FIFTY YEARS IN THE SERVICE OF THE EVOLUTION THEORY.[1]

BY DR. W. BREITENBACH.

THIS year Prof. Ernst Haeckel can celebrate a peculiar jubilee. It is fifty years ago last September since his first public appearance, so pregnant with consequences, in behalf of the Darwinian theory. In the autumn of 1859 appeared Darwin's epoch-making work *On the Origin of Species by Means of Natural Selection, or the Preservation of Favored Races in the Struggle for Life,* which was edited the following year in the German language by the zoologist Bronn of Heidelberg. At first the book met but scanty approval from German zoologists and botanists. Here and there literary voices in Darwin's favor made themselves heard, but they aroused no responsive echo, and the general public particularly continued to know nothing of the Darwinian theory and its revolutionary significance. Even the writings of the German zoologist Carl Vogt and the English zoologist Thomas Huxley, which appeared in 1863, did not make any impression in spite of the fact that even then they were discussing the serious problem of the application of the Darwinian theory to mankind. Huxley, especially, in his *Evidence as to Man's Place in Nature,* which is still classical and well worth reading, made the assertion that the anatomical differences between man and the man-like apes are less than those between the latter and the lower apes. With this proposition, which Haeckel later called the "Pithecometra principle," it was expressly declared clear and distinctly that man is most closely related to the anthropomorphic apes and must historically have originated from them. Even Carl Vogt arrived at the conclusion that man has developed from the animal kingdom.

[1] Translated by Lydia G. Robinson from the *Neue Weltanschauung* of September, 1913. The illustrations in this article, though not directly pertinent to its contents, are reproductions of a few instances of Professor Haeckel's own artistic work.

Haeckel himself became acquainted with Darwin's book in Berlin in 1861 after his return from Messina (where he had been making a special study of Radiolaria) and was sure that none of the zoologists and anatomists of Berlin at that time recognized the Darwinian theory. Only the intelligent botanist, Alexander Braun, gave his assent in great measure. But from the moment in which Haeckel finished reading the *Origin of Species* he was an enthusiastic and confident adherent of Darwin, the further extension of whose theory was henceforth to be the most important task of his life.

He utilized the first opportunity which offered itself to declare his agreement with Darwin's theory. This occurred in a note in his *Monographie der Radiolarien* which appeared in 1862. The note reads: "I can not refrain from taking this opportunity to give expression to the great admiration with which Darwin's remarkable theory of the origin of species has filled me. The more, since this epoch-making work has met with a prevailingly unfavorable reception from German specialists, and to some extent seems to have been totally misunderstood. Darwin himself wishes his theory to be put to the test in as many directions as possible, and looks 'with special confidence to young aspiring naturalists, who will be capable of judging both sides of the question impartially. Whoever is inclined to the view that species are inconstant will perform a good service to science by scrupulously acknowledging this conviction; for only in this way can the mountain of prejudices be removed under which this object lies buried.' I fully share this opinion, and feel compelled for this reason to express my conviction with regard to the mutability of species and to the actual genealogical relationship of all organisms. Although I shrink from sharing Darwin's views and hypotheses in all respects, and from regarding as correct the entire demonstration he has attempted, I must still admire in his work the first serious scientific attempt to explain all the phenomena of organic nature from a sublime unitary point of view and to replace incomprehensible miracle by comprehensible natural law. Nevertheless, there may be more error than truth in Darwin's theory in the form in which it appeared as the first attempt of the kind. As incontestably important principles of the greatest significance, at all events, as are natural selection, the struggle for existence, the relation of organisms to one another, the divergence of character and all other principles elucidated by Darwin in support of his theory, still it is easily possible that just as many and as important principles which affect the phenomena of organic nature in the same way or with even greater restriction are still totally unknown to us." After

a few more observations the note then concludes: "The greatest defect of the Darwinian theory probably lies in the fact that it does not furnish any point of departure for the origin of the primitive organism from which all others have gradually developed, most probably a simple cell. If Darwin assumes for this first species another special act of creation, it would be very inconsistent to say the least, and, it seems to me, not intended seriously. But apart from these and other shortcomings Darwin's theory possesses as it stands the undying merit of having put sense and meaning into the whole theory of the relations between organisms. When we consider how every great reform, every long step in advance, meets with the more violent opposition the more unfeelingly it overturns well-rooted prejudices and opposes prevailing dogmas, we certainly can not wonder that Darwin's ingenious theory has hitherto met only attacks and repulses instead of well-deserved recognition and investigation."

In the text of the work on Radiolaria also there are single passages which show that Haeckel even then had fully grasped the great significance of the Darwinian theory, and he had previously sought to sketch a genealogical system of the Radiolaria.

This courageous open confession of the youthful zoologist was hidden in a large scientific monograph limited to the narrowest circle of specialists, and made no outward impression. But Haeckel was stirred in his inmost being by the new theory and regarded it as his duty to assist in obtaining for it the recognition it deserved. In 1863, the meeting of the German naturalists and physicians was held in Stettin. On September 19, Haeckel gave the first public address "On Darwin's Evolution Theory." The lecture is a clear intelligible presentation of the new theory of the English naturalist and thus early puts in systematic form the farthest reaching consequences to which Darwin himself at that time could not commit himself, and does so, moreover, from purely external reasons. Haeckel condenses the fundamental idea of the Darwinian theory tersely thus: "All the different animals and plants which are living to-day, as well as all organisms which ever have lived upon the earth, have not been created as we have been accustomed to assume from our earliest youth, each one for itself independently in its species, but have developed gradually in spite of their wide variety and great diversity in the course of many millions of years from some few, perhaps even from one single original form, one supremely simple primitive organism. Accordingly, so far as we human beings are concerned, we, as the most highly organized vertebrates, would have to look for our primitive common ancestors among the apelike mammals; still

farther back among kangaroo-like Marsupialia; still farther, in the so-called secondary period, in lizard-like Reptilia; and finally in a still earlier time, in the primary period, in low organized fishes." At the end of his lecture Haeckel calls the Darwinian evolution theory the "greatest scientific advance of our time, promising to do for organic nature what Newton's law of gravitation has accomplished for inorganic nature."

In the Stettin address Haeckel, the leading German naturalist, had not only brought Darwin's new theory before the forum of the

VIEW FROM RAMBODDE PASS.
After a photograph from *Wanderbilder.*

German scientific world but also before the broader public. With dauntless courage he deduced from it that most important inference of man's descent from the animals, by which Darwin's theory was destined to attain, and has attained, such prodigious significance for the transformation of our entire world-conception. Of course the address of the young Jena professor met with the liveliest opposition on the part of the older naturalists present who ridiculed Darwin's views and theories and declared them to be absolutely untenable, without suspecting what folly they themselves were com-

mitting. But this opposition, which is the lot of everything new and revolutionary, did not last long, and the result of Haeckel's speech was that the idea of a development of the higher from the lower took firm hold in science and in the educated public at large, and that the theory of man's descent from animals never again disappeared from the public view. So this speech at Stettin took its place by the side of the above-mentioned writings of Huxley and Vogt, and from that hour Haeckel took upon himself the leadership in Germany of the struggle for the theory of descent. He has kept it up for almost a generation and was later not unjustly called *the German Darwin.*

Let us see wherein Haeckel's further services in behalf of the new theory mainly consist. A few years after his speech at Stettin he gave two lectures before a small circle in Jena, "On the Origin and Pedigree of the Human Race." In them he developed the general arguments which compel us to classify man in the animal kingdom and to apply to him the same laws of evolution which prevail there. Since from his physical constitution man is undoubtedly to be counted in the animal kingdom, since he is a genuine mammal and must be placed at the top of these most highly developed vertebrates, it necessarily follows, if we grant the truth of the theory of descent in general, that man too must have developed from the lower animals, apes, semi-apes, the Marsupialia, and further back from the Amphibia, fishes and invertebrates. In 1865 Haeckel said literally: "If we can prove the truth of the Darwinian theory, our acceptance of a descent of man from lower vertebrates must necessarily follow, and we are altogether exempt from any special demonstration for the latter hypothesis." Even then Haeckel placed the greatest value upon this philosophical basis for the animal genealogy of the human race, and he worked it out still further a year later in his great work *Generelle Morphologie.* The following passage from this classical work deserves to be retained for all time: "The theory of descent is a general law of induction which follows with absolute necessity from the comparative synthesis of all organic natural phenomena and particularly from the threefold parallels of phyletic, biontic and systematic evolution. The statement that man has developed from the lower vertebrates, and indeed most clearly from actual apes, is a particular deductive conclusion which follows with absolute necessity from the general law of induction of the theory of descent." "All further discoveries which in the future will enrich our knowledge about the phyletic development of man," adds Haeckel, "can be nothing but special verifications of that deduction which rests upon the broadest inductive basis." All the

later work in all the domains of anthropological morphology, comparative anatomy and ontogeny, physiology and even physiological

THE SACRED BODHI TREE, CEYLON.
From a crayon drawing in *Wanderbilder.*

chemistry, has confirmed again and again this bold deduction of Haeckel in the year 1866.

In the above-mentioned *Generelle Morphologie* may also be

found the comprehensive foundation for that great law which must be regarded as Haeckel's most important contribution to the extension of the evolution theory and whose further development and application from that time on governed his Darwinistic labors. I mean his "biogenetic principle" which is hotly contested to this day. According to this principle of organic evolution, ontogeny, or the germ-history of the individual, is a brief repetition of the history of the race depending on the law of heredity. The separate stages of ontogenetic evolution give us at least an approximate picture of the development through which have passed the ancestors of the animal in question in the course of the geological evolution of the earth. In other words: In its development from the fertilized ovum every animal passes through a series of forms through which in a similar sequence his ancestors have passed in the course of the earth's history. The history of the germ is a sketch, a miniature, of the history of the race.

The first intelligent presentation of this law was furnished in 1863 by Fritz Müller in his brief paper "For Darwin," a paper whose great value Haeckel has laid stress upon throughout his whole life with the warmest words of approval. I gave an extensive report of the first proof of the biogenetic principle by Fritz Müller in my *Populäre Vorträge aus dem Gebiete der Entwicklungstheorie.*

By means of this law the significance of ontogeny, or the individual development of animals from the fertilized ovum, stood out more prominently than heretofore, and it was only natural that Haeckel should concern himself exhaustively with this branch of zoology. He investigated particularly the first development of the lower animals from the ovum, and by this means (at the same time utilizing similar investigations on the part of other zoologists, especially of the Russian Kovalevski) arrived at the ingenious conception of his famous "gastræa theory" which he worked out and established in various writings during the years 1872 to 1884, and which must be counted among his most conspicuous accomplishments in zoology.

Comparative germ-history or ontogeny has established by exact observations that from the fertilized ovum of all metazoans or many-celled animals after the general divisions of the ovum or segmentations, an early or germ-form proceeds which shows essentially the same construction in all classes of animals.

This germ-form in all typical cases is a small bubble- or cup-shaped formation whose wall consists of two layers of cells containing an opening at one end through which the inner cavity of the

sac is connected with the outside world. The two cell layers are the cotyledons, the inner or entoderm and the outer or ectoderm; these enclose the primitive digestive cavity (archenteron) and the opening in the partition is the primitive mouth (blastopore). The entire structure is called the gastrula. Such a typical gastrula appears in representatives of all metazoans. Often the form of the gastrula is secondarily modified as a consequence of various conditions, but the two cotelydons, the archenteron and the blastopore, can always be distinguished. From this simple gastrula all the later organs of the animal body are derived in a further evolution, as can be separately demonstrated.

To these ontogenetic facts Haeckel now applied the biogenetic principle, arriving at the following supremely important conclusion: The embryonic form of the gastrula is the repetition (dependent on heredity) of a primitive ancestral form of real animals, the so-called gastræa. In other words, all metazoans are descended from an original animal form, long since extinct, which was constructed essentially similar to a typical cup-shaped gastrula, the gastræa. This phylogenetic utilization of ontogenetic material is Haeckel's work. When some naturalists nowadays wish to dispute this service of Haeckel's they seem to understand but poorly the historical evolution of science.

In the biogenetic principle and the gastræa theory Haeckel has given to science clues which lead safely through the labyrinth of ontogenetic facts and solve the riddles of the history of the animal kingdom and hence also of our own race.

Haeckel attempted to apply this new knowledge to man in a comprehensive manner in his *Anthropogenie* which appeared in its first edition in 1874, after he had already worked out the fundamental features of animal and human descent in different editions of his popular *Natürliche Schöpfungsgeschichte*. The *Anthropogenie,* human ontogeny and phylogeny, was almost entirely disregarded by the narrower specialists, was even attacked from several quarters with extreme violence. Gradually, however, the attacks ceased, one edition followed another, and to-day the fundamental features of the *Anthropogenie* have been accepted by practically all well-informed and competent zoologists and anthropologists. The "question of questions," as Thomas Huxley called that of the descent of man, has been discussed for a number of years with extreme animation, not only among the laity but also in strictly scientific circles, and some of our best anatomists and anthropologists are devoting their entire energy to it.

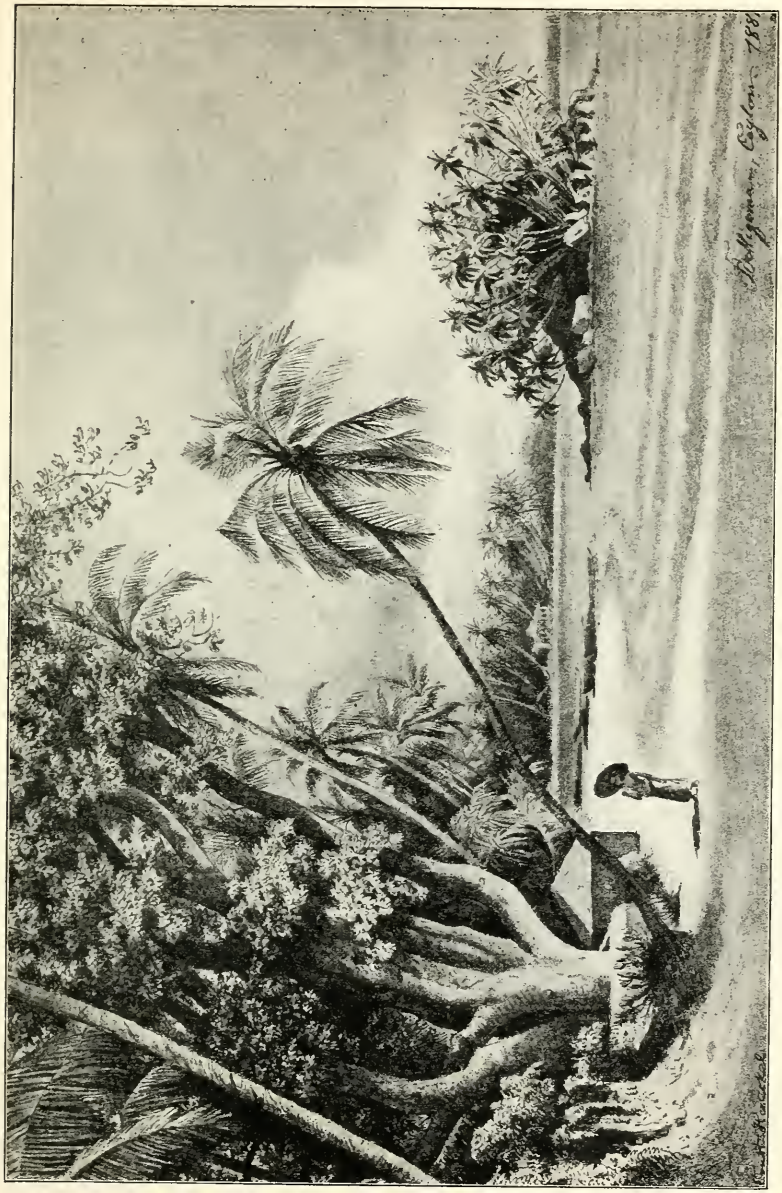
To be sure these investigators are concerned almost exclusively with the narrow specific question of the immediate antecedents of man, hence his relations to the nearest mammals, the apes. Haeckel on the contrary has from the beginning treated the problem of man in its widest scope and attempted to follow back the ancestral line of our race to the beginnings of the animal kingdom. In all the rapidly succeeding editions of the *Anthropogenie* and the *Natürliche Schöpfungsgeschichte,* he has constantly endeavored to improve his phyletic theories and hypotheses and to bring them into harmony with the state of research in each case. When he gave a condensed exposition "On Our Present Knowledge of the Origin of Man" at the International Congress of Zoologists at Cambridge in 1898, he met with entire accord from this forum of international science. For the last time he discussed and substantiated in detail his views on human phylogeny in his pamphlet *Unsere Ahnenreihe* (1908).[2]

In human phylogeny Haeckel distinguishes two great halves which he again divides into three grand divisions. The first and oldest half includes the time before the Silurian and is distinguished by the fact that there are extant no fossil records of our ancestors from that time. In this first main section of the line of ancestors there can have been only invertebrates whose soft bodies could not leave any fossilized relics. Here paleontology can give us no information about the race, and we are directed to comparative anatomy and very especially to comparative ontogeny. The safe guides to these domains are the biogenetic principle and the gastræa theory. It is to-day recognized by all competent investigators that the earliest ancestors of the vertebrates, to which man belongs, must also have been invertebrates; there is also general unanimity with regard to the fact that the earliest ancestors of all metazoans are to be sought in the one-celled protists. But where the connection of the vertebrates with the invertebrates is to be found, scholars can not yet agree, as I have pointed out in Volume VIII of the *Neue Weltanschauung* with regard to a very fantastic theory of an American zoologist. Any special hypothesis about the exact point of contact is just as uncertain as the general phyletic hypothesis of the descent of vertebrates from invertebrates is certain.

We have firmer ground beneath our feet in considering the second half of our ancestral line, which reaches from the Silurian up to the present time and of which we can gain information from many fossilized remains of the fauna of those times. Comparative

[2] Since I have given an extensive analysis of this work in the *Neue Weltanschauung* of 1908, pages 442-453, I will here simply refer to this essay.

anatomy and ontogeny bear conclusive witness to the unity of the system of vertebrates, and the increasing number of vertebrate



COCOA ISLAND AND THE REST HOUSE AT BELLIGEMMA.
From a crayon drawing in *Wanderbilder*.

fossils leaves no room for doubt that the higher vertebrates have developed from the lower. In the history of the evolution of the

earth there appear in succession fishes, frog-like fishes, Amphibia, lizards, the earliest mammals, later and higher mammals, and among these latter there again appear first the lower and then the higher forms and at last the real apes and man. Haeckel regards the following as the last stages in man's ancestral line: (1) The earlier cynopithecus (baboon and long-tailed monkey); (2) Later cynopithecus (senile and proboscis monkeys); (3) Early man-apes (gibbons); (4) Later man-apes (orang outang and chimpanzee); (5) Ape-men (*Pithecanthropus*); (6) Primitive man (*Homo Primigenius*, Neanderthal); (7) *Homo sapiens.*

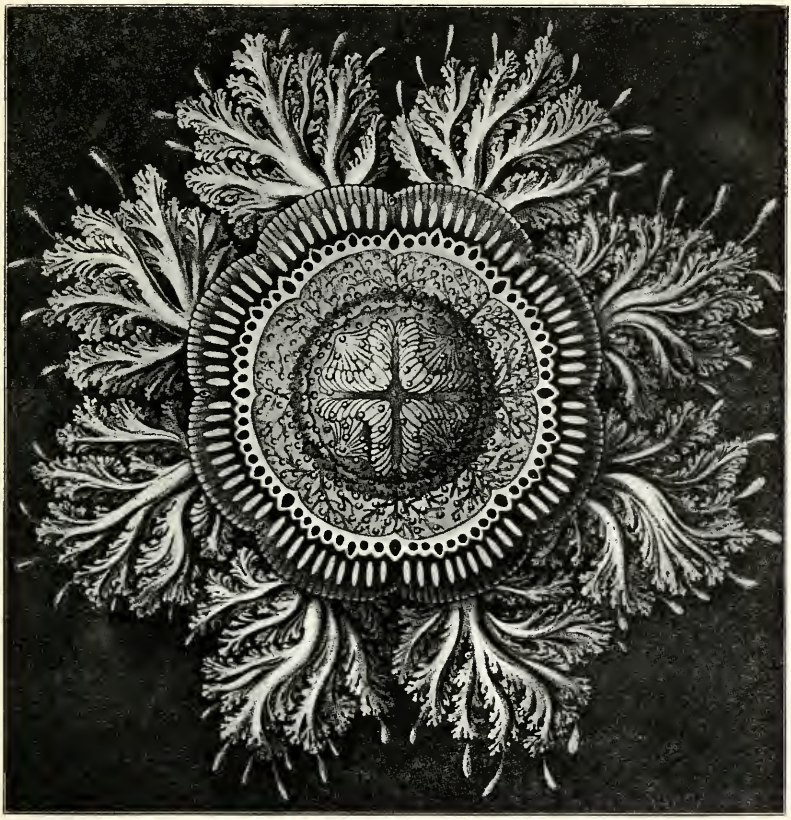
However one may regard singly the various phyletic hypotheses which Haeckel has advanced for the elucidation of the human genealogical tree in the course of fifty years, one thing must be granted even by his enemies: He has known how to open up the whole question in Germany, he has interested the great educated public in it, and last but not least he has compelled specialized science to take her proper place. At the end of his life he has the satisfaction of seeing that the ape-theory, formerly in such ill repute, has now become an integral component part of specific anthropology. The churches, that formerly were the keenest opponents of the theory of descent, have become familiar with the idea of the blood relationship of man with the animal kingdom, and even Jesuit authors give us to understand that the theory of the physical descent of man from the higher mammals does not stand in any insurmountable contradiction to the doctrines of the church.

In his fundamental work of 1859 Darwin had deliberately left man entirely out of account. Only in one passage at the end we find this significant sentence: "Light will be thrown upon man and upon his history." It is characteristic of the state of science in Germany at that time that Bronn, the first translator of Darwin's book, suppressed this passage. But I have pointed out in a pamphlet entitled *Die Abstammung und Vorgeschichte des Menschen* (Brackwede, 1907) that Darwin in reality had concerned himself with the application of the theory to mankind long before Huxley, Vogt and Haeckel. Later, in *The Descent of Man and Selection in Relation to Sex* which appeared in 1871, Darwin decidedly espoused the theory of the animal descent of man and placed himself entirely on Haeckel's side, from which position he never departed as long as he lived.

Nevertheless it remains to Haeckel's undying credit that he continued to build up Darwin's structure. It is he who applied the

theory of descent most consistently to man and courageously taught that man was descended from apelike ancestors.

As in his work on *The Origin of Species* Darwin neglected to extend his theory upwards, he also let an important omission creep in at the bottom, to which Haeckel had already called attention in his Stettin address. Darwin did not explain the first appearance



RHIZOSTOME (*Toreuma belligemma*).
From *Wanderbilder.*

of organisms on earth, or, as they said in those days, the origin of the primitive organism. To this point Haeckel had already called attention in Stettin in the following words: "Another and probably the most important defect in the Darwinian theory lies in the fact that it furnishes us with no starting point for the beginning or spontaneous generation of one or a few most primitive tribal organisms from which all others develop. Was it a simple cell like those which

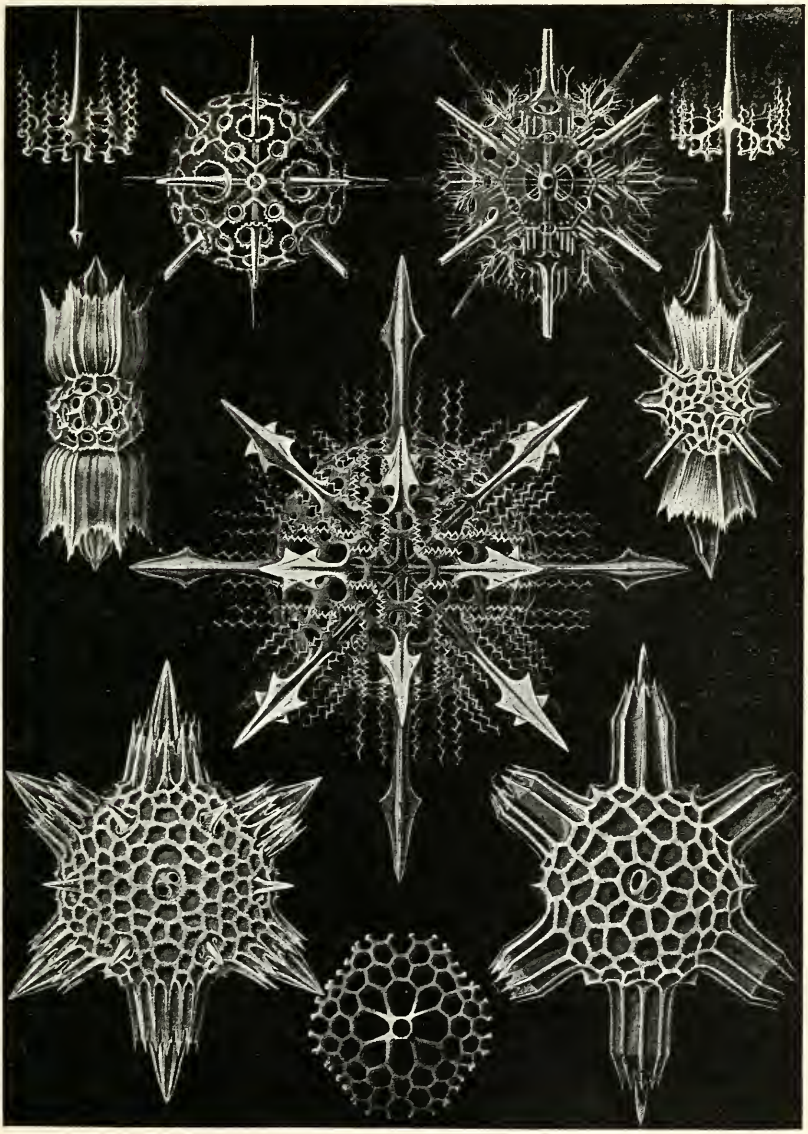
even now exist in great quantities as independent beings in the doubtful boundary between the animal and plant kingdoms, or such as one of the ovums of all organisms are represented to be at some time or other? Or was it in a still earlier time merely a simple animated globule of protoplasm, capable of nourishment, reproduction and growth, a moner similar to certain ameba-like organisms, which seem not yet to have reached the degree of organization of a cell?"

Haeckel with great keenness of perception has sought to fill up these lower gaps in the Darwinian theory by his hypothesis of spontaneous generation.[3] There are of course a number of such hypotheses but the one which Haeckel has gradually built up in the course of time seems to correspond most closely to biological and paleontological facts. That spontaneous generation has distinguished representatives among specialists to-day is recognized from the fact that Professor Schäfer of the department of physiology at Edinburg, at the last meeting of the British Association gave a lecture on the subject which has received a great deal of comment and in which spontaneous generation was characterized as a necessary hypothesis. Spontaneous generation, i. e., the actual origin of primitive vital substance (similar to the protoplasm of to-day but by no means necessary as it is) from inorganic elementary substance and combinations, is a logical demand of the evolution theory, for it is the first hypothesis to produce a direct connection between the lifeless and the living world as implied in the concept of evolution.

The anthropogenetic works of Haeckel have still another important significance for our entire world-conception. Ontogenetically we can distinguish quite exactly the moment when a new human individual begins its existence. It is the moment in which the nucleus of the masculine sperm-cell coalesces with the feminine ovum-cell in fertilization. In this process the first tribal cell of the new individual has grown from the fertilized ovum-cell, and from this the whole body gradually develops ontogenetically. This one fact overthrows the old dualistic soul-theory of theology. If the soul were really a special immaterial being independent of the body, which abandoned it after death in order to continue in the "Beyond" a life of its own, then the great question arises, Whence comes the soul of the new human embryo into the mother's body? The church of course assumes that it enters the embryo at a definite moment.

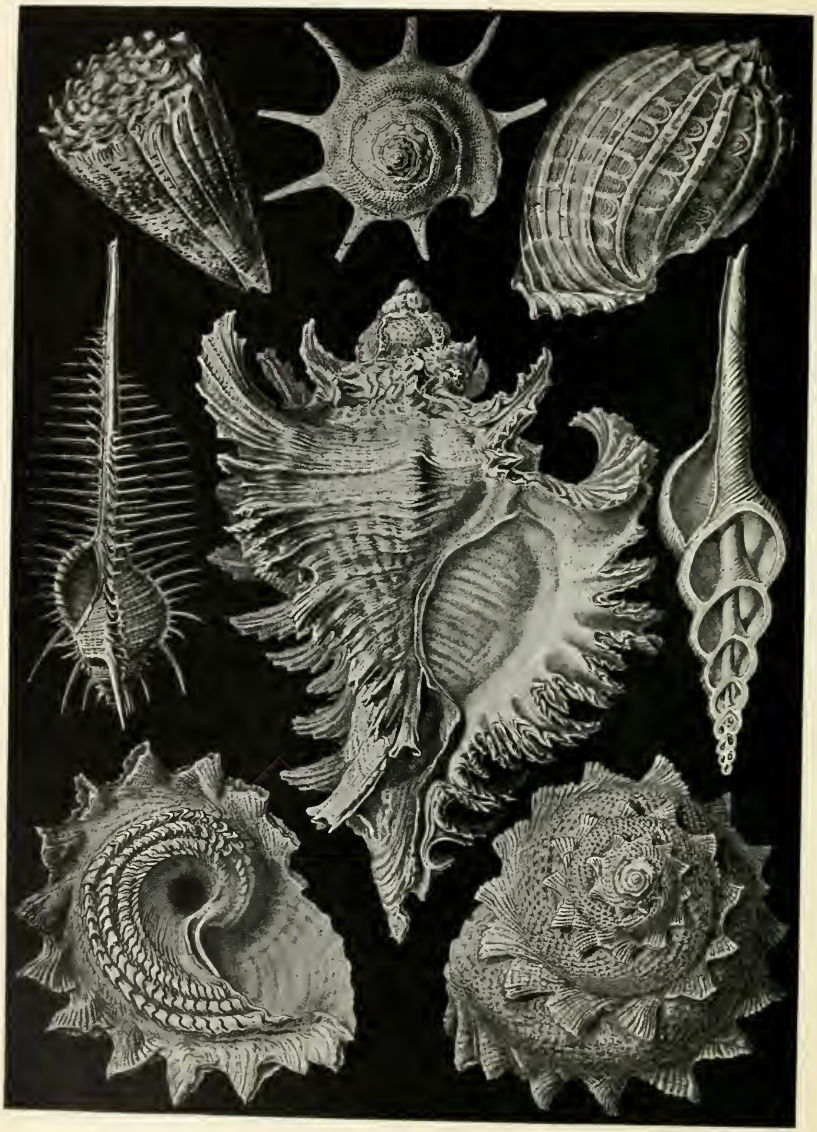
[3] I have reviewed extensively the most important theories of spontaneous generation in my *Populäre Vorträge aus dem Gebiete der Entwicklungslehre* (Brackwede) and here refer to it for a more detailed consideration of the subject.

Monistic anthropogeny must reject such a fantastic view. According to this science the soul of the grown man is the aggregate of the functions of the neurons or psychic cells of the brain and develops



ACANTHOPHRACTAE.
From *Kunstformen der Natur.*

as gradually from the combined cell-souls of the blending sexual cells as the grown body develops from them. With the death of the soul-cells the soul also disappears, just as certain phases of it are



SNAIL SHELLS (*Posobranchia*).
From *Kunstformen der Natur.*

destroyed simultaneously with the loss of a part of the psychic organ. With this fact confirmed by every experience of physiology, falls the ancient dogma of the immortality of the individual soul and with it one of the main props of the dualistic doctrines of the church. It is exactly this knowledge that makes the churches such bitter enemies of the theory of descent in general and of anthropogeny in particular.

At the end of the nineteenth century Haeckel combined all the far-reaching and partly revolutionary ideas which were put forward in the *Generelle Morphologie, Natürliche Schöpfungsgeschichte* and *Anthropogenie*, in his famous *Welträtsel* and *Lebenswunder*, and elaborated them into a well-rounded and consistent monistic world-conception. This book on the "Riddles of the Universe" has called forth a veritable flood of writings, *pro* and *con*, such as has been the case with but few books in all the literature of the world. The controversy still rages with regard to the *Welträtsel*, which has been translated into about fourteen languages and has a circulation counting in the millions. Very recently a Hindu professor visited Haeckel and asked permission to be allowed to translate the book into the Hindu language. He felt able to prophesy definitely that copies of this translation would be sold in India in hundreds of thousands. Whatever may be a person's attitude toward the single points discussed in the *Welträtsel*, it remains, in spite of all opposition, the book which has pointed out the way to millions of people in their search for a new spiritual content in their life after they have ceased to find consolation in the old doctrines of revealed religion and dualistic philosophy. Even to the lowest strata of society in all civilized lands the *Welträtsel* has carried all the great ideas of the evolution theory and of monism, and no power will be able to eradicate them again from the world. In the course of time the consequences of this deed will be boundless. Not only must the philosophy of the schools, which still lies almost completely under the spell of Christian theology, come to an understanding with the monistic conception if it does not wish to sink back very soon to the rank of medieval scholasticism, but it will also recognize the important facts of anthropology (the vertebrate nature of man and his animal descent) and will even be obliged to utilize them in the construction of a new world-conception. But the direct consequence of the monistic philosophy of the future (whose beginnings we can see even now) will then be the upbuilding of a new conduct of life in all directions, gratifying beginnings of which are likewise to be observed.

Eight years ago the new world-conception of monism which Haeckel has supported since his youth formed with his cooperation an external organization which, however, has unfortunately not become what its founder had hoped. This is not the place to enter into details. We shall only mention the bare facts because the founding of the Monistic League signifies a certain rounding off of Haeckel's life-work in the service of Darwin and the evolution theory.[4]

Having now attained a general survey over the most significant work of Haeckel with regard to Darwin's new theory, the next thing is to consider briefly also his specialized work in purely zoological lines. However, these specifically zoological works of Haeckel which contain so many new Darwinistic ideas are so little known to the public at large, and also usually so little accessible, that I prefer to abandon any attempt here at a suitable appreciation, and the more since I have attempted to do the matter justice in my biography of Haeckel.[5]

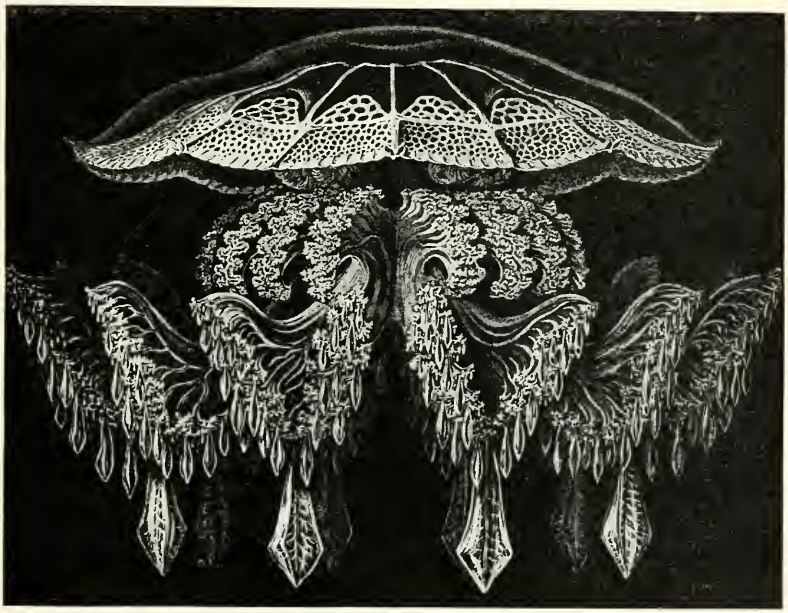
I shall only recall briefly a few fundamental works. From the Darwinian theory there immediately arose a new conception of the systems of animals and plants. If the higher forms of life really are descended from the lower then all of them must be related to one another, and the system became a genealogy of animals and plants. Haeckel was the first naturalist to systematize the animal and plant worlds from this new point of view, and as early as in his *Generelle Morphologie* he sketched the first genealogical trees. They were persecuted for a long time and attempts were made to render them ridiculous. In the course of years, however, they have gained general currency in science, and to-day one meets them in almost all the better morphological and systematic works. Haeckel himself improved the first phylogenetic attempts from year to year, and in the years 1894 to 1896 published his three-volumed *Systematische Phylogenie* as a "sketch of the natural system of organisms on the phylogenetic basis," which contains the pedigrees of all the larger divisions of the animal and plant kingdoms.

The gastræa theory made possible for the first time a real phylogenetic classification of the animal kingdom. From this theory there first followed the very important division of the animal kingdom into protozoans and metazoans, the one-celled lower and the many-celled higher animals. Then followed the so-called homology of

[4] More details are contained in my recent pamphlet *Die Gründung und erste Entwicklung des Deutschen Monistenbundes* (Brackwede, 1 Mark).

[5] W. Breitenbach, *Ernst Haeckel; ein Bild seines Lebens und seiner Arbeit*, 2d. ed., Brackwede.

cotyledons which gave further basis for a natural division of the metazoans. The fundamental features of the gastræa theory are to-day recognized very generally as correct, and by most zoologists are made the basis of a classification of the animal kingdom. This theory has also given the impulse to many other investigations, and especially has made possible an actually scientific comparative germ-history, or ontogeny. The often remarkable facts of ontogenesis or germ-history, Haeckel sought to make intelligible by the biogenetic principle. To him ontogenesis was causally conditioned by phylogenesis or race-history. How greatly these Haeckelian ideas



CHANDELIER MEDUSA (*Rhopilema Freda*).
From *Wanderbilder.*

have influenced zoology is shown by a glance at the literature of that time and later.

If in the face of these great services (of which many more could be enumerated) many of the younger zoologists to-day believe that they might throw Haeckel aside as old iron, the explanation of this attitude in many cases is not difficult. Some of these gentlemen are concerned with the most delicate researches in the structure and division of cells, others perform experiments in the artificial generation of monstrosities and the like—in short a great part of zoology has again become the tiniest (and often very fruitless) detail work,

and the present generation of zoologists seems gradually to have lost sight of the great whole. For there are people who concern themselves all their life long almost exclusively with the nuclei of cells, regarding these tiny particles as more important than the powerful synthetic works which Haeckel has accomplished in the biogenetic principle or in the gastræa theory, or than the great and permanently fundamental monographs on Radiolaria, Medusae, and Siphonophora. It may also appear precarious to many younger men who would fain make a speedy career for themselves, to attach themselves to the atheist and monist Haeckel, even though they can not avoid utilizing in their work many ideas and terms which Haeckel was the first to introduce into science. For experts in these matters this fact only increases the greatness of Haeckel, which in spite of all persecutions, calumnies and insults still endures. They matter less for the man, whose services for zoology can not be entirely denied, than for the great work which now for fifty years he has supported and built up so courageously and so successfully, which was called into being by Charles Darwin, the great master of us all, and which becomes more and more the solid foundation of our monistic naturalistic world-conception. May it be vouchsafed Ernst Haeckel, who is soon to celebrate his eightieth birthday and who for fifty years has fought "for Darwin," to pursue for many more years from the exalted height of his purified world-conception the further development of the teachings of Darwin and of himself.