since the incidental expenses of printing and postage are being met independently.

ISIDORE LEVITT,
Secretary

CAMBRIDGE, MASS.

QUOTATIONS

THE BRITISH ASSOCIATION

THE meeting of the British Association at Hull ended yesterday. It will be remembered chiefly by Sir Charles Sherrington's presidential address, on which discussion did not cease during the week, nor is it more likely to die down when science and philosophy have had time to study the full text. So far as it was a positive statement it was definitely on the materialistic as opposed to the vitalistic interpretation of Nature. It explained the increasing number of mechanisms in the body of men and animals which are now understood, and definitely referred these to the order of chemistry and physics instead of to vague non-material principles. So far, its assault was limited to fashionable doctrines within the sphere of science, and should disturb only those who trace purpose and consciousness back to animalculæ, or attribute a *psyche* to the cells of the liver. With regard to the mind itself no positive statement of a materialistic interpretation was made; on the contrary, Sir Charles Sherrington, with a deliberateness perhaps in itself suggestive, reiterated our complete failure to interpret mind in terms of matter. But the president traced the relations between the evolution of the nervous system and the rise of mind in the animal kingdom with meticulous care, and insisted so coldly but so minutely on the correspondences between what he stated to be mechanism and what all regard as mind that it is at least open to read intention into his argument. No one can doubt but that the British Association, through its president, has fulfilled one of its highest functions this year. It has set men thinking and talking on one of the more fundamental problems that excite the human intelligence.

Otherwise the meeting at Hull was useful rather than distinguished. There were many solid papers, some valuable discussions, and no more than the customary number of attempts to reach the public ear by the methods of exaggeration, or of insistence on the dramatic side of a communication. The debate on nitrogen was a sound and instructive contribution to one of the branches of applied science most vital to the safety and the prosperity of nations. The coming together of zoologists, government officials, fishery experts and members of the fishing industry did much to enlighten both science and industry. We admit with pleasure that since we and others called attention to the diffuse and overloaded nature of the program of meetings of the association, the organization has been notably improved, especially with regard to the arrangement of joint discussions, in which two or more sections take part. Our special correspondents, however, inform us that there were still at the Hull meeting many cases of several papers or discussions of wide interest set down for the same day and hour. Unfortunately, moreover, not a few of the speakers and readers of papers had rudimentary ideas on public speaking, and attempted to cover far too much ground in the time allotted to them, or overloaded their contributions with unnecessary introductory matter. Science should not disdain the art of presentation.—The London *Times*.

SCIENTIFIC BOOKS

Respiration. By J. S. HALDANE, M. D., LL. D., F. R. S., Fellow of New College, Oxford; Hon. Professor, Birmingham University. Yale University Press, 1922. 427 pp., 104 figures, and an appendix of analytical methods.

THIS volume contains the Silliman Memorial lectures at Yale University for 1915, revised so as to bring the presentation of the material up to the date of publication. It is a monograph covering the field of respiration: a field which, largely as the result of the work of Haldane and his collaborators, has assumed outstanding importance in recent years, and promises further important developments in the near future in theoretical knowledge and in practical applications to clinical medicine and industrial hygiene.

In brief, this book is the carefully revised and coordinated presentation, while the author is at the acme of his productive powers, of

the life work of one of the master investigators of our time. It is a fit companion to the volumes from the pens of previous Silliman lecturers, including such names as J. J. Thomson, Sherrington, Rutherford, Nernst, Bateson, and Arrhenius.

It begins with a brief but illuminating account of the historical development of the knowledge of respiration; its relation to chemistry and physics on the one hand, and to the theory of physiological regulation on the other. The chapters following deal with carbon dioxide and the chemical regulation of breathing; the nervous mechanism and control and some of the nervous disturbances of respiration, as in "soldier's heart," neurasthenia and fatigue; the blood as a carrier of oxygen with a discussion of the properties of hæmoglobin and the variations of its dissociation curve; the blood as a carrier of carbon dioxide and the relations of carbon dioxide to neutrality regulation in the blood and other fluid media of the body; the causes and effects of anoxhemia, and the importance and frequency of oxygen deficiency as a factor in functional disturbances; the mutually regulative relations of blood reaction and breathing; the much disputed question of gas secretion in the lungs; the influence of vitiation of the atmosphere upon health in relation to industrial hygiene; high atmospheric pressures and caisson disease; low atmospheric pressures, mountain sickness, and the physiological conditions to which aviators are exposed; and an appendix giving the specialized methods which the author has developed for investigation in this field.

Two general aspects of Haldane's work deserve particular notice: Other master physiologists—formerly Voit, and in modern times, particularly Pawlow—have emphasized the importance of dealing with the normal and complete organism—for example, the conscious, healthy, happy, unanæsthetized, unrestrained dog. It is the failure of the general run of investigators to appreciate and apply this doctrine, and their attempt to infer truth directly from the essentially false conditions of most experimentation—for example, much of the current blood pressure experimentation, and the reduced circulation—which leaves so little value in most of the articles filling our journals. They deal merely (as Haldane incisively expresses it in his preface) "with fragments of frogs and other animals." Haldane, on the contrary, more than any other physiologist has found ways to use as his "versuchstier" not only the normal mammalian organism, with functions unpreverted by experimental conditions, but living, conscious, active man. The investigator himself and his collaborators have been the chief subjects of his experiments. Indeed Haldane's demonstration of the possibility and the efficiency of experimentation upon man will probably in the future be accounted his greatest contribution. By no other method apparently could the character and uniformity of the alveolar CO_2 regulation,—the central fact of the Haldanian conception of respiration—have been established.

The second aspect of Haldane's thought which gives it permanent philosophical value is his treatment of respiration and the blood as aspects and illustrations of physiological regulation: that extraordinary power of every living organism to maintain itself, so different from, or rather so much in addition to the equilibrium of an inorganic system. It is the capacity to "preserve constant the conditions of life in the internal environment," as Claude Bernard expresses it.

This conception of "organicism" as the central doctrine of biology differentiates Bernard, Haldane, and others who hold it, from the vitalists on the one hand, and from the mechanists on the other. It prompts the most thorough analysis of which our present day and incomplete chemistry and physics are capable into the physico-chemical conditions and properties of the humors and cells; but it looks on this analysis as merely a preliminary and sees as the essential topic of the physiologist those "living" reactions and processes by which the organism "preserves constant," or rather adjusts, controls, and regulates, within narrow limits of variation such "conditions of life" as osmotic pressure, hydrogen ion concentration, temperature, content of sugar, calcium, and potassium and a thousand other elements already

known, suspected, or yet to be discovered "in the internal environment."

YALE UNIVERSITY YANDELL HENDERSON

SPECIAL ARTICLES

A CASE OF DUPLICATE GENES IN CREPIS CAPILLARIS (L.) WALLR.

THE rosette leaves of *Crepis capillaris* (L.) Wallr. normally have a more or less pronounced pubescence on the lower surface of the midrib. Often the upper surface is also similarly pubescent, but not by any means in all cases, and the significance of this latter difference, if any exists, has not been learned.

In 1918 in a culture which had its origin from wild plants growing in Berkeley there was found a plant ($17.192P_2$) which did not show the pubescence on the lower surface of the midribs of the rosette leaves. When selfed this plant reproduced the type and a strain of "smooth" leaved plants was established. Although there is some variation in the amount of pubescence on the ribs of different plants of the hairy strain, there is no difficulty in distinguishing the two groups.

Crosses between these races at first gave discordant results. More recently with larger cultures and perfected technique data have been collected which indicate that hairiness of the midribs is due to duplicate dominant genes, which are not in the same chromosome group.

Two F_2 cultures in 1921 gave 556 hairy- to 40 smooth-leaved plants, a rato of 14.926 to 1.073 ± 0.106, which is a very good fit indeed. Among the F_2 plants there should be an equal number giving segregating populations and populations containing only one type of plant. Among those segregating in F_3 half should give 15 : 1 ratios and half 3 : 1 ratios.

Data from F_3 populations are not yet complete but cultures giving both 3 : 1 and 15 : 1 ratios have been obtained from another cross. These results show that the hairy plant used as pollen parent in this case was AABb which gave all hairy in F_1 and equal numbers of 3 : 1 and 15 : 1 populations in F_2. This supplies also the necessary data to satisfy theoretical requirements for the duplicate gene interpretation.

Complete data from crosses involving hairy and smooth characters are reserved for a future publication.

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INHERITANCE OF GLANDULAR PUBESCENCE IN CREPIS CAPILLARIS (L.) WALLR.

THE usual wild type of this species has glandular pubescence on the involucral bracts and extending downward on the pedicel for some distance from the flower head.

In 1918 a single plant appeared which did not have these glandular hairs. Such plants have been designated as "bald." The culture in which this "bald" plant appeared grew from seed sent us from Copenhagen, Denmark. Since this first appearance, "bald" plants have been found in cultures derived from five other geographical locations as follows: England, Sweden, Chile, France and the Azores Islands.

The identity of the gene in all the cultures except that from France has been established by crossing, which in all cases produced only "bald" plants.

The bald character is produced by a single recessive gene. The F_1 plants obtained from crossing bald with glandular were completely glandular. In a culture of 77 back crossed plants 39 were glandular and 38 bald. A total of 210 F_2 plants gave a segregation of 174 glandular to 36 bald, the ratio being 3.314 : 0.685. The deviation in this case is 3.89 times the probable error. The major part of this deviation is due to one culture which produced 72 glandular to 2 bald plants. When this culture is excluded from the totals, there then remains 102 glandular to 34 bald, which is an exact 3 : 1 ratio. The F_2 bald plants which were tested bred true in F_3. Only two glandular F_2 plants have been tested, both segregating in F_3.

Detailed data for all bald cultures will be given in a future publication.

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