with plant-bearing beds of the horizon (as determined by Sir W. Dawson) of the Laramie, or so-called miocene of the Mackenzie River and Alaskan coast. A few fossil plants, which are probably of cretaceous age, were also found at one place on the Pelly.

The miocene proper is represented in the upper Liard valley by soft stratified rocks associated with basalts; and basaltic flows of limited extent, and probably of the same age, occur on the Pelly, at the confluence of that river with the Lewes, on the latter river at the Cañon, and again in the Stikine valley east of the coast mountains. There is not, however, in the entire region examined, any wide basaltic plateau.

Some features of special scientific importance occur in connection with the superficial deposits and the evidences of glacial action, but these cannot be more than mentioned in this brief note. It may be stated, however, that true bowlder-clay is frequently seen in the river-sections, and generally passes up into and is covered by important white or gray silty deposits, resembling those of the Nechacco basin in British Columbia, and of the Peace River region to the east of the Rocky Mountains. These later-glacial silts are particularly widespread in the Upper Yukon basin. Terraces are generally conspicuous features in the landscape, and extend even to the higher parts of the district, while water-worn and travelled stones were found to occur at a height of at least 4,300 feet on an isolated mountain near the watershed between the Liard and Pelly Rivers. In the Lewes and Pelly valleys, traces of the movement of heavy glacier-ice in northward or north-westward directions were observed in a number of places, the grooving and furrowing being equally well marked at the water-level and across the summits of hills several hundred feet higher. The facts are such as to lead to the belief that a more or less completely confluent glacier-mass moved in a general north-westerly direction from the mountainous district south of the southern sources of the Yukon, toward the less elevated country which borders the lower river within the limits of Alaska. This observation, taken in connection with the evidence of the former northward movement of glacier-ice in the Arctic regions to the east of the Mackenzie (*Annual Report of the Geological Survey*, 1886, p. 56 R), appears to have very important bearings on theories of general glaciation.

The discovery of small rounded bowlders or pebbles of jade (nephrite) on the upper part of the Lewes River may be mentioned as of interest. Though not actually observed in place, the material is evidently derived from the altered volcanic rocks, probably of paleozoic age, which are abundant in the district. The theory that the jade used by the coast tribes for the manufacture of implements was imported by them from Asia, if still held by any, can scarcely any longer be maintained as tenable.

A second minor point of interest brought to light in connection with the expedition is the existence of a very wide-spread deposit of volcanic ash in the Upper Yukon basin. This generally occurs beneath the soil, but is distinctly newer than the silts or latest glacial deposits. It forms a layer which is seldom more than a few inches in thickness, and is doubtless to be attributed to some single great volcanic eruption of a date long antecedent to our historical knowledge of the north-west part of the continent.

GEORGE M. DAWSON.

SCIENTIFIC NEWS IN WASHINGTON.

National Academy of Sciences; Partial List of Papers; Presentation of Medals. — How to detect Cottonseed-Oil in Lard. — Aboriginal Copper-Workers in the Lake Superior Region; Proofs that they were Modern. — The Siana Indians; Investigations by the Bureau of Ethnology. — International Entomology.

National Academy of Sciences.

THE National Academy of Sciences has been holding its annual meeting in Washington during the past week, but too late to report its proceedings in this number. Among the features of the meeting were the presentation, on Wednesday evening, of the Henry Draper medal to Prof. Edward C. Pickering, director of the Harvard Observatory, for his work upon astronomical photography; the J. Lawrence Smith medal to Prof. H. A. Newton of Yale University, for his work on meteors; and the reading of memorial papers commemorative of Prof. J. C. Watson and Capt. James B. Eads, by Prof. G. C. Comstock of Wisconsin University, and Mr. William Sellers of Philadelphia, respectively.

Among the papers expected were the following: 'The Rotation of the Sun,' by Prof. J. E. Oliver of Cornell University, Ithaca, N.Y.; 'The Foundations of Chemistry,' by Dr. T. Sterry Hunt of Montreal, Canada; 'On an Improved Form of Quadrant Electrometer, with Remarks upon its Use,' by Prof. T. C. Mendenhall, director of the Rose Institute, Terre Haute, Ind.; 'On the Vertebrate Fauna of the Puerco Series,' by Prof. E. D. Cope of Philadelphia; 'Re-enforcement and Inhibition,' by Dr. Henry P. Bowditch of Harvard University; 'On Apparent Elasticity produced in an Apparatus by the Pressure of the Atmosphere, and the Bearing of the Phenomena upon the Hypothesis of Potential Energy,' by A. Graham Bell of Washington; 'The Orbits of Aerolites,' by Prof. H. A. Newton of Yale University.

Detection of Adulteration of Lards.

The recent examinations of lards made at the Agricultural Department have resulted in the discovery of a test by which the presence of cottonseed-oil may be detected instantly by any dealer or housekeeper. The experiment is as follows: As much lard as can be taken up on the point of a case-knife is placed in a teacup. About a quarter of an ounce of sulphuric acid is poured upon it and thoroughly mixed with it. If the lard is pure, it will coagulate, and there will be a little difficulty in the mixing. If it is adulterated with cottonseed-oil and stearine, the mixture will take place immediately and easily. After half a minute, one-fourth of an ounce more of sulphuric acid should be poured upon and mixed with it. The whole process thus far should not occupy more than one minute.

The substance thus obtained is poured into a common test-tube, such as may be bought at any chemist's shop for a few pennies. The acid, somewhat colored, will sink to the bottom, and the fatty substance will remain on top. If the lard thus tested was pure, the color of the latter will be that of a light-colored sponge, changing in a minute or so to a dark-cinnamon color. If it has been adulterated with cottonseed-oil, the color at first will be darker, changing immediately to a dark brown. These differences of color are so marked that no experience is required to detect them.

Cards might be printed upon which the colors produced by the sulphuric-acid re-action for both pure and adulterated lards might be shown; and dealers, by using this test, may prove to their customers in a minute or two that the lard that they are selling is an unadulterated article. The experiment is simple, and the cost of it almost nothing. The novel thing about it is the placing of the mixture in a test-tube in which the acid may become separated from the fatty substance, thus making the test much more decisive and satisfactory. This was first suggested by Dr. Thomas Taylor, who has extended his experiments to a great number of different animal and vegetable oils.

Algonkin Metalsmiths.

Mr. Henry Lee Reynolds read a paper before the Anthropological Society at a late meeting, in which he replied to M. Paul du Chatelier, who has discussed the great antiquity of the ancient mines discovered at Lake Superior, in 'Materiaux pour L'Histoire Primitive et Naturelle de l'Homme.' The idea, he said, that these mines were very ancient, is commonly prevalent. Although Drs. Charles T. Jackson and I. C. Lapham gave quite plausible reasons for thinking them to be the works of the present race of Indians, men like Wilson and Whittlesey subsequently published standard works in which they asserted their belief in a contrary opinion; and these latter theories are now being promulgated by a host of writers like M. du Chatelier.

Mr. Reynolds reviewed the evidence upon which these theories are based, criticised some of it as misleading and some of it as having lost its original importance and prominence in the light of later ethnologic and archæologic research, and expressed the opinion that the mines in question are the work of the ancestors of some of the historic Algonkin tribes, if not of the historic tribes themselves. In proof of this he quoted some pertinent testimony from early chroniclers to show that the copper reported as having been found among the historic tribes could not all have been drift-metal discovered upon the surface. Three sources whence the

aboriginal copper was obtained were mentioned, a general description of the pre-Columbian status of the art of copper-working given, and an account added of his own method of examining old records and studying archæologic discoveries in his endeavor to learn what this actually was.

The chief end of this paper, however, he said, was to present some facts which seemed to indicate active aboriginal mining operations subsequent to the arrival of the French in the Lake Superior region. After referring to some evidence which mound specimens offered on this point, he added, "But the best assurance of the later fabrication of our copper specimens is to be found in the fact that a vast quantity are discovered upon the surface, particularly in the States bordering upon Lake Superior, while an extremely small percentage come from the numerous mounds existing in the same territory. I examined, last summer, 231 specimens of copper in the possession of the Public Museum at Milwaukee, and 200 more in the cases of the Wisconsin Historical Society at Madison. Not one was found in a mound, but all were either picked up from the surface or turned up with the sod in cultivation of the fields. Now, these specimens, more or less exposed as they are to the action of the atmosphere, bear scarcely any indications of greater decomposition than the specimens found deep in the mounds. How can this be if they antedate the advent of the whites? They are mostly, if not all, implements; and all have been shaped out of native copper by patient handling, doubtless with the assistance, in some cases, of stone moulds. Some are of such shape as to give rise to the suspicion that the workman must have attempted an imitation of some tool or weapon which he had seen in the hands of the French pioneers. The resemblance of the knives and chisels to European ones is very marked, while several of the spear-heads are indeed close copies of the old-fashioned French pike which must have been carried in those days in establishing the Jesuit missions. In proof of this, I saw last summer, in Illinois, one of these old iron pike-heads which had been taken from a mound near by. It had the same three-sided or bevelled feature, formed by a slight ridge running through the centre of one side, which is so often seen in our spear-heads of native copper. Many of these spear-heads also have sockets, and a perforation for a rivet. Now, it is hard to realize how these two ideas of a socket and a hole for a rivet, if they are not imitations, can predominate, as they do, over the simpler form of a tang or notch and the customary Indian method of fastening; for the Indian's first impulse in handling copper would be to imitate the types of spear-heads that he had already fashioned in stone. Then, too, the imitation of these types in stone would have been the simplest forms in the fabrication of copper; and the simplest must, in the natural order of things, be the first that occurs to the uninfluenced native mind. That this suspicion is well founded is demonstrated by the discovery of one of these socket spear-heads in which a broken rivet remained. This rivet proved to be iron. The specimen was ploughed up in a Wisconsin field, and is described by Dr. J. D. Butler in the *American Antiquarian*, vol. iv. p. 232.

"Indian wares, we know, by successive barter or by appropriation by right of war, traversed a vast and extensive territory; yet it must be noted that there is no continental distribution of this class of copper implements such as is observable in other objects of American art. They seemed confined almost strictly to the territory reached by French influence, for in this limited area they outnumber by a surprising majority the aggregate of all specimens of a similar class, mound or surface, found elsewhere in the country."

A series of facts were then presented and commented upon, which give rise to the suspicion that the mines themselves postdate the arrival of the whites. Continuing, he said, "Valuable testimony bearing upon the probability of these observations is furnished by Dr. P. R. Hoy of Racine, Wis. This gentleman found in a grave in his State two crude pieces of mined copper, together with two blue-glass beads of European make. These two lumps of copper had sharp angles and ridges, showing conclusively that they had been mined; for, if they had been drift-copper, they would have been more or less worn and rounded. But this is not all. Among other things associated with those two little European beads was a copper lance-head similar in type and fabrication to one gathered from the *débris* of the Keweenaw mines.

"In the light of such facts as these, the question naturally arises, 'Were not the best part of the copper implements that have been found in Wisconsin, Michigan, and Illinois fabricated since the advent of the French?' It does not seem to have occurred to the writers who describe such specimens, that in those remote, unsettled parts of the country the Chippewas and Winnebagoes could have possessed and worked native copper for many years without the fact being generally known." Mr. Reynolds showed that this was the case, even as late as the second decade of the present century, by giving an extract from a letter of Satterlee Clark, who was the Indian agent for the Winnebagoes from 1828 to 1830.

The Siana Indians.

During last season, 1887, Professor Powell, director of the Bureau of Ethnology, directed that certain researches be made among the Siana Indians of New Mexico. This tribe is located on a mesa (tableland) overlooking the Rio Jemez, a stream draining the Jemez Mountains, and is one of the tributaries of the Rio Grande, forming a junction with that stream about eighty miles south of Santa Fé. There are three tribes of communal dwellers located on this stream, the Jemez, Sianas, and the Santa Anas, the latter two peoples speaking the same dialect. No general results have been of greater interest than those from Siana. This tribe now only numbers about one hundred and twenty-five individuals, though the ruins of their former habitations, which are immediately connected with those of the present, indicate an extensive population.

The habits and customs of these people are in principle much like those of other Pueblos, yet their ceremonials are peculiar to themselves. Their dances are all religious, one of which is the celebrated snake-dance, which occurs every alternate year. This peculiar dance occurs with only one other Pueblo tribe, the Mokis, in Arizona. The Sianas, however, perform this dance in a secluded spot some distance from their present village, which is so accessible to travellers that they are much disturbed at this time. Their other ceremonies are numerous, and are performed in supplication for prosperous crops, for rain, and for protection from disease and other misfortunes. The houses of their village are composed of large, round lava bowlders laid in mortar, on the same general plan of construction as those of other Pueblos. They are extremely idolatrous in their worship. Their estufas are stored with innumerable objects of such worship. In one may be seen a large altar composed of various animals representing the rattlesnake, bear, wolf, panther, wild-cat, and a few nude representations of mythic human beings, which to them are their gods of music, rain, war, etc. In different directions, and not very far distant from their village, are shrines for different gods, representing different great elements, to which these Indians continually pray.

The bureau secured large and representative collections of all the religious and domestic objects possessed by the tribe, also complete notes of their myths, religious rites, and ceremonials, which are to be elaborated for one of the forthcoming reports of the Bureau of Ethnology.

Some Recent Entomological Matters of International Concern.

This was the subject of a paper read before the Philosophical Society at its meeting, March 31, by Dr. C. V. Riley. Selecting three species of insects which prevail in several different parts of the world, and are injurious to agriculture or horticulture, he devoted his paper chiefly to a consideration of their natural history.

The first was the white or fluted scale, — the *Icerya*. This has of late years done great injury to the orange-grove, and to many other trees and shrubs of southern California. Its original home was probably Australia, whence it was introduced into New Zealand, Cape Town, South Africa, and California. All the evidence points to its introduction into that State by the late George Gordon of Menlo Park, about the year 1868, probably from Australia, on *Acacia latifolia*. The trees most injured by it are the acacia, lime, lemon, orange, quince, pomegranate, and walnut.

The second species of which Dr. Riley spoke was the Hessian-fly. An added interest has recently been given to it because of its introduction into England. It has long been known upon the continent of Europe, and the prevailing belief has been that it was introduced therefrom into the United States during the revolutionary war by

Hessian troops. It was first announced in England two years ago by Miss E. A. Ormerod, consulting entomologist of the Royal Agricultural Society, and it has proved more or less injurious. It has rapidly extended during the past two years, so that now it is found on most portions of the eastern coast, extending up into Scotland. In North America it has spread over the entire wheat-producing country, having appeared in California during the past three years. Dr. Riley thinks that all the evidence points to the importation of the Hessian-fly into England from the continent of Europe, and not from America. He is also of the opinion that on account of the cooler summers and milder winters, and the lateness at which wheat is sown in England, there is very little danger that the crops will be injured there to any such extent as in America and in portions of continental Europe. In fact, it is very injurious only under conditions where two generations are pretty likely produced in the same year; and he is satisfied that in England, as a rule, only one generation will be produced.

The third of the insect pests of which Dr. Riley spoke was the hop-plant louse, *Phorodon humuli*, of which the full life-history has been learned within the past year. It hibernates at the present season of the year. The little glossy, black, ovoid eggs of the species are found attached to the terminal twig, and especially in the more or less protected crevices around the bud, of different varieties and species of plums, both wild and cultivated. From this winter egg there hatches a stem-mother, which is characterized by being somewhat stouter, with shorter legs and honey-tubes, than in the individuals of any other generation. Three parthenogenetic generations are produced upon plums, the third becoming winged. This instinctively flies to the hop-plant, which is entirely free from attacks during the development of the three generations upon plums. A number of parthenogenetic generations are produced upon the hop, until in autumn, and particularly during the month of September, winged females are again produced. This is the pupifera or return migrant, and she instinctively returns to the plum. Here she at once settles, and in the course of a few days, according as weather permits, produces some three or more young. These are destined never to become winged, and are true sexual females. Somewhat later, on the hop, the true winged male, and the only male of the whole series, is developed; and these males also congregate upon the plum, on the leaves of which, towards the end of the season, they may be found pairing with the wingless females which stock the twigs with the winter egg. Twelve generations may be produced during the year, but there is great irregularity in the development of these generations, and the return migrant from the hop is produced at the end of the season, whether from individuals of the fourth or fifth generation, or of the twelfth. Each parthenogenetic female is capable of producing one hundred young (the stem-mother probably being more prolific), at the rate of one to six, or an average of three per day, under favorable conditions. Each generation begins to breed about the eighth day after birth, so that the issue from a single individual runs up easily, in the course of the summer, to trillions. The progeny from a single stem-mother may, under favoring circumstances, blight hundreds of acres in the course of two or three months.

The exact knowledge thus gained, said Dr. Riley, simplifies the protection of the hop-plant from *Phorodon* attack. He suggested destroying the insect on the cultivated plum in early spring, and the extermination of the wild-plum trees in the woods. The introduction of the pest into new hop countries in the egg state upon plum cuttings or scions may be avoided. Infection from one hop-yard to another never takes place.

ELECTRICAL SCIENCE.

Electrical Energy from Carbon without Heat.

A FEW years ago Mr. Willard E. Case brought forward a battery in which an electric current was generated without the consumption of the elements of the cell, the energy being derived from some external source of heat. The electrodes were tin and platinum immersed in a solution of chromic chloride, which, at ordinary temperatures, has no action on the plates. If the cell be heated, "part of one of its elements, chlorine, leaves the chromic chloride, goes over and temporarily combines with the tin, forming a proto-chloride of tin." This action generates an electric current with an electro-motive force of about .3 of a volt. When the cell is allowed to cool, the tin crystallizes out again, and the cell is as it was before. We have, then, a current of electricity the energy of which is obtained from the source of heat applied to the cell, the possible efficiency of the arrangement being fifteen or sixteen per cent. For many reasons this cell cannot be practically used; but Mr. Case has pursued the general subject, and, in a paper lately read before the Institute of Electrical Engineers, he has brought forward some extremely interesting and suggestive experiments. It is probable that the ultimate sources from which electrical energy will be derived are natural sources of power, — waterfalls, etc., and coal; the conversion in the latter case being direct. For the former a perfected storage-battery is necessary; for the latter, some means of oxidizing the coal without the production of heat, the energy being converted directly into electric currents. Mr. Case's experiments in the latter field are as follows: "In a glass cell containing sulphuric acid C.P. (specific gravity 1.81, temperature 75° F.) two electrodes were immersed, — one of platinum, the other of lump graphite. Only a slight electro-motive force was indicated, .007 of a volt, due to the combination, the graphite acting as the positive element. On the addition of a small quantity of chlorate of potassium to the acid, the electro-motive force immediately rose to .8 of a volt, the graphite being disintegrated after a time. This cell polarized rapidly, which was partially prevented by mechanical means. . . . A method of exclusion was adopted to ascertain the oxidant of this electrolyte: chlorine peroxide ($Cl\,O_2$) appeared to be the only active agent. It is decomposed by the carbon, chlorine being evolved with some oxygen. It was assumed that in this cell graphitic acid ($C_{11}H_4O_5$) was formed as the result of the chemical actions." Different forms of carbon were tried in the cell, giving a different electro-motive force for each form, varying from .3 of a volt to 1.25 volts.

Mr. Case sums up the results as follows: "Undoubtedly the direction of experiments in the future will be to find some cheap substance which will absorb oxygen from the air and give it up to the carbon; in fact, acting as a carrier of oxygen, so oxidizing it without heat. And this is not improbable, as we already know of substances which do this, though giving a low electro-motive force: thus, for instance, the ferric salts are reduced to ferrous by agitating their solutions with carbon, being regenerated by absorbing oxygen from the air. By pursuing this line of investigation, we can be sure we are not ignorantly striving against any law of nature when attempting to convert the whole potential energy of carbon into electrical energy."

If we take the energies of combination of different substances as indicating approximately the electro-motive force obtainable from the action, we will find, in looking at the tables giving energies corresponding to various chemical actions, that the greatest electro-motive force we can hope for with batteries in which metals are consumed does not exceed three or four volts. With the hydrocarbons it is different: the energy in some cases is very great; and a battery in which part of the action consists of the formation of some hydrocarbon, or the change from one hydrocarbon to another, might give a much greater electro-motive force than any battery with which we are acquainted. It is very probable that some one will discover a practicable battery of the type Mr. Case has pointed out.

MAXIMUM EFFICIENCY OF INCANDESCENT LAMPS. — Two things are very well known about incandescent electric lamps: their efficiency increases as we increase the current through them, and their brilliancy, and their life decreases from the same causes. There are two items of cost in electric lighting, — the cost of the current supplied to the lamp, and the cost of renewal of the lamps themselves. By running lamps at a very high candle-power, we decrease the amount of current required per candle, but our bill for breakage of lamps is correspondingly increased. Now, it is evident that if we know the cost of the current and lamps, and the life of lamps corresponding to different efficiencies, we can calculate the least expensive way to run our lamps. This Mr. Howell has done in an excellent paper read before the American Institute of Electrical Engineers. He has obtained, in the first place, the efficiency of certain Edison lamps corresponding to different candle-powers