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The Interpretation and Application of Certain Terms and Concepts in the Ecological  
Classification of Plant Communities. by George E. Nichols

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that to name an association as the association of such and such a habitat is to begin at the wrong end. Some of the newer definitions of synecological terms given by the authors may be summarised as follows:

*Association-fragment.* A plant-community which cannot form an elementary association on account of restriction of the habitat.

*Facies.* Various forms of an association due to geographical position.

*Variants.* Deviations of associations due to other than geographical causes.

*Association-complex.* A union of associations or fragments of associations to a phytogeographical unit. (Cf. Nichols's use of the same term, p. 102 below).

*Twin-associations (Zwillingsassoziationen).* Associations floristically and physiognomically corresponding in one or certain layers only. (The conception of a 'Zwillingsformation' was introduced by Hult.)

The authors accept Warming's concept of the formation and adopt Drude's conception of 'elementary associations' (see this JOURNAL, 2, p. 52).

The authors are concerned also that more respect should be paid to priority in the use of the terminology of vegetation. In this matter we fear they will not meet with a great deal of sympathy. If there was one point on which all the phytogeographers present at the Brussels Congress of 1910 were agreed it was that there must be no fixation of terminology until general agreement was reached. It is perfectly clear that the failure to reach general agreement means that the development of concepts is still incomplete, that various points involved in the concepts employed are still obscure, and it is quite futile to attempt to fix nomenclature while that is the case.

**Nichols, George E.** "The interpretation and application of certain terms and concepts in the ecological classification of plant communities." *The Plant World*, 20, 1917, pp. 305-319 and 341-353.

In sharp contrast with the authors whose papers have been noticed above Nichols takes the principle of succession as the groundwork of his classification. He regards the association as the fundamental unit of vegetation, but unlike the Swedish authors defines it as the group or community of plants occupying a common habitat, which again he defines as a unit area with an essentially uniform environment. These definitions at once introduce the difficulty of what is to be considered an 'essentially uniform' environment, as to which difference of opinion is often acute owing to the great complexity of the interactions of the factors involved. We agree with the 'floristic school' in preferring to define the association by its floristic and vegetational composition. Broadly speaking we all know an association when we see one, or rather when we have had some little experience of it and its neighbours, just as broadly speaking we all know a species in the same way. In both cases there may be differences of opinion as to just how much either should include, as to whether we should count a well-marked facies correlated with a difference of habitat as a distinct association, or whether we should separate a well-marked variety as a distinct species. We are impressing our concepts on nature in both cases, but they are good workable concepts for all that, because there is, ordinarily, a certain discontinuity between the types of well-marked associations as between the types of well-marked species. But the habitat cannot yet be defined so closely in terms of its ultimate elements, and we therefore do well to start with the unit of vegetation itself as defined by floristic composition and by structure. The author accepts Clements's consociations (alternative dominants) and societies (local aggregations of species of secondary importance), as units subordinate to the association, but considers these as floristic rather than ecological units since they are not as a rule correlated with marked differences of habitat. He also distinguishes *habitat-types*

formed from parallel series of habitats, and corresponding *association-types* formed from the series of associations which inhabit them.

In considering the successional relations of associations Nichols postulates a regional climax association-type, which has attained the highest degree of mesophytism which the climate of the region permits, but he dissents from the assumption commonly made or implied by American ecological writers that all the vegetation of a climatic region is on its way to approximate to that type. He says it is untenable in the light of many years of field experience and fails either to accord with theoretical considerations or to harmonise with observed facts. He contends that while the climatic climax is reached on the most favourable soils the edaphic influences of less favourable soils are limiting factors in succession, that they not only determine its rate but its extent. He thus arrives at the conception of an *edaphic climax association* which is prevented from reaching the climatic climax by the edaphic factors of the habitat. As a good case of such an edaphic climax the New Jersey pine barrens are cited. This well-known area has been uninterruptedly out of water since Upper Miocene times, but while it is situated in a climatic region of deciduous forest, it has never got beyond the pine stage of succession on account of the nature of the soil.

The author also puts forward the related concepts of the *habitat-complex* and the *association-complex*, formed by the different related habitats and corresponding associations existing within a physiographic unit area, as for instance, a pond, a burned area and so on. Such a habitat-complex is a physiographic entity of a higher order than the single habitat, and the association-complex is similarly an ecological entity of a higher order than the single association. This ecological unit the author identifies with the *edaphic formation*, covering the whole series of successional stages actually met with in the physiographic unit area. Thus Nichols's "edaphic formation" corresponds with Moss's "formation," and his "edaphic climax association" with Moss's "chief association."

Mr Nichols also recognises *edaphic formation-types* and *edaphic formation-complexes*; concepts built up in a similar way to those of the corresponding combinations of associations. The edaphic formation-complex of a climatic region corresponds, in this terminology, with the *climatic formation*. Finally we have the *climatic formation-type*, which includes all climatic formations determined by similar climates, such as the often cited case of the sclerophyllous Mediterranean and Californian vegetation, the deciduous forest of the eastern United States and of Western Europe, the short grass of the American Great Plains and of the Russian steppes, and so on. The author concludes his paper by an application of his system to the vegetation of the northern Cape Breton region, which he has particularly studied.

## NOTICES OF PUBLICATIONS ON BRITISH VEGETATION

**Paulson, R.** "Notes on the Ecology of Lichens, with special reference to Epping Forest." *Essex Naturalist*, **18**, 1918, pp. 276—286. 3 plates.

The author shows that the lichen flora on the bark of hornbeams (*Carpinus betulus*) in Epping Forest differs from that on oakbark and includes sixteen species, of which eight are shade lichens belonging to the Graphidiaceae, a family very poorly represented in the oakwoods of the same neighbourhood. Where this family occurs on oaks it is on the bark of young trees (usually *Q. sessiliflora*) fifteen to twenty-five years old, before it has become deeply furrowed. The growth of the lichens prevents the furrowing of the bark over the