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“Auswanderungslehre” historically, affording a valuable *résumé* of previous researches from Sachs (1863) onwards, and concluding with tabular details of the author’s ash-analyses of various plants of widely-differing affinities; the respective weights of the various food-materials in the green leaf, and the yellowing, falling leaf are compared. Part ii. (pp. 70–96) deals with the colour-change induced in the leaf before it falls—namely, from green to yellow. The subject is viewed from many points: the arrangement of the chlorophyll; anatomical changes in the leaf-base; microscopic changes in the chloroplasts; climatic influences; effect of anthocyan upon translocation of food-stuffs. This part concludes with the statement that the yellowing of the leaf is not the result of its gradual dying, but a vital process, the visible effect of various physiological changes. Part iii. (pp. 97–117) is entitled “Schlussbetrachtungen,” and deals with the general causes of leaf-fall in evergreen plants and in deciduous trees. Finally, the causes of the loss of food-material from leaves before their fall is discussed. This loss, it would seem, is not due to such a simple process as the mere travelling of the substances into the permanent parts, but is an essential portion of the complicated changes, structural and chemical, inseparable from the phenomenon of leaf-fall. The subject before us is one aspect of the wider familiar proposition that leaf-fall is essentially a process concerned with life, not death. And this process is so complex, the changes presumably so continuous and covering so long a period, that the observations of a single student, taken even with that scrupulous care of which Dr. Swart’s work bears the unmistakable impress, must needs be somewhat unconvincing, if only for the practical limits placed upon their frequency during that period. This book of his is, nevertheless, of considerable historical interest, and is written with a lucidity and conciseness not always common in the work of his countrymen. The author’s own results are not very considerable, but they should afford a useful indication of the general lines upon which co-operative research might profitably be directed.

H. F. WERNHAM.

Untersuchungen über die Flechtengonidien. Von FREDR. ELFVING.
Acta Soc. Sci. Fenn. Helsingfors, 1913. Tom. xlv. No. 2.
71 pp.; 8 plates.

IN this publication Herr Elfving has revived the old controversy as to the origin of the green cells or gonidia in the lichen. The dual nature of the thallus has been so long accepted, and has fitted in so exactly with the life conditions of the conjoint organisms, that it gives one a considerable shock to be taken back to the position held by Tulasne, and to find it again seriously maintained that the gonidia are genetically connected with the hyphæ. The author has not tested his theory by cultures—which alone would be decisive—but by examination of the growing areas of the thallus. He claims to have seen the different stages of formation of the gonidia in a number of lichens associated with such

different "algæ" as *Cystococcus*, *Trentepohlia*, *Stigonema*, and *Nostoc*. He allows that those gonidia increase by division within the thallus after they have been formed by the hyphæ, and that they also may live a free life in the open as "algæ."

Elfvig's view lands us in a series of problems: how are we to account for the origin of other algæ that do not enter into symbiosis with the lichen fungus, but the life-histories of which are entirely comparable with that of gonidia in a free condition, unless, as he seems to hint, the ancestors of those algæ are to be found among lichen gonidia? Again, how explain the twofold reproductive system combined in one plant—the fungal and the algal; each after its kind? It is easier to suppose wrong observations as to the genetic connection of the colourless and the coloured cells, than to accept the conclusion that a homogeneous plant should exactly follow the life-history of two different groups of plants, and of various sections within that group. The author does not attempt to explain these anomalies; he is content to affirm and reaffirm the correctness of his own observations.

A. L. S.

BOOK-NOTES, NEWS, &c.

It has required large type, wide leading, and broad margins to extend to less than a hundred small pages Dr. William Macdonald's reprinted papers on *Makers of Modern Agriculture* (Macmillan). The "makers" are Jethro Tull (1674–1740), Thomas William Coke—"Coke of Norfolk"—(1752–1842), Arthur Young (1741–1820), Sir John Sinclair (1754–1835) and Cyrus H. McCormick (1809–1884)—the last a Virginian, "the inventor of the reaper"—*i. e.* the reaping machine. The sketches betray evidence throughout of their newspaper origin; thus the notice of McCormick begins:—"It is hardly to be expected that those people who devoutly chant in a million churches the fourth sentence of the Lord's Prayer should think with gratitude of any other person than the Divine Giver of all Good. Yet it is strange to reflect that, although every schoolboy knows something of the life of our least Poet Laureate, not one in ten thousand could tell you the career of the man who responded in a truly miraculous manner to the heartfelt, world-voiced matin of both rich and poor, 'Give us this day our daily bread.'" The knowledge which Macaulay ascribed to his schoolboy pales before that which Dr. Macdonald postulates for his. The "subsequent paper," promised on p. 52, does not appear: it was to deal with the writings of Young, of which Dr. Macdonald says: "Our library is far from complete, yet we possess sixty-six volumes of his sparkling prose, which placed one upon another attain a height of nine feet—a monument of amazing industry . . . He met and conversed with the greatest savants of the age, yet his mind never burst the old wine bottles which he served out in the Sussex store." "Sparkling prose" of this kind adorns the little book throughout, but we cannot help thinking it is dear at half-a-crown net.