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

temperature-sense, as the changing of the position of the larvæ at different times of day indicates. Insects must be very insensitive to pain, or a spider would hardly eat up its own leg just after it had been cut off, as Forel observed. Ants are thus well supplied with senses, and, though their actions are largely instinctive, some control over the co-ordination of these instincts undoubtedly exists.

Another worker in the same field, Dr. H. C. McCook (*Proceedings of the Philadelphia Academy of Sciences*, part iii. 1887), contributes a note on the sense of direction in ants. The species is the *Formica rufa* of Great Britain, and the observation was made in Scotland. These ants build mounds as much as three feet high and from six to seven feet in diameter at the base. From such a mound, roads are seen to radiate. These roads are stained dark, probably by the action of the formic acid which the ants secrete; and the leaves and grass over which the road passes are worn smooth by the constant action of innumerable legs. From one such mound three roads radiated, and were traced to their termini, — three oak-trees, on the branches of which were *Aphides*, the 'milk-cows' of the ants. The directness of these roads was remarkable. The first was twenty-one paces (about sixty-five feet) long, and was almost perfectly straight from the nest to the tree. The second was twenty-three paces (seventy feet) long, and varied less than three inches from a straight line if measured from the nest to a point within two feet of the tree, where an originally straight path had been abandoned for a détour. The third road was thirty-four paces long; for six paces it ran straight, then encountered an old stump that caused a deflection, but then went directly to the tree, across a foot-path, and, as it was, the deviation was not more than three feet from a straight line. The straightness of these roads cannot be attributed to chance; and the fact that ants can see only a little way off (and especially in this mass of bracken and other plants) opens up a real problem as to the nature of a sense of direction in ants. Dr. McCook adds the mention of the remarkable feat of a Texas ant making an almost perfectly straight path 669 feet long, 448 feet of which ran under ground at an average depth of 18 inches.

THE FUNCTION OF THE CEREBRUM IN THE DOG. — In his last contribution to the physiology of the brain, the eminent physiologist at Strassburg, Professor Goltz (*Pflüger's Archiv*, 1888), gives an account of a dog from which one entire cerebral hemisphere had been removed. Here there was not, as some physiologists would expect, a paralysis and an anæsthesia on the side opposite the injured organ; but the action of the dog was quite normal, only that he preferred the side controlled by the intact hemisphere. This goes to show that in the dog one hemisphere can to a large extent perform the functions for the entire body. As a converse proof, if symmetrical regions are removed from both halves of the brain, the result is a much more serious one. An animal lacking both its frontal lobes had its intelligence much diminished, was restless, constantly moving, could not feed itself, could not hold a bone, and was a decidedly abnormal dog. A dog with both its occipital lobes gone shows marked sensory defects, but behaves much more normally than the former dog, thus indicating that the part removed is of vital importance.

A SUGGESTION FOR THE 'TELEPATHIC' THEORY. — Professor Josiah Royce has an apt word to say in regard to the cases of coincidence of a critical experience with a strong impression of danger on the part of a distant friend, which some regard as evidence of 'telepathy' (*Mind*, April, 1888). He offers as a solution of the many cases in which the evidence rests entirely on the word of a reliable witness, that the memory is the subject of a hitherto undescribed hallucination: it is an "instantaneous hallucination of memory, consisting in the fancy, at the very moment of some exciting experience, that one has expected it before its coming." As A learns of the death of B, it suddenly and vividly occurs to him that he expected B's death, and had a distinct presentiment of it. The belief might come with irresistible force, and acquire strength by reflection. One such hallucination of memory is well known: the feeling that an experience has been here before. Here we easily recognize the illusion, because we know that we do not live our lives twice; but in the other case no such corrective is at hand. If such illusions occur, marked instances of them should be found among the insane. Two cases are cited, the one of a young girl whose lover (so she says whenever any thing happens) predicted every thing to her, — her removal to another asylum, a change of physicians, and so on. The other case is that of a young man who believes that all the events of asylum-life have been told to him in a previous conversation. The news of the day is similarly anticipated. An interesting point in this case is, that the patient tells that when these (imaginary) conversations occur he pays little attention to them, but when the real occurrence takes place he vividly remembers the former conversation. His memory for real events remains quite good. Now that attention has been called to the possibility of such illusions, normal instances of them should be forthcoming.

ELECTRICAL SCIENCE.

Cost of Electrical Distribution by Transformers and Secondary Batteries.

THE attention of electricians, both in this country and in England, has been lately called to the relative values of continuous-current and alternating-current distribution. In the discussion before the English Society of Telegraph Engineers and Electricians, the majority of the speakers seemed to incline toward the alternating system, apparently relying to some extent on rose-colored reports of the successful working of plants on this side of the water. There were several members, however, who spoke strongly in favor of the continuous-current system; and one of them, Mr. Crompton, has published figures of the comparative cost of installing ten thousand 16-candle power lamps, burning simultaneously, using in the first case the continuous-current system with storage-batteries; in the second, alternating-current transformers.

WITH SECONDARY BATTERIES.

Motive power, six 166-horse power sets=996 horse-power at £8 12s.	£8,700
Dynamos	4,800
Building to suit above	8,000
Charging-main, 45 tons at £80	3,600
Laying main in culvert	1,500
Distributing-mains, 12,000 yards at 16s. per yard	9,600
Service-boxes, 450 at £2	900
Batteries, four sets of 50 cells each	8,640
Regulating-gear	1,000
Total	£48,740

WITH ALTERNATING-CURRENT TRANSFORMERS.

1,450 horse-power at £3 12s. per horse-power	£12,500
Dynamos and exciters	5,540
Buildings to suit above	11,000
Charging-main	2,400
Distributing-main, 12,000 yards at 14s. per yard	8,400
Service-boxes, 450 at £2	900
Regulating-gear	500
Transformers, assuming one large one for two houses, 300 at £25 (including fixing)	7,500
Total	£48,740

These estimates may be taken for what they are worth: they probably give an approximate idea of the cost of different items. The storage system of Mr. Crompton, however, is not a complete storage system, such as will be used if secondary batteries become much more economical than at present. The cells are not located at some distance from the station, and charged by currents of high electro-motive force: they are placed *in* the station, and are only charged for a portion of the twenty-four hours, the plant remaining idle during the remainder of the day. For short distances, such as Mr. Crompton contemplates, this is possibly the best arrangement. It would have been interesting if the running expenses of the two systems had been compared, but the necessary data are hardly, at the present time, available.

ADVANTAGES OF ELECTRICITY FOR RAILROAD-WORK. — The rapid advances of the application of electricity to street-car traction brings up the question whether we cannot in the near future look to the displacement of the steam-locomotive by the electric motor. The conditions of street-car and railroad work are different: in the first, electricity is called upon to displace horses, an extremely costly motive power; in the second, it must displace steam. That it can economically replace horses has been shown