fusion of rock-masses by lightning. The greater portion of Mr. Diller's time in April was devoted to the study of this rock, which was deemed worthy of special examination, not only on account of its rarity, but also from the fact that it presents the opportunity to study the products of an uncommon method of fusion. While the formation of fulgurite in sand is of frequent occurrence, it is only exceptionally produced in solid rock. The most important locality where it has been heretofore discovered in solid rock is Little Ararat in Armenia reported by Abich. Upon the specimen collected by him, Wichmann has made a brief microscopical research. An endeavor is being made to obtain some of the fulgurite of Little Ararat for comparison with the Oregon specimens.

Saussure mentions glazed hornblende schist as occurring on the summit of Mont Blanc; Humboldt reports fulgurite from one of the peaks in Mexico; Ramond saw it at several points in the Pyrenees and the Auvergne: but these occurrences have never been investigated.

Mr. Diller prepared a number of delicate, thin sections of the fulgurite from Mount Thielson; and its relation to the various constituents of the rock has been very clearly made out. A chemical analysis has been made by Prof. F. W. Clarke.

The material fused by the lightning was cooled so quickly that it all remained amorphous, and formed a dark, porous glass. In order to test the conclusions reached in the microscopical analysis, an attempt was made to crystallize the fulgurite. A completely amorphous fragment was heated without fusion in a Bunsen lamp for six hours, and then found, in polarized light, to be made up of strongly doubly refracting fibres, with a marked tendency to spherulitic arrangement. A finely pulverized portion was fused, and as highly heated as possible in a blast-lamp for four hours and three-quarters, and then allowed to cool gradually. Under the microscope, it was found that much of the felspar, some pyroxene, and many undeterminable microlites, crystallized out of the glass during the heating. The various stages in the development of felspar crystals from more or less regular groups of microlites, through lathe-shaped bundles of fibres to a completely clear, transparent crystal, are easily traced. The microscopical as well as the chemical evidence, and that derived from the re-crystallization of the fulgurite, all indicate that the fusion was confined chiefly to the siliceous groundmass of the rock with which the fulgurite is associated. The rhombic pyroxene was also fused to some extent, while the plagioclase felspar and olivine were not affected. The examination also indicates that the composition of the glass derived from the fusion of parts of a heterogeneous rock is a function of the fusibility and electric resistance of its various constituents.

The basaltic rock on which the fulgurite has been found is unique in the character of its pyroxene. The various mineral constituents of the rock are now being separated, for the purpose of a chemical analysis, by means of Thoulet's solution.

RECENT PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Brooklyn entomological society.

May 31. — Mr. Roberts gave an account of the habits of the Elmidae, a large number of which were collected by him at the Clifton excursion. —— Mr. Schwensen called attention to the food-habits of some species of the Chrysomelidae, belonging or allied to Cryptocephalus. Many species are, in his experience, omnivorous; others, found only on certain groups of plants.

Academy of natural sciences, Philadelphia.

May 20. — Mr. Joseph Willcox stated, that, on the west coast of Florida, shell-mounds are very numerous, indicating the former favorite camping-grounds of Indians. The largest accumulation of shells is at Cedar Keys. A portion of the town is built on the mounds; and great quantities of the material, consisting almost entirely of oyster-shells, have been used in grading the streets. Human bones, stone implements, and fragments of pottery, are frequently found among the shells. Although Professor Wyman, in his memoir on Florida shell-heaps, asserts that stone chips are not common, being only found separately or a few together, and in no case indicating a place for the manufacture of arrow-heads or other implements, such a place of manufacture may be seen on John's Island, at the mouth of the Cheeshowiska River. Several bushels of chips are here scattered about, all made of the chert rock, the only material in Florida suitable for the purpose. —— Professor Heilprin, referring to the Foraminifera found in the rock-masses from Florida, stated, that, after a careful search, he had been able to add but one genus, Spheroidina, to those before enumerated. It was, he believed, the first time that any of the genera named at the meeting of April 22, except Orbitoides, had been discovered in America. He had also found another species of Nummulites, making, with N. Willcoxii, the second American form. The new species is twice the size of that named; and the septa are more numerous, and bent at a more acute angle. Two additional forms of Orbitoides had been determined, the presence of one of which, O. ephippium, places beyond doubt the oligocene age of the deposits containing it. —— Mr. Thomas Meehan exhibited flowers of the remarkable Halesia, the striking variation in the leaves and seeds of which had formed the subject of a former communication. The flowers of the sport are cup-shaped instead of tubular; and the wide divergence reached without any intervening modifications was another illustration of the fact that the maxim of

Ray, '*Natura non facit saltum*,' needed modification. He had noticed that such departures usually occur in different parts of the country at the same time. The common calla lily, for instance, had, in several cases during the present season, developed a spathe some four inches below the perfect flower: in other words, the usually naked flower-scape of the Richardia had borne a bract. Flowers with a pair of more or less imperfect spathes were not uncommon in some seasons; the peculiarity of the cases now referred to being the interval of several inches on the stem, which justifies the application of the term 'bract' to the lower spathe. Numbers of such specimens had been brought to him from the neighborhood of Philadelphia, while others had been sent from Ohio, Indiana, and Illinois, hundreds of miles apart. In view of such circumstances, he believed that varieties might spring from widely separated centres by the operation of a general law entirely independent of environment. We know that distinct forms do spring through single individuals from seed, and that, after struggling successfully with all the vicissitudes of its surroundings, the new form may succeed in spreading, through the lapse of years or ages, over a considerable district of country. But the idea, that always and in all cases species have originated in this manner, presents occasionally difficulties which seem insurmountable. In the case of the similarity between the flora of Japan and that of the eastern portion of the United States, we have to assume the existence of a much closer connection between the land over what is now the Pacific Ocean, in comparatively modern times, in order to get a satisfactory idea of the departure of the species from one central spot, and to demand a great number of years for some plants to travel from one central birthplace before the land subsided; carrying back species in geological time farther, perhaps, than geological facts would allow. But if we can see our way to a belief that plants may change in a wide district simultaneously in one direction, and that these changes, once introduced, may be able to perpetuate themselves till a new birth-time should arrive, we have made a great advance towards simplifying the problem. —— Mr. Edward Potts stated that a correspondent in Jamaica had failed to find there a single species of fresh-water sponge. It had been suggested that these organisms affect higher latitudes and elevated regions, — an opinion which the speaker was disposed to hold. In all the water-pipes examined by him, from the immediate vicinity of the basin, he had found abundant sponge-growth; and it had been asked if such growth might not be a cause of obstruction. In some sections of filled-up pipes, taken at a greater distance from the supply, he had found no sponge; the blocking substance being clay with iron impregnation. He had found, that, where masses of Mayenia Leidyi were strongly mixed in these pipes with iron, the skeleton spicules had undergone a curious change. In nearly all spicules, especially when young, a fine line can be traced down the middle; but, in the specimens referred to, a clear channel occupying two-thirds of the entire space, with openings at the ends, could be observed. It was suggested that the change was due to the iron retarding the deposit of siliceous matter in the central channel of the spicules. In the birotulate spicules of the same masses the margins of the disk-like ends were eliminated, leaving them in the form of rays.

Davenport academy of natural sciences, Iowa.

May 30. — Mr. W. H. Pratt called attention to some interesting peculiarities in several of the flathead skulls from the Arkansas mounds, in one of which appears a large 'Inca bone,' formed by the presence of a horizontal occipital suture in addition to those usually present; and in another the ear-openings are nearly closed by the bones growing into them. He also exhibited a number of ossicles — minute bones of the internal structure of the ear — which had been extracted in cleaning out the earth which filled the cavities. —— The honey-dew, which has been observed in such remarkable profusion this season, and the various opinions regarding its origin, came up for discussion; and twigs from several trees were presented for examination. The observations of several members seemed strongly to support the theory that the substance is, partly at least, produced by the bark-louse, Pulvinaria innumerabilis, and perhaps kindred species. This opinion was sustained by the following facts: 1°. It is found that the honey-dew is not deposited on the leaves at the top of the trees, hence is not an exudation from the leaf. 2°. It is not found on the white maples which are not infested by the bark-louse, several instances of which have been noticed. 3°. It is observed to a less extent on the box-elder tree; and on examination it is found that that tree is also infested by the Pulvinaria, though not so badly as the maple. 4°. It is observed that the honey-bee, which collects the honey-dew with great avidity, very often, and especially when the substance is considerably dried and hardened upon the leaves, proceeds directly to the under side of the limb, where the insects are fixed, and, running along the branch, examines them carefully, apparently seeking its supply from that source. 5°. It is also observed that there is always more or less of it upon the insects, especially in the morning; and, upon close examination, all are found to contain a quantity of the same substance. In view of these facts, the opinion was expressed, that, although further and thorough investigation is necessary to establish the fact, this will be the final solution. — that the honey-dew is largely the product of the Pulvinaria, the sap being by it extracted from the tree, and elaborated by the insect organism into this sweet substance, as is a similar or perhaps identical substance by some of the Aphides, and honey by the honey-bee.

Natural history society, Cornell university, Ithaca, N.Y.

May 29. — Mr. C. S. Prosser read a paper on silver in the Chemung and Catskill, the principal part of which was devoted to a consideration of the recently discovered silver-deposits near Oneonta, Otsego county, N.Y. It is claimed that valuable deposits of gold and silver have been found in the Catskill

or Chemung near Oneonta, and that, according to assays, the rock will yield per ton from fifty to a hundred and ninety-five dollars of gold and silver. In this paper the result of a series of assays was given, and no one indicated more than three dollars of silver to the ton of ore. There is in some of the rock a small amount of galena; and in this, from one to two ounces of silver in a ton of ore, but not any gold.

Society of arts, Massachusetts institute of technology.

May 8. — Prof. Edward C. Pickering addressed the society on the proper method of measuring colors. After referring to the difficulty of measuring color and in obtaining a proper unit for measurement, the speaker referred to the ordinary phenomena of color, and the effect of various bodies on the rays of light; dwelling, among other things, upon the effect of a large index of refraction in increasing the brilliancy of a body. The explanation was suggested, that the increased brilliancy of the so-called straw diamonds, so lately the subject of comment, and which were said to have been made of glass and painted, might have been due to a deposit upon them of a very thin layer of silver. The speaker said that the subject of color had generally been studied subjectively, that is, by its effect on the eye, and not objectively, as a phenomenon in itself. The generally accepted theory of color was explained, by which it is supposed that the eye can distinguish three primary colors, — red, green, and a bluish violet; and the objections to the use of Chevreul's color-circle as a means of measuring and distinguishing color were referred to. By the objective method of studying color, we may determine the intensity of each portion of the spectrum by a thermopile or bolometer, or by photography, or, again, by means of the instrument proposed by Vierordt, by which the lower half of the slit of a spectroscope can be varied in width until any part of the corresponding spectrum shall be just equal in brightness to that coming from the upper half of the slit, through which is passed the light to be measured. The amount of opening of the lower half of the slit affords an invariable scale for the measurement of the relative intensity of two lights. Professor Pickering had experienced numerous difficulties in experimenting with Vierordt's instrument, especially when the lights differed greatly in intensity. The photospectroscope which he had finally perfected was exhibited and described. It consists of a spectroscope with two slits, in which the relative intensities of two spectra may be measured by polarized light. Special devices were employed to render the images to be compared well defined on their edges, and of uniform brightness. The instrument allows of many practical applications in the measurement, by absolute standards, of paints, dyes, inks, glass, and the comparison of lights from various sources. Another application is to the measurement of the colors of stars, the chief difficulty being lack of light. In this measurement, Professor Pickering had modified the method of Professor Pritchard, who had compared the light of different stars by extinguishing them with a wedge of shade-glass, measuring by a scale the point at which they ceased to be visible. Professor Pickering had measured the relative intensities of the different colors by spreading out the light of the star into a spectrum, and allowing the star to transit along the wedge, the time of disappearance of each color being noted. The exact color is determined by a series of slits. All the spectra are brought into the same position by an auxiliary image brought into the field by means of a plate of plain glass cemented to the side of the principal prism. The results given by this instrument are very encouraging, and promise to give a satisfactory measure of the intensity of each part of the spectrum of the stars.

Biological society, Washington.

May 3. — Dr. R. W. Shufeldt remarked in the course of his description of a pair of ribs on the occipital bone of the large-mouthed black bass, Micropterus salmoides, that recently he had made a number of dissections of this fish, and in every instance had found a pair of ribs upon the occipital bone, just above and internal to the foramen of the vagus nerve (see *Science*, Nos. 65 and 69). They are without epipleural appendages, but otherwise like the abdominal ribs. If this fact be new to science, it is a very interesting discovery, of great morphological significance, and introduces an important factor in the theory of the segmentation of the skull. It had not been noticed in any of the prominent works upon comparative anatomy generally used as text-books, nor in a recent and very thorough article by Dr. Sagemehl upon the cranial osteology of Amia caloa (*Morph. jahrb.*, 1883). Dr. Shufeldt had also discovered these ribs thoroughly developed in the tunny, Orcynus thynnus, and thought that they would doubtless be found in others of the Scombridae and Centrarchidae. —— Dr. T. Gill briefly reviewed the salient structural features of the various representatives of the order Squali, as well as the history of the classification of the group, and claimed that there were five principal types of structure manifested in the various forms, whose anatomy is more or less satisfactorily known: 1°, the Pternodonta, or Selachophichthyoidi, represented by but one known species, lately described by Mr. Garman (*Science*, No. 52); 2°, the Opistharthri, of which the Notidanidae or Hexarchidae are the only known forms; 3°, the Proarthri, of which the Heterodontidae, represented by the well-known 'Port Jackson shark,' forms the only existing family; 4°, the Anarthri, to which belong all living sharks excepting those now specifically eliminated; and, 5°, the Rhinae, to which belong the family Squatinidae, including the so-called 'angel-sharks.' The speaker was inclined to consider several of these more than sub-ordinal, and rather as of ordinal value; but, until they had been better studied, he would reserve opinion on this question. There was one type, represented by the extinct Cladodontidae, whose position was doubtful. For these he had formed the group Lypospordyli; but it was not evident whether it belongs with the true Squali, or whether it may not be related to the Holocephalus, the character of the branchial arches being dubious. —— Mr. N. P.

Scudder exhibited specimens of muskrat skeletons, showing the number of the lumbar vertebrae to be six, and not three, as stated by Professor Flower. He also showed that the malar bone formed part of the continuity of the zygomatic arch; correcting the statement of Dr. Coues, in his 'Monograph of American Rodentia,' p. 253, with regard to the jugal of the muskrat, which is there described "as a mere splint, not forming by itself any part of the continuity of the arch, for the squamosal and maxillary spurs are absolutely in contact. This is a strong point of Fiber." Mr. Scudder remarked that muskrats were enabled to live from four to six minutes under water; owing, probably, to the enlargement of the abdominal *vena cava*, which extended over the abdominal aorta. He believed muskrats to be omnivorous, and said that the same individual could be taken repeatedly in the same trap.

May 17. — Dr. J. M. Flint gave a brief account of the history of medicine among the Chinese according to their own authors, and then discussed their theories in regard to the nature and causes of disease, and the action of remedies. Their ignorance of anatomy, and the consequent effects upon their theory and practice, were shown. The materia medica of the Chinese was then considered in detail, and its peculiarities, as well as its resemblances to our own present and past, as illustrated by the collection of Chinese drugs now in the possession of the National museum. —— Mr. Wiley Britton sent a paper on the buffalo gnat of Tennessee, in which he stated that its habitat was confined to the Mississippi valley, below the mouth of the Ohio River. The flies generally make their appearance about the first of April, and remain from two to four weeks. They destroy annually more or less live-stock, particularly mules and horses; which, however, could be protected by thorough greasing. The bite of this gnat is poisonous, causing a swelling somewhat like a bee-sting. —— Dr. T. H. Bean, in a paper on the white-fishes of North America, said there were twelve species indigenous to North America, besides the Inconnu, which is not properly a white-fish, though related to it. He made a few general remarks concerning the wide distribution, great abundance, and importance of the white-fishes as food, and stated the range of each species, its maximum size and weight, and its variations through age and conditions of habitat. A brief key to the species, intended to facilitate their speedy identification, and based upon natural characters only, was included in the paper. —— Dr. Thomas Taylor exhibited a new instrument, a micrometer, of his own invention, for measuring accurately and instantly to the $\frac{1}{2000}$ inch the thickness of any object. He also explained that pseudo-bacteria were produced by the heating of blood at a comparatively low temperature, and proposed to make experiments for the purpose of deciding whether a continuous fever of four or five days, with the blood at 104°, would produce the same results as blood artificially heated to 110°. If so, it would account for mistakes that have been made by persons inexperienced in examining the blood of fever patients, who report the presence of bacteria when it was simply pseudo-bacteria, or broken blood-corpuscles, as shown by Beal and others. He further explained a method of throwing upon a screen the circulation of blood in a frog's foot, the magnification depending upon the distance of the reflecting object, using the high powers of the microscope on the principle of double sight.

NOTES AND NEWS.

ALONG the eastern verge of the Bahamas, somewhere in that skirmish-line of islands consisting of Cat, Watling's, Samana, Mariguana, and Turk's, Columbus made his landfall. Each has had its advocates; and the late Gustavus V. Fox, in 1880, in a report of the coast-survey, maintained the claim of Samana, which at that time was the only one possible, that had failed of an advocate. His arguments are now reviewed, and the whole question examined afresh, by Lieut. Murdoch of the navy, in a paper just printed in the proceedings of the U. S. naval institute. He claims for Watling's, which has had some strong supporters since it was first named by Muñoz in 1793. It is believed to be the landfall by Capt. Becher of the royal navy, who has printed the most considerable monograph on the subject; and such leading students of our earliest history as Major among the English, and Peschel among the Germans, have also been its advocates. The question is never likely, however, to be set at rest, unless contemporary documentary evidence, not now known, comes to light. We have nothing but Columbus's own journal to guide us, and a part of that only in abstract as Las Casas made it. No theory can satisfy all the conditions which it prescribes; and those which can be satisfied do not seem to pertain exclusively to any one point, as the variety of views clearly shows. Watling's may be said to receive the support of the greatest number of authoritative critics; and nothing more conclusive can be held to have been attained.

— In an article in the June *Century*, entitled 'What is a liberal education?' (noticed in an earlier part of this number), President Eliot of Harvard thus speaks of the place of natural science in a liberal scheme of study: —

The last subject for which I claim admission to the magic circle of the liberal arts is natural science. All the subjects which the sixteenth century decided were liberal, and all the subjects which I have heretofore discussed, are studied in books; but natural science is to be studied, not in books, but in things. The student of languages, letters, philosophy, mathematics, history, or political economy, reads books, or listens to the words of his teacher. The student of natural science scrutinizes, touches, weighs, measures, analyzes, dissects, and watches things: by these exercises his powers of observation and judgment are trained, and he acquires the precious habit of observing the appearances, transformations, and processes of nature; like the hunter and the artist, he has open eyes and an educated judgment in seeing; he is at home in some large tract of nature's