C.G.S. units, they have found that the percentage broadening is directly proportional to the field strength; the absolute amount for sodium in a unit field being 11.46×10^{-6} Angström units.

A. A. Michelson describes some recent experiments, having as their object the discussion of the question as to whether there is a relative motion of the earth and the ether. Light from a certain source was separated into two pencils by a plane-parallel glass plate, and carried by two equal paths back to the observing telescope, where the interference fringes resulting could be observed. The apparatus was set up in a vertical east and west plane, the path being 200 feet long and 50 feet high. In order to eliminate disturbances due to temperature, the path of the light was inclosed in an iron pipe exhausted to within $\frac{1}{100}$ of an atmosphere. It was then found possible to measure the position of the central bright fringe to within something like $\frac{1}{20}$ of a fringe-width. The results of the measurements go to show that if there is any displacement of the fringes it is less than $\frac{1}{20}$ of a fringe. Hence it follows that the earth's influences upon the ether extends to distances comparable to the earth's diameter. The author concludes by saying that with these results before us we are driven to one of the three following extraordinary conclusions:

"1. The earth passes through the ether (or rather allows the ether to pass through its entire mass) without appreciable influence. 2. The length of all bodies is altered (equally?) by their motion through the ether. 3. The earth in its motion drags with it the ether even at distances of many thousand kilometers from its surface."

SOCIETIES AND ACADEMIES.

GEOLOGICAL SOCIETY OF WASHINGTON, MEETING OF MAY 12, 1897.

UNDER the title 'Physiography of the West Coast of Peru,' Mr. S. F. Emmons described some of the prominent physiographic features noted by him during a recent and rather hurried journey along the west coast of Peru as far as 16° south latitude, and on a trip on the Oroya railroad from Lima up to the western crest of the Andes and back.

First, he noticed the remarkable difference in rainfall and consequent change in vegetation experienced in the few hours' sail from the mouth of the Guayaquil River, in Ecuador, to the most northern part of Peru. From a region of copious rains and tropical luxuriance of vegetation and often dense forests one passes, over night, to a region where it rains once in seven years, and farther, to where it is absolutely rainless. As far as seen, there is no tree growth on the west slope of the Andes in Peru. In the larger valleys, on the other hand, where irrigation is possible, sugar, cotton, and all varieties of cereals, vegetables and fruits flourish under cultivation. The most evident cause of this condition of things lies in the fact that the wind along the coast blows almost continuously from the south, coming from a colder to a warmer atmosphere, or one whose capacity for carrying moisture is constantly increasing. Hence there is no condensation until the wind currents strike the high mountain slopes. In Ecuador the influence of the highly-charged equatorial currents is felt, and near the mouth of the Guayaquil River the continental watershed pushes westward to within 50 miles of the coast, thus presenting a condensing barrier on the land to the northward-moving currents.

A second striking feature is the enormous extent to which the coast bluffs and the northern slopes of the mountains that approach the sea are covered by white drifting beach sands borne along by the same prevailing south wind. At one point these sands, beautifully ripple-marked, completely mantled the southeast side of a deeply cut mountain valley to an elevation of four to five thousand feet above the sea level, and sand fields were observed inland, along north and south depressions in the elevated plateaux or pampas, 40 to 50 miles from the coast.

Striking evidences of recent elevation and subsidence of the coast regions are most frequent, and where the coast line is formed, as it frequently is, of soft and readily disintegrable Tertiary beds it is seen to be rapidly wearing away under the influence of the long and powerful waves of the Pacific Ocean. Near Pacasmayo a river valley is seen to have been

truncated by this wearing action and at the same time to have been elevated about 50 feet within a comparatively short time. Near Lomas a Tertiary plain 15 to 10 miles wide, and reaching 500 to 600 feet above tide, between the mountains and the sea, has been so recently reclaimed from the sea as to have scattered over its surface not only beach pebbles, but frequent sharks' teeth and occasionally jawbones of whales, from the latter of which the villagers construct the crucifixes they always plant upon some prominent headland. Further inland there is a broad peneplain nearly 6,000 feet above the sea level, fringed by an old sea-beach of rolled pebbles more or less covered by beds of volcanic tuff.

The geological formations along the coast belt, as far as observed, are mostly granites and diorites, in places surrounded by horizontal or slightly crumpled beds from which fossils of probable Miocene and Pliocene age were obtained. To the former apparently belong the very considerable extent of petroleum-bearing beds in northern Peru near Cape Blanco. The main mass of the western crest of the Andes, where observed, consists of closely compressed, infolded limestones, slates and conglomerates, with intrusive andesites and other igneous rocks. These sedimentary beds are thought to be of probable Jurassic age, though no fossils were obtained.

The Telluride mining district, in the San Juan mountains, was described by Mr. C. W. Purington. It is situated in southwest Colorado, on the line of the Rio Grande Southern Railway. It is a mountainous region characterized by precipitous topography. The mountains rise to 14,000 feet from a plateau of 7,000, which bounds the region on the west. The rocks are nearly flat-bedded sedimentaries of Triassic, Jurassic and Cretaceous age, overlain in the eastern part of the quadrangle unconformably by a heavily bedded conglomerate, 200 feet thick, above which lie 2,000 feet of andesitic breccias, in part waterlaid, and still higher 1,000 feet of volcanic flows, andesite and rhyolite. Diorite stocks of large dimensions have cut all the other rocks of the region and are most recent in age. Surface denudation has exposed them to view. The centers of volcanic activity lies to the east of the sheet.

Several well-defined fissure-systems, due to the action of extraneous forces, penetrate the rocks of the region. The systems are characterized by the alternation of widely and narrowly spaced zones of fissures. The zones of narrowly spaced fissures vary from one to ten feet in width, and it is along these that the workable veins are found. Relative movement of the walls of the closely fissured zones, accompanied by trituration of the included rock, developed open space which the ore now occupies. The veins carry gold, mostly free, but in part combined with metallic sulphides, silver mostly in galena and freibergite, less frequently as stephanite, pyrargyrite, polybasite, etc. Beside iron, lead, copper and zinc sulphides, there occur as gangue, predominating quartz, carbonates, barite, fluorite, sericite and other minerals in small amount. Gold and silver veins occur closely associated. Accompanying the veins the wall rocks are altered, and impregnated with iron pyrite, occasionally auriferous. The values vary between wide limits. They must be given in more detail than is possible here. The veins show remarkable continuity in length, one having been profitably worked for a distance of more than two miles.

The ore is of Tertiary age, is of deep-seated origin, and has been deposited from solutions; $20,000,000 is a low estimate for the product of the district. It has steadily increased in importance since 1875, and very rapidly within the last five years. Formerly silver was the principal product; now much the larger output is in gold.

W. F. Morsell.
U. S. Geological Survey.

New York Academy of Sciences—Section of Geology, May 17, 1897.

The first paper of the evening was by Mr. D. H. Newland, entitled 'Occurrence and Origin of the Serpentines near New York.' Mr. Newland spoke of the occurrence of Serpentines in the vicinity of New York and classified them according to origin into two probable divisions; one including those from New Rochelle and Hoboken, possibly derived from metamorphosed igneous rocks, and second, those from the other

localities more probably derived from some form of sedimentary rock.

The second paper of the evening was by Professor J. F. Kemp, entitled 'Notes on Butte, Montana, and its Ore Deposits.' Professor Kemp described the geological position of the copper and silver bearing ore rocks of Butte, and illustrated his talk with a number of lantern slides made from photographs in the region last summer. He spoke particularly of the geological succession exhibited in the relationship of two forms of granite, an earlier basic and a later acitic cut by later rhyolite flows.

The third paper was by Professor Kemp, entitled 'Notes on the Geology of the Trail from Red Rock to and beyond Leesburg, Idaho.' This paper brought forth the first account known of the geology of about 100 miles of the trail mentioned, where the rocks are very varied in character, but mostly early Cambrian quartzites, together with many igneous rocks including Tertiary rhyolites. The ore producing region is found in the valleys where the gravels are washed in some places by hydraulic force and some gold gained therefrom.

The last paper of the evening was by Professor C. A. Doremus, and was illustrated by a series of specimens received from France from M. Moissan, representing certain of the metals and carbides formed by the electric furnace. Some of these were very interesting geologically, because of their peculiar properties; particularly the carbonates of aluminum, calcium and cerium, which latter, when tested with water, produces all the series from marsh gas to the heavier petroleum products. The specimens exhibited are for final placement in the National Museum at Washington, D. C.

This being the last meeting of the Geological Section before the summer vacation, adjournment was made until October.

RICHARD E. DODGE.
Secretary.

THE TORREY BOTANICAL CLUB, MARCH 31, 1897.

THE first paper, by Dr. Albert Schneider, 'The Phenomena on Symbiosis,' and a paper by Leonard Barron on 'Horticulture in Botanical Gardens,' were read by title, owing to unavoidable detentions.

The evening was occupied by a paper by Professor Edward S. Burgess, on '*Aster macrophyllus and its allies*,' illustrated by chart of relationship and by numerous specimens. The speaker sketched the history of the species *Aster macrophyllus*, in which it has been the custom of American botanists to include all large-leaved asters. He showed how diverse these asters are and in what confusion their assignment to a single species results, and indicated the characters according to which they form two groups, each of several species and varieties.

The paper, which will soon appear in print, was discussed by Mr. E. P. Bicknell, who confirmed the distinctions offered, by the results of his observations about New York, and by Dr. Britton, who paid a tribute to the masterly manner in which Dr. Gray has treated the subject of the genus *Aster*, so far as material was then available, and who referred to the special need for extended field-work and further collaboration which this genus has long presented.

APRIL 13.

DR. ALBERT SCHNEIDER presented a paper entitled 'Methods employed in the examination of powdered drugs and their adulterations.'

He described certain microscopic structural features which he had investigated with a view to find characters by which to distinguish the more important drugs, giving details of such characteristics determined by him for mace, senna, leaves of Eucalyptus globulus, etc.

Dr. Britton spoke of the utility of this work and of its object, in behalf of the new edition of the U. S. Pharmacopœia.

The paper was followed by an early adjournment to facilitate the attendance of members upon the annual exhibit given by the New York Microscopical Society.

EDWARD S. BURGESS,
Secretary.

BOSTON SOCIETY OF NATURAL HISTORY.

THE Society met April 7th, with thirty-two persons present. Professor J. Eliot Wolff spoke of the occurrence of tourmalines at Mt. Mica, Paris, Me., and gave an account of the locality, with a history of its discovery. Sev-

eral varieties were described; also the minerals formed in the rocks associated with the tourmalines. Two kinds of gem tourmaline were recognized and their occurrence in cavities or pockets noted. Professor Wolff showed a series of tourmaline crystals, including two of the largest yet discovered; also a number of the original plates illustrating Mr. Hamlin's 'History.'

Dr. Charles B. Davenport discussed the *rôle* of water in growth. Organic growth was defined as an increase in volume. The definitions given by others were reviewed and analyzed. The processes of growth were analyzed and the factors involved in growth noted. The experiments and observations of plant physiologists assign the principal *rôle* to water in the growth of plants. Experiments made to determine the percentage of water in the body of developing tadpoles at different stages show that growth is due chiefly to imbibed water. The *rôle* of water in the development of organisms and its bearing on the meaning of curves of growth were discussed in detail.

Samuel Henshaw,
Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of the Academy of Science of St. Louis on the evening of May 17, 1897, twenty-six persons present, a committee appointed at an earlier meeting presented a short biographic sketch of the late Dr. James N. Leete, for many years an active and influential member of the Academy.

Mr. J. B. S. Norton read a paper embodying the results of an examination into the effects of the tornado of May, 1896, on trees about St. Louis, in which it was shown that, while ordinary winds have some influence on the form and strength of trees, in strong winds uprooting is caused by wet soil, weak spreading roots and a large surface exposed to the wind. If the roots hold, breaks may occur in the trunk or branches, depending on the strength of the wood, the form of the tree, the mode of branching and the weight and resistance of foliage. While the edge of dry leaves presented to the wind offers little resistance, when foliage is wet and massed this may be very different. Local variations in these several factors make a comparison of different species difficult. It was shown that *Acer dasycarpum* was badly broken on account of its brittle wood and heavy foliage, while the weak-wooded *Tilias* and *Liriodendrons* were also broken. Spreading-topped trees, like *Ulmus Americana*, as a rule, were broken and uprooted, though the branches were only bent in the tougher-wooded individuals. As a general thing, conical trees, like *Ulmus campestris*, *Liquidambar* and most conifers and the strong-wooded oaks, were little injured. *Taxodium distichum*, from its slender form, strength and elasticity, was injured least of all. It was shown that after the tornado, which occurred early in the vegetative period, most of the trees continued the summer's growth by producing new foliage shoots. While a few died from the inability to secure food, others indicate injury by flowering and fruiting more profusely than usual. It was shown that some of the trees which were broken have already begun to show serious decay where the branches were removed, so that the final injury can hardly yet be measured.

The results observed here were compared by the speaker with those which have been reported from time to time in connection with severe storms elsewhere.

The paper was discussed by Mr. H. von Schrenk, who submitted some interesting specimens, slides and drawings illustrating the formation of a double ring in 1896, resulting from the refoliation of the branches denuded shortly after the season's growth had begun.

William Trelease,
Secretary.

NEW BOOKS.

L'évolution régressive en biologie et en Sociologie. Jean Demoor, Lean Messurt, Émile Vandervelde. Paris, Alcan. 1897. Pp. 324.

Guide to the Genera and Classification of the North American Orthoptera found North of Mexico. Samuel Hubbard Scudder. Cambridge, Edward W. Wheeler. 1897. Pp. 87.

The Entropy Temperature Analysis of Steam Engine Efficiencies. Sidney A. Reeve. New York, Progressive Age Publishing Co. 1897. Pp. 250.