tion, a white oak association, a chestnut oak association with *Kalmia latifolia,* a black oak association, a Liriodendron association, and many moss and lichen associations. The forest as a whole may represent an alliance or order. The coastal dune region of Long Island and New Jersey has also many associations: Ammophiletum, Hudsonietum, etc. The "dune complex" is a complex of associations which can not be classed together floristically. They may be classified syngenetically (by successions, which are often highly hypothetical), or they may be grouped under such a mongrel term as "formation," meaning all the types of vegetation on a given area. Useful as such a "formation" is for some purposes, it is compounded of vegetation and land area.

The application of these ideas to the vegetation of North America will make the distinctions more clear and concrete. We may cite the great grassland area of the central United States and Canada. From the geographic standpoint this constitutes a province, which may be divided, following the map of Shantz and Zon,[4] into two sectors: the prairie (tall grass) sector and the plains (short grass) sector. The prairie sector is divisible into at least a northern district, including the eastern part of the Dakotas and western Minnesota, two central districts and a southern. The most of Iowa, with parts of Illinois, Missouri, Nebraska and Kansas, including all the rich prairie region with mild climate, may be termed the Iowa district (one of the central districts cited above). In this district several subdistricts can be clearly recognized. And if still smaller geographic units are desired, geographic terms must be invented for them.

From the sociologic standpoint Weaver and Fitzpatrick[5] and Weaver[6] have given us the most exact analysis of the prairie yet available. From their work it is plain that the associations of the prairie are several. There is at least one *Andropogonetum scoparii* (two others occur on Long Island. *Cf.* Blizzard),[7] apparently as *Andropogonetum furcati,* certainly a *Spartinetum michauxii,* apparently a Stipetum. In the Iowa prairie region there is also the *Typhetum latifoliae, Phragmitetum communis* and various Cariceta and Cypereta. Besides these, the Iowa district has many stands of Quercetum of two or three types, *Ulmetum americanae,* and many moss and lichen associations.

[4] H. L. Shantz and R. Zon. Atlas of American Agriculture, "Natural Vegetation," U. S. Department of Agriculture, Bur. Agric. Economics, 1924.

[5] J. E. Weaver and T. J. Fitzpatrick, "Ecology and Relative Importance of the Dominants of Tall Grass Prairie," *Bot. Gaz.,* 93: 113–150, 1920.

[6] J. E. Weaver, "Who's Who among the Prairie Grasses," *Ecol.,* 12: 623–632, 1931.

[7] A. W. Blizzard, "Plant Succession and Vegetational Change on High Hill, Long Island," *Ecol.,* 12: 208–231, 1931.

Geographic units and categories are essential and adequate for geographic purposes. Sociologic units and categories are wholly distinct and should be sufficient unto themselves. The recognition of these units will make possible the long-desired description and understanding of plant distribution, and thereby of animal distribution also.

HENRY S. CONARD

GRINNELL COLLEGE

ON CONCEPTS IN PHYTOSOCIOLOGY

DR. H. S. CONARD, who is largely responsible for the actual work of translating Braun-Blanquet's "Pflanzensoziologie," and to whom I am indebted for the opportunity of examining his critique in advance of its publication, is entirely correct in his statement that confusion in phytogeographic and phytosociologic nomenclature has long existed. It is also a fact that Braun-Blanquet has done much to clear up this confusion, or at least to state one view-point in such terms that one may easily grasp his meaning.

All classification is based on the grouping of individuals and the unit-individual in plant sociology is the *stand,* as numerous geobotanists have stated, as Braun-Blanquet emphasizes and as Dr. Conard reiterates. In all classifications, similar unit-individuals are brought together to form a group-unit, which in this case is the association.

Objects which have only a single character may be classified in one way only, but stands of vegetation show similarities in various characters and may be grouped in various ways accordingly. These lead to very diverse group-units, just as men may be classified according to politics, religion or occupation, resulting in each case in a different set of groups. Floristic similarity is the character chosen by Braun-Blanquet for phytosociologic classification, and in that most botanists will agree.

One must also distinguish carefully between the mental processes of classification and combination. In the former, units are grouped according to similarity and the result is an abstract concept. In the latter, units are grouped on a different basis and the result is a concrete unit of entirely different nature. Thus we classify leaves into simple and compound, opposite and alternate, depending on similarity but leading to different groups, while we combine leaves, stems and roots to make a concrete individual plant. If we classify stands of vegetation, we arrive at the association in one form or another, depending upon the character chosen as a basis. If we combine stands, we arrive at the mosaic of vegetation which covers an area. Generally speaking, we arrive first at the mosaic of a small area and by successive combinations at that of successively larger tracts. This is

precisely what Braun-Blanquet has done, so far as his results are concerned, and he has termed his concrete combinatory group-units, beginning at the most comprehensive, region, province, sector, district and subdistrict. As a matter of actual mental process, I believe his work was analytic rather than synthetic for these five upper groups. At another place in his book he mentions the association-complex as a combinatory unit, but carries his synthesis no higher and does not attempt to connect the subdistrict with the association-complex. In reviewing the book, as mentioned in Dr. Conard's first paragraph, I could only presume that the analysis and the synthesis met here, since no other intermediate group was mentioned.

Dr. Conard's statement that "association" can never be a geographic term is open to argument. He says himself that they occupy space, which would seem to entitle them to geographic standing. Elsewhere he says that the geographic unit, *Iowa prairie region,* contains associations. On the other hand, the association is a concept and as such can not occupy space. Nevertheless, the geographers certainly use as an accepted term the concept "valley," abstracted from the general characters of concrete individual valleys. It seems that one should not be too dogmatic on this point. There can, of course, be no argument on the distinctness of geographic and sociologic group-units. This distinction is a fundamental feature of Braun-Blanquet's book and is excellently illustrated by Dr. Conard.

There is a further point which needs some attention. The unit-individual of geobotany, the *stand,* is built up by successive combinations into larger and larger geographic groups to the final all-inclusive vegetation of the world. The same stands are built up by successive classifications through the higher abstract concepts of alliance, order and class to the ultimate concept—vegetation of the world. At this point the final groups are at least coextensive, although one is abstract and the other concrete.

Lastly, let me emphasize a final point. The stand, which serves at the basic unit in plant sociology, is itself a combinatory group and may be made large or smalll, according to opinion. Stands are classified into associations, according to floristic similarity, but the degree of similarity is again a matter of opinion. The nature of the association, therefore, depends on the nature of the stand and on the degree of similarity demanded. Unless a botanist has been in the field with Braun-Blanquet, seen the results of Braun-Blanquet's ratiocination demonstrated and attuned his own mental processes to exactly the same key, he has no assurance that his interpretation of associations in America corresponds with that of our Swiss colleague in the Alps. It is true that the association is in some ways comparable to the species and that either unit may be cut large or small, according to personal opinion and prevailing fashion. Within any limited region too, associations are just as valid as species. Whether this validity prevails over wide areas may be questioned, as I have elsewhere suggested.[1]

Different mills produce different qualities of flour from the same wheat. The association-concept is the product of our mental mills. What we need in plant-sociology is a mental process that gives us a standardized product, and to this end Braun-Blanquet has done very much to help us.

H. A. GLEASON

NEW YORK BOTANICAL GARDEN

OBSERVATIONS OF ANIMAL BEHAVIOR

IT is with some misgiving that I relate the following snake story, for what I saw may be either a well-known characteristic of this species or it may seem highly improbable. While walking along a road in southern New Jersey recently, I saw a small green snake, possibly 15 inches long, wriggling on the polished roadbed without making any forward progress. After touching it with the toe of my shoe a few times, it shammed dead, as many other snakes do. Then I turned it over with my foot and, to my amazement, it kept right on rolling over and over, for all the world like a stick, although ripples passed up and down its body as though it employed the snake motion in turning or rolling over and over, sidewise—not like the alleged hoop snake. When it reached the side of the road, however, it went about its business in the usual manner, while I stood there wondering if I really had seen what I thought I saw.

C. R. UNDERHILL

LOWER BANK, N. J.

IT was my good fortune to witness recently an incident in the behavior of the honey-bee which seems to me to be worthy of record. In the rear of my house is a bird bath about fifteen inches in diameter and possibly holding, when full, a body of water two inches deep in the center. Yesterday, while pulling weeds within a yard of the bath I saw one bee foundering in the center. In order to save himself he got over upon his back and floated but could not make any headway toward shore and there was no wind to move him in any direction. Presently one of the several bees drinking around the shallow rim flew out over the center, came down close to the drowning bee, and, after the two had successfully locked their feet in some way, flew vigorously toward the shore and landed his hapless mate safely.

H. R. PHALEN

ST. STEPHENS COLLEGE

[1] *Bull. Torrey Club,* 53: 1–20, 1926.