though this seems to be due partly to a misunderstanding of the term "maintenance of the individuality of chromosomes." The single spireme, which results from the fusion of chromomeres upon the linin thread, enters into the synaptic stage. In accord with LAWSON, Miss WOOLERY has found by measurements, which she records, that there is an enlargement of the nuclear cavity; but, contrary to the former's conclusions, the space occupied by the chromatin material is found by actual measurement, which she also records, to be less. During synapsis there is a shortening and a thickening of the thread to form the uniform spireme which later emerges from the synaptic ball. Unfortunately, there are no drawings to show the thread at the time of greatest contraction. During second contraction the first appearance of the split spireme is recorded, though the double structure spoken of in figs. 11 and 12 may possibly have been an earlier appearance of this condition. In several places considerable emphasis has been placed upon the fact that portions of the spireme are in connection with the nuclear membrane. The question would arise here, whether these were connections of any significance or merely portions of the chromatin that were tardy in movement. Reduction is by means of cross segmentation at the periphery of the radiating loops, as found during second contraction; this act being followed by a side-to-side approximation of the limbs of the loops or of separate portions of the thread, thereby forming the bivalent chromosomes. Evidences of spindle formation do not bear out LAWSON'S theory that the fibers are expressions of lines of tension due to the contraction of the nuclear membrane.

The idea that the resting nucleus is composed of two substances, chromomeres and linin, is still held by this investigator. Before definite conclusions can be drawn concerning the structure of the resting nucleus and the formation of the spireme from the resting condition, a closer series during the early prophases and the late telophase of the last division of the sporogenous tissue must be made. The careful measurements of the nuclear cavity and the chromatin mass at the time of the first contraction cannot fail to show fallacies in the view put forward by LAWSON.—MILDRED NOTHNAGEL.

Periodicity in mitosis.—In a paper on embryonal growth and its diurnal period, KARSTEN[14] deals with the periodicity of cell division. He calls attention to the fact that many algae shed zoospores in the early forenoon, and therefore must have undergone cell division during the night; and he cites the work of investigators who have shown positively that *Spirogyra*, *Zygnema*, diatoms, and desmids divide at night, most of them between 9:00 P.M. and midnight. He was not able to find similar records for the higher plants. The work of KELLICOTT[15] on the periodicity of mitosis in *Allium* was overlooked. KARSTEN

[14] KARSTEN, G., Über embryonales Wachstum und seine Tagesperiode. Zeitschr. Botanik 7:1–34. 1915.

[15] KELLICOTT, W. E., The daily periodicity of cell division and of elongation in the root of *Allium*. Bull. Torr. Bot. Club 31:529–550. 1904.

had already noticed that temperature affects the rate of cell division, and consequently he carried on his experiments in a large thermostat at a constant temperature of 25°. The most extensive investigation was made upon the root tips of seedlings of *Vicia Faba*. From 7:00 P.M. to 11:00 P.M. mitoses are slightly more frequent, and about 4:00 P.M. there is some diminution in the number. Roots of *Zea Mays* showed a uniform rate of mitosis throughout the 24 hours. Stem tips of seedlings of *Pisum sativum*, grown in the dark at a temperature of 25°, showed a larger number of mitoses between 9:30 P.M. and 1:30 A.M. By 3:00 A.M. the mitoses were much less frequent, and continued to diminish until the minimum was reached at 6:00 A.M. Stem tips of seedlings of *Zea Mays*, grown under the same conditions, begin to show an increase in the number of mitoses about 10:00 P.M. and a maximum is reached at 4:00 A.M., after which the number diminishes, reaching the minimum at about 8:00 A.M. When the stem tips were lighted from 6:00 A.M. to 6:00 P.M., by an electric light, the behavior was practically the same; but when they were lighted from 6:00 P.M. until 6:00 A.M. and kept in the dark from 6:00 A.M. until 6:00 P.M., the periodicity was accentuated; while continuous lighting made the periodicity less conspicuous.

The general conclusion is that, so far as mitosis is concerned, roots have no periodicity, but stems show it in a marked degree, with the maximum period in the night. It is evident that this investigation suggests further work by those who, like KARSTEN, have facilities for isolating and controlling factors. While so many observations have been made upon growth, and so many curves have been plotted, the literature does not seem to contain any curves for mitosis. Growth and cell division are two distinctly different phenomena which are often confused, or it might be more nearly correct to say that the cell division has been altogether disregarded.—C. J. CHAMBERLAIN.

Strobilus of Gnetum.—PEARSON[16] has made a careful study of the puzzling inflorescence of the Gnetales, and has added much to our knowledge of the facts. Not only have the structures involved been confusing, but the terminology as well, for how to apply the terms strobilus and flower has been perplexing. Calling the unit structure a "flower," and the whole cluster therefore an "inflorescence," the following statement of PEARSON'S results may be made. He finds that wide differences occur within the same species in the number of staminate flowers produced in basipetal succession at each node, in *G. scandens* the number of such flowers in a single inflorescence sometimes being as many as 3000. The "antherophore" apparently elongates rapidly just before dehiscence of the anthers, freeing them from the envelope. In *G. Gnemon* the staminate inflorescence "usually bears one or more complete female flowers," and in some material these ovulate flowers are more abundant in oldinflores cences, from which some or all of the staminate flowers have fallen. In *G. scandens*,

[16] PEARSON, H. H. W., A note on the inflorescence and flower of *Gnetum*. Ann. Bolus Herbarium 1:152–172. *pls. 24–26.* 1915.