(five-leaved clovers), *Plantago lanceolata ramosa,* and variegated leaves).

"If one of the two parents [in a cross] stands in the relation to the other of having arisen from it by retrogressive or degressive mutation," the progeny, in successive generations, follow Mendel's laws; otherwise they do not, and the result of a cross is then a unisexual, or constant hybrid race. Constant hybrid races correspond to progressive mutations, the Mendelian law to retrogressive and degressive forms of differentiation (pp. 576–577).

But though the mutation theory is a direct outgrowth of the hypothesis of intracellular pangenesis, it fortunately does not stand or fall with the latter, for no scientific theory ever had a firmer foundation in fact—in experimental evidence—than that of mutation.

De Vries claims to have demonstrated experimentally that: (1) "Ordinary or fluctuating variability does not provide material for the origin of new species" (p. 56). While this does not exclude the possibility of different modes of origin of new species, still "Inferences drawn from data after its appearance can hardly be considered as decisive" (p. 56). That is, *the problem is an experimental one.* (2) "The elementary species are demonstrably the existing units of the system; whilst the larger species are only aggregations of these." (3) Elementary species (the theory has nothing to do, except indirectly, with the mode of origin of taxonomic groups) do arise by the method of mutation (discontinuous variation). They have time and again, in a wide variety of sorts, been seen so to arise. No one has ever actually witnessed the origin of a species by any other method.

It is probable that the doctrine of the elementary units of organisms will ultimately prove to be de Vries's most important contribution; though perhaps this doctrine means less to the advancement of philosophical and experimental biology than the firm establishment of the fact, quoted on the fly-leaf of "Species and Varieties," that "The origin of species is an object of experimental investigation." The demonstration of this fact, so conclusively as to compel practically every investigator to acknowledge its truth, is the greatest service rendered to evolutionary biology since Darwin.

On the whole, the translators have performed their work well, though in a few places (*e. g.,* on pp. 608 and 609, cf. German edition, Vol. II., pp. 666), the English can hardly be regarded as a translation of the original. The color plates and the text-figures, notably plate IV., and figures 26, 40 and 54, are quite inferior to those of the German edition. However, it is not easy to find points to criticize adversely, and every one is hoping that an English edition of the now omitted portions, by the same translators, will soon appear.

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Outlines of the Theory of Electromagnetism. By GILBERT T. WALKER. Cambridge, University Press. 1910.

This volume contains a series of lectures delivered before the Calcutta University on some of the more important developments of electromagnetic theory. The chief novelty of it, compared with other English books on mathematical physics, lies in the consistent use of vector methods, and their advantage is shown by the large amount of material condensed into fifty-two pages. While little of the material is new, the book will be of great assistance to those who wish to familiarize themselves with the present condition of the theory, as well as to those who wish to obtain a working knowledge of vector methods applied to physical problems. For the latter object no better course could be devised than a careful study of this book, with frequent transformations of the vector formulæ into their more familiar Cartesian equivalents.

The first chapter gives an outline of vector analysis, including the vector expressions for the more important analytical theorems of constant use. In the second chapter vector methods are applied to magnetostatics, and

here the advantages of these methods are most clearly brought out. The third chapter gives a statement of the Hertzian form of Maxwell's equations. In Chapter IV. Hertz's theory for moving media is discussed and it is shown how experimental results prove its inadequacy.

The motion of a single charge moving with uniform velocity through the ether is considered in Chapter V., and in the next chapter the electron theory of Lorentz is applied to stationary media. The treatment of stresses within a material medium is not satisfactory; no account is taken of the variation of specific inductive capacity with the state of strain, and therefore the stress system obtained is that of Maxwell, which we know is not capable of experimental verification. In the last chapter Lorentz's theory is applied to moving bodies, ending with a brief account of aberration. The interpretation of the Lorentz transformation in terms of the theory of relativity is not touched upon.

There are many other matters that might properly come within the scope of this work, but it does not profess to be exhaustive, and as an outline it may be commended most highly.

E. P. Adams

CONTAGIOUS ABORTION IN CATTLE

It is often asserted that tuberculosis is, from the economic point of view, the most important disease affecting the cattle of this country. It is undoubtedly true that contagious abortion is to be ranked as second in economic importance and, by many of the best informed breeders and dairyman this disease, that may destroy the usefulness of a dairy animal during one fourth to one half of the average period of productivity, is considered more important than tuberculosis. Certainly it is true that the breeder and dairyman have been more helpless in the fight against this disease than against tuberculosis, for knowledge is available that will enable any farmer to free his herd from tuberculosis and so to maintain it. In the case of contagious abortion, no such knowledge is available, and until quite recently no method had been devised by which it could be ascertained whether or not an animal about to be introduced into a healthy herd was infected. The work of Bang and his associates has demonstrated the cause of the disease as it appears in Denmark. This work has been confirmed by others in England and Germany. In the United States, in spite of the efforts of many investigators, the *B. abortus* of Bang had not been found. Dr. W. J. MacNeal, formerly at the University of Illinois, isolated an organism that he believed, relying on its cultural and morphological characteristics, to be identical with the Bang organism.

Within the last year, the complement deviation test, now so widely used for the diagnosis of syphilis, has been applied with great success to the detection of contagious abortion in cattle, by Drs. Bang and Holth in Copenhagen. Dr. W. P. Larson, who had become familiar with the test during his association with the Danish bacteriologists, returned to this country in May, since which time he has been engaged in connection with the departments of agricultural bacteriology and veterinary science of this experiment station in the study of the disease in this country. Using a culture of the organism brought from abroad as one of the specific components of the test, it has been shown that the disease as it occurs in this country is caused by the same organisms as found in Europe. Using the blood serum of known infected animals, the complement deviation test can be employed to identify a suspected organism. The organism has been isolated from fetuses from five herds in various parts of the state and the identity of the cultures established by the test. There remains no doubt that the disease in this country is caused by the same organism as that found in Europe.

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