BOTANY

Chairman: A. T. GUARD, Purdue University

Professor Benjamin H. Smith, Indiana State Teachers College, was elected chairman of the section for 1944.

The morphology of the Paleozoic fructification Bowmanites (Sphenophyllales). A. T. CROSS, University of Notre Dame.—The new species of Bowmanites, *B. trisporangiates* Hoskins and Cross, from an Iowa coal ball has made possible a revision of the generic concepts of this long known group of plants. The gross morphology and general anatomy are reviewed. An attempt is made to analyze the nature and origin of the sporangiophore as a unit of structure in this cone genus and to relate it to allied forms. A new interpretation of the spore walls is possible and the presence of a perisporium associates this group of plants more closely with the Sphenopsida.

Correlation of microclimatic factors with species distribution in Shenk's woods, Howard County, Indiana. RAY C. FRIESNER, Butler University, and Charles M. Ek, Kokomo.—Shenk's woods, a large tract of primeval forest, six miles east of Kokomo, very obviously to the eye, comprises two types of forest. About one-fifth of the total area is very sharply set off from the remainder by differences in its component species. The larger portion may be characterized as Quercus-Ulmus in which four species of oak (*Q. borealis* var. *maxima*, *Q. bicolor*, *Q. macrocarpa*, and *Q. muhlenbergii*) occupy 56.3% of the crown cover; *Ulmus americana*, 20.4%; *Fraxinus americana*, 6%; *Acer saccharum*, 4.95% and *Ulmus fulva*, 4.43%. In the smaller area, *Acer saccharum* occupies 66.1% of the crown cover, Quercus spp., 19.1%; *Fagus grandifolia*, 11.1% and *Ulmus fulva* 5.95%. The herbaceous species are strikingly different in the two areas. The Quercus-Ulmus area shows very few spring-flowering species and these in low frequencies while the Acer-Fagus area shows both a larger number of the early-flowering species and all of them in high frequencies. Summer- and Autumn-flowering species are also much fewer in number and of lower frequencies in the Quercus-Ulmus area than in the Acer-Fagus area.

Evaporation studies show very similar rates in the two areas, the curves completely paralleling each other with first one and then the other a little higher.

Study of edaphic factors shows that the moisture equivalent is higher in all horizons in the Quercus-Ulmus than in the Acer-Fagus area. In spite of the higher moisture equivalent the percentage of growth water in the soils is higher at all horizons in the Quercus-Ulmus area and the differences are much accentuated during the critical weeks of

July and August. Differences in the species occurring in the two areas is probably largely due to the differences in composition of the soil which in turn affects soil temperature, aeration and available growth water.

A chronological chart for plant physiology. RAYMOND E. GIRTON, Purdue University.—A chart has been devised which presents parallel developments in nine sub-divisions of plant physiology and in world events. The physiological sub-divisions considered are: (1) general, (2) the cell, (3) photosynthesis, (4) nitrogen metabolism, (5) mineral nutrition, (6) water relations, (7) translocation, (8) respiration, and (9) growth. Progress in each sub-division is connected with the names of individual authors and is arranged in chronological order.

The effects of different sources of nitrogen on the deficiencies of certain mineral elements in tomato plants. WENDELL R. MULLISON and DOROTHY L. SCOTT, Purdue University.—This is a progress report on the effect of two types of nitrogen compounds on the deficiency signs and symptoms of several nutritional elements. The types of nitrogen were an oxidized form such as nitrogen in a nitrate salt and a reduced form of nitrogen such as the nitrogen present in urea. The compounds used were calcium nitrate, urea, ammonia, guanidine nitrate, and guanidine sulphate. Calcium nitrate produced the most favorable growth and urea seemed to be the best of these compounds containing nitrogen in the reduced form. The mineral deficiencies involved were for calcium, potassium, phosphorus, magnesium, sulphur, manganese, and boron respectively.

The deficiency symptoms of plants supplied with urea as contrasted with those plants supplied with nitrate nitrogen were different in several cases. Although the plants grown on nitrate nitrogen in general were better than those plants supplied with urea nitrogen, in some cases the onset of the deficiency symptoms was delayed when urea was used as a nitrogen source.

A card game designed as an aid in teaching the characteristics of gilled mushrooms. C. L. PORTER, Purdue University.—Two sets of cards are used. Set I, known as the "genus set," has the name of a mushroom genus printed on each card. Together with the name of the genus there is also typed below the name the three to six characteristics that are necessary to differentiate that particular genus from all other genera.

Set II, known as the "characteristic set," has one distinguishing characteristic printed on each card.

Genus cards are distributed equally among the players. Five "characteristic" cards are dealt to each player. The remaining "characteristic" cards are stacked in the center of the table.

The object of the game is for each player to acquire a group of characteristics that will define definitely a mushroom genus. When he has succeeded in doing this he has a "book." Books differ in value depending upon the number of characteristics that must be assembled to define a mushroom genus. A three-"characteristic" book has a value of three points; a four-"characteristic" book has a value of four points, etc.

The player with the most points at the end of the game wins.

This game was used as a part of classroom exercises with extraordinarily good results. Not only did class members learn very rapidly the characteristics of the mushroom genera but they aided greatly en field identification.

It is the opinion of the author that such a device could be used in teaching the basic principles underlying the classification and identification of many groups of organisms.

Pollen-grain structure in the classification of Spermatophytes. DOROTHY L. SCOTT, Purdue University.—The external characters of pollen grains were studied in order to determine their value in establishing phylogenetic positions of plant groups. Such pollen-grain structures as size, shape, furrow configuration, and external markings exemplify trends of development paralleling Bessey's system of plant classification. As unit characters, these pollen-grain structures are not indicative of relationships of orders within a phyletic line or of families grouped in an order. A high degree of similarity of characters of pollen grains from genera within a family suggests that the family may be used as the unit of pollen-grain structure. There are relatively few plant families that cannot be distinguished by their pollen grains. Differentiation of species is seldom shown by external pollen-grain structures.