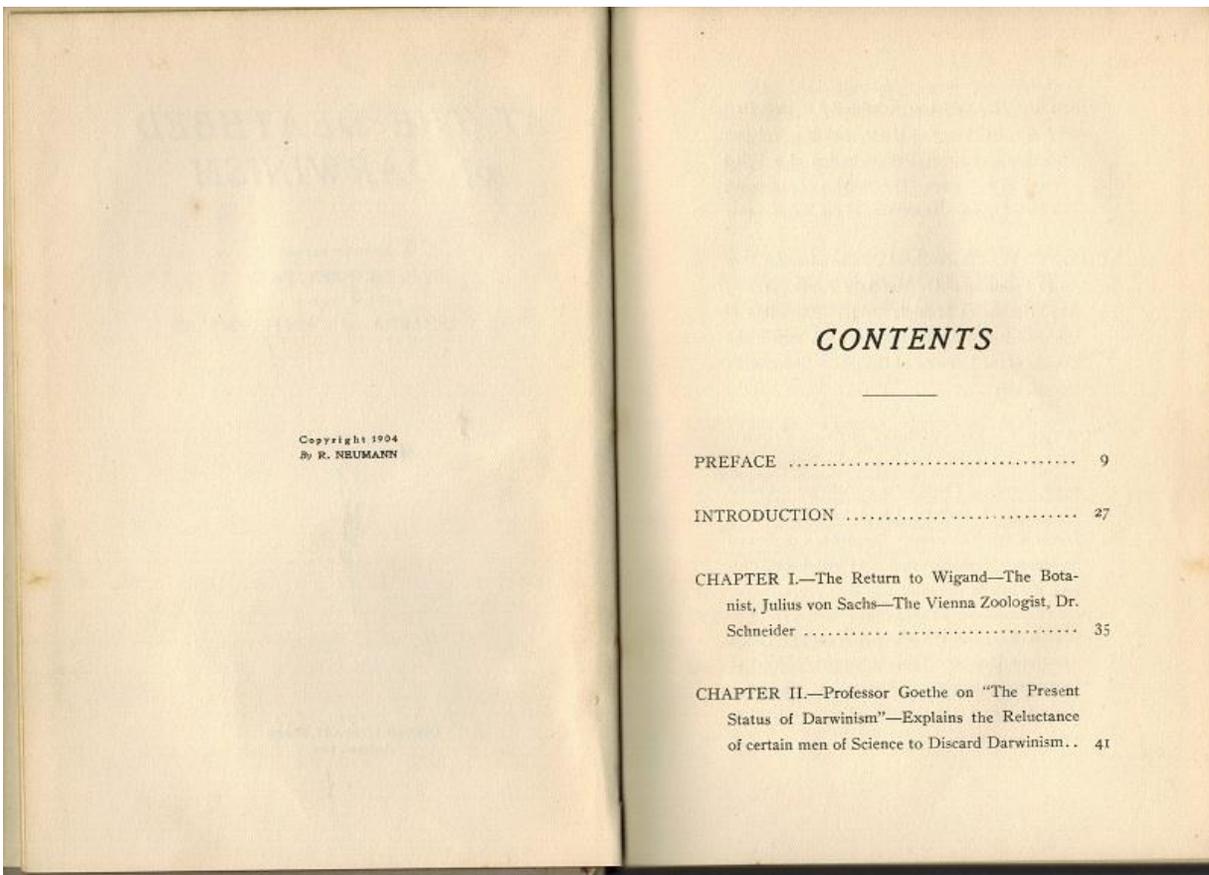
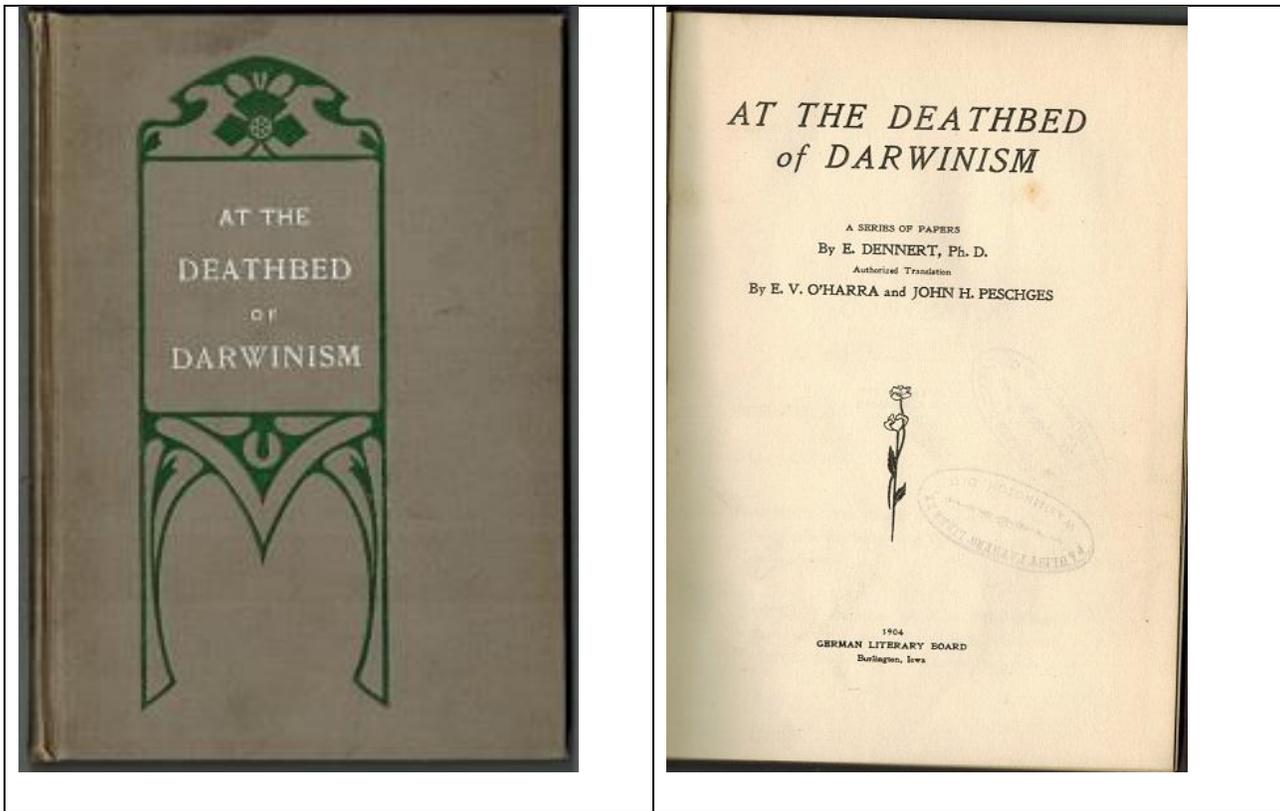


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**PREFACE.**

The general tendency of recent scientific literature dealing with the problem of organic evolution may fairly be characterized as distinctly and prevailingly unfavorable to the Darwinian theory of Natural Selection. In the series of chapters herewith offered for the first time to English readers, Dr. Dennert has brought together testimonies which leave no room for doubt about the decadence of the Darwinian theory in the highest scientific circles in Germany. And outside of Germany the same sentiment is shared generally by the leaders of scientific thought. That the popularizers of evolutionary conceptions have any anti-Darwinian tendencies cannot, of course, be for a moment maintained. For who would undertake to popularize what is not novel or striking? But a study of the best scientific literature reveals the fact that the attitude assumed by one of our foremost American zoologists, Professor Thomas Hunt Morgan, in his recent work on “Evolution and Adaptation,” is far more general among the leading men of science than is popularly supposed. Professor Morgan’s position may be stated thus: He adheres to the general theory of Descent, i.e., he believes the simplest explanation which has yet

been offered of the structural *similarities* between species within the same group, is the hypothesis of a common descent from a parent species. But he emphatically rejects the notion—and this is the quintessence of Darwinism—that the *dissimilarities* between species have been brought about by the purely mechanical agency of natural selection.

To find out what, precisely, Darwin meant by the term "natural selection" let us turn for a moment, to his great work, *The Origin of Species by Means of Natural Selection*. In the second chapter of that work, Darwin observes that small "fortuitous" variations in individual organisms, though of small interest to the systematist, are of the "highest importance" for his theory, since these minute variations often confer on the possessor of them, some advantage over his fellows in the quest for the necessities of life. Thus these chance individual variations become the "first steps" towards slight varieties, which, in turn, lead to sub-species, and, finally, to species. Varieties, in fact, are "incipient species." Hence, small "fortuitous" fluctuating, individual variations—i. e., those which chance to occur without predetermined direction—are the "first-steps" in the origin of species. This is the first element in the Darwinian theory.

In the third chapter of the same work we read: "It has been seen in the last chapter that amongst organic beings in a state of nature there is some individual variability. \* \* \* But the mere existence of individual variability and of some few well-marked varieties, though necessary as a *foundation* of the work, helps us but little in understanding

how species arise in nature. How have all those exquisite adaptations of one part of the organization to another part, and to the conditions of life, and of one organic being to another being, been perfected? \* \* \* Again it may be asked, how is it that varieties, which I have called incipient species, become ultimately converted into good and distinct species, which in most cases obviously differ from each other far more than do the varieties of the same species? How do those groups of species which constitute what are called distinct genera arise? All of these results follow from the *struggle for life*. Owing to this struggle, variations, however slight and from whatever cause proceeding, if they be in any degree profitable to the individuals of a species, in their infinitely complex relations to other organic beings, and to their physical conditions of life, will tend to the preservation of such individuals and will generally be inherited by the offspring. The offspring also will thus have a better chance of surviving, for of the many individuals of any species which are periodically born, but a small number can survive. I have called this principle by which each slight variation, if useful, is preserved, by the term, "natural selection." Mr. Darwin adds that his meaning would be more accurately expressed by a phrase of Mr. Spencer's coinage, "Survival of the Fittest."

It may be observed that neither "natural selection" nor "survival of the fittest" gives very accurate expression to the idea which Darwin seems to wish to convey. Natural selection is at best a metaphorical description of a

process, and "survival of the fittest" describes the result of that process. Nor shall we find the moving principle of evolution in individual variability unless we choose to regard chance as an efficient agency. Consequently, the only efficient principle conceivably connected with the process is the "struggle for existence;" and even this has only a purely negative function in the origination of species or of adaptations. For, the "surviving fittest" owe nothing more to the struggle for existence than our pensioned veterans owe to the death-dealing bullets which did *not* hit them. Mr. Darwin has, however, obviated all difficulty regarding precision of terms by the remark that he intended to use his most important term, "struggle for existence" in "a large and metaphorical sense."

We have now seen the second element of Darwinism, namely, the "struggle for life." The theory of natural selection, then, postulates the accumulation of minute "fortuitous" individual modifications, which are useful to the possessor of them, by means of a struggle for life of such a sanguinary nature and of such enormous proportions as to result in the destruction of the overwhelming majority of adult individuals. These are the correlative factors in the process of natural selection.

In view of the popular identification of Darwinism with the doctrine of evolution, on the one hand, and with the theory of struggle for life, on the other hand, it is necessary to insist on the Darwinian conception of small, fluctuating, useful variations as the "first-steps" in the evolutionary process. For, this conception distinguishes

Darwinism from the more recent evolutionary theory, e. g., of De Vries who rejects the notion that species have originated by the accumulation of fluctuating variations; and it is quite as essential to the Darwinian theory of natural selection as is the "struggle for life." It is, in fact, an integral element in the selection theory.

The attitude of science towards Darwinism may, therefore, be conveniently summarized in its answer to the following questions: 1. Is there any evidence that such a struggle for life among mature forms, as Darwin postulates, actually occurs?

2. Can the origin of adaptive structures be explained on the ground of their *utility* in this struggle, i. e., is it certain or even probable that the organism would have perished, had it lacked the particular adaptation in its present degree of perfection? On the contrary, is there not convincing proof that many, and presumably most, adaptations cannot be thus accounted for?

The above questions are concerned with "the struggle for life." Those which follow have to do with the problem of variations.

3. Is there any reason to believe that new species may originate by the accumulation of fluctuating individual variations?

4. Does the evidence of the geological record—which, as Huxley observed, is the only direct evidence that can be had in the question of evolution—does this evidence tell for or against the origin of existing species from earlier ones by means of minute gradual modifications?

We must be content here with the briefest outline of the reply of science to these inquiries.

1. Darwin invites his readers to "keep steadily in mind that each organic being is striving to increase in geometrical ratio." If this tendency were to continue unchecked, the progeny of living beings would soon be unable to find standing room. Indeed, the very bacteria would quickly convert every vestige of organic matter on earth into their own substance. For has not Cohn estimated that the offspring of a single bacterium, at its ordinary rate of increase under favorable conditions, would in three days amount to 4,772 billions of individuals with an aggregate weight of seven thousand five hundred tons? And the 19,000,000 elephants which, according to Darwin, should to-day perpetuate the lives of each pair that mated in the twelfth century—surely these would be a "magna pars" in the sanguinary contest. When the imagination views these and similar figures, and places in contrast to this multitude of living beings, the limited supply of nourishment, the comparison of nature with a huge slaughterhouse seems tame enough. But reason, not imagination, as Darwin observes more than once, should be our guide in a scientific inquiry.

It is observed on careful reflection that Darwin's theory is endangered by an extremely large disturbing element, viz., accidental destruction. Under this term we include all the destruction of life which occurs in utter indifference to the presence or absence of any individual variations from the parent form. Indeed, the greatest destruc-

tion takes place among immature forms before any variation from the parent stock is discernible at all. In this connection we may instance the vast amount of eggs and seeds destroyed annually irrespective of any adaptive advantage that would be possessed by the matured form. And the countless forms in every stage of individual development which meet destruction through "accidental causes which would not be in the least degree mitigated by certain changes of structure or of constitution which would otherwise be beneficial to the species." This difficulty, Darwin himself recognized. But he was of opinion that if even "one-hundredth or one-thousandth part" of organic beings escaped this fortuitous destruction, there would supervene among the survivors a struggle for life sufficiently destructive to satisfy his theory. This suggestion, however, fails to meet the difficulty. For, as Professor Morgan points out, Darwin assumes "that a second competition takes place after the first destruction of individuals has occurred, and this presupposes that more individuals reach maturity than there is room for in the economy of nature." It presupposes that the vast majority of forms that survive accidental destruction, succumb in the second struggle for life in which the determining factor is some slight individual variation, e. g., a little longer neck in the case of the giraffe, or a wing shorter than usual in the case of an insect on an island. The whole theory of struggle, as formulated by Darwin, is, therefore, a violent assumption. Men of science now recognize that "egoism and struggle play a very subordinate part in organic devel-

opment, in comparison with co-operation and social action." What, indeed, but a surrender of the paramountcy of struggle for life, is Huxley's celebrated Romanes lecture in which he supplants the cosmic process by the ethical? The French free-thinker, Charles Robin, gave expression to the verdict of exact science when he declared: "Darwinism is a fiction, a poetical accumulation of probabilities without proof, and of attractive explanations without demonstration."

2. The hopeless inadequacy of the struggle for life to account for adaptive structures has been dealt with at considerable length by Professor Morgan in the concluding chapters of the work already mentioned. We cannot here follow him in his study of the various kinds of adaptations, e. g., form and symmetry, mutual adaptation of colonial forms, protective coloration, organs of extreme perfection, tropisms and instincts, etc., in regard to the origin of each of which he is forced to abandon the Darwinian theory. It will suffice to call attention to his conclusions concerning the phenomena of regeneration of organs. By his research in this special field Professor Morgan has won international recognition among men of science. It was while prosecuting his studies in this field that he became impressed with the utter bankruptcy of the theory of natural selection which Darwinians put forward to explain the acquisition by organisms of this most useful power of regeneration. "It is not difficult to show that regeneration could not in many cases, and presumably in none, have been acquired through natural selection (p. 379). If an earth worm

(*Alloleobophora foetida*) be cut in two in the middle, the posterior piece regenerates at its anterior cut end, not a head but a tail. "Not by the widest stretch of the imagination can such a result be accounted for on the selection theory." Quite the reverse case presents itself in certain planarians. If the head of *Planaria lugubris* is cut off just behind the eyes, there develops at the cut surface of the head-piece another head turned in the opposite direction. "These and other reasons," concludes Professor Morgan (p. 381), "indicate with certainty that regeneration cannot be explained by the theory of natural selection."

The ingenuity of the Darwinian imagination, however, will hardly fail to assign some reason why two heads are more useful than one in the above instance, and thus reconcile the phenomenon with Darwinism. For, according to Professor Morgan "to imagine that a particular organ is useful to its possessor and to account for its origin because of the imagined benefit conferred, is the general procedure of the followers of the Darwinian school." "Personal conviction, mere possibility," writes Quatrefages, "are offered as proofs, or at least as arguments in favor of the theory." "The realms of fancy are boundless," is Blanchard's significant comment on Darwin's explanation of the blindness of the mole. "On this class of speculation," says Bateson in his "Materials for the Study of Variation," referring to Darwinian speculation as to the beneficial or detrimental nature of variations, "on this class of speculation the only limitations are those of the ingenuity of the author." The general form of Darwin's argument,

declared the writer of a celebrated article in the North British Review, is as follows: "All these things may have been, therefore my theory is possible; and since my theory is a possible one, all those hypotheses which it requires are rendered probable."

3. We pass now to the question of the possibility of building up a new species by the accumulation of chance individual variations. That species ever originate in this way is denied by the advocates of the evolutionary theory which is now superseding Darwinism. Typical of the new school is the botanist Hugo De Vries of Amsterdam. The "first-steps" in the origin of new species according to De Vries are not fluctuating individual variations, but mutations, i. e., definite and permanent modifications. According to the mutation theory a new species arises from the parent species, not gradually but suddenly. It appears suddenly "without visible preparation and without transitional steps." The wide acceptance with which this theory is meeting must be attributed to the fact that men of science no longer believe in the origin of species by the accumulation of slight fluctuating modifications. To quote the words of De Vries, "Fluctuating variation cannot overstep the limits of the species, even after the most prolonged selection—still less can it lead to the production of new, permanent characters." It has been the wont of Darwinians to base their speculations on the assumption that "an inconceivably long time" could effect almost anything in the matter of specific transformations. But the evidence which has been amassed during the past forty years leaves

no doubt that there is a limit to individual variability which neither time nor skill avail to remove. As M. Blanchard asserts in his work, *La vie des cires animées* (p. 102), "All investigation and observation make it clear that, while the variability of creatures in a state of nature displays itself in very different degrees, yet, in its most astonishing manifestations, it remains confined within a circle beyond which it cannot pass."

It is interesting to observe how writers of the Darwinian school attempt to explain the origin of articulate language as a gradual development of animal sounds. "It does not," observes Darwin, "appear altogether incredible that some unusually wise ape-like animal should have thought of imitating the growl of a beast of prey, so as to indicate to his fellow monkeys the nature of the expected danger. And this would have been a first step in the formation of a language." But what a tremendous step! An ape-like animal that "thought" of imitating a beast must certainly have been "unusually wise." In bridging the chasm which rational speech interposes between man and the brute creation, the Darwinian is forced to assume that the whole essential modification is included in the first step. Then he conceals the assumption by parcelling out the accidental modification in a supposed series of transitional stages. He endeavors to veil his inability to explain the first step, as Chevalier Bunsen remarked, by the easy but fruitless assumption of an infinite space of time, destined to explain the gradual development of animals into men; as if millions of years could supply the want of an agent

necessary for the first movement, for the first step in the line of progress. "How can speech, the expression of thought, develop itself in a year or in millions of years, out of unarticulated sounds which express feelings of pleasure, pain, and appetite? The common-sense of mankind will always shrink from such theories."

4. The hopes and fears of Darwinians have rightly been centered on the history of organic development as outlined in the geological record. It has been pointed out repeatedly by the foremost men of science that if the theory of genetic descent with the accumulation of small variations be the true account of the origin of species, a complete record of the ancestry of any existing species would reveal no distinction of species and genera. Between any two well-defined species, if one be derived from the other, there must be countless transition forms. But palaeontology fails to support the theory of evolution by minute variations. Darwinism has been shattered on the geologic rocks. "The complete absence of intermediate forms," says Mr. Carruthers, "and the sudden and contemporaneous appearance of highly organized and widely separated groups, deprive the hypothesis of genetic evolution of any countenance from the plant record of these ancient rocks. The whole evidence is against evolution (i. e., by minute modification) and there is none for it." (cf. *History of Plant Life and its Bearing on Theory of Evolution*, 1898). Similar testimony regarding the animal kingdom is borne by Mr. Mivart in the following carefully worded statement: "The mass of palaeontological evi-

dence is indeed overwhelmingly against minute and gradual modification." "The Darwinian theory," declared Professor Fleischmann of Erlangen, recently, "has not a single fact to confirm it in the realm of nature. It is not the result of scientific research, but purely the product of the imagination."

On one occasion Huxley expressed his conviction that the pedigree of the horse as revealed in the geological record furnished demonstrative evidence for the theory of evolution. The question has been entered into in detail by Professor Fleischmann in his work, *Die Descendenztheorie*. In this book the Erlangen professor makes great capital out of the "trot-horse" (*Parade Pferd*) of Huxley and Haeckel; and as regards the evolutionary theory, easily claims a verdict of "not proven." In this connection the moderate statement of Professor Morgan is noteworthy: "When he (Fleischmann) says there is no absolute proof that the common plan of structure must be the result of blood relationship, he is not bringing a fatal argument against the theory of descent, for no one but an enthusiast sees anything more in the explanation than a very probable theory that appears to account for the facts. To demand an absolute proof is to ask for more than any reasonable advocate of the descent theory claims for it." (Professor Morgan, as we have already seen, rejects Darwinism, and inclines to the mutation theory of De Vries.) The vast majority of Darwinians must, therefore, be classed as enthusiasts who are not "reasonable advocates of the descent theory." For has not Professor Marsh told his readers

that "to doubt evolution is to doubt science?" And similar assertions have been so frequently made and reiterated by Darwinians that the claim that Darwinism has become a dogma contains, as Professor Morgan notes, more truth than the adherents of that school find pleasant to hear.

More interesting, however, than Huxley's geological pedigree of the horse is Haeckel's geological pedigree of man. One who reads Haeckel's *Natural History of Creation* can hardly escape the impression that the author had actually seen specimens of each of the twenty-one ancestral forms of which his pedigree of man is composed. Such, however, was not the case. Quatrefages, speaking of this wonderful genealogical tree which Haeckel has drawn up with such scientific accuracy of description, observes: "The first thing to remark is that *not one* of the creatures exhibited in this pedigree has ever been seen, either living or in fossil. Their existence is based entirely upon theory." (*Les Emules de Darwin*, ii. p. 76). "Man's pedigree as drawn up by Haeckel," says the distinguished savant, Du Bois-Reymond, "is worth about as much as is that of Homer's heroes for critical historians."

In constructing his genealogies Haeckel has frequent recourse to his celebrated "Law of Biogenesis." The "Law of Biogenesis" which is the dignified title Haeckel has given to the discredited recapitulation theory, asserts that the embryological development of the individual (ontogeny), is a brief recapitulation, a summing up, of the stages through which the species passed in the course of its evolution in the geologic past, (phylogeny). Ontogeny is a brief reca-

pitulation of phylogeny. This, says Haeckel, is what the "fundamental Law of Biogenesis" teaches us. (The reader of Haeckel and other Darwinians will frequently find laws put forward to establish facts; whereas other men of science prefer to have facts establish laws). When, therefore, as Quatrefages remarks, the transition between the types which Haeckel has incorporated into his genealogical tree, appears too abrupt, he often betakes himself to ontogeny and describes the embryo in the corresponding interval of development. This description he inserts in his genealogical mosaic, by virtue of the "Law of Biogenesis."

Many theories have been constructed to explain the phenomena of embryological development. Of these the simplest and least mystical is that of His in the great classic work on embryology, "Unsere Koerperform." His tells us: "In the entire series of forms which a developing organism runs through, each form is the necessary antecedent step of the following. If the embryo is to reach the complicated end-form, it must pass, step by step, through the simpler ones. Each step of the series is the physiological consequence of the preceding stage, and the necessary condition for the following." But whatever theory be accepted by men of science, it is certainly not that proposed by Haeckel. Carl Vogt after giving Haeckel's statement of the "Law of Biogenesis" wrote: "This law which I long held as well-founded, is absolutely and radically false." Even Oskar Hertwig, perhaps the best known of Haeckel's former pupils, finds it necessary to change Haeckel's expression of the biogenetic law so that "a contradiction con-

tained in it may be removed." Professor Morgan, finally, rejects Haeckel's boasted "Law of Biogenesis" as "*in principle, false*." And he furthermore seems to imply that Fleischmann merits the reproach of men of science, for wasting his time in confuting "the antiquated and generally exaggerated views of writers like Haeckel."

"Antiquated and generally exaggerated views." Such is the comment of science on Haeckel's boast that Darwin's pre-eminent service to science consisted in pointing out how purposive adaptations may be produced by natural selection without the direction of mind just as easily as they may be produced by artificial selection and human design. And yet the latest and least worthy production from the pen of this Darwinian philosopher, *The Riddle of the Universe*, is being scattered broad-cast by the anti-Christian press, in the name and guise of popular science. It is therein that the evil consists. For the discerning reader sees in the book itself, its own best refutation. The pretensions of Haeckel's "consistent and monistic theory of the eternal cosmogenetic process" are best met by pointing to the fact that its most highly accredited and notorious representative has given to the world in exposition and defense of pure Darwinian philosophy, a work, which, for boldness of assertion, meagerness of proof, inconsequence of argument, inconsistency in fundamental principles and disregard for facts which tell against the author's theory, has certainly no equal in contemporary literature. In the apt and expressive phrase of Professor Paulsen, the book "fairly drips with superficial-

ity" (von Seichtigkeit triefen). If the man of science is to be justified, as Huxley suggested, not by faith but by verification, Haeckel and his docile Darwinian disciples have good reason to tremble for their scientific salvation.

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