THE ONONDAGA LAKE SQUIDS.

SINCE sending my note concerning the alleged discoveries of squids in Onondaga Lake I have learned through Principal Wilson of the Putnam School at Syracuse that a third specimen is said to have been secured at a time, I should infer, before the other two were taken. This story, however, has not been traced to its starting point. Much more interesting, as apparently corroborative testimony of the existence of these creatures in Onondaga Lake, is the circumstantial relation given to me by Professor J. M. Scott, teacher of sloyd in the Syracuse Public Schools, a son of Principal W. H. Scott of the Porter School. On reading the accounts and seeing the cuts of the squids alleged to have been taken by Mr. Terry, as printed in the Syracuse *Herald,* he was reminded of a find of his own, in regard to which he writes me as follows:

"Some twelve or thirteen years ago a number of boys, of whom I was one, were fishing just to the left of the outlet and had a small scoop net for catching crabs and minnows. Another lad and myself went ashore, and in fooling around in the mud near the shore looking for crabs I saw something queer and got it in the net. We took it to an old man who claimed to be a sailor and he told us it was a squid. Not knowing it was of any value whatever, we amused ourselves with it awhile and left it in the water after having killed it. I have since thought it was a queer find." JOHN M. CLARKE.

THE FOSSIL TREE BRIDGE IN THE ARIZONA PETRIFIED FOREST.

TO THE EDITOR OF SCIENCE: I have recently learned from a friend who has visited the petrified forest in Arizona that the famous natural bridge is in danger of being washed away. It consists of a log spanning a gully about twenty feet in width and from ten to twelve feet in depth. Each end of the log is embedded in sandstone formed of the original deposit. Spring rains in recent years have widened the gully, and threaten to demolish the natural abutments. I write to call the attention of the readers of SCIENCE to the matter, hoping that some one may be in a position to influence the authorities in that section of Arizona to take some steps to preserve this remarkable tree.

HENRY F. OSBORN.
AMERICAN MUSEUM OF NATURAL HISTORY.

SHORTER ARTICLES.

MENDEL'S PRINCIPLES OF HEREDITY AND THE MATURATION OF THE GERM-CELLS.

IN view of the great interest that has been aroused of late by the revival and extension of Mendel's principles of inheritance it is remarkable that, as far as I am aware, no one has yet pointed out the clue to these principles, if it be not an explanation of them, that is given by the normal cytological phenomena of maturation; though Guyer and Juel have suggested a possible correlation between the variability or sterility of hybrids and abnormalities in the maturation-divisions, while Montgomery has recognized the essential fact in the normal cytological phenomena, though without bringing it into relation with the phenomena of heredity. Since two investigators, both students in this University, have been led in different ways to recognize this clue or explanation, I have, at their suggestion and with their approval, prepared this brief note in order to place their independent conclusions in proper relation to each other and call attention to the general interest of the subject.

Bateson, in his recent admirable little book on Mendel's principles, is led to express the surmise that the symmetrical result in the offspring of cross-bred forms 'must correspond with some symmetrical figure of distribution of gametes in the cell-divisions by which they are produced' (p. 30). It is needless to remind cytologists that the study of the maturation-mitoses, especially in the case of arthropods, has revealed a mechanism by which such a symmetrical distribution may be effected; for the germ-cells in the great majority of cases arise in groups of fours, formed by two divisions, of which one is in many cases described as differing in character from the ordi-

nary somatic mitoses in that it separates whole chromosomes by a transverse division ('reducing division' of Weismann). Wholly independently of Mendel's conclusions a considerable number of cytologists (vom Rath, Rückert, Häcker) early reached the conclusion that the chromatin-masses from which arise the 'Vierergruppen' (tetrad-chromosomes, or their equivalents) represent double or 'bivalent' chromosomes, each of which was conceived to arise by the union (synapsis), end to end, of two single chromosomes. An actual conjugation of chromosomes in synapsis was inferred by Rückert in some cases (*e. g.*, in *Pristiurus*), and more recently described in a far more detailed way in *Peripatus* and certain insects by Montgomery (1901), who reached the remarkable conclusion that 'in the synapsis stage is effected a union of paternal with maternal chromosomes, so that each bivalent chromosome would consist of one univalent paternal chromosome and one univalent maternal chromosome.' The ensuing transverse or reducing division, therefore, leads to *the separation of paternal and maternal elements and their ultimate isolation in separate germ-cells.* This conclusion rested upon evidence too incomplete to warrant its acceptance without much more extended investigation—it was, indeed, more in the nature of a surmise than a well-grounded conclusion. During the past year Mr. W. S. Sutton, working in my laboratory, has obtained more definite evidence in favor of this result, which led him several months ago to the conclusion that it probably gives the explanation of the Mendelian principle. In the great 'lubber grasshopper' *Brachystola* the chromosomes of the spermatogonia were found to be grouped in eleven pairs of different sizes, which reappeared in essentially the same relation through at least eight successive generations of these cells. In synapsis the graded pairs are converted into similarly graded bivalent chromosomes that appear to arise by a conjugation, or union at one end, of the two members of each of the earlier pairs. Cogent reason is given by Sutton for the conclusion that the chromosome-pairs consist each of a paternal and a maternal member. It is known that in fertilization chromosomes are contributed in equal numbers by the two gametes ('Van Beneden's Law'). Boveri's recent remarkable experiments on sea-urchins have proved that a definite combination of chromosomes is necessary to complete development, and strongly suggests, if they do not prove, that the individual chromosomes stand in definite relation to transmissible characters taken singly or in groups. Every nucleus, however, contains two such combinations; for the facts of parthenogenesis and merogony prove that either the paternal or the maternal group alone may suffice for complete development. It is a natural conclusion from these facts that the constant morphological differences of the chromosomes observed in the grasshopper are correlated with constant physiological differences. If such be the case it appears highly probable, though the argument can not here be presented in all its weight, that those of corresponding size, associated in pairs, are the paternal and maternal homologues (*sit venia verbo*)! Sutton has pointed out that if this be indeed the case, the union of these homologues in synapsis, and their subsequent separation, which this preliminary union involves, in the reducing (second maturation) division, leads to the members of each pair being isolated in separate germ-cells; and this gives a physical basis for the association of dominant and recessive characters in the cross-bred, and their subsequent isolation in separate germ-cells, exactly such as the Mendelian principle requires.

A similar conclusion was subsequently, but independently, reached by Mr. W. A. Cannon, of the Department of Botany, though by a different and less direct path of approach. A study of hybrid cotton-plants, which are fertile, showed the maturation-divisions to be entirely normal, in contradistinction to the sterile hybrids of *Syringa*, where Juel has shown that the maturation-divisions are abnormal in character. It thus appeared that a sifting apart of paternal and maternal elements, such as Mendel's law demonstrates to occur, cannot be explained on the hypothesis of irregularities in the maturation-divisions (as had been suggested by Guyer's earlier work

on pigeon-hybrids). Cannon therefore concluded, on this *a priori* ground, that such a separation of paternal and maternal elements must occur in the normal maturation-divisions, not only in the cross-bred, but also in the normal forms, and that in the character of these divisions must be sought the basis of the law. It is interesting that such a conclusion should have been reached by a botanist, on account of the fact that most recent botanical workers in this field have reached the result that transverse or reducing divisions do not occur in the maturation of the germ-cells in higher plants. It has, however, become clear that only the most exhaustive study of the most favorable material, particularly in the earliest stages of the maturation-divisions, can positively decide this question, and the importance of the most accurate and detailed further study of the phenomena is now manifest. The results I have indicated are already in part in press and will in due time be fully discussed by their authors. Should the study of the maturation-divisions indeed reveal the basis of the Mendelian principle we shall have another and most striking example of the intimate connection between the study of cytology and the experimental study of evolution.

EDMUND B. WILSON.

ZOOLOGICAL LABORATORY OF
COLUMBIA UNIVERSITY,
December 11, 1902.

THE ENLARGEMENT OF THE NAPLES STATION.

THE increased number of investigators who make each year the pilgrimage to Naples, as well as the development there of new departments of investigation, have made it imperative to enlarge the present buildings of the station. The plans for the new construction are finished, the money generously contributed, and the building is about to begin. The city of Naples, proud of her renowned Station, has given the ground for the new part. The new building will be placed near the end of the larger of the two present ones. The exterior of the new part is exactly like the larger, which is also the older, of the present buildings. The capacity of the working part of the Station will be doubled by this addition.

The new building will be devoted, in the main, to physiology and to physiological chemistry, for each of which there is to be a large laboratory, well equipped with the most modern appliances. In addition to these there will be a number of smaller rooms for special physiological work. A new feature will be rooms in which the water in the aquaria can be kept throughout the year at any desired temperature.

In the new building there will also be a large number of small rooms for zoological work—the old 'tables' in the big room opposite the present library will be given up, and the room itself added to the library. Thus the new plan, when carried out, will not only give more room, but also better accommodations.

With the awakening of zoological research in this country during the last twenty years there has been a steady increase in the number of those who go to Naples. The first American table, that of Williams College, was occupied during '83 and '84. Previous to that time eight Americans had occupied European tables. In '85 and '86 the University of Pennsylvania maintained a table; and then, after an interval of five years ('86 to '91) during which America was not represented, a table was supported by Major Davis, from '91 to '96.

The Smithsonian Institution has maintained a table from '93 to '02, which has been occupied by twenty-six investigators. Harvard University had a table for two years ('97–'02), and Columbia University has, through the generosity of a friend, paid, for five years ('96–'02), for half of 'The University Table.' Finally, the 'Association for Maintaining the American Women's Table' has supported a table for four years ('98–'02).

At present America maintains only three tables, 'The Smithsonian,' 'The University,' and 'The Women's Table.' These are entirely inadequate to allow all those who apply for tables to obtain them. For instance, there are five desirable candidates for 'The University Table' alone for the present year.