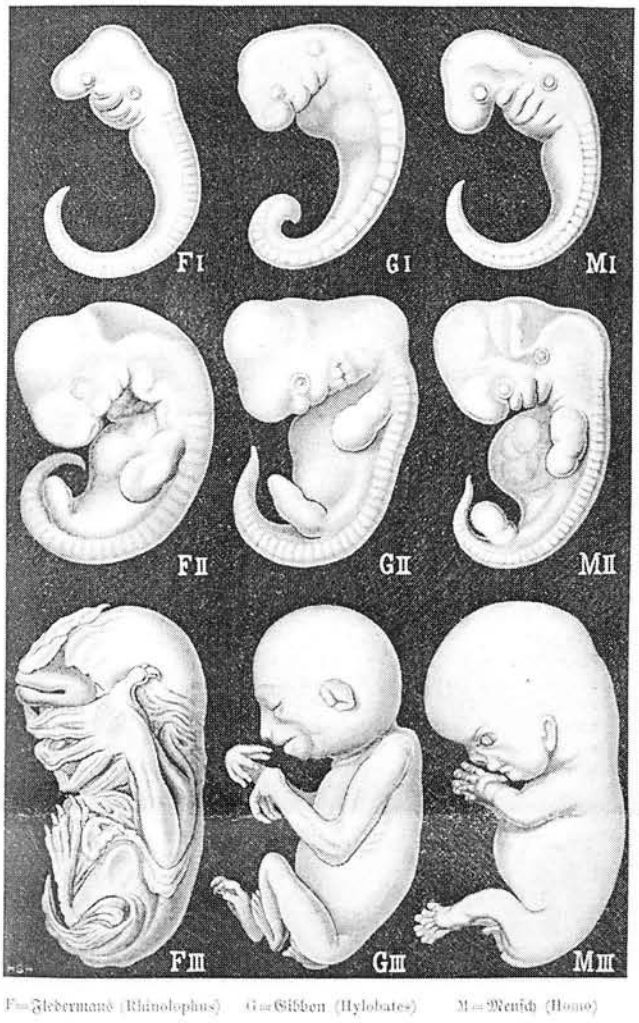

FIGURE 28.4. Haeckel's famous diagram showing the growth of the individual (ontogeny) mimics the history of the group (phylogeny). From Haeckel's 1905 Berlin Lecture series, *Der Kampf um den Entwickelungs-Gedanken*

acquired characteristics. Both Darwin and Haeckel believed that traits acquired by parents could alter the hereditary substance and be passed to offspring. Natural selection could operate on such traits as well as on those that spontaneously arose as small variations; such variations would result from the impact of the environment on the sexual organs of the parents. Weismann (1889, 419–48), by contrast, demonstrated that five generations of mice whose tails were cut off and then bred together nonetheless gave birth to offspring with tails intact. He argued that the germ-plasm, carried in the genital organs, had only a one-way connection with the somato-plasm, which gave rise to manifest bodily features: the germ-plasm guided development of the organism but remained unaffected by changes in the body of the creature. There was a certain sense in which the germ-plasm, in Weismann's view, was immortal, carried along through the hereditary line.

OBJECTIONS TO DARWINIAN THEORY BY GERMAN BIOLOGISTS

Haeckel's biogenetic law became the point of attack by other biologists who more or less accepted the idea of transmutation. The three aforementioned embryologists – Rüttimeyer, His, and Goette – became Haeckel's most vitriolic critics. They especially objected to the recapitulation hypothesis, mostly from a desire to protect the newly emerging field of professional embryology from the ingressions of evolutionary theory; this kind of territoriality continued to fuel studies of embryology in the twentieth century (see De Beer 1940 and Oppenheimer 1967). Indeed, these embryologists issued an indictment of fraud against Haeckel, a charge that would haunt him through his later years and provide grounds for suspicions about evolutionary theory more generally. Rüttimeyer (1868), in an early review of Haeckel's *Natural History of Creation*, noticed that illustrations of embryos at the very earliest stages were strikingly similar: Haeckel had used the same woodcut three times to depict what he called the sandal stage of development in the embryos of a dog, a chicken, and a turtle. Haeckel argued that at the earliest stages it was impossible to discriminate the embryos. In later editions of his book, he employed just one illustration of an embryo at this very early stage and claimed it might as well be the depiction of a dog, chicken, or turtle because they cannot be distinguished. Though Darwin and Huxley supplied moral support to Haeckel, the damage was done, and the charge of fraud was frequently repeated by enemies of evolutionary theory in Germany.

Wilhelm His directed the most probing and relentless attack against Haeckel. In *Our Corporeal Form and the Physiological Problem of Its Origin* (*Unsere Körperform und das physiologische Problem ihrer Entstehung*, 1874), His argued for the primacy of proximate mechanical causes – as opposed to remote evolutionary causes – for the understanding of embryological development. He took the opportunity, as well, to remind his readers of the fraud perpetrated by one of evolution's leading exponents and of that individual's continuing malfeasance. His claimed that Haeckel exaggerated the length of the tail of the human embryo to make it more apelike.

His's insistence on appealing only to proximate, potentially observable causes conformed to the epistemological dicta of Haeckel's former teacher and later opponent, Rudolf Virchow. In a famous confrontation at a meeting in Munich in 1877, Virchow utterly rejected Haeckel's proposal that evolutionary theory be taught in the German lower schools. Virchow claimed that authentic science should avoid speculation and rely only on observable and experimentally justifiable causes. Evolutionary theory supposed the spontaneous generation of life in the early seas and the transition from apelike creatures to man, neither of which could be demonstrated. But the real danger of evolutionary theory, Virchow (1877) urged, was its connection with socialism, the fuel that ignited the Paris Commune a few years earlier. Both Darwin and Huxley thought this political indictment in Bismarck's Germany was vicious and unfair; but it obviously carried weight. Haeckel (1878) himself would argue that evolutionary theory had no political implications; one could draw such implications only when the theory was wedded to antecedent philosophical and political doctrines.

THE RELIGIOUS OBJECTIONS TO EVOLUTIONARY THEORY

The most vocal opposition to evolutionary theory came from religious dogmatists. In particular, members of the Keplerbund (an organization of Protestant naturalists) objected to the antireligious and anti-Christian conclusions that Haeckel and others had drawn on the basis of evolutionary theory. Eberhard Dennert (1861–1942), a lower-school teacher and founder of the Keplerbund, unleashed a torrent of pamphlets and books in opposition to Darwinian ideas. Typical was his *On the Deathbed of Darwinism* (*Vom Sterbelager des Darwinismus*, 1905), which pitted Darwin's version of evolution against that of others, with the implication that the whole enterprise was uncertain. Dennert (1905, 6) concluded that we had "no clear and exact demonstration of evolutionary doctrine." Several of the books and articles of the Keplerbund were translated into English and became the basis for tracts in the collection called *The Fundamentals* (1910–15), from which the religious movement in the United States received its name.

The response to evolutionary ideas in the Catholic community took an unexpected turn. In the wake of the German liberals' reaction to Pope Pius IX's brief against the modern world – the *Syllabus errorum* (1864) – Bismarck took the opportunity to curb the growing power of the Catholic Center Party. He promoted what Virchow called a *Kulturkampf* against the Roman Church, which ultimately led to the expulsion of the Jesuits from Germany in 1872. By the end of the century, however, the hostilities had quieted to the extent that rumor even had the Emperor ready to convert to Catholicism. Haeckel was called from retirement by friends to combat the resurgent ultramontanist threat. In a series of lectures he gave in Berlin in 1905, he disclosed what he thought a Jesuit plot. Father Erich Wasmann, S.J., had published a book entitled *Modern Biology and the Theory of Evolution* (*Die moderne Biologie und die Entwicklungstheorie*, 1904) (Fig. 28.5). Wasmann, a research biologist who specialized in ants and beetles, had surprisingly argued that evolutionary theory was supported by empirical facts. His work on an order of beetles that lived in ant nests, the myrmecophile, had convinced him of a view that he had previously rejected. He investigated several species of these beetles and discovered that some had taken on the color of the various ant species with which they lived and that others, even more remarkably, seemed to have evolved to resemble ants and were treated accordingly by their hosts. But a Jesuit who endorsed evolutionary theory! Haeckel thought there had to be sinister motivation involved, something Jesuitical. Wasmann did reserve to divine power the existence of man's soul and rational faculties, even if his body arose from apelike ancestors. His effort at reconciliation

FIGURE 28.5. For all that Father Eric Wasmann S.J. endorsed evolutionary thinking, he earned the skepticism and hostility of Haeckel, who thought he was up to something devious and sinister. From *Berliner Tageblatt*, 7 February 1907

ultimately became the way the Vatican decided to avoid a repetition of the Galileo affair.

EVOLUTIONARY THEORY AND NAZI BIOLOGY

Several recent critics have alleged that Darwinian theory was foundational to Hitler's racism and Nazi biology more generally. Daniel Gasman (1971, 40) claimed that "Haeckel ... was largely responsible for forging the bonds between academic science and racism in Germany in the later decades of the nineteenth century." According to Gasman (1998, 26), Haeckel had virtually begun the work of the Nazis: "For Haeckel, the Jews were the original source of the decadence and morbidity of the modern world and he sought their immediate exclusion from contemporary life and society." Richard Weikart, in his book *From Darwin to Hitler* (2004, 6), argues that "no matter how crooked the road was from Darwin to Hitler, clearly Darwinism and eugenics smoothed the path for Nazi ideology, especially from the Nazi stress on expansion, war, racial struggle, and racial extermination." In the 2008 film *Expelled*, promoting the doctrines of intelligent design, the purported connection between Darwinism and Hitler is made part of the religiously conservative effort to undermine evolutionary theory. In the film, Weikart and the philosopher David Berlinski discuss the issue; and the latter asserts that "if you open *Mein Kampf* and read it, especially if you can read it in German, the correspondence between Darwinian ideas and Nazi ideas just leaps from the page."

Before indicating the factual misrepresentations of these indictments of Darwinian theory, a few conceptual considerations are in order. First, even if Hitler was a dedicated reader of the *Origin of Species* and drew inspiration from the book, that has no bearing on the truth of the basic premises of Darwinian theory or the moral character of Darwin and his followers. Hitler and the Nazis endorsed modern chemistry and its uses in the extermination camps, which of course hardly precludes the truth of that science or morally taints all chemists. It can only be rampant ideological confusion to suggest that somehow Darwin and Haeckel, both dead long before Hitler came to power, are responsible for the crimes of the Nazis or that the alleged connection with Nazi biology invalidates evolutionary theory. Second, the theory fundamental to the Nazi social hygienists, as well eugenicists in Britain and the United States, was Mendelian genetics, which in the early part of the century was seen as a replacement for Darwinian theory. Yet, none of those railing against Darwinism suggests that somehow genetics has been falsified or morally corrupted by the Nazi employment of that science. Finally, the charges made by Gasman, Weikart, Berlinski, and other members of the Discovery Institute, the Seattle organization that defends Intelligent Design, reduce the complex motivations of Hitler and the Nazis to monistic simplicity; Gasman, Weikart, and the rest ignore the economic, political, and social causes operative in the Germany of the 1930s, as well as the deeply rooted anti-Semitism that ran back to Luther and medieval Christianity.

There is little doubt that Charles Darwin and Ernst Haeckel, as well as most evolutionary thinkers of the nineteenth century believed in a hierarchy of races, with the criteria being intelligence and moral character. In this assumption, however, they did not differ from most other thinkers of the period (R. J. Richards 2002a). The preevolutionary scientists Carolus Linnaeus (1707–78), Johann Friedrich Blumenbach (1752–1840), and Georges Cuvier (1769–1832) – all of whose works subsequently directed thought about the distinction of human races – ranked those races in a hierarchy, with Europeans in the top position. James Hunt (1833–69), founder of the Anthropological Society of London and no friend of the Darwinians, declared in his presidential address to the society that Africans constituted a distinct species, much closer to the apes than to Europeans (Hunt 1864). There was, thus, nothing unique about evolutionists' recognizing such hierarchies; the assumption of a progressive racial gradation pervaded European cultural life and certainly did not derive from evolutionary theory. In respect to anti-Semitism, however, the facts speak well of Darwin and Haeckel. In Darwin's case, rather, they do not speak at all: he mentioned Jews only once or twice in letters that betray no taint of anti-Semitism. Haeckel, when queried about anti-Semitism by the journalist Hermann Bahr (1894), declared that he did not share that prejudice, though some of his students did. He recognized

that Germany and some other countries barred Jewish immigrants from the East, particularly Russia, because they refused to be assimilated; and he thought such restrictions justified, not because they were Jews, but because they would not conform to conventional norms. He concluded his discussion with an encomium to the educated (*gebildeten*) Jews who had always been vital to German social and intellectual life: "I hold these refined and noble Jews to be important elements in German culture. One should not forget that they have always stood bravely for enlightenment and freedom against the forces of reaction.... We cannot do without their tried-and-true courage" (Bahr 1894, 69). Some Nazi apologists did make an effort to recruit Haeckel, as well as other German cultural giants – Beethoven, Humboldt, Goethe – posthumously to the Nazi side. Yet because Haeckel was at times regarded as a friend of Jews and because of his materialistic monism, Nazi Party officials claimed his work in no way formed a foundation for *volkische Biologie* and demanded that any such suggestion cease. His books were banned by Nazi officials in Saxony, along with those by Jewish authors (R. J. Richards 2008, 269–76).

Did Hitler have any knowledge of Darwinian evolutionary theory (R. J. Richards 2013)? Darwin's name does not appear in any of Hitler's writings. But perhaps the racial views expressed in *Mein Kamp* ([1925–27] 1943) yet indicate the influence of Darwin, as Berlinski urges. But only the dogmatically robotized would find in those tedious pages anything resembling Darwinian theory. Hitler (1943, 312) makes no claim that the human species arose from lower animals; his notions of racial homogeneity and a "general drive to racial purity" (*allgemein gültigen Triebes zur Rassenreinheit*) are foreign to a theory that requires variation and transmutation; his assertions that religion is not in conflict with "exact science" (294) and that it forms the foundation for morality (293) deny the efforts of Darwin and Haeckel to replace religious dogma with exact science and to demonstrate the origin of morality in the natural selection of community groups. Hitler's notions of struggle or battle (*Kampf*) among the races seems antithetic to Darwin's conception that struggle occurs primarily and most strongly *within* a variety or race and only distantly among distinct varieties or species. Indeed, because Hitler characterizes the Jews as alien (*fremde*) and having racial features completely distinct from the Teutons, any struggle, by Darwinian lights, ought to be mitigated or eliminated. Hitler's ideas about the degenerate quality of Jews and the dangers of racial mixing come more likely from the anti-Darwinian Huston Stewart Chamberlain (1855–1927), the Germanophilic Englishman: he married Richard Wagner's daughter Eva, became a friend and correspondent of Hitler, and was greatly admired by Alfred Rosenberg (1893–1946), the individual responsible for elaborating Nazi racial theory. Chamberlain's masterwork, *Foundations of the Nineteenth Century* (*Die Grundlagen des Neunzehnten Jahrhunderts*, 1899), quoted by Hitler in *Mein Kampf* (1943, 296), devotes considerable space (1899, 1:323–459) to explaining the alien (*fremde*) and inferior status of the Jews and why racial mixing would cause the degeneration (*Entartung*) of the superior, pure German race (1:325). Chamberlain thought the existence of Jews "a crime against the holy laws of life" (1:374). This mystically besotted historian called for "a struggle of life and death" (*ein Kampf auf Leben und Tod*, 1:531) against the non-German races; but like that of his disciple Hitler, his notion of struggle was a common trope and owed nothing to Darwinian natural-selection theory, which he compared to the theory of phlogiston (2:805).

By the beginning of the 1930s, Darwinism had reached a nadir. The geneticist and formidable historian of biology Erik Nordenskiöld (1936, 476–77) had declared it dead; its romantic speculations had been replaced by real science, laboratory genetics. Not death, of course, but a slumber. Awakened by the unexpected congress with genetics, the "modern synthesis" of the mid-1930s and early 1940s laid the grounds for the flourishing of the biological sciences today.