

## THE BOUNDARIES OF NATURAL SCIENCE.<sup>1</sup>

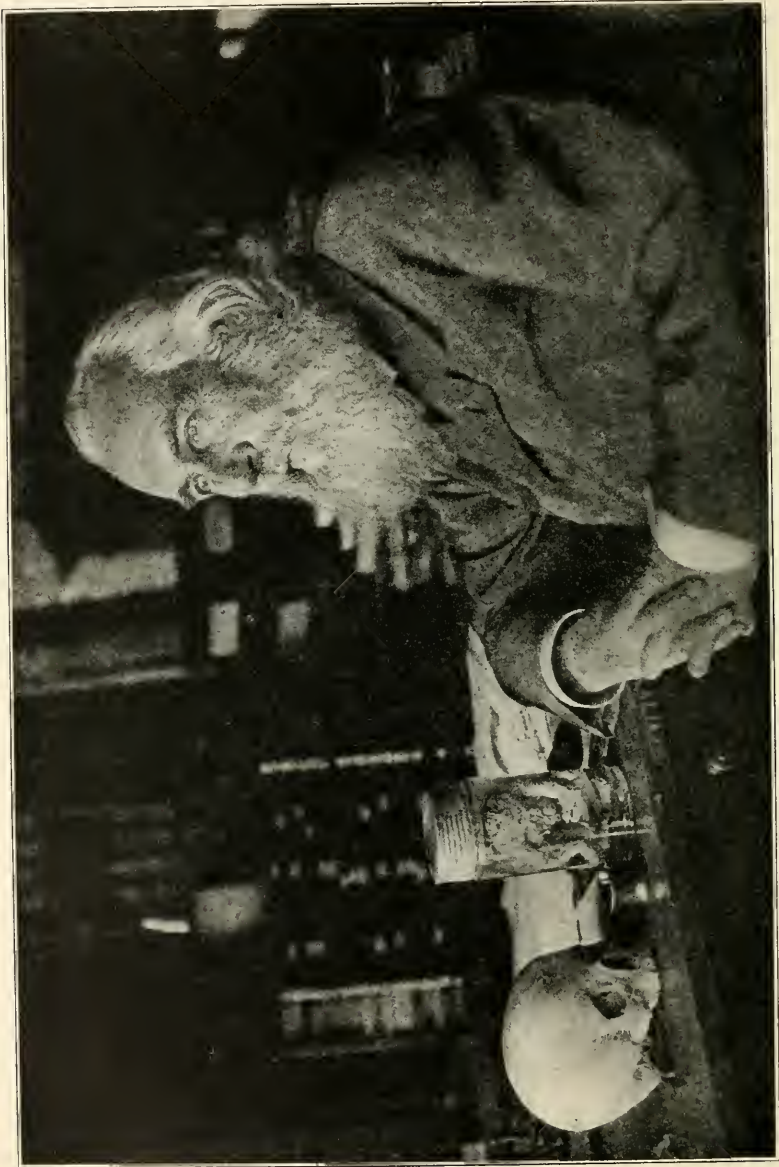
BY ERNST HAECKEL.

THE meeting of German naturalists and physicians of 1913 may look back more proudly than ever before upon the wonderful results accomplished by natural science in the last half century. In each one of its many sections there was opportunity to admire the marvelous immensity of the progress recently attained and to emphasize its practical significance for our modern culture. But disregarding all the separate brilliant results of the particular sciences and rising to the most comprehensive survey of the magnificent whole, the most gratifying result of all, indeed, remains the conviction that the study of nature has gradually taken by storm the entire domain of the human intellect, that *all* true "science" in the last analysis is *natural* science.

To be sure this legitimate claim is still opposed even to-day in large circles as an unwarranted presumption; the so-called mental sciences are opposed to the natural sciences as being of equal, or rather of superior, value. But unprejudiced comparison and critical investigation (free from all traditional dogmas) convince us that all branches of the former should be classified in the all-embracing domain of the latter. History in its broader sense—universal history as well as the history of the nations, the history of the earth and natural history—all are branches of the general theory of evolution. The philological sciences, comparative study of languages and psychology, are parts of physiology. Philosophy as the proud "queen of the sciences," gathering all general results of the special branches into the common focus of its "world-conception," has lasting value only as it is the monistic philosophy of nature. The an-

<sup>1</sup> On the occasion of the triennial meeting of naturalists at Vienna Professor Haeckel published this brief essay in the *Neue Freie Presse* in a somewhat abbreviated form. With the author's permission this was republished in the *Neue Weltanschauung* of October 1913, including the parts which had been previously omitted. From this more complete form it is here translated into English by Lydia G. Robinson.

cient traditional antitheses of spirit and body, energy and matter, *psyche* and *physis*, fuse into its unified concept of substance.



HAECKEL IN HIS STUDY (1907).  
Photograph by Paul Carus.

The opposition which our firmly established unitary world-conception—"naturalistic monism"—still meets constantly from con-

servative and clerical circles, rests particularly upon the old vitalism, upon the dualistic hypothesis that a special life force (*vis vitalis*) creates the phenomena peculiar to organic life independently of universally prevailing physical laws.

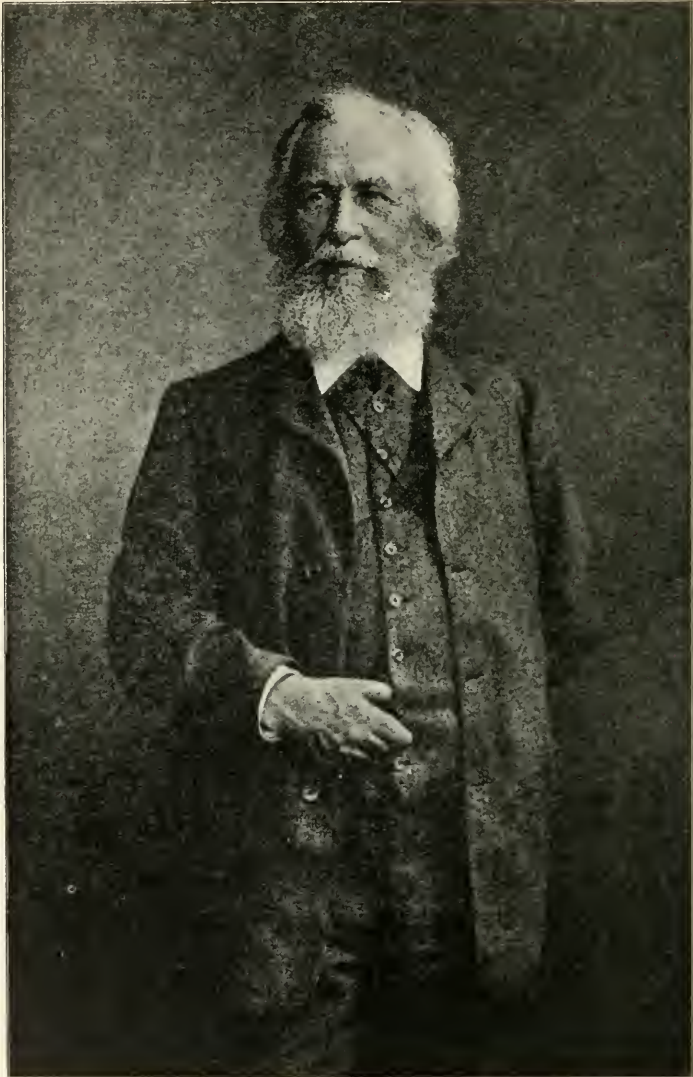
This "anthropistic romance" leads to the poetical fiction of a "personal God" who as creator, preserver and ruler of the world is supposed consciously to direct the entire course of its development according to a definite aim and purpose.

As much as sixty years ago this old misleading vitalism was thoroughly refuted, and since then our modern evolution theory has completely removed the ground from beneath its feet. When, nevertheless, a new form of the same thing, the so-called neovitalism, succeeds in again presenting its claims, this anachronism is explained on the one hand by the deficient biological education of its representatives and on the other hand by the deeply rooted primeval instinct of the speculating human mind toward the mysterious and occult. This is particularly true of the mystical conception of consciousness, a partial phenomenon in the psychic life of man and the higher animals, in which even some prominent naturalists perceive an impassable boundary to our knowledge of nature. The advanced comparative and genetic psychology of modern times has led us to the conviction that the most highly developed human consciousness does not owe its origin to any supernatural "spirit," but like all other psychic activities represents the work performed by the neurons, the ganglion-cells in the cortex of our cerebrum.

When now in spite of this fact the philosophy of the dualistic school speaks of a special universal consciousness (*Weltbewusstsein*) this error arises from the unjustified transference of human psychic activities to the realm of the universe as a whole. Our monistic natural philosophy has convinced us that "a spirit in all things dwells," and that the unitary and all-comprehensive "God-nature" does not require human personification. Although this natural monistic view of the world was a clearly formed conception in the minds of the prominent thinkers of antiquity, it has attained a firmer empirical foundation through the magnificent progress made in the knowledge of nature, and especially in the modern theory of evolution, in the last half-century.

At the head of this marvelous progress stands the final solution of the great "problem of man," the clear scientific answer to the world-old questions, Whence? Whither? Why? On the strength of its three great documents, paleontology, comparative anatomy and ontogeny, the theory of descent has convinced us that man is

the most highly developed mammal; that like the vertebrates he has developed in the course of many millions of years from a long line



HAECKEL IN 1905.

of animal ancestors. This has now become a "historical fact." Human ontogeny has taught us that every single human being, like every other vertebrate, takes its origin from a single simple cell.

The wonderful series of forms which this one-celled germ passes through until its full completion as a complex human organism is a brief repetition (dependent on the laws of heredity and adaptation) of the long and wonderful line of ancestors which our animal progenitors have passed through in the course of many millions of years. In other words, "the history of the germ is a short sketch of the history of the race." This "biogenetic principle" is no airy hypothesis but a clear theory firmly established by facts.

The great biologist who was the first fearlessly and with clear consciousness to consummate this important solution of the problem of man referred to it in 1863 with good reason as "the question of all questions." Since now exactly fifty years have passed since this world-moving discovery it is certainly fitting that the great meeting of naturalists in Vienna should at the same time celebrate proudly and gratefully this "jubilee of anthropology." This is more important and of greater consequence than all the brilliant festivals taken together which are being celebrated in this year of many jubilees. For the previous boundaries of natural science have now fallen; its dominion has become extended thereby over the whole realm of man's intellectual life. *Nature is everything*, and therefore all true science is also at bottom "natural science."

"Pure reason" sees at first in this advance in modern natural science only the most important reform of the theoretical world-conception, but sooner or later it must also involve a corresponding practical reform in our conduct of life. The deplorable state in which traditional dualism to-day still holds captive our social and ethical, our political and pedagogical conditions, will give place more and more to liberal progress toward rational freedom. The pure *monistic religion* which will develop therefrom will, thanks to the conquests of our modern natural science, lead the humanity of the twentieth century to a higher grade of perfection.