No greater praise can be accorded to the publication as a whole than that it is an epochal contribution to the library of the high-school teacher.

Julius Sachs

A Monograph of the Mycetozoa: A descriptive catalogue of the species in the Herbarium of the British Museum. By Arthur Lister, F.R.S., F.L.S. Second edition, revised by Gulielma Lister, F.L.S. With two hundred and one plates and fifty-six wood cuts. London, printed by order of the Trustees of the British Museum. 1911. Octavo, 302 pp.

It marked an epoch in the study of these organisms when in 1894 Arthur Lister brought out an exhaustive monograph of the Mycetozoa based on the specimens in the British Museum. It was illustrated with seventy-eight plates of much more than usual merit, which proved invaluable aids to the student, as did also the illustrated keys to the genera which accompanied the "orders." Now, seventeen years later, and nearly four years after the author's death, a second edition is brought out by his daughter, who had aided him in the preparation of the first edition, as well as in the work undertaken in anticipation of the present edition. The result is a modernized and much augmented monograph, following, however, in the main the treatment given in the earlier volume. Some of the genera have been changed in their positions in the group, the most notable change of this kind being that by which *Lycogola* is moved from the Calonemineæ (with capillitium) to the Anemineæ (without true capillitium). In the new book families are still called "orders," in which one may discern the influence of the botanical nomenclature of the immediate English past. This appearance of botanical antiquity is shown also in the use of "Cohort" and "Sub-Cohort."

Comparing the two editions, one finds forty-nine genera in the new edition as against forty-three in the old, and two hundred and forty-six species in the new, to one hundred and seventy-six in the old. These numerical changes are mainly due to the very considerable increase of available material for study resulting from the widespread interest aroused by the publication of the first edition. Other changes which will be noted by the student of these organisms result in part from a better knowledge of their structure, and somewhat to the application of the laws of botanical nomenclature formulated in Vienna and Brussels, by which many names have been changed. For aid in this work cordial credit is given to Professor T. H. Macbride, the well-known American authority on the Mycetozoa.

Looking over the book, one is struck by the obvious mixing of botanical and zoological ideas. Nowhere in the book are the Mycetozoa spoken of as plants; nor on the contrary are they called animals. They are invariably called "organisms." Yet in the introductory chapter in connection with the statement that swarm-cells coalesce to form a plasmodium we are told that "in consequence of this discovery, which indicated a relationship with the lower forms of animal life, DeBary in 1858 introduced the name Mycetozoa." Yet the specimens on which the monograph is based are in the Herbarium of the British Museum, while the preface is written by A. B. Rendle, of the Department of Botany, and as has been said above the nomenclature has been revised in accordance with the laws of botanical nomenclature. Verily, it is difficult to break the traditions of even scientific men! If we were to take up the study of the Mycetozoa to-day for the first time it is certain that we should all agree that they are animals, but because they were thought to be plants for so long, it is difficult to transfer them from the plant kingdom to the animal.

And it must be confessed that the beauty of the spore-stage is so great that we can not blame the botanists for their unwillingness to let these pretty things escape from the botanical domain. There is also much the same feeling now among the myxomycologists that there was among the lichenologists thirty years ago when DeBarry and Schwendener and other botanical insurgents were saying that the lichens were fungi. And yet to-day the fungus nature of the lichens is conceded by botanists the world over. So it will be with the Slime Moulds, that are "passing," to be replaced by the Slime Animals.

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SCIENTIFIC JOURNALS AND ARTICLES

THE May number (Vol. 18, No. 8) of the *Bulletin of the American Mathematical Society* contains the following papers: "Definite integrals containing a parameter," by D. C. Gillespie; "On the V_3^3 with five binodes of the second species in S_4," by S. Lefschetz; "What is mathematics" (review of Whitehead and Russell's "Principia Mathematica"), by J. B. Shaw; Review of Bianchi-Lukat's "Differentialgeometrie," by L. P. Eisenhart; "Notes"; "New Publications."

The June number of the *Bulletin* contains: Report of the April meeting of the Chicago Section, by H. E. Slaught; Report of the twenty-first regular meeting of the San Francisco Section, by T. M. Putnam; "Implicit functions defined by equations with vanishing Jacobian," by G. R. Clements; Review of Darwin's Scientific Papers, by E. W. Brown; Review of Pareto's "Manuel d'Economie politique," by E. B. Wilson; "Notes"; "New Publications."

SPECIAL ARTICLES

THE LAWS OF PHOTOELECTRIC ACTION AND THE UNITARY THEORY OF LIGHT (LICHT-QUANTEN THEORIE)

IN a note which was published in a recent number of SCIENCE (Vol. 35, p. 783, May 17, 1912) Dr. Karl T. Compton and the writer announced, as the result of experiments, certain conclusions they had come to regarding the relation between the number and kinetic energy of the electrons emitted by different metals under the influence of light, on the one hand, and the frequency of the light and the position of the metals in the voltaic series, on the other. The following brief outline of a method of deducing and extending these laws from theoretical considerations, is not without interest.

Let N_v be the number of electrons emitted in unit time by unit area of a metal in the presence of unit density of isotropic radiation of frequency between v and $v+dv$, let T_m represent the maximum kinetic energy of these electrons and T_v their mean kinetic energy. The writer[1] has shown that N_v and T_m have to satisfy equations which can be reduced to

$$\int_0^\infty N_v h v^3 e^{-hv/R\theta}\, dv = A_1 \theta^2 e^{-w_0/R\theta} \qquad (1)$$

and

$$\int_0^\infty N_v T_m h v^3 e^{-hv/R\theta}\, dv = 2A_1 R\theta^3 e^{-w_0/R\theta}. \qquad (2)$$

In these equations h is Planck's radiation constant, A_1 is a constant characteristic of the material and independent of the temperature θ, w_0 is the internal latent heat of evaporation of one electron at the absolute zero and R is the gas constant reckoned for a single molecule. The following is a solution of equations (1) and (2):

$$N_v = 0, \text{ for } 0 < hv < w_0, \qquad (3)$$

$$N_v = \frac{A_1 h}{R^2 v^2}\left(1 - \frac{w_0}{hv}\right), \text{ for } w_0 < hv < \infty, \qquad (4)$$

$$T_m = hv - w_0, \text{ for } w_0 < hv < \infty. \qquad (5)$$

Equations (1) and (2) have to be slightly modified when reflection of the electrons is taken into account. The result does not appear to make any important difference in (3) and (4) but, instead of (5), we get

$$T_v = s(hv - w_0), \text{ for } w_0 < hv < \infty, \qquad (6)$$

where s is the ratio between the proportion of the incident energy which is absorbed, and the proportion of the incident matter (or electricity) which is absorbed, from the stream of electrons which returns to the body in a state of thermal equilibrium. It can be shown that s lies between zero and unity.

If we define v_0 by the equation $w_0 = hv_0$ it can easily be shown that the experimental results announced by Dr. Compton and the writer are confirmatory of equations (3), (5) and (6). One of the most interesting consequences of the theory is equation (4) which has not yet been tested by experiment.

[1] *Phys. Rev.*, Vol. 34, February and May, 1912; *Phil. Mag.*, Vol. 23, p. 615, 1912.