remain in the water until the formation of the first polar spindle, before being fertilized. The second cleavage takes place about 24 minutes later; the third cleavage occurs after 30 minutes more; the fourth after another 35 or 40 minutes; and after a further lapse of about 50 minutes, or in a little less than 3½ hours after fertilization, the fifth division, with its resulting 32 cells, is completed. A very symmetrical blastula appears about 7½ hours after the eggs are fertilized, and in 1½ hours more the embryos begin to swim. The third cleavage, which is distinctly right-handed, shows the first differentiation of the cells in regard to size; the upper four, or those next to the polar bodies, being slightly, though perceptibly, *larger* than the lower four. The cleavage is typically spiral and almost perfectly regular. There are only the slightest indications of a vitelline membrane, so that the polar bodies are lost at an early stage. The near equality in the size of the blastomeres also tends to increase the difficulties encountered in following out the details of the cell-lineage. The pilidium with peculiarly short side-lobes, which develops from these eggs, will live for two weeks or more in the laboratory, although I have never seen the young nemertean develop within it.

13. *Cerebratulus luridus* Verr. Specimens collected in Cape Cod Bay by Professor Verrill contained apparently ripe eggs in August.

14. *Carinella pellucida* Coe ripens its sexual elements in July at New Haven and Woods Holl.

15. *Parapolia aurantiaca* Coe. Genital products mature in August at Woods Holl.

16. *Valencinia rubens* Coe. A single specimen found at Woods Holl in August 1894 was filled with ripe spermatozoa.

17. *Cephalothrix linearis* Oersted. At Woods Holl this species commonly matures its genital products in August. The eggs may be artificially fertilized. The development is direct and may be readily followed. McIntosh* has published figures of the embryos of this species.

The above includes merely those dates at which genital products have been found mature, and should by no means give the impression that they may not be found in some of the species at other times, both earlier and later than is here indicated. The times when the eggs are normally deposited is certainly liable to considerable variation. *Amphiporus ochraceus*, for example, has on one occasion been found mature as early as January, although the eggs are produced more abundantly four or five months later. In this respect the nemerteans agree with many other invertebrates. In some others, as *Cerebratulus lacteus*, the time during which the eggs can be fertilized lasts for a few weeks at the most, and this period, at New Haven, varies from February to April according to some undetermined peculiarity of the season.

It will be seen that of the common species recorded here nearly all become sexually mature on the southern coast of New England during the summer months. Only one lays its eggs in mid-winter and only two in the very early spring.

W. R. COE.

YALE UNIVERSITY.

THE COLUMBIA MEETING OF THE SOCIETY FOR PLANT MORPHOLOGY AND PHYSIOLOGY.

THE second annual meeting of this Society was held in conjunction with the meetings of the American Society of Naturalists and the Affiliated Societies at Columbia University, December 27 to 30, 1898. On the evening of December 27th a reception was tendered to the members of the Society and visiting botanists by the Torrey Botanical Club of New York, and the Society

* British Annelids; Part I., Nemerteans. Ray Society, 1873.

joined with the Affiliated Societies in the entertainments of Wednesday and Thursday evenings, and in the annual discussion on Thursday afternoon. On Friday a visit was made to the New York Botanical Garden, where the grounds and buildings were shown and explained by the Director, Dr. N. L. Britton. At the business meeting the following officers were elected for the ensuing year: President, Dr. J. M. Macfarlane; Vice-Presidents, Professor G. F. Atkinson and Professor D. P. Penhallow; Secretary, Dr. W. F. Ganong. The following new members were elected: Messrs. F. C. Stewart, C. O. Townsend, F. C. Newcombe, B. D. Halsted, J. B. Pollock, D. S. Johnson, L. M. Underwood, M. B. Waite. The President, Dr. W. G. Farlow, presided over the sessions, at which the following papers were read. Detailed abstracts of these will appear in the February number of the *Botanical Gazette:*

Some Peculiar Morphological Features of Paulownia imperialis: Dr. J. W. Harshberger, University of Pennsylvania.—This paper contained a discussion of noteworthy anatomical, ecological and morphological features in this introduced tree, particularly in buds, flowers, fruits and petioles.

The Life-history of Leuchtenbergia principis (abstract): Dr. W. F. Ganong, Smith College.—This paper is an attempt at a complete life-history of this rare and highly specialized species of Cactaceae, whose development has hitherto been quite unknown. This contribution is offered as the first of a series of life-histories in this family intended to supply data for a better understanding of phylogeny and of principles of morphology and ecology.

Observations upon Root-tubercles: Professor B. D. Halsted, New Jersey Agricultural College.—The author's observations showed that the root tubercles on spring-grown beans of a certain variety are much more abundant than upon autumn-grown plants of the same variety grown in the same soil. He discusses the reasons for this, finding that of temperature, directly or indirectly, most important, and points out the bearing of his facts upon some others which have puzzled students of the subject.

Further Notes on the Embryology of the Rubiaceæ: Mr. F. E. Lloyd, Teachers' College.—The author described very peculiar features in the development of the ovule and seed in several members of this family, including the development of as many as eight or ten macrospores in one ovule, very large antipodal cells, and the development of haustoria from the suspensor which absorb the endosperm.

The Inflorescences and Flowers of Polygala polygama: Mr. Charles H. Shaw, University of Pennsylvania.—In this paper it is pointed out that in this well-known species there are, in addition to the commonly recognized aerial and subterranean cleistogamic blossoms, other green cleistogamic blossoms borne above ground, the characters of which are remarkably intermediate between those of the other two kinds. A full comparison of characters makes this plain.

Observations on some Monocotyledonous Embryo-sacs: Mr. R. E. B. McKenney, University of Pennsylvania.—The author described an unusual method of development of the embryo-sac in two species of *Scilla*, and discussed its significance. Incidentally he gave attention to the centrosome question, and was unable to find them in any of the stages studied, thus confirming the work of Mottier and others who doubt their occurrence in the higher plants.

The Structure and Relation of the Crystal-Cells in Sensitive Plants: Mr. R. E. B. McKenney, University of Pennsylvania.—It is here pointed out that the crystals in cells sheathing the phloem in sensitive plants are insoluble in the ordinary reagents and possibly are made of insoluble silicates. They are also more abundant in the more

sensitive species, and peculiar features are found in the cells containing them. The author thinks it probable they are connected with the transmission of stimuli, the real place and nature of which are not yet known.

The Structure and Parasitism of Aphyllon uniflorum: MISS AMELIA B. SMITH, University of Pennsylvania.—This paper, preliminary in character, described the anatomy of this species and its characters of degeneration due to its parasitism upon a species of Aster.

On the Occurrence of Tubers in the Hepaticæ: DR. M. A. HOWE, Columbia University.—The author calls attention to the few known cases of tuber formation in Hepaticæ, and gives a detailed account of the anatomy of the tubers in *Anthoceros phymatodes*, a California species. He interprets these tubers as structures adapted to carry the life of the plant over a season of drought and also as playing a part in vegetative propagation.

Morphology of the Genus Viola: DR. HENRY KRAEMER, Philadelphia College of Pharmacy.—The author has made a detailed microscopical examination of selected characters, particularly in the flower, in several species of the genus *Viola* as a basis for the determination of the phylogeny of those species, and he gives a preliminary classification of those investigated. The work is the continuation of earlier published studies, and is part of a detailed investigation the author expects to make of the entire genus.

Influence of Electricity upon Plants: DR. G. E. STONE, Massachusetts Agricultural College.—The paper contains the results of experiments upon some 20,000 germinating plants to which electrical stimuli were applied by various methods and in different intensities. The author shows, by careful quantitative methods, that, within certain limits, germination is accelerated by the application of electricity; that there is a latent period and a minimum, optimum and maximum response, and that the relation between perception and stimulus follows Weber's Law.

Notes on the Germination of Spores: DR. C. O. TOWNSEND, Maryland Experiment Station.—The author describes results of experiments made to determine the effect upon their germination of exposure of spores in distilled water to different external conditions. Such exposure, as shown by comparison with control experiments, produced no appreciable effect upon the power of the spores to germinate, except when they were frozen, in which case they failed to germinate at all.

Sensitiveness of certain Parasites to the Acid Juices of the Host Plants: DR. ERWIN F. SMITH, Department of Agriculture.—This paper describes the author's experiments made to determine whether his hypothesis, based upon observation, is correct, that the slow progress of some bacterial diseases of plants is due to the restraining influence of the acid juices of the host plants. By comparison with the results of cultures in solutions of known acidity, he was able to confirm this belief.

Further Observations on the Relations of Turgor to Growth: DR. CARLETON C. CURTIS, Columbia University.—The author described the results of experiments in altering the strength of solutions in which certain fungi were being cultivated, and the effects of the transfer upon growth and turgor force.

Symbiosis and Saprophytism: PROFESSOR D. T. MACDOUGAL, University of Minnesota.—The author points out that the term saprophyte, or holosaprophyte, should be applied only to those forms that obtain organic products without the aid of mycorrhiza, etc., and that hitherto but a single seed-forming plant has been placed in this category. To this, however, the author now adds *Cephalanthera* as result of his researches.

Influence of Inversions of Temperature and Vertical Currents of Air upon the Distribution of Plants: Professor D. T. MacDougal, University of Minnesota.—As a result of observations made at Flagstaff, Arizona, the author concludes that inversions of temperature through diurnal changes and resultant air currents are more important in affecting plant distribution than has hitherto been supposed. Such changes tend to give minor highlands a more equable temperature than adjoining hills and cañons; to deflect zonal boundaries on great level plains and among minor topographical features, and to favor the growth of moisture-loving species along the margins of table-lands bordering on valleys.

Peculiarities of the Distribution of Marine Algæ in North America: Presidential Address, Dr. W. G. Farlow, Harvard University.—This address, illustrated by maps, discussed the distribution of North American Marine Algæ with particular reference to the factors, temperature, direction of ocean currents, character of coasts, etc., determining it. It is expected that it will later be published in full.

Some Appliances for the Elementary Study of Plant Physiology: Dr. W. F. Ganong, Smith College.—The author exhibited and described some simple and inexpensive appliances invented by him for illustrating some of the more fundamental physiological facts and phenomena of plants. These included a temperature stage, a clinostat, a self-recording auxanometer, an osmometer, a way of demonstrating the exchange of gases in respiration, a germination box, a useful way of preparing plants for transpiration weighings, and an efficient way of graduating growing roots, etc.

Some Notes on the Reproduction and Development of Nereocystis: Professor Conway MacMillan, University of Minnesota.—The author described his observations upon the life-history of this species, giving particular attention to the ecological aspects of the subject.

The Formation and Structure of the Dissepiment in Porothelium: Dr. E. A. Burt, Middlebury College.—The author traced the development of the fructifications of *Porothelium fimbriatum* from their origin to the tube stage, and contrasted the structure of the dissepiment in different cases.

Gelatin Culture Media: Dr. Erwin F. Smith, Department of Agriculture.—The author spoke of the value of gelatin culture-media and pointed out certain precautions to be observed in its use, particularly with reference to the fixing of the melting-point, the occurrence in it of sugar and of acid salts, and how the influence of these may be overcome.

Notes on the Relative Infrequence of Fungi upon the Trans-Missouri Plains and the Adjacent Foothills of the Rocky Mountain Region: Dr. Charles E. Bessey, University of Nebraska.—An abstract of this paper, given by Dr. Erwin F. Smith, showed that the author had noted, in the course of his fourteen years' collecting of fungi in the region named, that the number of species of fungi is large while the number of individuals is small, exactly the opposite of what is true in the same region for the flowering plants.

Different Types of Plant Diseases Due to a Common Rhizoctonia: Messrs. B. M. Duggar, Cornell University, and F. C. Stewart, New York Experiment Station.—The studies of the authors have shown that a stem rot of the carnation is due to a fungus agreeing precisely with *Rhizoctonia Betæ*, which has caused a serious rot of sugar beets in New York during the past year. The fungus is described and suggestions given for its treatment.

The Stem Rot Diseases of the Carnation: Mr. F. C. Stewart, New York Experiment Station.—The author points out that two distinct diseases of carnations have been confused. One is that described by him-

self and Mr. Duggar (in the preceding paper), and another is due to a *Fusarium*. The differences in the effects of the two are described.

W. F. GANONG,
Secretary.

SMITH COLLEGE, NORTHAMPTON, MASS.

ELEVENTH ANNUAL MEETING OF THE AMERICAN FOLK-LORE SOCIETY.

THIS meeting, held in connection with the affiliated societies, at Columbia College, on December 28th and 29th, was indicative of progress. According to the report of the Council the number of members had remained about constant, amounting to about five hundred. The report of the Treasurer showed that annual receipts and expenses were about equal. As the next volume of the series of Memoirs of the Society was announced a second part of 'Current Superstitions,' by Mrs. Fanny D. Bergen, including those relating to animals and plants; the first part of this work forms the fourth volume of the Memoirs, of which six volumes have now appeared.

As officers for 1899 were elected Professor C. L. Edwards, of the University of Cincinnati, President; Miss Alice C. Fletcher, Washington, First Vice-President; Mr. C. F. Lummis, Los Angeles, Cal., Second Vice-President. The Secretary and Treasurer hold over.

A committee was appointed to take into consideration the subject of the collection and record of folk-music, and to propose plans for the more adequate collection of negro folk-music in America.

The address of the retiring President, Dr. Henry Wood, of Johns Hopkins University, dealt with 'Folk-lore and metaphor in literary style.' The object of the speaker was to exhibit the dependence of the consciously artistic metaphor of literature to the traditional metaphor which forms its underlying basis.

Among papers read may be mentioned observations on 'The study of ethics among the lower races,' contributed by Dr. Washington Matthews. The writer considered the study of myths and traditions to be the safest guide in this field, which as yet has scarcely been traversed; but in the use of such material it is necessary to proceed with caution and employ the critical methods of modern science. If the gods of the tribe are considered as approving any action, or if the author of the tale appears to look for the approbation of his audience, it may be concluded that the act is regarded as possessing a moral quality, however, repulsive it may appear according to our ideas. That there exists a strong sense of the morality of conduct is obvious from the security of life; thus the Navahoes live in entire peace withouts courts or punishments. With this people there exists no penalty for theft; the thief is merely required to restore the stolen property. According to the myths incest is presumed to be confined to witches and cannibals. Truthfulness is not inculcated as a duty, yet Dr. Matthews had found the veracity of the people to be about equal to that of the whites. Expectation of reward in a future life does not exist. Conscience forms an effective power. The tales attest the frequency of active benevolence.

Mr. W. W. Newell offered some observations on the relation, in sun-myths, of the visual impression to the symbolic conception. He pointed out the antiquity and universality of the radiant disk as a solar symbol, arguing that the effect on the sight must have been constant. He considered the variety of the myths to be the result of causal explanations, the orb being considered as an object somehow to be got through the sky, treating of the Indian myths regarding the sun-bearer, who is often confounded with the orb he carries. Dr. Boas observed that among the Kootenay, for