and is abundant in embryonic tissues; its exact rôle cannot be defined. The relation of the element sodium to the organism is most problematical; it may exert a stimulating effect upon protoplasm, or its presence in the substratum may facilitate beneficial chemical changes. It does not enter into the composition of the plant in appreciable quantity however. The bulletin does not give adequate treatment to the pure mechanical functions of salts in the maintenance of turgidity, and it might have gained in value to the agricultural experimenter by the delineation of lines of practical investigation to be followed. It is highly controversial in parts and one is impressed with the very great differences of conclusions which may be reached from a consideration of the same facts by a comparison with the sections of Pfeffer's Plant Physiology or any other publication treating the same subject.

D. T. MACDOUGAL.

*Science Sketches: Chemistry its Evolution and Achievements.* By FERDINAND G. WIECHMANN, PhD. New York, William R. Jenkins. 1899. Pp. vii + 176.

The study of the evolution of chemical science from its earliest beginnings possesses a fascinating interest. The author of this little book has endeavored so to present the subject as to make it useful to all who take a general interest in science. In matters which pertain to the development of chemistry before the nineteenth century the treatment is satisfactory. For the present century the book does not altogether succeed in tracing the *evolution* of the science. It seems rather to give a series of more or less isolated facts about the growth of chemical knowledge than to give a clear picture of the development of the science. Perhaps this should not be too severely criticised, for it is immensely difficult to give such a picture for the period in question.

If the theory that diamonds are extra-terrestrial in origin has actually been proposed by any one as suggested on p. 117, it must have arisen from a curious confusion as to Moissan's thought in the matter. Moissan says that in discovering the diamonds in the meteorites he has 'caught nature in the act,' meaning, not that the diamonds were in the meteorites as they flew through space, but that they were formed during the passage of the meteorite through the air and its subsequent cooling. This thought seems to have guided Moissan in his successful production of diamonds.

In the discussion of liquid air the failure to mention the pioneers Cailletet and Pictet is remarkable. Some reference should also have been made to the Linde machines by which liquid air is now produced in quantity on essentially the same principle as that used by Tripler.

W. A. NOYES.

BOOKS RECEIVED.

*Scientific Papers.* PETER GUTHRIE TAIT. Cambridge, The University Press. 1900. Vol. II. Pp. 500.

*Railroad Construction, Theory and Practice.* WALTER LORING WEBB. New York, John Wiley & Sons; London, Chapman & Hull, Ltd. 1900. Pp. x + 456.

*Introduction to Science.* ALEXANDER HILL. London, J. M. Dent & Co. Pp. 140.

*SCIENTIFIC JOURNALS AND ARTICLES.*

THE April number (Vol. I., No. 2) of the *Transactions* of the American Mathematical Society contains the following articles: 'On the metric geometry of the plane $n$-line,' by F. Morley; 'On relative motion,' by Alexander S. Chessin; 'Plane cubics and irrational covariant cubics,' by Henry S. White; 'A purely geometric representation of all points in the projective plane,' by Julian Lowell Coolidge; 'The decomposition of the general collineation of space into three skew reflections,' by Edwin B. Wilson; 'A new method of determining the differential parameters and invariants of quadratic differential quantics,' by Heinrich Maschke; 'On the extension of Delaunay's method in the lunar theory to the general problem of planetary motion,' by G. W. Hill; 'On the types of linear partial differential equations of the second order in three independent variables which are unaltered by the transformations of a continuous group,' by J. E. Campbell.

THE May number of the *Bulletin* of the American Mathematical Society contains the following articles: 'On the geometry of the circle,' by Dr. Virgil Snyder; 'Isomorphism between

certain systems of simple linear groups,' by Professor L. E. Dickson; 'The Hessian of the cubic surface,' by Dr. J. I. Hutchinson; 'Note on the group of isomorphisms,' by Dr. G. A. Miller; a review by Professor F. S. Woods of two memoirs by Lobachevsky, translated from the Russian by Engel; a review by Professor James Pierpont of Vogt's Leçons sur la resolution algébrique des equations; a review by Professor L. E. Dickson of Young and Linebarger's Elements of the Differential and Integral Calculus; a review by Mr. J. K. Whittemore, of Pascal's Calculus of Variations; 'Notes'; and 'New Publications.'

The *Botanical Gazette* for April contains a new study of *Isoetes* by Dr. R. Wilson Smith, of the Hull Botanical Laboratory. It is concerned with the structure and development of the sporophylls and sporangia, and is illustrated by eight plates. The paper is a valuable contribution to our knowledge of the structure and relationships of a much vexed group. Dr. Roland Thaxter publishes concerning the structure and reproduction of *Compsopogon*, a peculiar group of filamentous blue-green algæ, andillustrated by a single plate. Dr. J. C. Arthur publishes the results of cultures of Uredineæ in 1899, giving eleven species whose aecidial and teleutosporic forms have been definitely connected. C. Sauvageau writes concerning the origin of the thallus, alternation of generations, and the phylogeny of *Cutleria*. The number also contains the usual installment of book reviews, notes for students, and items of botanical news.

The *News Bulletin*, Number 4, of the New York Zoological Society, contains several fine pictures of animals now in the Society's park, as well as two showing methods of installation. The most striking of these is the Alligator Pool in the reptile house which with its background of palms has a pleasing suggestion of the tropics about it; the pool proper is 35 feet long, 9 feet wide and 4 feet deep, giving ample space for its occupants. It is noted that the largest alligator has added four inches to the length of twelve feet and one inch which it possessed when brought from Indian River in July, 1899. This seems rather a rapid rate of growth for so large an alligator. The water birds are reported to be passing successfully through their spring moult and we look to the park for some tangible evidence for or against the vexed question of color change in feathers without moult. In the bird house the experiment has been tried of decorating the walls which form the backs of the cases with landscapes and this has been done so successfully by Mr. Robert Blum that the cranes have several times tried to walk through the wall. A call is made for new members as funds are needed for various improvements and for immediate expenses, and it is to be hoped that the admirable showing already made may cause this call to be listened to.

The leading article in *The American Naturalist* for April is by George James Peirce, on 'The Relation of Fungus and Alga in Lichens,' and the author considers that the association is one of parasitism of the former upon the latter. Howard Crawley describes 'A Flagellated Heliozoan,' which he considers a form of *Vampyrella lateritia*, and H. S. Jennings presents a paper on 'Reactions of Infusoria to Chemicals: a Criticism' of a paper by W. E. Garrey. L. B. Walton discusses 'The Basal Segments of the Hexapod Leg,' attempting to homologize and account for the origin of these parts, and R. W. Shufeldt has some 'Notes on the Psychology of Fishes.' Frank C. Baker describes 'A New Museum Tablet' of binders' board, edged with black and faced with manilla paper, and T. D. A. Cockerell treats at some length the question of 'The Lower and Middle Sonoran Zones in Arizona and New Mexico,' in which he shows that in the arid west the influence of fluctuations of temperature is much greater upon cultivated than upon wild plants, these latter having become adapted to their environment. Under 'Synopses of North American Invertebrates' Harriet Richardson gives a second part of The Isopoda. The reviews are almost entirely confined to those of zoological literature.

*The Plant World* for April opens with a paper by Mary G. Fanning, on 'Some Algæ in Ornamental Waters.' Sadie F. Price notes 'Abnormal Leaves and Flowers,' E. W. Berry 'Abnor-

mal Forms of Dogwood,' Willard N. Clute has a fifth article on 'The Making of a Herbarium,' and Mrs. Caroline A. Creevey concludes the series devoted to 'Plant Juices and their Commercial Values' with a brief paper on dye plants. C. F. Saunders notices 'The Small Mistletoe in Pennsylvania,' and the editor comments on forest preservation. Charles Louis Pollard, in the supplement presenting the 'Families of Flowering Plants,' treats of the order Glumiflorae—the grasses and sedges.

## SOCIETIES AND ACADEMIES.

### BIOLOGICAL SOCIETY OF WASHINGTON.

THE 323d regular meeting was held on Saturday, April 5th. C. H. Townsend spoke of 'The Flying Foxes of the South Pacific Islands' under this title describing the fruit bats, *Pteropus*, found during the recent voyage of the United States Fish Commission steamer *Albatross*, and illustrating his remarks with lantern slides and specimens. The speaker stated that no bats were found in Polynesia to the eastward of the Tonga and Samoa groups although search was made for them.

A large rookery of flying foxes on the island of Tongatatu was visited and many fine photographs were taken showing the bats clinging in large numbers to the tree-tops. The rookery is located in a small native settlement near Nukalofa, the bats about 8000 in number, occupying the tops of 14 large trees in the midst of the village. The rookery is carefully protected by the chief of the village, who permitted the naturalist to take away only three specimens. It was understood that they had been guarded by the people from time immemorial, although the animals are frugivorous and evidences of their depredations on the island fruits were found constantly.

Mr. Townsend collected many flying foxes at Namuka Island (Tonga group), where they were found scattered in the forest. They were seen in the Fiji and Samoan islands also but no specimens were secured.

In a paper entitled, 'Acorns as Food,' Mr. V. K. Chesnut, after briefly mentioning the various places where sweet acorns are, or were, used for human food along the Mediterranean and in the United States and Mexico, gave a special illustrated account of the interesting manufacturing and chemical processes which have gradually been evolved by the Indians of Mendocino County, California, to extract the tannin and the bitter principle from the bitter acorns. The acorns of the black oak (*Quercus californica*), chestnut oak (*Q. densiflora*), and valley white oak (*Q. lobata*), especially, constitute an important and almost essential portion of the food of these Indians during the greater part of the year.

Mr. W. A. Orton spoke on the 'Sap-flow of the Maple' in spring, giving a brief description of the methods of making maple sugar and a report of some of the investigations made at the Vermont Experiment Station under the direction of Professor L. R. Jones. Sap pressure and flow in the sugar-maple occurs at intervals from October to May, when the weather conditions are favorable, but is most active for a month during March or April. To produce sap-flow it is necessary that the temperature should rise from several degrees below the freezing-point to some degrees above it. If this change be at all sudden there will be developed a pressure within the tree of 15–25 or more lbs. per square inch. Charts showing the relation of the temperatures as measured by a self-recording thermometer, to the sap-pressure recorded by a self-recording steam-pressure gauge attached to a maple tree were exhibited, and it was shown that in general there was a very close relation between sudden rises of temperature and of sap-pressure, there being pressure on warm days followed by suction at night. Sap flow diminished toward the top of the tree. It was greatest in the outer part of the tree, but continued longer from deeper in the wood. It was concluded that the cause of sap-flow was physical rather than physiological, being due to the expansion of confined air and water in the vessels of the wood, brought about by a sudden rise of temperature. There is little if any root-pressure during the season of sap-flow, and as the trees are dormant the old question of ascent of water from roots to leaves hardly enters into the problem. The direction of sap-flow was studied by injecting lithium into the tree near the tap-hole and testing the sap with a spectroscope. It was found that