

Botany at the British Association.

(a) *The Oldest Land Flora.*

THE Edinburgh meeting will be long remembered among botanists as that at which a consideration of the oldest land flora, namely, that of the Rhynie Chert beds, took a prominent place. This subject bulked largely in the president's address; it formed the basis of a series of papers presented to a joint meeting of the Sections of Botany and Geology, and it was fully illustrated by a marvellous series of microscope preparations demonstrated by Dr. Lang and Dr. Kidston in the laboratory of the Royal Gardens.

The Rhynie Chert beds of Devonian age contain identifiable remains of algæ, fungi, and bacteria, but the chief interest attaches to the forms which, though classified as vascular cryptogams, present in many respects little more differentiation than a seaweed, and, indeed, show many resemblances to some of the higher seaweeds of the present day. They are leafless and rootless forms bearing sporangia scarcely differentiated from the vegetative portion of the axis. Nevertheless, they are undoubted land plants, as shown by "the presence of water-conducting tissue and stomata and by manifestly air-borne spores." The function of roots was apparently performed either by root-hairs or by special branches of the rhizome. The spores were usually borne on terminal sporangia which were evidently fertile branch endings.

Dr. Lang described the plant remains found in these beds, and more particularly those of the vascular forms constituting the family of the Rhyniaceæ, viz. a filamentous alga probably allied to the modern blue-greens; another form which appears to be connected with the Characeæ; and a fragment of the supposed seaweed *Hematophyton*, showing for the first time its external characteristics, together with several members of the fungi. The Rhyniaceæ include *Rhynia major* and *R. Gwynne Vaughanii*, *Hornea Lignieri*, and *Asteromyelon Mackei*, the latter with its small investing leaves being the most complex. The vascular tissue is of a very simple order, the water-conducting elements being spirally thickened and the phloem elements large and thin-walled with oblique ends. The latter tissue is continuous with a central column in the sporangial heads, recalling the columella of the mosses.

The vertical distribution of the various forms in the peaty beds of the chert indicates that petrification occurred in the lower parts of the bed while plants were still growing on the higher parts. Probably the irritating action of vapours from a volcanic fumarole in the neighbourhood caused the necroses and swellings observed on the plants.

Dr. Horne stated that recent work pointed to the Continental origin of the deposit and indicated that the Rhynie plants actually grew where they were preserved.

Dr. Kidston concluded that if *Asteroxylon* were flattened out and preserved as an impression it would resemble very closely the middle Devonian species called *Thyrsophyton Milleri*, and he believed that the fact afforded some indication of the Middle Old Red Sandstone age of the Rhynie bed.

Several of the later speakers directed their remarks more to the theoretical importance of these discoveries and their relation to modern theories of evolution. This had been dwelt upon at some length by Dr. Scott, who emphasised the present-day lack of unanimity with regard to the nature and extent of variation as the material upon which evolution

works. Dr. Lotsy pointed out the dilemma summed up in the phrases "like breeds like" and "like may breed unlike." He thought that the great phyla were widely separated, and had possibly separate origins, and while for *classes* of plants, as generally considered by the palæobotanist, the first phrase emphasised the truth, when the smaller units or *species* were considered it was clear that frequently "like breeds unlike."

(b) *Forestry and its Problems.*

A whole day was devoted to forestry, the Botany and Zoology Sections holding joint session during the part of the programme concerned with insect problems. Mr. J. Sutherland, Assistant Commissioner for Forestry in Scotland, gave a very complete account of the past and present position of forestry in Great Britain, and enumerated in an exhaustive manner the advantages of a consistent State policy of extended afforestation. The new forestry policy now provides that the 3,000,000 acres of 1914 shall be increased during the present century by 1,750,000 acres of coniferous trees, and that two-thirds of the programme shall be completed during the next forty years. This programme cannot, however, be put into actual effect without the co-operation of land-owners and State. A large proportion of money expended in forestry becomes available as wages, and consequently it provides a great stabilising influence in keeping workers in rural areas. He quoted the increase of population from 69,000 to 289,000 which has taken place in the Landes Department of France as a result of afforestation. He further indicated the immense importance of forests in time of war.

Prof. Stebbing traced the history of Indian forestry since 1850, when a committee of the British Association was set up at the instigation of Dr. Cleghorn "to consider the probable effects from an economic and physical point of view of the destruction of tropical forests in India." The result of the efficient management of the Indian Forest Department shortly afterwards set up has been a plentiful supply of forest products and a considerable annual revenue.

Dr. Borthwick and Prof. Henry both urged the importance of selecting the varieties most suitable to the climatic conditions found in the country, and expressed the opinion that the State might reasonably undertake the protection of forests from devastating fires.

(c) *Quantitative Analysis of Plant Growth.*

The discussion on "The Quantitative Analysis of Plant Growth" was introduced by Dr. Lawrence Balls, who illustrated his points largely by reference to the cotton plant. The problem of plant growth is a physico-chemical one, and therefore must be explored by quantitative methods and checked by statistical treatment. Dr. Balls hinted at the possibility of elucidating geometrical constructions in the cell parallel to those established by Dr. Church for external form. This would furnish developments akin to those which the study of atomic structure has brought to the physicists. The recent advance in physiological thought as well as in actual technique gives us reason to expect rapid increase of knowledge even in so intricate a problem as that of growth.

Contributions to this discussion were made by Messrs. Briggs, Kidd, and West on "The Quantitative Study of the Growth of *Helianthus annuus*," and by Prof. Priestley and Miss Evershed on "A Quantitative Study of the Growth of Roots."

(d) Some other Papers.

The papers delivered before the Section dealt with a diversity of subjects. Mr. Matthews contributed a paper on "The Distribution of Certain Elements of the British Flora." These show peculiarities of geographical distribution in Great Britain which, when studied cartographically and compared with their occurrence on the Continent, seem to furnish additional evidence in favour of the views of some of the earlier students of the problems of plant repopulation after the Glacial period. The Palæartic flora of post-Glacial times is now confined to the highest Scotch mountains, and has been replaced elsewhere in Great Britain by a temperate flora from the Continent.

Mr. Hamshaw Thomas gave an account of his investigations into the structure of some angiospermous fruits discovered in the Middle Jurassic rocks of Yorkshire. Each fruit, which shows traces of what may be a stigma, contains about eight small seeds clothed with a double fibrous integument. While the specimens are obviously Angiosperms in that the seeds are developed inside a fruit-wall, the seeds themselves show resemblances to some of the primitive Gymnosperms or Pteridosperms, and may yet throw light on the origin of the flowering plants, that difficult problem referred to by Charles Darwin as an "abominable mystery."

Prof. McLean Thompson, in his account of the floral development of the cannon-ball tree and its bearing on the floral morphology of the Myrtales, put forward the view that the gigantism of cells and sterility of pollen found associated with the floral lopsidedness had arisen as a mutation.

Dr. Batten gave an account of the organs of attachment in Polysiphonia; Miss Saunders put forward a theory of the morphological nature of the Dicotyledon shoot, viz. that each internode consists of an axial core clothed with a skin of the extended bases of the leaves immediately above.

Major Hurst's paper on "The Origin of the Moss Rose" raised many interesting problems, particularly

in view of the recent cytological work on this genus. Täckholm and Blackburn and Harrison ascribe hybridity as the cause of the irregular distribution of unpaired chromosomes found to be associated with abortive pollen. Darwin's view that the moss rose is a bud variation of the familiar cabbage rose (*Rosa centifolia*) seems to be confirmed. The moss rose would appear to have arisen as a mutation, and to have been in cultivation only since the end of the seventeenth century, while the cabbage rose has been cultivated for more than two thousand years. In conclusion, Major Hurst expressed his views thus:—"In terms of the recent development of the chromosome theory of heredity it may be said that the moss mutation arose through the presence of an additional factor in a single locus of a single chromosome of a somatic cell."

"The Behaviour of the Somatic Nucleus in Development" formed the subject of a paper by Prof. McLean, who described briefly the discovery of the binucleate phase, and discussed its significance in relation to senescence, normal histogenesis, and somatic segregation of characters.

The eminent Dutch botanist, Dr. J. P. Lotsy, furnished a paper on "Factors of Evolution." He deprecated the custom of tracing the course of evolution through the genealogy of species which exist only as a conception. Nature produces individuals, some of which interbreed freely and may be termed "syngameons," and these have been mistaken for species. The course of evolution should rather be traced by the genealogy of the gametes, and the questions of fundamental importance are: Can a gamete vary by itself without loss of chromosomes? And are such variants transmissible? The only transmissible changes proved to occur are the results of crossing, and they transgress the limits of the Linnean species. Not enough attention has yet been given to the crosses between gametes differing in the number of chromosomes and the consequent irregular distribution which causes changes that may even simulate Mendelian segregation.

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Mont Blanc Meteorological Observations.

THE seventh volume of *Annales de l'Observatoire Météorologique Physique et Glaciaire du Mont Blanc* (altitude 4350 metres) has now been published, under the direction of M. J. Vallot, founder and director of the observatory, following the sixth volume which was published in 1905 (tome 7, Paris, G. Steinheil, éditeur, 1917). It records the death of Janssen in 1908 and the transformation of the provisional society of his observatory at the summit (4808 metres) into a *société définitive* which placed that observatory also under the direction of M. Vallot. Both were utilised in 1908, but that on the summit became not merely uninhabitable, but dangerous, and it was therefore demolished in 1909. Since that date work has been carried on only at M. Vallot's observatory, which he had placed at the disposal of the society. The volume referred to deals only with the work accomplished before the union of the observatories. The researches made at the cost of the society have been published *en résumé* in the *Comptes rendus*; those which cannot find a place there, as well as reports *in extenso*, will appear in later volumes of the *Annales*.

The publication of the seventh volume has been delayed by M. Vallot's ill-health and by the war. It contains two papers by M. Henri Vallot, one on some modern maps of the massif of Mont Blanc,

the other on the progress made with the map on the scale of 1:20,000 by the brothers Vallot; also some "Notes expérimentales sur le mode d'action des cures d'altitude," by M. G. Kuss, of the Sanatorium d'Angicourt. The greater part of the volume is occupied by an elaborate discussion by M. J. Vallot of the barometric calculation of altitudes, particularly on the correction for the diurnal variation of the temperature of the air, which with the ordinary formula may cause differences of as much as a hundred metres in the estimation of a difference of level of 2800 metres. The discussion leads up to the suggestion for correcting the value of the difference of height obtained by the "classical" tables by a correction based on the mean temperature of the day for the base station, on a temperature for the upper station obtained from the base temperature by subtracting one degree for every 154.5 metres, and on a special correction for diurnal variation of temperature based on a month's observations in 1887 of Mont Blanc with reference to Geneva. Suitable winter values have still to be ascertained. Examples of the application of the method are given and a defence of the procedure in view of recent work on the subject, which is of practical importance for meteorological maps as well as for Alpinists. It is, however, full