The Orbits of Aerolites.

Professor H. A. Newton, in discussing the orbits of aerolites, presented the results of the observation and study of a great number of meteors. Without following his line of argument, which was a very able one, his principal conclusion may be given, which is that the aerolites are moving in direct and not in retrograde orbits; that is, they move in the same general direction as the earth, and not in an opposite direction. The fact that the earth does not meet as many as it overtakes is one of his reasons for this conclusion. At the same time he admitted that there may be two reasons why fewer meteors met by the earth should be observed, besides their actual comparative number: first, they may move with such velocity that few reach the earth; and, second, they may fall when men are asleep or not abroad, that is, in the morning hours. The first of these points he did not discuss; but of the second he said, that of ninety-four observed aerolites that reached the earth, and whose zenith is known only at the instant they fall, more appeared in the afternoon than in the forenoon, seven-eighths of them in the daylight. Of the meteorites which we have in our cabinets, he said, and which have been seen to fall, by far the greater part have come from stones that were following the earth, and not moving in the opposite direction.

Spectrum Photography and the Spectrum of Carbon.

Professor H. A. Rowland of Johns Hopkins University presented two brief but very important papers on the spectrum. With new and greatly improved instruments invented and constructed at the university, he has succeeded in making a much more perfect map of the solar spectrum than his former one. The definition of the lines is far better than before, and in some cases single lines have been divided up. He also projected upon a screen, pictures of a number of the groups of lines in the spectrum of carbon, and announced his discovery of the wider distribution of carbon in the sun than has previously been demonstrated.

Vertebrate Fauna of the Puerco Series.

In his paper on the above subject, Professor E. D. Cope gave the position of this formation as below the lowest eocene beds, and above the upper cretaceous, and so of doubtful reference to one or the other of these great systems. The beds of Puerco occur in New Mexico; and Professor Cope said that he had described one hundred and six species from them, of which twelve are reptiles, one a bird, and ninety-three are mammalia. Besides a species of snapping-tortoise (*Chelydra crassa*, Cope), the reptiles presented nothing remarkable excepting three species of aquatic saurians of the genus *Champsosaurus*, Cope, which have their nearest relations in the period next older (Laramie). The greatest interest attaches to the mammalia. The species all belong to extinct families and suborders, except four possible lemurs; and the predominant orders of the first immediately following in time are absent. Eleven of the species are probably monotromes, or of the same order as the Australian duck-bill; forty-nine are flesh-eaters; and twenty-six are hoofed types. All the forms show themselves to be the ancestors of the later and modern mammals by indubitable characters of their structure.

AN ETHNOGRAPHICAL COLLECTION FROM ALASKA.

THE American Museum of Natural History in New York has received a magnificent ethnographical collection from Alaska, collected by Lieutenant Emmon, which forms a valuable supplement to the Powell collection from British Columbia, in the same museum. While the latter includes principally specimens of Haida and Tsimpshian origin, the new accession has been collected among the Tlingit, in whose territory Lieutenant Emmon spent more than five years. The new collection is now on exhibition in the museum, occupying about a fourth of the ethnological hall.

It is arranged in several groups, the first comprising a collection of fishing implements and weapons. The implements resemble in style those of the Haida and other tribes of the North-west coast. Of particular interest is a throwing-stick from Sitka, carved in the style peculiar to the Tlingit and Haida. The implement itself, however, is undoubtedly an imitation of the Eskimo throwing-board. The next group comprises a collection of weapons and armatures. We find among these, jackets made of heavy elk and sea-lion skins, which were impenetrable to the stone and copper weapons of ancient times. The Russian buttons on one of these show that it was used comparatively recently. Besides these, there is a series of remarkable armatures made of round sticks tied firmly together, and of thin pieces of wood arranged in a similar way. While the body was thus protected, heavy masks and hats, carved so as to present the crest of the warrior, fairly covered the head. They consisted of two or three parts made of heavy wood; and we can easily imagine how fierce a Tlingit warrior, incased in this armature, must have looked. The stone battle-axes, of which the collection contains quite a number, could hardly hurt men protected by this hat and coat.

In the same case in which these armatures are on exhibition, we see a collection of whistles used in dances. These do not properly belong to the Tlingit, who do not use whistles at their festivals, but are imported from the Queen Charlotte Islands, the country of the Haida, who have a great variety of these instruments. There is one flageolet in the collection, and several others are known which were collected among the Haida; but it is doubtful whether they are an original invention of these tribes, or an imitation of European instruments. It is very remarkable that the Tlingit should hardly use any whistles during their dances, while all tribes of British Columbia use them to a great extent. This is one of the few facts that are known, tending to prove that the culture of North-west America has been derived from various sources. It is to be regretted that the Powell collection does not contain whistles from the Kwakiutl, which would serve as a valuable object of comparison with those of the Haida, of which the museum possesses a great number.

Lieutenant Emmon has collected very valuable implements made of mountain-goat horn; but, what is more interesting, he shows us how these beautiful spoons and ladles are manufactured. The elegant curvature of the handle is produced by means of a strong piece of wood with two oblique perforations, a larger and a smaller one. The lower portion of the horn is pushed through the wider perforation, and the point turned back so that it can be pushed into the smaller hole. Thus it gets the curved shape required for the handle. The spoon itself is pressed between two pieces of wood, similar to a lemon-squeezer. By the side of the mountain-goat horn implements we observe beautifully carved paint-brushes, paint-pots made of stone, paints, baskets, and other household goods.

The most interesting part of the collection, however, is the large number of masks and dancing-implements, the greater part of which have been taken from graves. There are also very valuable and interesting rattles. It is remarkable that the collection contains only a few rattles in the shape of ravens, and these not elaborately carved, while the Powell collection contains many beautiful specimens of this class. This fact shows that they were probably not originally a Tlingit, but a Haida or Tsimpshian design. Besides this, Lieutenant Emmon states that they are only used in dances and festivals that have no religious character. In all shamanistic ceremonies other styles of rattles are used. Among the Tsimpshian, on the other hand, the raven rattle is the exclusive property of the Raven gens. Among the rattles of the Tlingit we observe many a beautiful carving, and it is worthy of remark that most of them represent certain myths or mythical beings. We observe the fabulous grandmother of men, of whom the Haida also tell, the Yēk (the genii of man), and the shaman tearing out the tongues of various animals in order to obtain the power of witchcraft.

Above these rattles, neck-rings made of red-cedar bark are exhibited. It appears, from a study of the Emmon and Powell collections, that these rings are not by any means so extensively used by the Haida and Tlingit as by the Kwakiutl, among whom they are closely connected with their religious ceremonies and dances. Indeed, it seems almost impossible to properly classify the neck-rings of the Haida and Tlingit, which seem to be used almost exclusively as ornaments. Among the Kwakiutl, the spirits of the dead, the cannibal, and other mythical figures, are each represented by a peculiar kind of ring, which is highly prized by its owner. When these rings are worn, the faces of the dancers are painted in a cer-

tain way, peculiar to each mythical figure, which may be suggestive of the origin of the use of masks on the coast. We notice a much decayed ring in Emmon's collection, carefully woven by folding narrow strips of cedar-bark. The Tlingit were unable to give any information as to the use of this ring. It is in use among a certain gens of the Kwakiutl (Qanikila) near the north point of Vancouver Island. The ring is set with haliotis-shells, and adorned with ermine-skins, the ends being rolled up in helix-like figures. A head-ring made in a similar way belongs to the dress of the dancer. It is exclusively worn by the daughter of the chief of the gens Qanikila, and is highly valued. An enormous quantity of bark is required for its manufacture. Its occurrence in a Tlingit grave shows the extent of the trade all along the coast, even before the advent of the whites.

In the same case a great number of crowns used by dancers is exhibited. They are made of mountain-goat horns, of wood carved so as to imitate the shape of the horns, or of copper. They are also used by the neighboring tribes. Among the head-ornaments we observe a great number of strips made of bear-skin with two ears. The same kind of ornament is found in the Powell collection, collected among the Tsimpshian, who trim it with human hair dyed red and white. Of course, there are painted leather aprons, and beautiful blankets woven of mountain-goat wool, in great variety.

The most important part of the collection are the masks, of which a great number are exhibited. They are especially valuable, as Lieutenant Emmon took great pains to ascertain the meaning of the masks, which thus become a rich source of information for the student of ethnology. A comparison of these masks with others collected on Vancouver Island and in Dean Inlet shows that the style of North-west American art, although uniform in general outlines, has its specific character in various localities. The imitation of animal forms is much closer here than in the southern regions, where the forms are more conventional, certain attributes of the animal alone being added to human figures. Another and a very interesting peculiarity of these masks are the figures of animals attached to the faces. The Eskimo tribes of southern Alaska carve their masks in the same fashion, numerous attachments belonging to each. This is another proof of the influence of Indian art upon that of the Eskimo. The figures attached to the faces refer, as a rule, to certain myths; and the same is true of the Eskimo masks and their characteristic wings and figures.

A few of the masks in the Emmon collection, although used by the Tlingit, are evidently of foreign origin. There is, for instance, a mask of the human-headed crane, one of the principal masks of the Tsimpshian; and another one with two faces, the outer being cut in the middle and opening on hinges. Such masks are also peculiar to southern tribes.

A considerable number of masks show deep hollow eyes and sunken cheeks. They represent the heads of dead men. Among the other a certain class with thick lips and beards, and eyebrows made of otter-skin, are of interest. They represent the fabulous Kushtaka, the otter people, of which many tales and traditions are told. Another remarkable mask is that of the mosquito. This is of special interest, as the mosquito is among the southern tribes the genius of the cannibal, and as cannibalistic ceremonies are not known to be practised by the Tlingit. It may therefore be assumed that the myth referring to the mosquito is found in a somewhat altered form among the Tlingit.

A great number of small idols, the Yĕk, or genii of the shamans, forms another group of the collection. They are used in incantations. There is also a very remarkable pillow, — a curved piece of wood, nicely carved, which is placed under the shaman's neck while he lies in a trance, and helps him to confer with the spirits.

We will only mention the numerous charms, bone and stone ornaments, beautiful jades, slate, and other stone implements, many of which are beautifully finished. This remarkable collection is one of the most complete, systematic, and consequently valuable, brought from the North-west coast to the museums of our country. It is to be hoped, that, after the new wing of the museum shall have been completed, the Powell collection, which is at present stowed away, will be exhibited for comparison. Both collections may serve as a foundation for studies on the ethnology of southern Alaska and northern British Columbia. F. B.

MENTAL SCIENCE.

The Mental Powers of Insects.

ALONG with the introduction of scientific methods into psychology there was ushered in the comparative study of psychic phenomena. The interest was no longer exclusively concentrated upon human intellect, but the study of the minds of animals was shown able to contribute results of great value for many of the most important generalizations of a scientific psychology. Moreover, it has become recognized that we must not read into the actions of animals motives and conceptions suggested by our own conduct under analogous conditions, but must interpret the results objectively, and decide from the results whether our notions of the plan of animal behavior is valid or not, and to what extent. Among the problems included in such a scheme, the power of the senses is of fundamental importance; for these are the avenues of connection between the organism and the environment. The difficulty here is to devise tests that will yield a definite result. In ourselves we can always have recourse to the analysis of consciousness. Some recent attempts to shed further light on the senses of insects will indicate the scope and difficulties of the problem.

Forel, a Swiss naturalist and worthy follower of Huber, has added to his studies of ants by testing their sensory powers (*Recueil zoolog. suisse*, iv. No. 2, 1887; also *Centralblatt für Physiologie*, No. 23). Among his observations are some tests of the sensibility to ultra-violet rays. Do ants see these rays, or do they feel them (presumably as heat-sensations) through the skin? He blinded some ants by coating their eyes with a varnish, and found the behavior of such ants to be hardly distinguishable from that of normal ones. They probably retained some light-sensibility, for they preferred to remain in the bright parts of the nest. These ants are now put into a box with a glass top. On this top is placed a piece of 'cobalt-glass,' that transmits the ultra-violet rays of the spectrum, and next to it a frame with a glass bottom containing a solution of esculine that absorbs the ultra-violet rays. In addition, there is a dish of water over one portion of the top to weaken the heat-rays, and over another portion a sheet of cardboard to give shade. The position of these objects is varied, and from the congregation of ants under one or other of them he draws the following conclusions: (1) the ants see light, and especially ultra-violet, as Lubbock had shown; (2) they perceive it chiefly with their eyes, for when the eyes are varnished they are indifferent to the ultra-violet, and re-act only to a bright sunlight; (3) the dermal sensations are not as important as had been believed.

Another interesting point concerns the power of ants to recognize one another after long separation. In one species (*Camponotus ligniperdus*) the return of a number of its fellows to a nest after forty-one days' absence was followed by a fierce struggle, in which several of the new arrivals perished. After a few days, however, there was peace between them. It is to be noted that the blinded ants also took part in the attack. A second party was returned after eight days, and at once recognized and received as friends. But this is variable in the different species; cases being on record in which recognition took place after a year's absence, and again where the ants in the pupa stage, removed for only four days, were attacked.

The use of the antennæ Forel believes to be mainly as organs of smell. If the antennæ be cut off or coated with paraffine, the ants are incapable of pursuing their ordinary routine of life; while wasps, whose heads, including the eyes and pharynx, were removed, but with the antennæ intact, sought and found honey, and even tried, though in vain, to eat it. In insects using their eyes in the main, the antennæ are rudimentary, and such insects are inactive at night. Ants, too, have a sense of taste, preferring some substances to others, but are not able to distinguish poisonous substances. The effect of poisons varies in different insects. Arsenic kills gnats, while hundreds of *Myrmica scabrinodis* eat it without ill results. Strychnine does not produce cramps in ants, and they die of it slowly, while slight doses of morphine bring on severe convulsions. The sense of hearing, excluding the sense of jar, is very rudimentary, if it exists at all; while touch is highly developed, ants re-acting to the slightest contact. The same is true of their