

Skeletal support

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THE TRAGIC SENSE OF LIFE

Ernst Haeckel and the struggle over evolutionary thought

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Ernst Haeckel (1901) by Emil Orlik

Twenty-three-year old Henrietta ("Etty") Darwin was an intelligent and vivacious woman who often felt bored by the quietness of life in the heart of the Kent countryside. Visitors provided some welcome excitement and were eagerly anticipated. On October 21, 1866, a tall, handsome German guest arrived at Down House, as she explained in a breathless letter to her brother George:

On Sunday we had a gt visitation. One of Papa's most thoroughgoing disciples, a Jena professor, came to England on his way to Madeira & asked to come down & see Papa. We didn't know whether he cd speak English & our spirits was [sic] naturally rather low. He came quite early on Sunday & when first he entered he was so agitated he forgot all the little English he knew & he & Papa shook hands repeatedly, Papa reiteratedly [sic] remarking that he was very glad to see him & Haeckel receiving it in dead silence.

The two scientists had exchanged letters and photographs (as was then the custom), and Ernst Haeckel had sent copies of his publications, which Darwin had praised highly. But this was their first meeting. Once the initial language difficulties were overcome, Etty noted that "some of his sentences were very fine". For Haeckel, it was a great moment – to meet the scientist whose revolutionary theory would, he believed, usher in a new, modern age in which superstition would be banished and humankind would finally live in harmony with Nature. Haeckel recalled the meeting with his hero many years later:

As the coach pulled up to Darwin's ivy-covered country house, shaded by elms, out of the shadows of the vine-covered entrance came the great scientist himself to meet me. He had a tall, worthy form with the broad shoulders of Atlas, who carries a world of thought. He had a Jupiter-like forehead, high and broadly domed, similar to Goethe's, and with deep furrows from the habit of mental work.

Haeckel was born in Potsdam in 1834, the son of a privy councillor to the Prussian court. The travel journals of Darwin and Alexander von Humboldt filled his impressionable mind with dreams of scientific adventures in exotic lands. His father took a more down-to-earth view of his future scientific career and Haeckel enrolled to study medicine at Würzburg University. It was here he discovered the delights of the microscope. "Vivant cellulae! Vivat Microscopia!", the student exclaimed to his father in 1853. But Haeckel, like Darwin, soon realized he was not cut out to be a physician. Illness and disease filled him with revulsion. As he explained to his parents in 1854, he still dreamed of following Humboldt's example and travelling to tropical countries, "where I can sit in some primeval forest with my wife (that is, my inseparable microscope) and . . . anatomize and microscopize animals and plants, to collect all sorts of zoological, botanical, and geographical knowledge, so that this material will allow me to accomplish something coherent".

That same year, while collecting specimens with the physiologist and zoologist Johannes Müller, Haeckel realized that marine invertebrate zoology might offer him the opportunity to make that dream come true. A few years later the "tall, golden, and strikingly handsome young scientist" set off for Italy to study the creatures in the seas

around Messina. There, he discovered a research subject that provided him with the material for his first monograph and launched his academic career.

He chose a group of animals that was almost unknown at the time – the Radiolaria, a class of one-celled marine organisms a mere one-thousandth of an inch in diameter that lived on the surface of the sea and secreted unusual skeletons of silica. Müller's final publication had been a short monograph on these creatures. But Haeckel realized he had only scratched the surface. By the time he had finished, he had increased by almost half the number of known species and for the first time analysed their internal structure. This ground-breaking research formed the basis of a large two-volume monograph, *Die Radiolarien (Rhizopoda Radiaria)* (1862). It was a brilliant study, one that announced the arrival in the scientific community of an immensely talented researcher.

Haeckel proudly dispatched a copy to Down House. Darwin was astonished: the Radiolaria volumes were, he told Haeckel, "the most magnificent works which I have ever seen". Haeckel had read Darwin's *Origin of Species* in 1860 and had been utterly enthralled. As a scientist at the beginning of his career, he found that Darwin's theory suddenly provided him with a direction and a purpose. He believed he could uncover the positive proof of descent that would make Darwin's dangerous idea into an irrefutable law of nature. Indeed, he claimed that Radiolaria provided empirical support. He began systematizing his species into some fifteen different families and drew up a genealogical table indicating descent relations.

In the year his book on the Radiolaria was published, Haeckel became a professor at Jena University. The university had been the powerhouse of Romanticism, an intellectual home to Schiller, Novalis, Fichte, Schelling, Oken and Hegel. More importantly, "the spirit of Goethe hovered over all". That same year, 1862, Haeckel married his cousin Anna Sethe. She was, says Richards, "in many ways the young, long-haired, blond, blue-eyed scientist's female double". Haeckel described her to a friend as "a true German child of the forest . . . a completely unspoiled, pure, natural person". Haeckel proudly informed the father of evolution that his wife called him "her German Darwin-man". She was, writes Richards, "the lodestone of his life" and "he thought of her love as a kind of salvation, a lifeline that could pull him back from the dark abyss of materialism toward which he felt himself dragged by his science". But tragically, just two years after they were married, on his thirtieth birthday, Anna died after a short illness. Haeckel was

driven almost out of his mind with grief, "falling unconscious and remaining in bed for some eight days in partial delirium". The experience scarred him for life. On his birthday, the anniversary of her death, he could never again work or even eat. More than once his thoughts turned to suicide. Her sudden death left a void in his life, which gradually filled with a "great stridency, bitterness and ineluctable sadness". In the year of Anna's death, he wrote to Darwin and told him the experience had made him "mature and resolute". His one goal in life was now to "work for your descent theory to support it and perfect it".

For a year Haeckel worked eighteen-hour days, like a man possessed. The result was a thousand-page monograph on evolution and morphology that "began in despair, advanced through anger, and ended in an encomium to transcendent nature", writes Richards. Haeckel's *Generelle Morphologie der Organismen (General Morphology of Organisms)*, 1866) was a volcanic work that "spewed fire and ash over the enemies of progress and radically altered the intellectual terrain in German biological science". But this book that was born of an overwhelming existential anger at mortality was also liberally sprinkled with "polemical bomblets". Many colleagues were appalled by the strident new tone, and the mild-mannered Darwin was taken aback by Haeckel's savage attacks on fellow scientists. T. H. Huxley, however, was delighted: "I am much inclined to think that it is a good thing for a man, once at any rate in his life, to perform a public war-dance against all sorts of humbug and imposture". Haeckel went on to take the fight for evolution to the general public. His *Natürliche Schöpfungsgeschichte (The Natural History of Creation)*, 1868) has been described by one biologist as "the chief source of the world's knowledge of Darwinism". It was among the most widely read popularizations of science in the nineteenth century. What was most striking – shocking, even – was

Haeckel's focus on the controversial issue of human evolution. It was not until 1871 that Darwin himself tackled this delicate subject in *The Descent of Man*. In the introduction, Darwin said of Haeckel's book, "if this work had appeared before my essay had been written, I should probably never have completed it". Haeckel understood immediately that for the general reader the central issue in evolution was the fraught topic of human descent. He therefore offered a "non-miraculous" theory of the development of humankind.

The book's frontispiece took the bull by the horns and graphically depicted the races of humankind (or "species" of men, as he saw them), with their animal forebears in a scale of descent. For a writer whose style could be prolix, his striking illustrations memorably encapsulated complex ideas. On occasion they also offered Haeckel an irresistible excuse for social commentary. A comparison between human and dog embryos prompted this memorable attack on those aristocrats who regarded themselves as a breed apart: "What must these members of the nobility think about that blue blood that rolls through those privileged arteries when they learn that all human embryos, noble as well as middle class, during the first two months of development, can hardly be distinguished from the tailed embryos of a dog or other mammals?". His drawings of embryos served to illustrate what Haeckel considered to be a central pillar in the evidence supporting Darwin's theory: the biogenetic law, or the idea that ontogeny recapitulates phylogeny. As Richards explains, this means that "the embryo of a contemporary species goes through the same morphological changes in its development as its ancestors had in their evolutionary descent". The many gaps in the fossil record frustrated Haeckel's attempts to find incontestable proof of evolution, and this alternative way back through time to the origin of species seemed to provide the vital evidence. Thanks to Haeckel, the biogenetic principle became "a dominant if controverted hypothesis".

It was not his science, however, but his art that let Haeckel down. He cited an illustration juxtaposing three embryos (dog, chicken and turtle) as evidence for Darwin's theory, claiming the three images were indistinguishable. Indeed they were. As one eagle-eyed reviewer noted, the same woodcut had been printed three times. The error was corrected in subsequent editions, but the charge of fraud stuck and haunted Haeckel for the rest of his life. It was, says Richards, a grave "error of judgment", even a "moral failure", although he clears him of "gross fraud". This mistake unleashed a torrent of abuse against Haeckel. Huxley wrote in typically pugna-cious terms to stiffen his resolve: "May your shadow never be less, and may all your enemies, unbelieving dogs who resist the Prophet of Evolution, be defiled by the sitting of jackasses upon their grandmothers' graves!". In 1867, Haeckel married Agnes Huschke, the daughter of a fellow Jena scientist. Although they had three children, it was not a happy relationship. Agnes did not share his love of science, and objected to his frequent lecture tours and research expeditions, of which he undertook about twenty during his life, even venturing as far as the jungles of Java and Sumatra in his mid-sixties. Richards suggests that these footloose wanderings

were partly due to a desire to escape the "miasma of the spreading gloom in his house". There are suggestions of sexual liaisons in exotic locations ("many beautiful women flung themselves at him").

But whatever Haeckel's motives, there is no doubting his desire to further the cause of science. In his lifetime, he produced more than twenty large technical monographs on aspects of biology, books that remain standard reference works today. His studies of the Radiolaria, sponges and corals (*Die Kalkschwämme*, 1872; *Arabische Korallen*, 1876), medusae (*System der Medusen*, 1879) contributed significantly to our knowledge of marine life as well as providing further evidence for Darwin's theory. Richards admits these are "forbidding waters" for the non-specialist, yet he writes engagingly and convincingly, overturning the conventional view of Haeckel as "a mere coryphée, poorly dancing the choreography of the English master".

Much of Haeckel's scientific research has been ignored by historians; scholarship and science are both poorer as a result. Richards cites the example of Haeckel's study of siphonophores, an order of hydrozoa in the phylum of Cnidaria, the stinging aquatic invertebrates such as jellyfish (*Zur Entwicklungsgeschichte der Siphonophoren*, 1869). Haeckel conducted "extraordinary experiments" on two-day-old embryos of the *Crystallodes* genus of siphonophore, which he discovered. As Richards says, these showed that "all

embryonic cells, at least early in development, were totipotent – they had the capacity to develop all parts of the organism". Had such work been more widely known, it would have been hailed as the harbinger of the exciting new field of "evo-devo", the evolutionary and genetic theory of species and individual development. But as Richards argues, by stepping into the limelight, Haeckel paid the price of obscurity for his scientific research: "his own success as a popularizer, ironically, did as much to cast his extraordinary science into the shadows as did the negligent attitude of subsequent scholars".

How then to measure the significance of this remarkable yet neglected figure? Before the First World War, more people learned about evolutionary theory from Haeckel than any other source, including Darwin. His best-selling popularization of monistic materialism, *Die Welträthsel (The World Puzzles*, 1899), sold 40,000 copies in its first year of publication – more than Darwin's *Origin* sold in three decades. By the beginning of the war it had sold 400,000 copies. Haeckel's expertise touched morphology, paleontology, embryology, anatomy and systematics. He also defined new fields such as chorology (biogeography, the geographical spread of organisms across the planet) and ecology. (Haeckel's love of jaw-breaking neologisms, such as organology, tectology and promorphology, is exceptional even for a German.) His great achievement was to create an evolu-

tionary synthesis that drew on new fields and data to provide powerful demonstrations and empirical evidence for the descent and modification of species. In Richards's words, he "supplied exactly what the critics of Darwin demanded, namely, a way to transform a possible history of life into the actual history of life on this planet".

The Tragic Sense of Life is an immensely impressive work of biography and intellectual history, and a fitting testament to a complex and contradictory character, a "polymorphic scientist-artist-adventurer". Richards succeeds brilliantly in re-establishing Haeckel as a significant scientist and a major figure in the history of evolutionary thought. He is particularly good at tracing the origins of Haeckel's "Romantic evolutionism" in the ideas of Goethe, Humboldt and Matthias Jakob Schleiden. Haeckel was unquestionably a Romantic and saw Darwin's theory as the inevitable culmination of earlier German theories of descent and modification. As the author of an earlier and equally impressive study of how Romanticism shaped biological thought in the first half of nineteenth century, *The Romantic Conception of Life* (2002), Richards is ideally qualified for this task.

Richards admits that Haeckel "has not been well loved – or, more to the point, well understood – by historians of science". Indeed, many contemporary historians – among them Stephen Jay Gould and Daniel Gasman – have regarded his influence as per-

nicious and even accused him of furnishing the Nazis with racist theories, despite the fact that in the 1930s his books were banned along with those of Einstein. Richards examines these accusations in forensic detail and argues convincingly that they are misplaced. Clearly, Haeckel's personality – his "fanatic heart" and the "reckless abandon" with which he pursued Darwin's theories – is partly to blame for this hostility. As Richards argues, the "overwhelming tragedy" of Anna's death is the key to understanding this militant Darwinist.

In Haeckel's twilight years, his life was blighted by yet another tragedy. In 1898, he received a fan letter from a minor member of the aristocracy, Frida von Uslar-Gleichen. It was the beginning of an intense yet poignant love affair. Frida was born in the year Anna died (1864) and he came to see her as the reincarnation of his first love. She became his "intellectual and cultural confidante, and their secret correspondence reveals that they dreamed of eloping to a tropical island. However, in 1903, Frida, who was suffering from a debilitating heart condition, committed suicide. For Haeckel it was a particularly cruel blow, one compounded by the fact that he had supplied her with the lethal dose of morphine. Haeckel lived to the age of eighty-five, writing and researching until the very end: it was only thanks to his science that he was able to rise above the tragedy of life.