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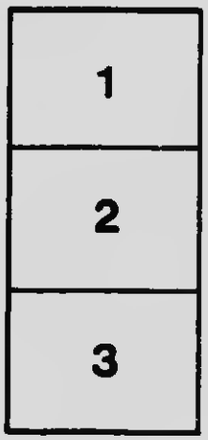

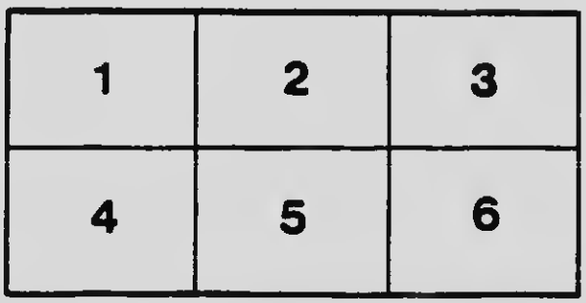

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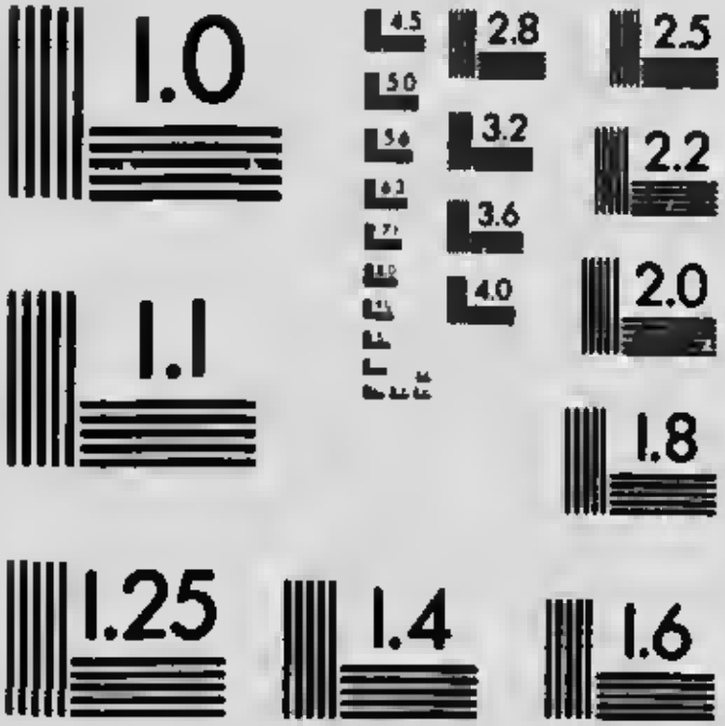

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To Miss Osborne
with all good wishes
from an old friend
H. B. Witton

Haeckel:

His Life, Work, and Companions.

BY H. B. WITTON, SR.

Read before the Hamilton Association May 14th, 1909.

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ERNST HEINRICH HAECKEL was born at Potsdam, in the province of Brandenburg, Prussia, Febrnary the 16th, 1834. His birthplace is notable for its royal palace and sonvenirs of Frederick the Great. From his youth up his motto was: "Each minute has its value; play or work, but do something." His life was in keeping with his motto. In youth he became a good Greek and Latin scholar; an acquirement he found serviceable when he had to coin names for more than three thousand new species. In token of his learning, and as reward for service, during a long life devoted to science, Haeckel has had conferred on him many medals, degrees and diplomas. Of the latter he has received nearly a hundred from colleges and universities of renown.

Haeckel has always deemed himself a child of the nineteenth century. In that opinion he can hardly be gainsayed, for perhaps no man ever lived in closer sympathy with the advanced spirit of his age. The science of zoology, to which his life has been devoted, in the times immediately preceding our own, stamped on the thoughts and opinions of men an ineffaceable impress. In the sixteenth and seventeenth centuries the new light thrown on the world of inorganic matter was hardly more marvellous than was that in the nineteenth century shed on the world of organic life. The doctrine of Copernicus, confirmed a

hundred years afterwards by the telescope of Galileo, and accepted as it was by the reason of the learned and common sense of the multitude, was no nobler contribution to a knowledge of the universe than was made by the biologists of the nineteenth century. Herchel's nebulæ and Ehrenberg's monads may well excite in thoughtful minds admiration and reverence, those by their grandeur, these by their minuteness; for both make known vast regions of the great universe which, so far as human records show, were never before unveiled to mortal vision.

Following the wish of his father, Haeckel studied medicine. But the bent of his mind was to the study of zoology; and the works of Goethe, Alexander Von Humboldt, and Schleiden, further influenced him in that direction. At that time in Germany a band of notable men, by their skill and industry, did much to make biology a new science. Of this group was Von Baer, by birth a Russian, whose ovological discoveries still keep his name famous. With them also were Schleiden and Schwann, noted for their respective discoveries in the cell-structure of vegetable and animal life; and Virchow, who first turned the cell theory to account in pathological investigation. Among others of that band were Kolliker, the foremost histologist of his day; and Johann Mueller, often referred to as the father of modern physiology. All these men were personally known to Haeckel, and several of them were his intimate friends.

Gegenbaur, the comparative anatomist, in 1853 told Haeckel that marine life could be profitably studied on the Mediterranean coast, and first kindled in him the desire to visit the Strait of Messina. Johann Mueller, by virtue of his strong personality and professional skill, did much to mould the character of Haeckel. For many years Mueller's portrait had a place over Haeckel's desk; and he wrote to a friend: "Whenever I get tired I look at it and gain fresh strength." He went to Heligoland with Mueller on

a zoological expedition, where the master was well pleased with his pupil, especially with his skill in sketching the objects of their study; and predicted for him a brilliant future. Haeckel's Heligoland trip furnished him with materials for his first zoological essay. It was on the ova of certain fishes—the scomberesoces—and was printed in Mueller's Archives for 1855. In the same volume was started the well known controversy over Virchow's contention that each human body is a state composed of millions of individual cells.

In 1855 Haeckel went to Wurtzburg, where for three years Virchow directed his studies. A quarter of a century afterwards these two men differed as to the value of free discussion in matters of science; but at Wurtzburg Haeckel was Virchow's assistant, and felt nothing but admiration for the great pathologist and his doctrine. The burden of Virchow's teaching was Monism, the unity of created things; and that as the object of medical science, man is to be regarded as a member of the higher vertebrates subject to the laws of that class. Haeckel was in his twenty-first year, and then, as in later life, cultivated an earnest reverential spirit. His fellow students he warned against the evil of scepticism; and for himself took to heart the saying of Faust: "The whole sorrow of humanity oppresses me.

Haeckel went with Kolliker in 1856 on a holiday trip to the Riviera. Two or three others, and Mueller himself, were there at the same time; and together they caught, studied, and made drawings of all sorts of living creatures. Haeckel carried home materials for future work; and at Berlin, during the following winter, he prepared for his degree of Doctor, a dissertation on "the tissues of the Crayfish." He took his degree in medicine in March, 1858; Ehrenberg, the great microscopist, presiding on the occasion. During the same year he had a friendly discussion with Mueller on the development of the gregarina; and, before the close of the year, was stricken with grief by news of Mueller's sudden death.

In compliance with his father's wish he then entered on the practice of medicine. But his heart was with his zoological studies; and to gain time to follow them up, it is said his hours for consultation were fixed at from five to six o'clock in the morning. During the whole year in which he was a medical practitioner, he had but three patients; not one of whom died under his earnest attention. In the same year Haeckel was betrothed to his cousin Anna Sethe.

From January, 1859, to April, 1860, Haeckel lived and studied in Italy. There is an old saw that Italy is charming in books, but one should never go there. That, however, was not Haeckel's experience. On every side he found there abundant means of enjoyment. He was pleased with the Italian people; and says that the charming scenery of Sicily nearly seduced him to turn landscape painter. But an artistic temperament is the exclusive privilege of no one class. Here and there one of every class inherits that endowment. Haeckel was blessed with it. His house is a gallery of water-colors, his own handywork; and a number of his sketches have been published in Germany as "Travel Pictures." His son, too, has succeeded to his father's skill, and is a professional artist. Much of Haeckel's time was spent at Messina, then so beautiful, since, alas! so desolate. To him the sublime beauty of that Strait exceeded that of the Bay of Naples. As one of Haeckel's biographers says: "That is a land of ancient myths. The Cyclops hammer their work in Etna. Scylla and Charybdis lurk in the Strait. In the days of Homer, when the sun of civilization rested on a corner of Asia, a dim Munchausen world was lived there." Moreover it was at Messina, that by his thorough study of the radiolaria, Haeckel laid the foundation of his fame.

The radiolaria are microscopic forms of life encased in shells of rare beauty. The shells are siliceous in substance, have projecting radiating spines, and are pierced with

minute holes, through which in life the amœboidal almost structureless animal protrudes long hair-like threads of its substance, after the manner of the sun animalcule, actinophrys sol, common in fresh water. They were first found by Ehrenberg in the North Sea, were called by him polycistina, and were afterwards re-named by Mueller radiolaria. They have been found in many seas, and in a fossil state in various parts of the world. The Barbadoes earth, well known to microscopists, has them in abundance in many forms, all of which are of exquisite beauty. Before the year 1859 Haeckel knew but little about these tiny forms of life; but by the following year he had discovered one hundred and forty-four new species. In the September of that year he read a paper about them at the Scientific Conference at Koenigsburg; and in 1862 he published his "Monograph" Die Radiolarian," in a sumptuous folio volume of nearly six hundred pages, with a second volume of thirty-five descriptive plates, from his own beautiful drawings.

Study of the radiolaria occupied no small fraction of Haeckel's life. The value of his work is best seen from his report of these forms of life for the British government. As is well known, the British ship Challenger, from 1872 to 1876, made a voyage for exploration of the deep sea. With the best appliances ooze was brought up from the bottom of the ocean from nearly four hundred places. Some of these spots were more than a mile below the surface of the sea. The results of that voyage are embodied in fifty quarto volumes, sold at £100. Of these volumes four-fifths—forty volumes—are Natural History reports by men of unquestioned ability. Besides some other forms of life brought home by the Challenger, all the radiolaria dredged from the deep sea were entrusted to Haeckel for examination, classification and description. He devoted ten years to the task. His report is in English. It fills two volumes comprising 2,750 pages, with 140 large plates. When the

Challenger's collection was submitted to Haeckel, the radiolaria included 810 species. When his report was finished, the number was 4,318 species, arranged in 739 genera.

It was in that monograph Haeckel first expressed his admiration for Darwin's theory of the origin of species. The ground of that satisfaction was not because the theory itself was new, but for the reason that the mode by which in process of time new species originate was described with a precision and wealth of illustration before altogether unknown. The belief that plants and animals have been developed from pristine germs, so far from being new, found expression in some of the oldest cosmogonies. In point of age it ranks with the earliest speculations of the race. Among other representative men who held that belief may be named Aristotle, Saint Augustine, and Thomas Aquinas. These were great men who influenced the thought of thei. time ages ago. Of a later date were Buffon, Lamark, Geoffroy Saint Hiliare and Erasmus Darwin ; while contemporaneous with Charles Darwin himself were Wells, Matthews, Chambers and Herbert Spencer, whose essay in the "Leader" in 1852 contrasted the theories of direct creation and evolution of species, in favour of the latter. All these eminent men, with others who might be named, each after his own ideas, held to a theory of the evolution of life in the world.

To but few men were these facts so well known as to Haeckel. Yet Darwin had presented his theory with such logical completeness, lucidity and fullness of illustration from all departments of organic life, that Haeckel wrote : "I cannot refrain from expressing the great admiration Darwin's able theory of the origin of species has inspired in me. This is the first great attempt to construct a scientific physiological theory of the development of organic life, and to prove that the physiological, chemical and physical forces that to-day rule in nature, must also have been in the world of yesterday."

Haeckel devoted himself to popularizing Darwinism, to defending it against opponents, and to supplementing and extending its doctrine. But he did more than that. He undertook a restatement of biological science, and revision of zoological classification on the basis of evolution. To that strenuous task he brought rare natural gifts, comprehensive, precise knowledge: and what was also essential to success, an iron constitution. Bolsche, his biographer says: "From his splendid physique in early manhood, he won at Leipzig a laurel crown for the athletic deed of leaping twenty feet." And he humorously adds that the night after the contest the friendly host put a pair of dumb-bells into Haeckel's bed, in case he desired to take another spell of exercise before morning.

Darwinism and the labours of Haeckel are so intimately connected that for a right estimate of his character a summary of that theory is relevant and next to indispensable. A library would be needed to show the ramifications of Darwin's doctrine. Still a glimpse at the leading facts on which his theory rests, the order in which these facts impressed him, and the chief conclusions he deduced from them may suffice. These may be compressed into a few sentences. In his early studies Darwin suspected that species might be mutable. But, pending due investigation, he suspended judgment. Linnæus had conferred a boon on science by his use of combined words denoting genus and species to designate certain differences of organic life. That method admirably served to distinguish the various members of each family of living things, after the manner that each member of a household is distinguished by use of a conjoint Christian name and surname. Linnæus, it is said, believed that some one species of each genus originated from direct creative fiat; but that kindred species of that genus, other than such an one, were of secondary origin. But by most of his followers every species was held to be immutable, and to have been originated by creative fiat. The described species of organic life now exceed half a million;

though in the days of Linnæus those known were hardly a twelfth of that number.

To many studious men the species of Linnæus represented typical forms of life brought into being by creative fiat; forms of life capable of reproducing offspring in continuous succession, which, like themselves, would remain separate, distinct, immutable, without variation beyond narrow limits. But to those holding such a theory, the remins of fossil extinct organisms seemed anomalous. Moreover among those extinct fossils were strange gigantic creatures. In America the megatherium was found; the mammoth was found on the coast of Siberia; and in England ichthyosauria were found. Numerous explanations regarding the extinction of these monsters were given. Sir Anthony Carlisle, a great surgeon in his day, thought they were just sent down from heaven to see whether earth would support them. A more thoughtful explanation was that before the flora and fauna known to man, there were long periods of tranquility in the earth's history, each period having its own plants and animals, and each period being followed by a catastrophy annihilating one set of organic beings, and ushering in a new creation. This was the widely accepted theory of cataclysms, favoured to some degree by no less an authority than Cuvier. But early in 1830 appeared the first volume of Lyell's "Principles of Geology," a work destined to be a landmark in the history of science. It was from the first recognized as a dispassionate, well reasoned refutation of the catastrophic school of geologists, and a lucid exposition of the doctrine that the geological history of the earth has run a course of uniform continuous development in conformity with laws like those now in operation.

When, in 1831, Darwin, as naturalist on the Beagle, embarked for South America on a scientific expedition, he took with him Lyell's newly published volume. And in part from Lyell's reasoning, and in greater part from his

own observations, Darwin, after his five year's voyage, returned to England a confirmed uniformitarian in geology. During his expedition Darwin kept in mind the subject destined to be his life work—the transmutation of species. In the Pampas he noted great fossil animals, armour-clad after the manner of the armadillos, one species of which is scarcely a foot long; and he had seen in going southwards that closely allied animals replace one another. And soon after his return home he commenced to compile note-books on the same subject. The first of these books was opened in 1837, and facts were collected wholesale, for he says: "I worked on true Baconian principles."

Godwin, in his "Political Justice," published in 1793, pictured an ideal state of society free from crime and misery; and at the close of his book he controverted the teaching of Robert Wallace, that the advantages of such a community would be nullified by the excessive population that would ensue. Five years afterwards Malthus, in his famous essay, restated the objections of Wallace with greater force. His more comprehensive argument, tersely put, was that population increases in a geometrical and means of subsistence in an arithmetical ratio; and that vice and crime are but necessary checks on that increase of numbers. In the autumn of 1838, fifteen months after Darwin began his systematic inquiry, he chanced to read "Malthus on Population." He had already learned much as to the struggle for existence going on in the world of life, and, as he read, the thought struck him that under such stress favourable variations would tend to be preserved, and those unfavourable to be destroyed. So the reading of Malthus afforded a provisional theory aiding him to gather in facts, and gave him heart to continue his labours.

As his mass of facts accumulated, his views took more definite shape. But not till 1842, when he had worked five years, did he indulge in the satisfaction of a slight pencil-written abstract of his theory. What he wrote

barely filled thirty-five pages. But a longer sketch soon followed; and in 1856, after more than nineteen years labour, he yielded to the advice of Lyell and began to write out his views "pretty fully." Darwin's collection of facts established beyond cavil that organisms of the same species differ, no one being exactly like another; that these various characteristics tend to go down from generation to generation; and that more organisms come into the world than there is room for, hence the struggle for life which leads to survival of the fittest.

Of the particulars leading up to these conclusions regarding variation, heredity, and survival in living organisms, all are interesting, many are curious, and one or two should be mentioned. Darwin found that the elephant, though living nearly a hundred years, is the least prolific of animals, having an average of only six young. Yet if that ratio of increase in succeeding generations went on without casualties for 750 years, at the end of that period there would be eighteen millions of elephants living. In the case of flies: the house-fly lays batches of eggs having about 130 eggs in a batch; and has five or six batches in a season. In three weeks an egg becomes a fly, itself laying eggs. If all these lived, and half were females, the progeny in one season of a single female fly would be a million cubic feet of flies, reckoning 200,000 flies to a cubic foot. But in fact house-flies vary but little in number from year to year. The mass perish. Among plants, the hedge-mustard, sisymbrium sophia, often has in a single plant three-quarters of a million seeds. If these, and their products, at the same rate of increase, grew to maturity for three years, the land surface of the globe would not hold them all. But the mass perish by the way-side; only a few of the fittest survive.

Hence arose the conclusion that from such selective action of external conditions come permanent varieties of plants and animals; and the same causes in long periods of

time give rise to species, and in still longer periods to differences that are generic. Thus in Darwin's own words: "From the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the highest animals directly follows.

As Darwin made these inductions from his store of facts, an essay came to him with a request that it might be read before the Linnean Society. It was sent from the Malay peninsula, where its author, Mr. Alfred Russel Wallace, a comparatively young Welsh land surveyor, was making search for natural history treasures, as he had previously done in the valley of the Amazon. The paper was entitled: "The tendency of varieties to depart from their original type;" and to Darwin's surprise it contained exactly the same theory as his own. The essay was read at the Society in 1858, as its author desired; and at the instance of Lyell and Hooker, a short paper by Darwin, and a letter a year before written by him to Asa Gray were sent with it. Darwin says that the paper by Mr. Wallace was admirably written; while his own letter to Gray was not intended for publication, and was therefore but an off-hand statement of his conclusions. Neither at the Society's meeting nor in its journal did these papers attract special notice. Prof. Haughton was the only man of note to say in print a word about them; and his comment was: "What in these papers is true is not new, and what is new is not true."

In the following year, 1859, the "Origin of Species" was published. If the Linnean papers were coolly received, the warmth, friendly and otherwise, which greeted appearance of the complete statement in that book made up for earlier indifference. That work kindled a discussion remarkable for its keenness, duration and marked ability of the disputants on both sides. Darwin met his earnest opponents with respect and dignity; and all ridicule with indifference. For the rest, here it must suffice to say, when Darwin's

worldly task was done, it had been so faithfully done that no spot was deemed by his countrymen a fitting resting place for his ashes, but the venerable Abbey, where, near to her great heart, England treasures the memory of her noblest and dearest sons. By Hooker, Huxley, Earl Derby, the Dukes of Argyle of Devonshire, and by others who also loved him, Charles Robert Darwin was borne to his grave in Westminster Abbey, a grave which fittingly is but a few feet from that of Newton, and is marked only by the simple inscription of his name and dates of birth and death. His life is an additional instance that :—

> "Every truth that yet
> In brightness rose and sorrow set,
> That time to ripening glory nurs't,
> Was called an idle dream at first."

A recent authoritative historian has recorded in the Cambridge Modern History that Darwin first made effective the idea of evolution which has been applied not only to natural history but "to religion, to philosophy, to history, to criticism ; and will likely influence the treatment of such subjects in the future even more than in the past."

Many problems connected with Darwinism arose in Haeckel's mind ; though special zoological work claimed much of his attention. In early life the medusæ were his favourite study. In looking back to the days spent with Mueller on the shores of the Mediterranean in 1854, he says : "Never shall I forget the delight with which I first gazed on the Medusæ and strove to sketch their beauty of form and colour." His enthusiasm is not surprising. In appearance these little creatures are like bubbles in the water. Agassiz, who made them a special study, and wrote a memoir concerning them in his "Contributions to Natural History," mentions that a friend of his asked if they are "organized water ;" and the Professor thought it was an apropos question, admirably descriptive. In sheltered bays of the Atlantic, Agassiz found them in such

shoals during summer that an oar could not be dipped into the water without injury to many. And in a shallow of the Mediterranean it is a sight not to be forgotten to watch their iridescent forms flashing in the sunlight below the surface of the sea. Many of them are bell-shaped, though where the clapper of the bell should be there is found a stomach provided with a mouth.

Zoologically the medusæ are an order of ocean jelly-fish, of the class hydrozoa. The fresh water polyps, Trembley so well described a century and a half ago, are their dwarfed, distant relations; and the fossil graptolites in the rocks of our Hamilton escarpment, are still more distant members of their kindred. Haeckel intended to describe one family after another of all the medusæ If his scheme was not carried to completion, his investigations went further than those of his predecessors who were men of distinction. His work in this field of labour reached over several years. His first paper appeared in 1864: and more than two decades afterwards the twenty-eighth volume of the Challenger Reports contained his elaborate memoir on one form of the strange compound social medusæ—the syphonophora.

Haeckel's "System of the Medusæ," with atlas of fine plates, he published in 1879. It was mainly technical—a work written by a specialist for specialists—but nevertheless had its popular side. Even in the dry work of naming species, the human, imaginative side of Haeckel's nature could not be hidden. One species he named melusina formosa after the old charming legend of the water-fay who was wedded to the Prince. His first wife died in her twenty ninth year. Her loss wrung from his heart the cry of Goethe: "What are the hopes and pains built up by man the creature of a day!" Among the names in his list is this note: "This specific name of this most beautiful of the medusæ, the desmonema annasethe, is in memory of Anna Sethe, the gifted and refined wife to whom the author of this work owes the happiest years of his life.

In 1866 Haeckel published his "General Morphology of Organic Life." A second title added that it was grounded on the theory of descent propounded by Charles Darwin. Huxley described the book as "one of the greatest scientific works ever published;" and years after he had written it Haeckel referred to it as a comprehensive, difficult work that had found few readers. It could hardly be a popular book. The morphologist concerns himself specially with the outer form and internal structure of living beings. To him we are told "every animal has a something in common with all its fellows; much with many of them; more with a few; and usually so much with several that it differs little from them." A morphological classification, therefore, is one that groups together living things according to their degrees of likeness and difference in structure. In this work Haeckel, with much skill and labour, showed how differences between the highest animals and highest plants decrease as they are traced back, till the protista, embracing the lowest forms of life in each kingdom of nature, can hardly be distinguished one from the other.

Haeckel closed this work in these words: "Our philosophy knows but one Almighty God who dominates, without exception, the whole of nature. We see His activity in all phenomena. The whole inorganic world is subject to Him, just as much as the organic. The phenomena of inorganic nature are just as truly the direct action of the Almighty as is the flowering of the plant, movement of the animal, or the thought of man. We all exist by the grace of God; the stone as well as the water, the radiolarian and the pine, the gorilla as well as the Emperor of China. No other conception of God except this, that sees His spirit and force in all natural phenomena is worthy of His all-enfolding greatness; only when we trace all forces and all movements, all forms and all properties of matter to God as the sustainer of all things, do we reach an idea of and reverence for Him that worthily corresponds to His infinite greatness."

Haeckel's discussion of the general principles of zoology did not, however, divert him from investigating special forms of life. The spongida had always attracted his attention. For botanists and zoologists during a long time doubted whether sponges should rank as members of the animal or vegetable kingdom; and, moreover, sponges, from their simple structure and plastic form, were fitted to throw light on the problem of species. For some time prior to Haeckel's special investigation, sponges had been assigned place on the animal border of the protista; and the animal particles of a living sponge were known to be "a subaqueous community of animal life, in which each unit takes its stand by a continuous flowing stream drawing sustenance from the water as it passes by." For five years Haeckel studied the chalk-sponges; twice taking up abode on the sea-coast to have specimens for study in their native habitat. His investigations showed how next to impossible it is to draw fixed limits for animal species. Varieties of the chalk-sponges he found passed from each other and back again with such frequency and with such differences that he humourously said: "You may reckon on one genus and three species; three genera and twenty-one species; or thirty-nine genera with two hundred and eighty-one species." His conclusions were that all these forms are transitional and were derived from one ancestral form, the Olynthus.

In the prosecution of his zoological work, Haeckel became a somewhat notable traveller. In early life his sojournings were confined to the shores of the North Sea, and to various parts of the Mediterranean coast. But in later life he studied the coral reefs of the Red Sea, visited the Canary Islands, and made a memorable voyage to Ceylon by way of India. His Eastern trip, though but of six months duration, furnished matter for a fascinating book, as well as supplying him with materials for long investigation. His main object was to supplement his favourite collections of Mediterranean life with the kindred

life of the Indian Ocean towards the equator. In that object he succeeded; though the heat and moisture of the tropics made preservation of his collections a task which sorely taxed his limited resources.

For six weeks he lived and worked at the Singhalese fishing village of Belligam, on the south-eastern part of the island. There, cut off from European associations, and with none but native companions, he roamed the forest in quest of plants and animals, dived with natives to the bottom of the sea for corals, microscopically investigated his treasures, and with his own hands soldered them up in air-tight tin cases for future use. For all this strenuous work in tropical heat, during four months sojourn in Ceylon, he escaped without a day's illness. These experiences, related as they are with vivacity and humour, and his notes on the physical geography of the island, and the tropical luxuriance of its fauna and flora, make Haeckel's "Visit to Ceylon" a pleasant, edifying book of travel.

Early in his professional life Haeckel became convinced that accurate knowledge of cell-structure was the foundation of biological science; and each fresh discovery confirmed that conviction. Of vertebrates the fertilized germ-cell from which the race is perpetuated, is made up of cell-plasm and nucleus. In each such cell—though a mere speck—in some particulars like to other cells, there nevertheless lurks the potentialities of its race, even, it is said, to the tendency in advanced life to develop special disease akin to that endured by its parents. The nucleus of such a cell contains granular matter, easily stained for microscopic observation, and therefore named chromatin. Recently it has been learned that such chromatin separates into minute bodies known as chromosomes; and to them has been attributed the chief function of heredity. Professor Thomson, of Aberdeen, has tabulated the actual number of such chromosomes peculiar to sundry species of living things. Forty years ago Haeckel's teaching pointed the

way to the later discoveries of Strasburger, Hertwig and their followers. On these facts conflicting theories have been built up. But the subject is obscure, and science moves at a rapid pace. Cautious men point out that not long ago it was impossible to look through solid matter, that dogmatism is unseemly, and that "Science commits suicide when it adopts a creed."

The University of Jena, where Haeckel has spent forty-eight years of his professional life, is beautifully situated in the valley of the Saale, about fifty miles from Leipzig. The town is famed for its places reminiscent of great men. Luther spent the night there at the Black Bear tavern, now an Hotel, after his escape from the Wartburg, near Eisenach, where his room and its outfit are still preserved. It was at Jena that Goethe wrote his "Hermann and Dorothea," and in another spot a bust of Schiller marks the place where he wrote "Wallenstein." The university dates back to the middle of the sixteenth century. It was founded as a centre for the new learning of that day; and has ever since been noted for willingness to grant able men a hearing for all new learning. Besides many other notable men, Fichte, Hegel, Oken and Schiller, were lecturers at Jena.

But of all the gifted men associated with this famous seat of learning, it is questionable if the writings of any one of them have been so widely read, in the same time, as those of Haeckel. A few years since a celebration in his honour was held at Jena, when his marble bust, by Kopf, the Roman sculptor, was presented to him. Professors and heads of universities in all parts of the world, from America to India, contributed to the testimonial. At the gathering a list of his books was given. Apart from contributions to scientific journals, the list showed more than forty volumes, having the aggregate of thirteen thousand pages.

His seventieth birthday in 1904 found him in Italy, engaged in his favourite studies. To a Munich journal,

which brought out on the occasion a special number in his honour, he made this reply: "Germany has more learned men than I am. They have read more books than I have. But from my earliest youth, when in my fourth year, I plucked flowers and admired butterflies, I have yielded to my heart's inclination and have incessantly studied one great book—Nature. This greatest of all books has taught me to know the true God. As physician, I saw human life in its heights and depths. In my travels through half the globe I learned the inexhaustible splendour of the earth; and with pen and pencil I have honestly striven to reproduce a part of what I saw, and to reveal it to my fellows."

At the beginning of April, 1909, Haeckel retired from his professorship at Jena. The leisure of his remaining days he will spend in writing a history of biology. One of his pupils becomes his successor. His concluding lecture at the university, on the 10th of February last, characteristically ended with these words: "I am firmly convinced that my successor, Prof. Plate, one of my most capable pupils, will not only fill my place but will surpass me."

Some of Haeckel's speculative opinions have been warmly controverted during his lifetime, and doubtless will furnish matter for controversy in the days to come. Still, apart from that residuum of error inseparable from human knowledge, time, the great arbiter, bids fair to place on the body of his practical teaching its seal of approval. But, however, that may be, the extent and precision of his knowledge excite astonishment, as his lucid method of imparting that knowledge compels admiration; while his ideal of duty, and his exemplification of that ideal in the deeds of daily life, make it doubtful if any amongst us dare ask to be judged by as high a standard.