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# Ernst Heinrich Philipp August Haeckel

16 February 1834 to 09 August 1919

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Ernst Haeckel was born in Potsdam (near Berlin), the residence of the Prussian kings in the period preceding the unification of Germany in 1871. His family was highly educated: his father, Karl, was a jurist by training and served in the Prussian court, his mother, Charlotte, was the daughter of a well-known jurist, and his elder brother, Karl, too, was a lawyer. One year after his birth, Haeckel's family moved from Potsdam to Merseburg, then the capital of Saxony, about 170 km to the south-west of Potsdam. His father was in charge of schools and ecclesiastical affairs at Merseburg, and Haeckel spent the next seventeen years in this relatively small town. At home, the young Ernst benefited from an intellectually rich atmosphere. His father was very fond of philosophy, natural sciences, geology, and travelogues, and often discussed these interests with him. His mother was a great admirer of classical German poetry, especially that of Goethe and Schiller, and instilled a love for poetry in her son that he maintained throughout his life. He also developed an early passion for sketching and painting, and by his teens, was a fairly proficient artist. His tutor, Karl Gude, introduced him to a wide array of themes in biology ranging from Linnaean classification to the quasi-evolutionary speculations of the comparative morphologist Lorenz Oken. In particular, Haeckel read and recalled being greatly inspired by the travelogues written by Alexander von Humboldt and Charles Darwin (*The Voyage of the Beagle*, in German translation), as well as Matthias Jakob Schleiden's book on plants and their life. Schleiden, along with Theodor Schwann and Rudolf Virchow (later Haeckel's teacher and subsequent scientific opponent), enunciated the cell theory that held that cells were the primary structural and functional unit of all life-forms. Interestingly, both von Humboldt and Schleiden were also among the early German biologists to write about the reality of evolution in the sense of the transmutation of species, though they did not then have any understanding of the mechanisms underlying that phenomenon. It is instructive to note how closely these three books foreshadow in many ways Haeckel's subsequent interests in, and contributions to, diverse sub-fields of biology, some of which he himself delineated and named.

Incidentally, even Darwin was much inspired by von Humboldt's travel account *Ansichten der Natur* (*Views of Nature*, 1808), a collection of essays vividly depicting the impressions that a five-year journey through the Americas left on him. During his own voyage aboard the *Beagle*, Darwin wrote to Henslow, "I formerly admired Humboldt, I now almost adore him; he alone gives any notion of the feelings which are raised in the mind on first entering the Tropics". Darwin's sister, Susan, even thought that Darwin's writing style in some passages



in *The Voyage of the Beagle* bore the imprint of von Humboldt's more poetic style. Both von Humboldt and Schleiden were, in turn, hugely influenced in the way they conceived of the study of the living world by the earlier writings of the philosophers Immanuel Kant (1724–1804) and Friedrich Schelling (1775–1854), and the great German poet and naturalist, Johann Wolfgang von Goethe (1749–1832). This is important to mention because Kant, Schelling and Goethe had a huge influence, not only on Haeckel but on generations of German biologists, till the centre of gravity of biological research shifted towards the anglophone world after the mid-twentieth century. More importantly, Haeckel's poetic and scientific sensibilities and the manner in which they interfaced were clearly part of the romantic tradition of German biology that had largely been seeded by Kant, Schelling and Goethe. The notion that there was an underlying unity to the diversity of life-forms, and that modularity was one way of generating diversity from a small variety of building blocks, as well as the belief that the best way to conceptualize an organism and how its constituents meshed together was through a consideration of its functioning as a whole in a specific ecological context, were all due to the influence of these three intellectual giants. Also, thanks to these three, was the pervasive notion in nineteenth-century German biology that the best insights into the living world would come only through a combination of poetic and scientific sensibilities.

In 1843, Haeckel joined the Merseburg Dom-Gymnasium (High School) and studied there till 1852. At the Gymnasium, he benefited from a solid grounding in chemistry, biology and also literature, especially the poetry of Goethe. For his matriculation, he had wanted to go to Jena, where his idol, Schleiden, taught. But due to a knee injury incurred while hiking in the mountains, he had to return to Berlin, where his parents had relocated, to convalesce. In 1852, consequently, he graduated from Berlin, and in the fall of that year joined the University at Würzburg to study medicine. Würzburg, at that time, had perhaps the best medical faculty in Germany, including such luminaries as Albert von Kölliker and Rudolf Virchow. Haeckel remained at Würzburg till 1857, when he obtained his medical doctorate. German medical education in those times was quite broad, and Haeckel greatly enjoyed studying histology and anatomy, including microscopy, with von Kölliker, as well as Virchow's cutting-edge lectures on pathology. In an era prior to the popularity of camera lucida drawings, it was said that Haeckel could draw specimens with one eye on the microscope and the other on his sketch. He also took courses in botany and zoology. In fact, as he often wrote to his parents, it was the biology part of the curriculum that kept him at Würzburg; he was not interested in actual medical practice and found the clinical courses depressing. During his medical school days, Haeckel was a somewhat aloof and solitary young man, indulging in his penchant for nature walks, reading Humboldt, Darwin and Schleiden, and, of course, poetry. In one of his regular letters to his parents, he wrote: "Poetry raises a man above the dust and worry of everyday life

and banishes evil thoughts.”

During his five years at medical school, Haeckel also managed to indulge his interests in biology, especially field biology. In 1854, he spent the summer term at Berlin, studying comparative anatomy and physiology with the legendary zoologist Johannes Müller, and the alternation of generations in plants with Alexander Braun. Later that summer, he and a friend went to some islands in the North Sea where they fortuitously met up with Müller and were invited to join his expedition examining marine invertebrates. This experience sparked off Haeckel’s long-abiding interest in this very diverse group of animals. He also recollected discussing the vexatious “origin of species” question with Müller that summer. Clinical training at Würzburg in 1855 was dull, but partly offset by a summer course in invertebrate anatomy with Carl Gegenbauer, who became a close friend, and Franz Leydig. In 1855, too, Haeckel visited Italy, and studied more marine invertebrates. He was also greatly put off by the ostentatious pomp and pageantry of the Catholic church. Haeckel had been brought up in a Protestant and liberal family, subscribing to the views of Friedrich Schleiermacher, who felt that the roots of religion were a feeling of awe and smallness in the face of nature, its vastness, diversity, and forces, and that elaborate theological doctrines were actually a distraction from these true roots. By the time he visited Italy, Haeckel’s earlier liberal religious views had already been further diluted by Virchow’s championing of materialism.

In 1856, Haeckel became Virchow’s assistant and once again visited the Mediterranean, this time on the French coast, at Nice. While there, Haeckel again ran into Müller and had another opportunity to collect and study marine invertebrates with him. In the winter of 1856–57, Haeckel worked on his medical dissertation on the histology of river crabs with Leydig in Berlin, and was awarded a medical doctorate in March 1857. He then did further clinical training at Vienna and Berlin, and finally qualified the State Medical Examination for getting licensed to practise as a clinician in 1858. However, as Haeckel had no interest in clinical practice, he still needed to undertake a ‘habilitation’ which would qualify him to teach at a university. The habilitation itself involved producing a serious dissertation based on independent research. Haeckel had hoped to work in Berlin, with Müller, towards his habilitation, but unfortunately, Müller died that same year. Moreover, in 1858, Haeckel got engaged to his first cousin, Anna Sethe, after they had been in love for several years since their first meeting in 1852. Without a university position, it would not be feasible to think of marriage. Thus, in 1859, Haeckel thought of returning to the Mediterranean and doing his habilitation research on marine invertebrates.

During his almost year-long sojourn in Italy in 1859, Haeckel drifted from Florence to Rome to Naples, once again deeply disturbed by what he felt was an extremely stifling and reactionary effect of the Catholic church on the Italian society. While in Italy, he did resume serious



painting but, for a long time, was neither happy nor doing any research. In Naples, he began some perfunctory research on invertebrates and fish, but soon became disillusioned and decided to ‘escape’ to the beautiful island of Ischia. On Ischia, Haeckel met a fellow German, the poet Hermann Allmers, thirteen years older to him, and the two developed an exceptionally close friendship based on a shared love for nature, painting and poetry. Allmers, in fact, seems to have also developed some degree of physical infatuation for Haeckel that does not seem to have been reciprocated. Together with Allmers, Haeckel embarked on what became essentially a long painting and poetic vacation from Ischia to Capri, back to Naples and a day-night climb of Mount Vesuvius, during which Allmers almost lost his life, and eventually on to Messina on the island of Sicily. This was a turbulent time in Italy, with Guiseppe Garibaldi spearheading the movement for the unification of all Italian speaking kingdoms and Duchies into a single state, and the two young Germans saw hope in those events for a similar unification of all the German-speaking states into one nation. During this long, drifting, and somewhat bohemian vacation, Haeckel toyed with the idea of giving up research and concentrating on art. But he was led back to biology by the thought that only scientific research and teaching would enable him to have a stable enough income to marry his beloved Anna.

Once Allmers left Messina in late 1859, Haeckel settled down to serious work. He had carried with him Johannes Müller’s small monograph on radiolarians, tiny protozoans that produce elaborate siliceous skeletons, a group that Müller had been working on before his death in 1858. He realized that Müller had not been able to do a comprehensive job on this fascinating and beautiful group of organisms and, hence, decided to focus on a detailed study of radiolarian structure, distribution and systematics for his *Habilitationschrift* (habilitation dissertation). Over the next few months, Haeckel worked furiously, collecting samples, studying them and recording data on microhabitat and distribution of the numerous previously undescribed species he unearthed. In April 1860, he moved back to Berlin and, with some support from the Berlin Academy of Sciences, began to work on his collection of radiolarians at the Berlin Zoological Museum. By the winter of 1860, Haeckel had moved to the University at Jena as an assistant to Gegenbauer, and had also come across Heinrich Georg Bronn’s German translation of Charles Darwin’s book *On the Origin of Species*. He was still furiously at work, simultaneously preparing his *Habilitationschrift* and a report to the Berlin Academy of Sciences. In March 1861, the 27-year-old Haeckel obtained his habilitation in the medical faculty at Jena and became a ‘Privatdozent’, implying that he could teach courses and derive an income directly from the fees charged of the students enrolling in the course. Through 1861, Haeckel was busy with lectures and writing a monumental two-volume work on the radiolarians, covering their morphology, structure, distribution, ecology and systematics. Early on, he became a popular lecturer and many of his early students recalled how inspiring he was when he spoke. In the same year, he



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became committed to a Darwinian world-view in biology, writing to his fiancée that he was “buried” in Darwin’s work.

In 1862, the massive two-volume *Die Radiolarien (The Radiolarians)* was published to much acclaim. The first volume was over 500 pages long, and the second consisted of 35 copper-plate illustrations, done by Haeckel himself, of stunning artistic beauty and accuracy, the latter confirmed much later by electron microscopy. More significantly, the book was imbued with an appreciation of Darwinian thinking as the organizing principle for systematics. Haeckel interpreted his voluminous data on radiolarian structure and ecology in light of Darwin’s theory of descent with modification and also offered up his analyses as a solid empirical example of Darwinian evolutionary theory. It is striking to note that this first work that positioned itself as an empirical validation of Darwin’s core ideas appeared within three years of *The Origin of Species*. Haeckel wrote, “When one considers how every great reform, every strong advance has found a mighty opposition, the more he will oppose without caution the rooted prejudice and battle against the ruling dogma; so one will, indeed, not wonder that Darwin’s ingenious theory has, instead of well-deserved recognition and test, found only attack and rebuff”. The clarion call had been sounded early, and Haeckel would, indeed, throughout the rest of his life oppose without caution, all dogma unaccepting of the Darwinian world-view, and that too with a passion and, sometimes, fury that would make T H Huxley, often called “Darwin’s bulldog”, seem mild by comparison. Shortly after the publication of the book, Jena appointed Haeckel as Extraordinary Professor and Director of the Zoological Museum. With financial stability assured, Haeckel and Anna were able to get married on 18 August 1862. They spent the next month in the Austrian Alps. Anna shared her husband’s passion for nature, mountains, and Darwinian thought, calling him her “Deutsche Darwin-Mann”. The first couple of years after their marriage were, perhaps, the happiest times of Haeckel’s life. His professional reputation grew by leaps and bounds, and his personal life was settled and happy, with a perfect soulmate. That winter, in addition to his regular lectures on zoology, Haeckel also delivered public talks on evolutionary biology, and in 1863, he presented a talk on Darwinian theory at the court in Weimar. In September 1863, the Society of German Natural Scientists and Physicians gathered at Stettin for its thirty-eighth annual meeting. The young Haeckel, still not thirty, was invited to deliver the first lecture on Darwinian theory, in a meeting where his idols and teachers, like Virchow and Schleiden, were also speakers. Haeckel not only delivered a clear and cogent account of Darwin’s basic ideas and the principle of natural selection, but also brought human behaviour and society into the domain of evolutionary explanation, thus anticipating Darwin’s *The Descent of Man and Selection in Relation to Sex* by almost a decade. He also defended Darwinian theory against attacks by a couple of other speakers at the meeting, and newspaper accounts suggest that the defence was both characteristically vigorous and well received by



much of the public. By the time the Stettin meeting was over, Haeckel was established as the foremost German Darwinian, and his lecture received considerable press coverage due to its obvious implications for the social and religious order.

At the beginning of 1864, just before his thirtieth birthday, Haeckel's life appeared to be as close to perfect as possible. Academically, he was a rising star, and his reputation was established across the land. He was a greatly respected lecturer and was enjoying the atmosphere in Jena, which had been the cradle of German romanticism in Goethe's days. His personal life was blissful, and Anna and he, together with Gegenbauer and his new wife, made up a quartet with many common interests, in nature, poetry, art and science. He had also written to his new idol, Darwin, sending him a copy of his book on radiolarians as a small homage to the great man's thought, and also newspaper clippings of his exposition and defence of Darwinian thought at the Stettin meeting. Life, however, often has a habit of serving up the nastiest blows when all seems to be wonderfully perfect. After a brief illness, Haeckel's beloved Anna died, ironically on his thirtieth birthday, barely nineteen months after they were married. To add to the irony, the very same day, Haeckel received the news that he had been awarded the very prestigious Cothenius Medal of the Leopold–Caroline Academy of German Natural Scientists and that he would be receiving the Medal from the Academy's President, Carl Gustav Carus, a personal friend of Haeckel's idol, Goethe, himself. Nothing would ever be the same again for Haeckel; henceforth, there would be a bitter edge to everything he did, and this personal tragedy also destroyed forever his belief in God and religion, however liberally construed. For the rest of his life, Haeckel would bitterly miss Anna's companionship and love, and as he threw himself into work as a form of escape from his loss, he began to wield Darwinism as the principal weapon with which to attack and destroy religion, which he now felt was a falsehood duping people into mistakenly believing in the goodness of God's world.

For over a week after Anna's death, Haeckel was distraught with grief, often unconscious or delirious. His parents and brother rushed to Jena to look after him lest he commit suicide, a very real possibility as Haeckel later recalled. They also persuaded him to take a trip to Nice, hoping that his beloved Mediterranean and the change of scenery and climate would help him recover from this unexpected and devastating loss. A few months in Nice did, indeed, help Haeckel recover in part from his loss, but not to his former self. He wrote in a letter to his parents, "The Mediterranean, which I so love, has effected at least a part of the healing cure for which I had hoped... I hold that from so deficient and contradictory a creation as man, a personal progressive development after death is not probable; more likely is a progressive development of the species on the whole, as Darwinian theory already has proposed it.... Mephisto has it right: Everything that arises and has value comes to nothing". Later, the same year, Gegenbauer also lost his wife, Haeckel and Anna's friend, to childbirth complications. This was a further



blow, and, henceforth, Haeckel would seek solace, not in a blissful afterlife for the meritorious, but in seeking to become one with nature in an understanding of it, and in the realization that it is nature from whence we come and into nature that we return, and that, during our sojourn on earth, it is nature in which we meaningfully exist and reside. Much later, he would confirm that the tragedy of 1864 “destroyed with one blow all the remains of my earlier dualistic world-view”. In his 1899 book *Die Welträthsel (The World Riddles)*, he rooted human morals and social behaviours firmly in biological evolution, disagreeing with both religion and the non-deistic but humanistic moral philosophy of thinkers like Kant, Nietzsche, and Stirner. “Indeed, the natural commandments of sympathy and altruism not only arose in human society millennia before Christ; they were to be found characterizing those higher animals that live in herds and social groups”, Haeckel wrote, continuing that “These traits have their oldest phylogenetic roots in the formation of the sexes in the lower animals and in the sexual love and parental care upon which the preservation of the species rests”. In one of the footnotes in the same book, he also noted that “Indeed, there are now numerous educated people who find their real edification, not in listening to prolix and meaningless sermons but in attending public lectures in science and art, in the pleasures of the limitless beauty that flows in inexhaustible streams from the womb of our Mother Nature”.

Haeckel returned in July to Jena and found Darwin’s reply to his letters waiting. He and Darwin exchanged further letters, cementing their friendship with an exchange of portraits. Haeckel also shared with Darwin his recent loss, writing that Anna “held the name Darwin in as high a veneration as I myself do”. He began planning a monumental work on evolutionary theory as the means of understanding biological diversity and its distribution, writing to Darwin again in October 1864, “Now in my isolation, which since the death of my wife is so lonesome, this engrossing work is a great consolation, and I toil at it with so great an enthusiasm, as if my Anna herself drove me to its completion and had left this task as a memorial”. In 1865, Jena made Haeckel an Ordinarius Professor of Zoology, awarding him an *honoris causa* doctorate in philosophy as well, to forestall a possible move to Würzburg. Later that year, Haeckel again resumed public lectures on Darwinism and began the work on his monumental two-volume *Generelle Morphologie der Organismen*, which appeared in 1866. Over the next three decades or so, Haeckel was very active professionally, and his work helped further develop evolutionary thought, the systematics of invertebrates, the early evolution of animal groups, developmental biology and oceanography. He was also very active in the public propagation of evolutionary thought, in arguing for a more liberal school education in Germany, and in the acrimonious debates between the conservative elements of society and religious establishment on the one hand, and those who believed in evolution, on the other.

In October 1866, Haeckel visited England for the first time, admiring museums, art galleries



and the botanical and zoological gardens, and meeting with Huxley, Hooker, Lyell, and Lubbock. The high-point of the trip was, of course, a meeting with Charles Darwin himself, at his country house at Downe on 18 October, a Sunday. Despite Haeckel's English being quite poor, and Darwin's German poorer, the meeting further cemented the friendship and mutual admiration that had grown through correspondence, and the two would remain in regular touch till Darwin's death in 1882. Haeckel later recalled the visit and his first meeting with his idol, who had struck him as being imbued with the attributes of Jupiter, Atlas and Goethe, "... out of the shadows of the vine-covered entrance came the great scientist himself to meet me... the welcoming, warm expression of his whole face, the quiet and soft voice, the slow and thoughtful speech, the natural and open flow of ideas in conversation – all of this captured my whole heart during the first hours of our discussion. It was similar to the way his great book on first reading had earlier conquered my understanding by storm. I believed I had before me the kind of noble worldly wisdom of the Greek ancients, that of a Socrates or an Aristotle."

From England, Haeckel journeyed to Portugal and the Canary Islands, where he met up with colleagues and students and spent several months studying diverse marine invertebrates before meandering back to Jena in mid-1867, via Morocco, Spain and Paris. The work started on this expedition culminated in his monumental treatises on siphonophores and other cnidarians, and on sponges, leading not only to a general theory of early animal origins (the *gastraea* theory), but also to the foundations of manipulative experimental embryology (*Entwicklungsmechanik*), later developed further by his brilliant students, Hans Driesch and Wilhelm Roux. In June 1867, Haeckel got engaged to Agnes Huschke, daughter of a renowned Jena anatomist, and the two were married in August the same year. The couple had three children: Walter (born 1868), who became a noted painter, Elisabeth (born 1871), and Emma (born 1873). Though the marriage lasted till Agnes' death in 1915, it was not a particularly happy one, with Agnes forever falling short in Haeckel's unfortunate comparisons of her with the deceased Anna. Agnes did not share Haeckel's intellectual interests and was quite upset with his continuing bitter debates with the church and conservative society. Haeckel increasingly sought escape from the marriage in scientific expeditions and his work.

In 1868, Haeckel developed his public lectures on evolutionary thought into a book aimed at a general readership, *Natürliche Schöpfungsgeschichte* (*The Natural History of Creation*). The book went through 12 editions in 52 years, was translated into multiple languages, reached many more readers than Darwin's book, and was described as "the chief source of the world's knowledge about Darwinism" in a history of biology written in the early twentieth century. In 1869, his monograph on the systematics and developmental biology of siphonophora was published. This was followed over the next thirty years or so by equally monumental works on calcareous sponges, monerans and other protists, the *gastraea* theory of early animal evolution,



systematics and phylogeny, biological individuality and the division of labour in multicellular organisms, and four volumes describing over a thousand species of radiolarians, cnidarians and sponges from oceanic samples collected from all over the world by the British Royal Navy's Challenger expedition between 1873–76. In addition, he wrote travel accounts of visits to Italy, India, Sri Lanka, and Southeast Asia, all profusely illustrated, as well as a book on Red Sea corals. He also continued to write more general works, including the famous *Die Welträthsel* (*The World Riddles*) in 1899, a book that placed evolutionary thought into a broader historical, philosophical and social context, as well as volumes on the contributions of Goethe, Lamarck and Darwin to evolutionary thought, the evolutionary and developmental history of humans, the importance of freedom of thought and learning in educational systems, and on his non-deistic quasi-religious philosophy of monism. His *Kunstformen der Natur* (*Art Forms in Nature* – see Classics, in this issue) is still regarded as a masterpiece of biological illustration. The phylogenetic trees that Haeckel popularized are today found all across the evolutionary literature, and the recently blossoming field of evo-devo owes its origins to Haeckel, even though this is not often acknowledged.

From the 1870s till his death in 1919, Haeckel was mired in controversies and acrimonious disputes, as his many critics and enemies hit back at him, often viciously. One major controversy related to his use, in the first edition of *Natürliche Schöpfungsgeschichte*, three repetitions of the same wood-cut picture to illustrate three embryos, claimed to be a dog, chicken and turtle, in order to emphasize the similarity between the early embryonic stages of vertebrates from different classes. This was first pointed out by Ludwig Rüttimeyer, an anatomy professor in Basel, in an 1868 review of Haeckel's book. The charge was correct, and certainly represented a gross error of judgement. Haeckel's response was that the fudging was done in a book meant for the general public (as opposed to a scientific publication), in part due to the need for haste amidst publication delays, and that it was done only to illustrate a well-known principle of similarity of early embryonic forms across vertebrates. The error was rectified in the second and subsequent editions. The charge, however, kept being resurrected, often by those who had scientific differences of opinion with Haeckel, as a means to denigrate his standing as a scientist. In 1874, the charge was repeated by Wilhelm His, who saw himself as one of the protectors of the 'purity' of embryology against any incursions of evolutionary thinking, as represented by Haeckel. Again, in 1891, Victor Hensen invoked the same charge as part of his quarrel with Haeckel over the latter's critique of the quality of Hensen's scientific work. Even as recently as the twenty-first century, suggestions that Haeckel's illustrations are somehow fraudulent continue to appear in the literature. However, as has been persuasively argued at length by Robert J. Richards in his 2008 biography of Haeckel and elsewhere, there is really not enough substance in these allegations, beyond a certain degree of artistic license in some of



the drawings, to support a serious charge of scientific misconduct. In some cases, distinguished modern-day embryologists have used his figures in their textbooks, and later, upon realizing that the figures were originally Haeckel's, have claimed to see something suspicious in them. In general, Haeckel has received inexplicably harsh treatment from many historians of science and influential popular science writers, like Stephen Jay Gould. There have also been repeated charges of racism and of his having provided the intellectual foundations for Nazism in Germany, despite clear evidence suggesting that like Darwin, Haeckel was probably less racist than the average biologist of his times, and that the Nazis themselves dismissed his scientific and philosophical theories (see *Box 1* in *Vignettes of Haeckel's Contributions to Biology*, in this issue). Indeed, for a German of his era, Haeckel actually stood out as fairly liberal on most social issues, including the vexatious issue of anti-semitism. He was often accused by critics of being too friendly with Jews, and anti-Christian (although he was anti-church and religion, not anti-Christian per se). Haeckel was also attacked vigorously by the church and conservative elements of the society who believed that his liberal views and evolutionary theories would drag humanity into a cess-pit of moral deprivation. Haeckel, of course, even in his later years, hit back with all the passion and, indeed, venom at his disposal.

During these decades of incessant attacks from critics and opponents, and an increasingly unpleasant atmosphere at home due to both his wife and youngest daughter suffering from severe depression because of his travels and immersion in his work, Haeckel found solace in a romance which briefly revived memories of his first relationship with Anna. In 1898, a young 34-year-old unmarried lady from an aristocratic but impoverished family, Frida von Uslar-Gleichen, wrote to Haeckel after reading his *Natürliche Schöpfungsgeschichte*, asking some questions about evolutionary theory. She was clearly well-read and intelligent, and appreciated Haeckel's thought. They began to correspond regularly, sharing books, and, in 1899, she helped Haeckel with the proof-reading of *Die Welträthsel*, even convincing him to tone down some of the more vitriolic passages. They met a couple of times and became lovers in 1900. In 1902, Haeckel introduced Frida to his son and daughter, and Frida's sister, too, was aware of their relationship. Carried away by the coincidence that Frida was born in 1864, the year that Anna died, Haeckel began to think of her as the reincarnation of Anna. The relationship, however, ended as tragically as his first one. Frida developed serious cardiac problems in 1902, which worsened the next year. She was in great pain and largely confined to bed, unable to withstand even the slightest exertion. Finally, she requested Haeckel, as a registered medical doctor, to help her procure morphine, which he did. In December 1903, Frida committed suicide, overdosing on the morphine she had requested for. A little later, in 1904, the dancer Isadora Duncan visited Germany and invited Haeckel to a dance performance she had choreographed, based on the evolutionary perspective of Darwin and Haeckel. It appears that she was enamoured of



him, having read his *Natürliche Schöpfungsgeschichte* and, in her own words, thereby having acquired religion whereas earlier she had none. It is not clear whether their relationship went beyond a cordial friendly acquaintance, but it was probably one of the last pleasant events of Haeckel's life. From 1908 onwards, Haeckel was in poor health and partly crippled by arthritis. He resigned from his university positions at Jena in 1909, but was allowed rooms to work in at the newly established Phyletic Museum at the University, which had been largely funded by Haeckel himself, who conceived of it as a "temple to the philosophy of nature". Unfortunately, a former student of Haeckel's, Ludwig Plate, who succeeded him as the Director of the Zoology Institute, and also oversaw the Phyletic Museum, hounded him out, partly because he was deeply critical of Haeckel's liberal and anti-religious views and his friendship with Jews. Haeckel retreated bitterly to his own house, Villa Medusa. In 1911, after he had fallen and broken his leg, his granddaughter, Else Meyer, moved in with him to look after the old man.

The last eight years of Haeckel's life were largely melancholic due to ill-health and the Great War, in which large numbers of his nephews, grandchildren, and grand-nephews died. A brief interlude of happiness was provided in 1914 by an invitation to visit Leipzig, to attend a gathering in his honour on his eightieth birthday. There were rich accolades paid, by scientists and social reformers alike, and a *Festschrift* volume *Was Wir Ernst Haeckel Verdanken* (*What We Owe Ernst Haeckel*) was released. Haeckel's daughter, son and grandchildren were also present at the event. The happiness was, however, tempered by the realization that the political atmosphere in Europe was becoming dark with the clouds of war. Haeckel (the first to use the term 'World War'), together with some French intellectuals, wrote about the need to prevent such an eventuality. But the Great War broke out later that year and, over the course of the next four years, brought a great deal of misery to Europe. When the French were joined by the British, Haeckel, who was also a great admirer of British science, was, like many other Germans, deeply saddened by this seeming 'betrayal' by their Anglo-Saxon cousins. He wrote rather bitterly about his views on the British act and this, no doubt, has contributed to his continuing unpopularity in the English-speaking world. In December 1918, with Germany in ruins following its unconditional surrender, Haeckel wrote, "At the conclusion of the calamitous four years of this disastrous world war, we stand almost without hope on the ruins of a ravaged culture... We must yet seek hope for a better future in a more solidly realistic school education, in a true knowledge of actual nature founded on monistic evolutionary doctrine. State and school must remain free of the traditional restraints of the church. Pure reason must overcome the governing superstition."

In early 1919, Haeckel, by now almost 85 years old, began to suffer from symptoms very suggestive of progressive heart failure. He often fainted and fell, sometimes suffering severe injuries and fractures, and was largely confined to his room. He finally passed away in August



1919, facing his last months of largely invalid life with exemplary equanimity and stoicism. He was cremated, as per his wishes, and his ashes were buried in the backyard of Villa Medusa, crowned by a bust originally sculpted in 1908. The house itself, now known as the Haeckel Haus, became a museum administered by the Jena University, through funding from the Carl-Zeiss-Stiftung, in which Haeckel's paintings, letters, manuscripts and research materials are preserved.

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