Jones, S.B. (Vanderbilt), chemistry; Elliott G. Brackett, M.D. (Harvard), orthopedic surgery, and Frederick H. Verhoeff, Ph.B. (Yale), ophthalmological research.

Dr. Otto Diels, of Berlin, has been called to the chair of chemistry at Kiel. Dr. R. Pohl, docent in Berlin, has been called to an associate professorship of physics at Göttingen.

DISCUSSION AND CORRESPONDENCE

DID SPENCER ANTICIPATE DARWIN?

In his book, entitled "The First Principles of Evolution," Mr. S. Herbert in speaking of Herbert Spencer says:

> Not only was he the first independently to adopt the evolutionary principle as a means of the solution of various problems of matter and mind, actually anticipating Darwin's discovery by a few years—a fact very little known by the general public—but he gradually elaborated a complete theory of evolution, comprising in one great formula the law of all existence.[1]

This statement, except the latter part of it, may hardly be said to be in conformity with the facts. When we remember the eminent services of Lamarck in the application of the evolutionary principle in his "Philosophie Zoologique" published in 1809, and subsequently (1815) in his "Histoire Naturelle des Animaux sans Vertèbres," it seems hardly fair to ascribe priority to Spencer in the adoption of the evolutionary principle, or even in adopting it "as a means for the solution of various problems of matter and mind"; and so far as Spencer anticipating Darwin is concerned, it is certainly incorrect, if by Darwin's discovery we understand, as most people do, the principle of natural selection.

It is true, of course, that as early as 1852, seven years prior to the publication of the "Origin of Species," Spencer presented with a clearness not since surpassed, the evolutionary hypothesis; and that in 1855 he published his "Psychology," which assumed the correctness of the broad evolutionary doctrine. But evolution and Darwin's discovery, as of course Mr. Herbert well knows, are quite different things.

In his autobiography, Vol. II., p. 56, Mr. Spencer says:

> Up to that time (1859) or rather up to the time in which the Linnean Society had become known to me, I held that the sole cause of organic evolution is the inheritance of functionally produced modification. "The Origin of Species" made it clear to me that I was wrong; and that the larger part of the facts can not be due to any such cause.

In an essay on "Transcendental Physiology," first published in 1857, Spencer used the following language:

> Various facts show that acquired peculiarities resulting from the adaptation of constitution to conditions, are transmissible to offspring. Such acquired peculiarities consist of differences of structure of composition in one or more of the tissues. This is to say, of the aggregate of similar organic units composing a germ, the group going to the formation of a particular tissue will take on the special character which the adaptation of that tissue to new circumstances had produced in the parents. We know this to be a general law of organic modifications. Further, it is the *only* law of organic modifications of which we have any evidence.[2]

Spencer himself instances this passage as showing the stage of his thought at that time concerning the factors of evolution. It will be observed that there is not the slightest hint of natural selection.

Again in his "Principles of Biology," Vol. I., p. 530, Mr. Spencer uses for the first time the phrase "survival of the fittest," as a substitute for "natural selection." In a footnote he explains why he sometimes uses the phrase "natural selection" after he had suggested the expression "survival of the fittest," and this expression had been approved by Wallace as a substitute for the other. He says:

> The disuse of Dr. Darwin's phrase would have seemed like an endeavor to keep out of sight my own indebtedness to him and the indebtedness of

[1] Herbert, S., "The First Principles of Evolution," p. 4, London, 1913.

[2] Spencer, H., "Essays," Vol. I., p. 91.

the world at large. The implied feeling led me ever since to use the expressions "natural selection" and "survival of the fittest" with something like equal frequency.

In the same volume, page 531, in referring to "natural selection," he says:

This more special mode of action Dr. Darwin has been the first to recognize as an all-important factor, though, besides his co-discoverer, Mr. A. R. Wallace, some others have perceived that such a factor is at work. To him we owe due appreciation of the fact that "natural selection" is capable of *producing* fitness between organisms and their circumstances.

Here we have "Darwin's discovery" specifically pointed out, and Spencer's acknowledgment of his own indebtedness.

Of course, it would have been no great matter even if the idea of natural selection had presented itself to Spencer before Darwin published the "Origin of Species" in 1859. Twenty years prior to that time it had suggested itself to Darwin and, being almost constantly at work on its application, he must have communicated the idea directly or indirectly to many of his friends. In fact he says in the short sketch of his life, prefixed to his "Life and Letters":

I tried once or twice to explain to able men what I meant by natural selection, but signally failed.

Possibly Spencer was one of these "able men."

Of course priority with respect to the idea of natural selection is of comparatively little importance. It flashed upon Darwin's mind, just as it did upon Wallace's, from reading a paragraph in "Malthus on Population." Darwin says:

In October, 1838, that is, fifteen months after I had begun my systematic enquiry, I happened to read for amusement "Malthus on Population," and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favorable variations would tend to be preserved, and unfavorable ones to be destroyed. The result of this would be the formation of a new species. Here then I had at last got a theory by which to work.

It was with both of these men an original idea, but it was foreshadowed by Aristotle, who, in his "Physicæ Auscultationes" (lib. 2, cap. 8, s. 2) said that:

Whatsoever, therefore, all things together (that is all the parts of one whole) happened like as if they were made for the sake of something, these were preserved, having been appropriately constituted by an internal spontaneity; and whatsoever things were not thus constituted; perished and still perish.

It was clearly recognized by Dr. W. C. Wells, in a paper read before the Royal Society in 1813 entitled: "An account of a white female, part of whose skin resembled that of a negro," and published in 1818. It was stated precisely by Mr. Patrick Mathew in 1831 in his work on "Naval Timber and Arboriculture." Everybody knows the story of how Darwin was "forestalled with a vengeance" by A. R. Wallace. It seems strange, then, that Spencer, who was writing more or less on biological subjects during the many years in which Darwin was at work on the idea of natural selection, does not appear to have gained even an inkling of the idea. He and Darwin were corresponding, and Darwin had complimented him on his admirable discussion of the development theory.

Perhaps the nearest approach of Spencer to the idea of natural selection occurs in an essay entitled "A Theory of Population Deduced from the General Law of Animal Fertility," published in 1852, although Spencer says he entertained as early as 1847, possibly earlier, the idea it embodies. In this essay, after declaring that the pressure of population has been the proximate cause of progress, Spencer goes on to say:

And here it must be remarked that the effect of pressure of population, in increasing the ability to maintain life, and decreasing the ability to multiply, is not a uniform effect, but an average one. . . . All mankind in turn subject themselves more or less to the discipline described; they either may or may not advance under it; but, in the nature of things, only those who do advance under it eventually survive. . . . For as those prematurely carried off must, in the average of cases, be those in whom the power of self-preser-

vation is the least, it unavoidably follows that those left behind to continue the race, are those in whom the power of self-preservation is the greatest—are the select of their generation.

Concerning this passage Spencer says in his "Autobiography," p. 451:

It seems strange that, having long entertained a belief in the development of species through the operation of natural causes, I should have failed to see that the truth indicated in the above-quoted passages, must hold, not of mankind only, but of all animals; and must everywhere be working changes among them.

He attributes his blindness to his belief that the inheritance of functionally produced modifications suffice to explain evolution, and to the further fact that he knew little or nothing about the phenomena of variation.

The great merit of Darwin is, of course, not in originating the idea of natural selection, but in so presenting it to the world that it won acceptance. The fact that others anticipated him so far as the idea is concerned, does not, of course, detract from his merit. Wallace is entitled to much credit for the independent discovery of the idea and its clear presentation, but his anticipation was only in the disposition to proclaim the discovery. The foundation of Darwin's immortality is the book, "The Origin of Species." He was perhaps the only man in the world at the time who could have written that book. We might have attributed the possibility to Wallace, but with a self-abnegation perhaps unparalleled in the history of science, he said:

I have felt all my life and I still feel, the most sincere satisfaction that Mr. Darwin had been at work long before me, and that it was not left for me to attempt to write "The Origin of Species." I have long since measured my own strength and know well that it would be quite unequal to that task. For abler men than myself may confess, that they have not that untiring patience in accumulating, and that wonderful skill in using, large masses of facts of the most varied kind, that wide and accurate physiological knowledge, that acuteness in devising and skill in carrying out experiments, and that admirable style of composition, at once clear, persuasive and judicial, qualities which in their harmonious combination mark out Mr. Darwin as the man, perhaps of all men now living, best fitted for the great work he has undertaken and accomplished.[3]

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THE ATOMIC WEIGHT OF RADIUM EMANATION (NITON)

In the International Atomic Weights Table for 1916,[1] the commission has adopted for radium the value of *226.0*, obtained by Hoenigschmid in 1911.[2] The atomic weight of radium emanation (niton), however, has been retained at its former value of *222.4* instead of substituting *222.0*, which would conform with the new value for radium. The probability of an oversight in publishing the table is perhaps eliminated by the appearance of the same value in the German report.[3]

The retention of the value *222.4* raises a question of considerable interest. The genetic relationship among elements, and the consequent interdependence of the atomic weights of radioactive elements is relatively new, and has as yet been given only indirect recognition in the atomic weight tables (see below). Of the 30-odd new radioactive elements, only radium and radium emanation have as yet been placed in the atomic weight table, since they are the only two which could as yet be obtained in sufficient quantity and purity for the application of ordinary methods of atomic weight determination.

Since no new experimental work has appeared on the atomic weight of niton, the retention of its old value until such work appears might be regarded *a priori* as justified. But it should be recalled that the experimental work of Gray and Ramsay,[4] on which the value *222.4* was based, in reality served only to demonstrate the order of magnitude of the atomic weight and would fit the value *222.0* equally as well as *222.4*. The latter

[3] "Contributions to the Theory of Natural Selection" (1871), preface, pp. iv, v.

[1] *Jour. Am. Chem. Soc.*, 37, p. 2,451.

[2] *Sitzb. Wien Akad.*, 120, p. 1,617; *ibid.*, 121, p. 1,973 (1912).

[3] *Zeit. phys. Chem.*, 90, p. 720.

[4] *Proc. Royal Soc.*, 84 *A*, p. 536.