performance of its functions, it seems only likely that others may; and consequently, that the study of adaptation must enter upon a new phase in connexion with the study of comparative and experimental morphology and of variation and correlation.

Another question raised is the insecurity of our conceptions of genera and other taxonomic groups, and the need of some more quantitative and phylogenetic basis. We divide the Podostemaceae, for example, into genera and sub-orders largely upon the degree of dorsiventrality displayed in the flowers and fruits, but we do not know the real quantitative or phylogenetic value of the distinctions. It also follows from the above conclusion that it is highly probable that many genera, species, sub-orders, or even larger groups, may be polyphyletic. We can easily imagine a group of allied or similar species, for example, all becoming more dorsiventral in their vegetative systems, and at last all of them showing the effect in the floral organs. As the effects in the latter seem to follow very definite rules, all these species may presently form a polyphyletic genus, there being no ancestor which has the generic characters. The same reasoning applies to higher groups, and in the very largest groups we are already beginning to perceive clearly that many, if not most, are more or less polyphyletic. It is evident that this view, if it prove true even in part, will help in clearing up the darkness which surrounds many of the problems of evolution, geographical distribution, &c.

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PERADENIYA.

FOLIAR PERIODICITY IN CEYLON[1].—The high temperature and humidity of the air in most parts of Ceylon allow almost continuous growth of the arborescent vegetation. There are, however, nearly two hundred species which become leafless at different times of the year.

External and internal factors affect the phenomena of defoliation and foliar renewal. The climatic effect is obvious from the fact that the majority of our deciduous species become leafless during our hottest and driest months. The deciduous trees respond only to one hot dry period of three or four months, and not to the dry part of each monsoon. Some species undergo complete defoliation twice per

[1] Abstract of paper read before Section K of the British Association, Belfast, 1902.

year; others exhibit periodic increase in foliar activity several times per year, in addition to a complete annual renewal, and many introduced species show great variation during their phase of acclimatization. In the northern districts, where the rains of the south-west monsoon are very feeble as compared with those at Peradeniya, the defoliation is considerably delayed. The climatic conditions in Ceylon are not equable enough to allow continued development along personal lines, and botanists desiring to study the personal equation in plant life should select a more equable area.

Internal forces are, however, obviously at work, as evidenced by the following facts:—

(*a*) Species retain full possession of their foliage or put forth new leaves when the temperature and dryness of the air is at the maximum.

(*b*) Some species drop their leaves and remain bare during our wet, cool months, when transpiration is at the minimum.

(*c*) Plants of the same species, on the same plots, are deciduous at periods varying by many weeks and months.

(*d*) The same species may undergo defoliation at approximately the same time of the year, though under the dissimilar climates of Peradeniya, Colombo, and Mannar.

The irregularity of foliar periodicity is very pronounced. There is not a month when all the trees are in full leaf.

The foliar periodicity of the evergreens is as complex as that of the deciduous trees, the foliar renewal taking place annually, semi-annually, or at other periods, all being subject to individual variations.

Complete defoliation and foliar renewal in temperate and tropical zones often results in the differentiation of rings of growth in the secondary xylem. The variation in our tropical species is so great that an exact knowledge of foliar activity must be at hand before the time-value of the rings of growth can be determined. Saplings may undergo foliar renewal in the first year, or several years may elapse before this occurs; mature plants may be characterized by annual, semi-annual, or periodic intervals of leaf production; further, many trees are repeatedly defoliated by the ravages of insects, bats, and Fungi.

Foliar periodicity is the most potent factor in determining the number and significance of the rings of growth, but for the complete interpretation of these a further knowledge of the rate of cambial activity and the independent effect of a hot dry season is necessary.

The rate of cambial activity is of especial value in determining the varying significance of the xylem differentiations in slow-growing deciduous or quick-growing evergreen trees.

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PERADENIYA.

THE MORPHOLOGY OF SPORANGIAL INTEGUMENTS[1].

Angiosperms.

Theories on the nature of the integuments of the *ovule*:—

1. *Foliar-appendage* theory: The integuments are the foliar appendages of the nucellus, which is a stem structure. Supporters of this view: Alex. Braun, Aug. St. Hilaire, Schleiden, Payer, Schmitz.

2. *Sui generis* theory: The integuments are special protective outgrowths of the sporangium, this latter being an organ *sui generis*. Evidence for this view is afforded solely by facts of ontogeny: Strasburger, Goebel, Eichler.

3. *Foliolar* theory: chiefly elaborated by last of undermentioned authors. Based entirely on the evidence of the abnormal metamorphoses of the ovule; these are of a very constant character, subject to control of very definite laws; the two integuments tend to proliferate into a three-lobed marginal leaflet or segment of the carpel, of which the terminal lobe, bearing the nucellus (when present) on its upper surface, represents the inner, while the two lateral lobes represent the outer integument; this is the extreme proliferated form. Between this and the normal ovule *every intermediate transitional form has been observed*, the extent of proliferation depending on the stage of development of ovule at which the tendency thereto sets in. Cases where proliferated outer integument appears as a simple lamina bearing normal cup-shaped inner integument containing nucellus on its *lower* surface; this structure arises morphologically by fusion of the inner margins of the two lateral lobes of the leaflet in the extreme proliferated form across the face of the latter, the terminal lobe at the same time becoming inrolled. The whole structure and mutual relationship of the parts is well shown by means of certain abnormal forms of foliage-leaf in *Syringa*. Hence the ovular integuments are the morphological homo-

[1] Abstract of paper read before Section K of the British Association, Belfast, 1902.