ence of peneplains on this earth of shifting base levels. Professor F. L. Washburn describes and figures the shoulder girdle of 'A Peculiar Toad,' presenting the abnormality of an extra (left) fore limb. The abundant literature on the subject of the Trenton Gravels receives an addition from Dr. Frank Russell, who describes some 'Human Remains from the Trenton Gravels,' concluding that the skulls which are figured are those of modern Indians, probably of the Lenni Lenapé. A goodly proportion of Notes and Reviews fill out the number.

THE *Journal of the Boston Society of Medical Sciences* for January comprises two parts, each containing a number of excellent plates. Those illustrating the articles on the 'Pathological Histology of Acute Lacunar Tonsilitis,' by J. L. Goodale, and the 'Character of the Cellular Exudation in Acute Keratitis of the Rabbit,' by W. T. Councilman, are particularly fine. Our anti-vivisection friends who discredit the existence of hydrophobia would do well to read the paper by Langdon Frothingham on 'Rabies in the Vicinity of Boston,' where 20 positive cases are noted between March, 1897, and December, 1898. An interesting series of 'Observations on the Effects Produced by the 6-mm. Rifle and Projectile,' by H. G. Beyer, is well calculated to create respect for the new Navy arm.

THE *Botanical Gazette* for February contains the following leading articles: 'New or Little Known North America Trees,' C. S. Sargent 'The Ecological Relations of the Vegetation on the Sand Dunes of Lake Michigan,' Henry C. Cowles; 'The Society for Plant Morphology and Physiology—Columbia Meeting,' W. F. Ganong. The briefer articles include: 'Notes on the Maximum Thermal Death-point of Sporotrichum Globuliferum,' B. M. Duggar; 'Descriptions of Two Willows from Central America,' W. W. Rowlee; 'A Peculiar Case of Spore Distribution,' F. L. Stevens; 'A New Silphium,' Wm. M. Canby.

SOCIETIES AND ACADEMIES.

SECTION OF PSYCHOLOGY AND ANTHROPOLOGY OF THE NEW YORK ACADEMY OF SCIENCES.

AT the regular monthly meeting of the section, on February 24th, papers were presented by R. S. Woodworth on the 'Accuracy of Movement, by F. C. Spencer on the 'Origin and Persistent Influence of Sacred Number Concepts,' and by F. Boas on 'Anthropometric Charts.'

Dr. Boas presented the results of recent investigations, which show that the anthropometric charts now used in the gymnasium by anthropologists are valueless as a means for estimating the development of individuals.

CHAS. B. BLISS,
Secretary.

ONONDAGA ACADEMY OF SCIENCE.

AT the January meeting annual reports of officers and sections were received and the following officers were elected: President, John Van Duyn, M.D.; Vice-President, J. A. Dakin; Secretary, P. F. Schneider; Corresponding Secretary, H. W. Britcher; Treasurer, Miss L. W. Roberts; Librarian, Miss V. L. Jones.

The report of the Geological Section showed considerable progress in the investigation of interesting local problems, and cited the discovery of a vein of quartz crystals in the Corniferous rock at the Onondaga Indian Reservation.

The report of the Botanical Section included new localities for several of the rarer plants of the county. One plant, *Glaucium glaucium*, was reported as new to the county, and two, *Crepis virens* and *Sanguisorba canadensis*, were reported as new to the State. *Selaginella selaginoides* was also found and is probably new to the State.

The report of the Zoological Section contained the result of feeding experiments on the larvæ of *Diedamia inscripta*. During the year upwards of thirty spiders were added to the list of Onondaga county species. Of these, nine species had not hitherto been reported in the State.

H. W. BRITCHER.

DISCUSSION AND CORRESPONDENCE.

WHAT IS THE CAUSE OF THE SO CALLED TOBACCO FERMENTATION?

THUS far it has been generally believed that the rise of temperature and the chemical changes that take place when the cured tobacco leaves are piled up in heaps are due to bacterial action. But careful investigations of the 'fer-

menting' leaves revealed the absence of extended bacterial colonies, the presenc of which were naturally to be expected if *bacteria* were the cause of the phenomena in question. The true cause, I have recently established beyond a doubt, is the presence of two kinds of *oxidizing enzymes* in the tobacco leaves. As soon as the Bulletin describing these investigations is published a full review will be given in this JOURNAL.

OSCAR LOEW.
DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY, U. S. DEPT. OF AGRICULTURE.

THE ANÆSTHETIC EFFECTS OF A SINUSOIDAL CURRENT OF HIGH FREQUENCY.

TO THE EDITOR OF SCIENCE: In your issue of June 3, 1898, I had the honor of communicating an observation on the anæsthetic effects of a sinusoidal current of high frequency. I take the liberty of sending you the following further observations.

a. The anæsthetic effect may be produced by sending the current longitudinally along the the nerve. Thus, a current sent along one of the nerves of the arm can be used to produce anæsthesia in parts of the arm supplied by it. With a pleasant current of about 28,000 alternations per second passing between the elbow and the hand, a needle can be painlessly run into the forearm.

b. At the suggestion of Professor B. Moore, of the Yale Medical School, I applied the current to the tongue, with a view to testing the theory that the sensation of taste may be due to vibratory stimuli. If the theory were true the fluctuations in the sinusoidal current might be expected to produce sensations of taste of various kinds. The experiment showed that fluctuations up to about 29,000 complete periods per second produce no sensations of taste whatever; the only sensation is that of tickling and puckering.

c. It should perhaps have been stated in my original communication that the main purpose of the investigations with the sinusoidal current was to determine the various sensations at different frequencies. They have been determined for two subjects as follows: (1) Threshold of sensation of touch at a frequency of about 480 complete alternations' per second; (2) threshold of disagreeableness at about 840; (3) threshold of pain at about 960; (4) disappearance of pain at about 1,440, followed by a peculiar, agreeable sensation; (5) disappearance of agreeableness at a point not yet determined, followed by a faint sensation; (6) disappearance of sensation at a point not yet determined. For constant conditions these figures are quite constant, the probable error ranging from $\frac{1}{10}$ of 1 % to 4 %.

d. Applying the electrodes to the nerves of the arm in a way to move the muscles of the forearm and hand I find a similar neuromuscular effect. As the current rises in frequency from zero the muscles contract steadily up to a certain point, after which they gradually relax. The process is the same when we start with a high frequency and descend to zero. The phenomenon can hardly be due to a diminished intensity of the high-frequency current.

e. It may be added that the instrument used is a Kennelly alternator run at a very high speed. Similar high-frequency machines have been used by Nikola Tesla, who has not recorded any of the above phenomena; possibly his machines do not produce sinusoidal currents.

f. Using another machine which simply interrupted a galvanic current up to 100,000 times per second I find that above a certain point (not yet measured) the interruptions cease to have any effect other than merely reducing the strength of the current when it is sent through the tissues.

E. W. SCRIPTURE.
YALE UNIVERSITY, NEW HAVEN, CONN.,
February 28, 1899.

NOTES ON PHYSICS.

THE METRIC SYSTEM.

THE Hartford Steam Boiler, Inspection and Insurance Company of Hartford, Conn., has issued a very neat and convenient volume, of 'pocket size,' containing tables for the Conversion of English weights and measures into their metric equivalents, and *vice versa*. It opens with a very interesting discussion of the metric system, which lacks, however, any recognition of the International Bureau of Weights and