tioned behaved in a manner similar to the primary roots, reacting more promptly in media offering considerable resistance to penetration than in looser media. In the case of secondary roots the lack of complete permanent georeaction in moist air, as contrasted with prompt and complete curvature in earth, seems to be due to the mechanical cause mentioned above in connection with primary roots.

On the Permeability of Certain Non-living Plant Membranes to Water: F. E. DENNY.

A report of a series of experiments with plant membranes in which quantitative measurements were made of their permeability to water. Membranes used were seed coats of peanut, cycad, almond, English walnut, pumpkin, bulb-scale of onion, etc. Measurements were made in an osmometer so constructed as to detect the passage through the membrane of very small quantities of water, and to keep the physical factors such as temperature and concentration of solution constant. In each test the exact area of membrane used was known. Results are reported showing the temperature coefficient for a rise of 10° C., and showing the permeability of the membranes as affected by the concentration of the bathing medium, direction of flow through membrane, and as influenced by certain chemical constituents of the membrane.

Influence of Temperature on the Moisture Intake of Seeds: CHARLES A. SHULL.

A critical analysis of the data obtained as to the rate of moisture intake by seeds possessing semipermeable coats (*Xanthium*) at various temperatures from 5 degrees to 50 degrees C. shows that the curve of intake is by no means so simple as was assumed by Brown and Worley for barley seeds. The curves of intake are essentially the same in character in certain seeds used, whether semipermeable coats are present or not, but differ in steepness according to the kind of seed used. The temperature coefficient for the rate of intake is decidedly lower than the Van't Hoff coefficient for chemical processes, and considerably lower than the values obtained with barley seeds. Moreover, plotting the logarithms of hourly rate of intake against temperatures does not yield straight lines. It is evident, therefore, that the conclusions reached by Brown and Worley are not applicable generally.

Some Experiments on Galvanotropism: C. H. FARR. (Introduced by R. A. HARPER.)

The Structure of the Bordered Pits of Conifers and Its Bearing upon the Tension Hypothesis of the Ascent of Sap in Plants: I. W. BAILEY.

The tension hypothesis of the ascent of sap in plants, as interpreted by Dixon, postulates continuous columns of water that are entirely free from bubbles (0.02 mm. or more in diameter) of air or gas. However, even if continuous columns of water are present throughout the year, which has not been demonstrated conclusively, it remains to be shown how high tensions can arise and be maintained in the tracheids of tall trees. The pit membranes of Conifers are not entire septa, and are not impervious to undissolved gases and solids, as has previously been supposed to be the case. They are porous or sieve-like in structure, and the surface tension of the sap, in the sieve-like pit membranes of various Conifers, is not sufficiently great to prevent the penetration of air or gas, under the tensile strains that are supposed, by Dixon, to occur in tall trees.

H. H. BARTLETT,
Secretary

SOCIETIES AND ACADEMIES

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 546th meeting of the Society was held in the Assembly Hall of the Cosmos Club, Saturday, December 4, 1915, and called to order by President Bartsch at 8 P.M. with 55 persons present.

On recommendation of the council Dr. R. W. Shufeldt, Washington, D. C., and Arthur deC. Sowerby, Tien Tsin, were elected to active membership.

On recommendation of the council the following resolutions were read and adopted:

WHEREAS: Dr. George M. Sternberg, former Surgeon General of the U. S. Army, a distinguished worker in the biological sciences as applied to medicine, long time an active member of the Biological Society of Washington and its president during the years 1895 and 1896, has passed from this life, therefore be it

Resolved: That the Biological Society of Washington keenly regrets his death and offers its warmest sympathy to Mrs. Sternberg, and will always be grateful to his memory for the important part which he took in the affairs and discussions of the society and for the distinction which his eminent name adds to its list of past presidents.

Signed L. O. HOWARD,
FREDERICK V. COVILLE,
PAUL BARTSCH

Under the heading Brief Notes, Exhibition of Specimens: Dr. O. P. Hay exhibited the skull of a walrus from the southern Atlantic coast of the United States and called attention to other specimens of walrus from localities now far south of its present range. It was Dr. Hay's opinion that the walrus had followed the retreating ice sheet northward. Dr. L. O. Howard called attention to the cluster-fly (*Pollenia rudis*), an insect resembling the house-fly but collecting in houses in autumn and leaving a yellow stain when crushed. Its life history was unknown until recently a foreign entomologist has shown that the larvæ are parasitic in earthworms in France. Dr. Howard is having large numbers of earthworms examined for such larvæ, but so far without success. He hoped that any one finding any grub parasitic in earthworms would communicate with him.

The first paper of the regular program was by Dr. Charles H. T. Townsend, "Identification of the Stages in the Asexual Cycle of *Bartonella bacilliformis*, the Pathogenic Organism of Verruga, and their Bearing on the Etiology and Unity of the Disease." The author finds that the complete asexual cycle of *Bartonella* can be interpreted from the figures and descriptions published up to April, 1913, and prior to the inception of the verruga work of Dr. R. P. Strong of the Harvard School of Tropical Medicine, and his associates. The six identifiable stages in these figures and descriptions are as follows:

I. *Early schizonts*—Gastiaburú & Rebagliata, Sept., 1912, in liver and eruption-tissue (eruptive phase).

II. *Maturing schizonts*, III. *Early merozoites*, IV. *Elongated merozoites*—Mayer, Rocha-Lima & Werner, April, 1913, in vascular endothelial cells of eruption-tissue (eruptive phase).

V. *Immature gametes*—Darling, 1911, in blood (fever phase).

VI. *Mature gametes*—Barton, 1905, in blood (fever phase).

The second and last paper of the program was by A. A. Doolittle "The Mississippi River Dam at Keokuk, Ia.; Its Effect upon Biological Conditions, especially those of the Plankton." Mr. Doolittle said:

The Bureau of Fisheries has been examining the new conditions caused by damming the Mississippi River at Keokuk, Ia., to develop electric power. The level of Lake Cooper, as the impounded waters are called, reaches northward for 54 miles, and must be maintained between 34 and 40 feet above 0 of the river gauge at Keokuk. In the lower portion of the lake the gorge of the Des Moines Rapids and its tributaries are filled. In the middle portion much island and farm land with standing forests are inundated. Water Persicaria is becoming established here. In the upper portion levees protect the threatened farm lands, which are kept drained by pumping stations.

There are present the usual characteristics of a river-lake: increased regularity of water stages, decreased current, decreased turbidity, establishment of aquatic plants. The most obvious and immediate effects, biologically, are, destruction of the famous mussels of the rapids, and interference with the migration of fish. Plankton is greatly increased; zooplankton in the Entomostracan species *Moina micrura, Diaphanosoma brachyura* and *Cyclops viridis*, phytoplankton species in *Converva, Anabaena, Clathrocystis*. Above the influence of the dam 50 Emtomostracan individuals, more or less, were present per cu. yd. throughout the summer. At Keokuk there were 1,500 in July, 270,000 in August, and 1,500 in early September, averaging about 10,000 per cu. cm. Green Algae was present in traces in the river proper; at Keokuk 0.14 cu. cm. in July, 29 cu. cm. in August, and 5 cu. cm. in early September. Blue Green Algae increased from traces in July to 2.6 cu. cm. in August and September at Keokuk. The river below the dam was enriched upwards of 100 times in mid-season. In weedy waters heavy bodied Entomostraca abounded; *Sida Scapholeberis, Simocephalus*, with a maximum of 178,000 individuals per cu. yd. whose volume was 23 cu. cm. Streams and sloughs filled from the lake ripened earlier than the lake, and maintained about 50,000 lake species of Entomostraca per cu. yd. Self-fed tributaries usually had plankton differing from that of the lake, sometimes Protozoa (*Euglena*) dominant, or Rotifers (*Asplanchna*), or their own Entomostracan forms. These could be traced into the lake, but they did not persist there. It is evident that there is a vast increase of fundamental food for some species of fish or their young. The discussion was illustrated with map, diagrams and slides showing conditions existing in the summer of 1914.

The paper was discussed by the chair, and by Messrs. Coker, Marsh and William Palmer.

The society adjourned at 10.10 P.M.

M. W. Lyon, Jr.,
Recording Secretary