It is interesting to note, as pointed out by Mr. Lyon, that this unusually large number of young is coincident with the possession of four mammæ, whereas two is the number known in other bats.

That the mammæ of an animal should be as many as the normal number of young produced would appear to be a reasonable proposition, but that the normal number of young equals the number of mammæ is quite a different one, from which many exceptions will suggest themselves. For instance, the seals have four mammæ, yet one young is the rule and two the exception among the species with which I am familiar.

The fact of an increased number of mammæ in these bats correlates well with the observed fact of an unusual number of young, and I would be pleased to know of farther observations that may tend to establish what is the average number.

HENRY L. WARD.
PUBLIC MUSEUM, MILWAUKEE.

BOTANICAL NOTES.

PLANT CELL STUDIES.

UNDER the title of 'Studies on the Plant Cell' Dr. B. M. Davis is bringing together in a series of articles published in the *American Naturalist* (May, 1904, to April, 1905) what is known of the structure and activities of the plant cell. This is necessary because of the inadequacy and incompleteness of the accounts to be found in even the most recent botanical text-books. The author hopes, also, to 'help to change an attitude toward investigations on the plant cell that is unfortunately too prevalent among botanists,' *i. e.*, to regard cytology as a very special field with an elaborate technique beyond the capabilities of the average botanist. In carrying out this plan the author divides the subject into six sections, viz.: (I.) The structure of the plant cell; (II.) the activities of the plant cell; (III.) highly specialized plant cells and their peculiarities; (IV.) cell unions and nuclear fusions in plants; (V.) cell activities at critical periods of ontogeny in plants; (VI.) comparative morphology and physiology of the plant cell. The treatment under each of these heads, as far as published, is very satisfactory, and the author has certainly succeeded in making a most lucid statement in regard to every point. Where necessary he does not hesitate to indicate our lack of knowledge in regard to any structure, as when he discusses the nucleolus, and says that its substance is not well understood. Yet he does not refrain from stating his belief where it may be an aid to a clearer general understanding of the subject, as in the discussion of the pyrenoid, which he conjectures will prove to be a metabolic center of the chromatophore which is more or less prominent according to conditions of nutrition, whose most conspicuous activity is 'the formation of starch by the direct transformation of portions of its substance.'

In the discussion of direct-cell division the author suggests the possibility that this may be a reversion to early ancestral conditions, mitosis being regarded as phylogenetically a later process. With regard to centrospheres the author recognizes their existence in thallophytes only. As to the theory of the permanence of the chromosome Dr. Davis says 'it can hardly be said that the doctrine is established.'

In passing we note that the author regards the plasmodium of the slime molds as a coenocyte, and further that coenocytes of all kinds are to be regarded as multinucleate cells, and therefore units, instead of compound structures whose cells have not become separated by walls.

In the last article (IV.), devoted to cell unions and nuclear fusions, the author draws a sharp line of distinction between those which are sexual and those which are asexual. Under the latter (asexual) he includes the fusions of amoeboid cells to form plasmodia, the nuclear fusions in the teleutospores of smuts and rusts, and the nuclear fusions connected with 'double fertilization.' The remaining articles of this instructive publication will be looked for with keen interest.

LEAF INTUMESCENCES.

IN the Sixteenth Annual Report of the Missouri Botanical Garden Dr. Hermann von Schrenk contributes an article on the interesting problem of the cause of intumescences

which sometimes occur on the leaves of various plants. After a historical discussion of leaf-intumescences as observed by other investigators, the author describes the experiments which he made by spraying cauliflowers with various chemical substances. He found that by using ammonium copper carbonate he could produce intumescences at will, varying from minute papillae to large wart-like excrescences, dependent upon the size of the drops of the spray. Sections of these artificially produced intumescences showed that the mesophyll cells had become enormously enlarged, first lifting up, and later rupturing the epidermis. The giant cells were very thin-walled, and occurred in hair-like rows in which the outer cells soon died and became filled with air, while in those lying deeper 'very much reduced chlorophyll grains could be found.'

By means of careful experiments the author concludes that the peculiar growth of these cells is due to chemical stimulation of a kind hitherto unrecorded. Attention is directed to the fact that somewhat similar intumescences containing giant cells are formed as a result of insect punctures, which it is surmised are due to 'some chemical influences exerted by the parent insect, the egg, or the larva.' It is to be hoped that the experiments which the author has now in progress may throw additional light upon this interesting subject, especially the connection between these chemically produced giant cells and those produced in insect galls.

THE CALIFORNIA POPPIES.

Dr. E. L. Greene, of the United States National Museum, publishes a revision of the California poppies (species of *Eschscholtzia*) in the June number of *Pittonia*. The paper is a continuation of work begun more than twenty years ago, and continued from that time to the present. The result is somewhat startling, even in this day of many species of hawthorns and violets. We may well repeat the author's remark, 'that the species are so numerous, one might well regret,' which he follows with this his own defense: 'but nature has yielded them, doubtless even more of them than are here enumerated.' All told the paper describes 112 species, about three fourths of which are described here for the first time. More than two thirds of all the species enumerated are annuals.

THE SMUT-FUNGI OF NORTH AMERICA.

Under the title of 'North American Ustilagineae' Dr. G. P. Clinton publishes in the *Proceedings of the Boston Society of Natural History* (Vol. 31, No. 9) a paper of two hundred pages on the systematic botany of the smut-fungi of North America. The paper is the result of ten years of work (the last two years in the cryptogamic laboratory of Harvard University), during which the author has engaged in: (1) economic studies of the species found in Illinois, published in bulletins 47 and 57 of the Illinois Agricultural Experiment Station; (2) systematic studies, of which the present paper is the outcome; (3) the distribution of exsiccati, one century of which appeared in January, 1903; (4) spore germination studies, now under way.

In the present paper the specific descriptions are based upon the author's examination of the available material, which includes practically all of the European and American exsiccati. This insures a broader treatment than the order has hitherto received at the hands of fungologists. It is significant of the conservative tendencies of the author that although he describes 205 species and varieties, he finds it necessary to make but nine new species. Nor does he find it necessary to erect any new genera, so that his 'new names' are but three.

The order includes two families, Ustilaginaceae, represented by *Ustilago* (72 species), *Sphacelotheca* (16), *Melanopsichium* (1), *Cintractia* (14), *Schizonella* (1), *Mycosyrinx* (1), *Sorosporium* (9), *Thecaphora* (9), *Tolyposporella* (8), *Tolyposporium* (2), and *Testicularia* (1); and Tilletiaceae, represented by *Tilletia* (19 species), *Neovossia* (1), *Tuburcinia* (2), *Urocystis* (12), *Entyloma* (127), *Burrillia* (3), *Doassansia* (11), and *Tracya* (1).

An admirable specific systematic list of host plants; a table showing the distribution of our species in other countries; a list of the more

important articles relating to the smut-fungi, and a full index complete this important contribution to our knowledge of this group.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

ARCHEOLOGICAL NOTES.

ICHTHYOLOGICAL NAMES.

MUCH attention was given by the older ichthyologists, notably Conrad Gesner, Rondelet, Artedi, Linné and Cuvier, to classical names of fishes, and their identification with well-known forms. In this country Louis Agassiz, upon the occasion of his rediscovery of *Parasilurus aristotelis* (*Proc. Amer. Acad.*, III., p. 325), was one of the first to bring home the importance of comparing ancient and modern vernacular names of plants and animals, his remarks being ably seconded by a later communication from Professor Sophocles in the same volume.

Within recent years President Jordan and H. A. Hoffmann[1] have attempted a thoroughgoing revision of classic and modern designations of the Hellenic fish fauna, overlooking, however, some of the best work that has been done by their predecessors in this field. For instance, they seem to have taken no heed of the extremely valuable historical and bibliographical works of Artedi, nor of the indispensable commentaries of A. Koraes on the fishes mentioned by Galen and Xenocrates. *À propos* the last-named author, we owe to Koraes the correction of Artedi's error in confusing the physician Xenocrates with the illustrious philosopher of the same name who flourished, as the Swedish naturalist gravely tells us, '*anno mundi 3630, circiter.*'

Amongst the numerous attempts that have been made to identify Aristotelian species, two or three are of superior merit. These are the 'Index Aristotelicus,' published by the Berlin Academy, Aubert-Wimmer's 'Aristoteles Tierkunde' (Leipzig, 1868), and Sundevall's 'Thierarten des Aristoteles' (Stockholm, 1863). A work that might serve as a model for a revised *Synonymia Piscium Græca*, apart from the author's peculiar ideas on animal symbolism, is D'Arcy W. Thompson's 'Glossary of Greek Birds' (Oxford, 1895). Writing in the same year, H. Lewy argues very plausibly for a Semitic origin of a great many Greek names of plants and animals, including fishes. Thus, when we say tunny, carp, chameleon, etc.,—though Mark Twain can not consistently allow this—we approach pretty closely to the speech of Adam. Other contributions of real value that deal with the etymology of the Greek fauna are the following: Nicolas C. Apostolides, 'La pêche en Grèce' (Athens, 1883); T. de Heldreich, 'La faune de Grèce' (Part I., Athens, 1878); D. Bikélas, 'Sur la nomenclature de la faune grecque' (1878), and Dr. Erhard's 'Fauna der Cycladen' (Leipzig, 1858). Finally attention may be called to the newly discovered Byzantine 'Fish Book,' a work dating presumably from the thirteenth century, for the elucidation of which scholars are indebted to Professor Krumbacher, of Munich.

Before leaving this subject, there is one feature in Homeric zoology which deserves notice. Fish, the great delicacy of Attic days, never enters into the diet of the great chiefs, who partake of great meals of roast meat in contradiction of all that we know of any historical Greeks, as Professor Mahaffy has shown, from the earliest to the present day. Even the early athletes trained on cheese, and the people were probably never a meat-eating race. The Dublin professor is inclined to believe, with all its implied significance respecting authorship, that the exclusion of fish from Homeric banquet scenes is 'a piece of deliberate archaism.

PREHISTORIC DARWINIANS.

ZELLER and Osborn have critically investigated the extent to which evolutionary ideas were developed among Ionian philosophers several centuries before our era, and it is doubtful if their main conclusions can be controverted. One must marvel, therefore, at the fertile ingenuity of a French writer, M. Henri Coupin,[2] who has out-Champollioned Cham-

[1] 'A Catalogue of the Fishes of Greece,' etc., *Proc. Acad. Nat. Sci. Phila.*, 1892, pp. 231–285.

[1] J. P. Mahaffy, 'Problems in Greek History,' p. 49 (London, 1892).

[2] 'Le poulpe et la croix gammée,' *La Nature*, May 20, 1905, p. 396.