the smooth *pahoehoe* was much more richly covered with vegetation, which occurred, however, only in cracks. On a 1907 flow plants were found just beginning to be established. The author concludes that on both types of lava, the first pioneers are lower cryptogams; on the *pahoehoe* these are soon succeeded by ferns and seeds plants, but on the *aa* there is a long-enduring lichen stage. Ultimately the natural forest of the region returns, except in places where man's influence causes the successful invasion of a naturalized flora. The *ohia* (*Metrosideros polymorpha*) is the dominating tree at first, and the *koa* (*Acacia koa*) is the dominating tree of the ultimate or climax forest.—H. C. COWLES.

Rainfall and soil moisture.—In studying the conditions which govern the plant activities of the semi-arid region about the Desert Laboratory, Tucson, Arizona, SHREVE[13] has made weekly determinations of the soil moisture at depths of 3, 15, and 30 cm. throughout the year, and compared the resulting data with the record of the rainfall for the same period, in order to see exactly how the former is affected by the latter. It is evident that precipitation of less than 0.15 inch has no effect upon the soil moisture, and that therefore there are periods of 140 days in the region under consideration without rainfall of sufficient amount to increase the moisture in the soil. This serves to indicate that in desert regions by no means all of the small rainfall is significant to vegetation as a source of water supply. The evaporation has been determined and plotted along with its ratio to the soil moisture, the march of soil moisture throughout the year, and the distribution of rainfall, making an instructive and detailed chart of those moisture factors which affect vegetation. Among other things it proves the range of moisture conditions at the Desert Laboratory to be one of great extremes.—G. D. FULLER.

Drought resistance in Hopi maize.—For centuries the Indians of New Mexico and Arizona have grown a race of maize in soil that is much too dry for the ordinary races of the species. A large factor in the success of this race, known as Hopi maize (from the Hopi Indians), is the extraordinary capacity for elongation possessed by the mesocotyl.[14] The Indians are accustomed to plant their maize at a depth of 15–45 cm.; this depth is for most varieties too great for effective germination. In ordinary races the mesocotyl can rarely be forced to grow to a length greater than 10 cm., whereas a length of 36 cm. can be induced in Hopi maize. Another advantage in the mesocotyl of Hopi maize is its ability to produce roots, a rare phenomenon in grass internodes. A third feature of great importance is the great elongation of the primary root

[13] SHREVE, F., Rainfall as a determinant of soil moisture. Plant World **17**:9–26. *figs. 3.* 1914.

[14] COLLINS, G. N., A drought-resisting adaptation in seedlings of Hopi maize. Jour. Agric. Research **1**:293–302. *figs. 2. pls. 29–32.* 1914.

in Hopi maize. However these striking features may have originated, it is obvious that they enable this race to grow in much more arid situations than other races of maize, and it is suggested that it may well become an important economic plant in arid regions.—H. C. COWLES.

Indiana Academy of Science.—The volume of *Proceedings* for 1912 contains the following abstracts and papers of botanical interest: "Further notes of the seedless fruits of the common persimmon (*Diospyros virginiana* L.)," and "The influence of certain environic factors on the development of fern prothallia," by DAVID M. MOTTIER; "The mosses of Monroe County," by F. L. PICKETT and MILDRED NOTHNAGEL; "Length of life of *Arisaema triphyllum* corms," and "Acetic alcohol as a killing and fixing agent in plant histology," by F. L. PICKETT; "Plants not hitherto reported from Indiana," by CHAS. C. DEAM; "Report of the work in corn-pollination, IV," by M. L. FISHER; "Conjugation in *Spirogyra*," by F. M. ANDREWS; "Photosynthesis in submerged land plants," by H. V. HEIMBERGER; "Indiana fungi, III," by J. M. VAN HOOK; "Fungous enemies of the sweet potato in Indiana," by C. A. LUDWIG; "Notes on some puff balls of Indiana," by FRANK D. KERN; "The improvement of medicinal plants," by F. A. MILLER; "The structure and diagnostic value of the starch grain," by R. B. HARVEY.—J. M. C.

Structure of tropical amphibious plants.—Material of *Ipomea reptans* and *Neptunia prostrata* obtained from pools in northwestern Madagascar that are quite dry during a considerable portion of the year was examined by CHOUX,[15] who compared the anatomy of the portions developed during the wet and dry seasons. He found considerable differences in size and external appearance, while in internal structure the stems developed during the dry season showed (1) proportionately greater development of vascular and fibrous tissue, together with smaller air passages; and (2) a considerable amount of stored starch, a food reserve quite lacking in portions developed during the humid season. It would seem, therefore, that in these two tropical amphibious forms the growth activity results during the dry season in the accumulation of reserve food; while during the wet season the growth is so vigorous that it uses not only the food then manufactured, but also that which has been accumulated during the previous months.—G. D. FULLER.

Osmosis in soils.—The recent results obtained by LYNDE,[16] showing that certain soils, notably the clays, promote the movement of soil water by acting as semipermeable membranes, increasing in efficiency with their depth, suggest

[15] CHOUX, P., De l'influence de l'humidité et de la sécheresse sur la structure anatomique de deux plantes tropicales. Rev. Gén. Botanique **25**:153–172. 1913.

[16] LYNDE, C. J., Osmosis in soils. Soils act as semipermeable membranes I. Jour. Phys. Chem. **16**:759–765. 1912; and LYNDE, C. J., and BATES, F. W., Osmosis in soils. Soils act as semipermeable membranes II. *Ibid.*, 766–781.