

ment of force in the human sphere, from the movement of an eyelid to the course of an express train or an ocean-steamer, could be traced back to what was known as will, and could be followed no further.

Mr. Tanner said it seemed to him that when dealing with metaphysics it was difficult to come to a common understanding. The paper was most interesting, but it appeared almost impossible to arrive at any satisfactory conclusion on such a subject.

Mr. A. R. Atkinson remarked that the difficulty in dealing with a subject like this was largely one of language. Words in general were not constructed with precision for the purpose of science, but roughly hewn for popular use; and, after their being so manufactured, the philosopher had to make the best use of them he could. The chief objection which a philosopher would take to Mr. Carlile's paper would probably be that there was too much common-sense about it. In ordinary language our view of the "cause" of a thing was determined by the particular aspect of it that had most interest for us at the time; but was it possible, philosophically, to separate the cause of anything from the whole antecedent history of the universe? Similarly, the doctrine of the conservation of energy showed that, scientifically speaking, no cause can ever cease to operate. This seemed to be the explanation of the argument which the author based on Newton's first law of motion. In conclusion, he protested against what he took to be the suggestion of a previous speaker—namely, that a subject of this kind lay beyond the scope of the Society.

Mr. Barnes also agreed with other members as to the great difficulties attending the discussion or conception of a question of this nature, and gave as an illustration a chain of circumstances showing how an occurrence or event might be traced back through the chain to a cause having apparently not the slightest or remotest connection with it. It seemed to him that all existing circumstances were the progeny of pre-existing circumstances, which was perhaps only another way of saying that "the cause of anything is the previous history of the world."

Mr. Carlile, in reply, said if a subject such as this was barred as unsuitable for the Society they would bar everything that had been written on the subject of philosophy as distinguished from special science, from Plato to Hegel. If agnosticism was proved untenable, the crude teleology of Paley was not the only alternative explanation of the universe. There were other explanations which did not leave reason out of account, such as that attempted to be given by Hegel. It was quite legitimate, in any case, to show the fallacy of one system, without having another system ready-made to substitute for it.

2. "A Chapter in the History of the Warfare against Insect-pests," by W. M. Maskell, F.R.M.S. (*Transactions*, p. 282.)

In the course of his paper the author referred to the fact that Dr. C. V. Riley had been obliged, through failing health, to resign his appointment as Director of the United States Agricultural Department (Entomological Branch), and pointed out that the farmers and cultivators of every country of the globe were indebted to him for his services during the past thirty years.

On the motion of Mr. C. V. Hudson, seconded by Sir James Hector, the following resolution was passed: "That the members of this Society sympathize cordially with Dr. Riley in his enforced retirement, on account of ill-health, from the position of State Entomologist to the United States, and beg to assure him of their high appreciation of the services which he has rendered during the last thirty years to cultivators of every country."

FOURTH MEETING: 25th July, 1894.

Mr. C. Hulke, Vice-president, in the chair.

New Members.—Mr. Robert Orr, Dr. H. Pollen, Mr. E. F. Hadfield.

Papers.—1. "On a New Species of Fern-bird (*Sphenæacus*) from the Snares Islands; with an Exhibition of Specimens," by Sir W. L. Buller, F.R.S. (*Transactions*, p. 127.)

2. "Notes on the Flightless Duck of the Auckland Islands (*Nesonetta aucklandica*)," by Sir W. L. Buller, F.R.S. (*Transactions*, p. 128.)

3. "Notes on the Ornithology of New Zealand; with an Exhibition of Rare Specimens," by Sir W. L. Buller, F.R.S. (*Transactions*, p. 104.)

Sir James Hector asked if the differences between the various species of the outlying islands exceeded the limits of variation within New Zealand itself. For instance, the Chatham Island pigeon on the table does not appear to vary from the normal so much as several specimens in the Museum. The Antipodes Island parrakeet is, no doubt, distinct, but the supposed representative species of the New Zealand red-top seems very doubtful. The change of name of the North Island woodhen is also only founded on slight difference of plumage; yet he had seen in the south-west coast black woodhens with three red and four black chicks nearly full-grown. The Chatham Island pukeko is another case of a species determined on very slender plumage characters. He would like to see more attention paid to characters derived from the internal anatomy of birds in their classification. He admired Sir W. Buller's inference respecting the climbing habits of the flightless duck of the Auckland Islands, and no doubt the skeleton of that bird will show evidence of its modification and adaptation to this novel mode of progression. To make a new species he held that divergence from the type must be due to influences extending over a long period of time and in an isolated locality.

Mr. Hulke was glad to hear Sir W. Buller protesting so strongly against the wholesale destruction of our native birds. They certainly should be protected. Those beautiful birds the tui and the bell-bird were fast disappearing.

Sir W. Buller, in reply, said that Sir James Hector's remarks had raised the old *questio vexata*, What is a species? It could not be denied that the line of demarcation between species and varieties is and ever will be an uncertainty. As he, the speaker, had pointed out on a former occasion, the "species" of one naturalist is the "subspecies" of another, and the "local variety" of a third. Sir James Hector's observations as to the difficulty of distinguishing between the black woodhen and the brown woodhen in the South Island was a case in point. Several species of this genus appear to run into one another by almost insensible gradations, and it is extremely difficult to draw the line between them. As to the amount of constant difference sufficient to distinguish one species from another, that too is an uncertain quantity, for it is practically at the discretion of the expert, and few experts are in exact agreement on this point. All this goes to prove the existence of transitional forms or "incipient species." Sir James Hector had expressed his belief that external characters, such as the colour of the plumage, and so forth, were of very little value as compared with the anatomical structure. That

was perfectly true, but it would be found as a rule that the external characters, such as the bill, feet, and wings, were but a reflex of the internal organization; they must of necessity harmonize with each other, the one being, in fact, the index of the other. For his own part, he considered that, whatever might be the system of classification, it was impossible to attach too much importance to the anatomical structure of animals. In his opinion, as to the class Aves, there never would be a perfect system evolved till the œsophagus and intestinal canal, as well as the osteological framework, of every bird had been completely investigated by ornithologists, as that of the common rock-dove (*Columba livia*) had been by the late Professor McGillivray. As to the small amount of specific difference distinguishing these island-forms from those inhabiting the mainland, this only went to prove that at no very remote date in the past there was a parent species from which these various forms had sprung, the differentiation of character having been caused, under the operation of natural laws, by the insulation of the descendants for the necessary period of time. For example, roughly speaking, each group of islands possessed its own parrakeet, but these were so closely related to one another that some naturalists regard them all as mere local varieties of the typical *Platycercus novæ-zealandiæ*. Be that as it may, no one can doubt a common parentage. The case is different as between *P. unicolor* and *P. erythrotis*. Here we have two parrakeets, possibly generically distinct, living side by side on Antipodes Island, a mere rock in the midst of the ocean. The larger form, *P. unicolor*, has been there long enough to become highly specialized in its structure and habits, having, as we see, become admirably adapted to its natural environment. The other form, *P. erythrotis*, differs so slightly from *P. novæ-zealandiæ* that some ornithologists refuse to accord it separate specific rank. As he had explained on a former occasion, he could only account for the co-existence of the two species by assuming an accidental colonization of the rock by the smaller red-topped form at a comparatively recent date. As to Sir James Hector's criticism with regard to Mr. Rothschild's *Carpophaga chathamensis*, he (the speaker) could hardly agree. He had himself shot hundreds of the New Zealand wood-pigeons, and he was willing to admit that within early limits there was much individual variation. But that was something very different from the presence of constant specific characters, however slight. He never undertake to pick out a Chatham Island wood-pigeon from a hundred New Zealand birds, the difference of plumage being sufficiently pronounced to make the bird readily distinguishable from *C. novæ-zealandiæ*. That both birds had originally come from the same stock he had not the slightest doubt. But, if we are to regard specific characters at all, then for the purposes of classification we must treat the Chatham Island pigeon as distinct from our own. If a so-called "species" passes the ordeal among expert ornithologists at Home, and is generally accepted as such, we cannot lightly ignore the distinction; but the very doubt raised by Sir James Hector bears directly on the question of descent with modification. Dr. Sharpe's *Porphyrio chathamensis*, referred to by Sir James Hector as a case in point, seemed to him entirely different; for this was just one of those ordinary instances of individual variation. If, on the other hand, all the specimens from the Chatham Islands had exhibited the peculiarities in coloration of Dr. Sharpe's specimen, he (the speaker) would have been willing to admit it as another illustration of the creation of insular species by natural means. As he had pointed out, however, that was not the fact.

4. "On the Anatomy of Flight of certain Birds," by Sir James Hector, F.R.S. (*Transactions*, p. 284.)

Mr. Tanner asked if it was true that the penguin could only move

in the water with its wings. He could quite understand from what Sir James Hector had exhibited how the albatros only used the tips of its wings for turning and directing its flight.

Mr. M. Chapman said the problem of the flight of the albatros is one of the most interesting that could engage the attention. It was not to be solved either by anatomy or mathematics, though both may probably assist to throw some light on the question. There is, however, more to be hoped for from observations or experiment. He had watched albatroses and similar birds hour after hour and day after day, and had been unable to come to any other conclusion than that they utilized upward currents of air. These upward currents are caused by the deflection of the wind from the backs of waves. They can be seen in a gale of wind by the showers of spray which fly upwards from breaking waves. On the islands where they breed, they choose their breeding-grounds on the bleakest and most exposed parts of the island, at a great elevation—1,000ft. and upwards. They cannot rise from the ground without wind, but do so with ease in a strong wind. In a light breeze they rise by violent exertion, barely able to maintain themselves, but make for the edge of the cliff, where the wind, striking the precipitous cliff-wall, makes a strong upward current, and the moment the bird gets into this current it shoots upward 100ft. or more in a moment, and is immediately master of itself. Flying at sea they may constantly be seen to dip into the trough of the sea, choosing that moment to turn to windward and rise. In flying to leeward they descend, accelerating their speed. In turning, the end-joint of the wing is bent, as if to avoid touching the water, but possibly to virtually shorten the wing. Another interesting problem was the question as to how the albatros feeds. He had seen an albatros on shore disgorge a large pelagic squid which must have weighed several pounds, and the castings of cuttle-beaks at their nests show that this is an important item of their food. But he had never seen one pick up anything while on the wing, or alight to feed except on offal thrown from a ship. They get little of this, as they first take a look at speed, and then have to make a wide sweep before they can alight at the spot. By this time the smaller birds have devoured the food.

Sir W. Buller said he had listened with great interest to Sir James Hector's paper on certain features in the anatomy of New Zealand birds. He would now ask Sir James whether the peculiarities of structure, showing adaptation to the environment of the species, so ably discussed in his paper, could be accounted for on any other hypothesis than that of natural evolution.

Sir J. Hector replied that the whole of the facts put forward by him supported that theory.

Sir W. Buller, continuing, said that, although Sir James Hector's description of the mechanism of the wing of the albatros was very instructive, and his theory in regard to the flight of this bird was a very ingenious one, he did not think we had yet quite solved the problem. The flight of the albatros was very wonderful, not only in its majestic sweep, even against the wind, but in its being so long sustained. When voyaging on the high seas he never tired of watching this untiring flight—to use Froude's expressive language—"sweeping past in a long rapid curve, like a perfect skater on an untouched field of ice." He mentioned a case within his own observation of an albatros performing a continuous flight of 3,000 miles (see *Trans. N.Z. Inst.*, vol. xxvi., p. 185). He agreed with Mr. Chapman that the feeding-habits of this bird still required explanation.

Sir J. Hector replied that he only looked on the fact he had stated as one of the factors in enabling the sustained flight of the albatros. It only suggested the mechanism by which the bird can take advantage without fatigue of the other causes indicated by previous writers and

those who had previously spoken. With reference to the supposed abstinence from food, he conjectured that the albatros was a night-feeder, and was enabled to capture its chief prey, the cuttlefish, by its phosphorescent luminosity, which must make it easier seen and captured in the dark than in the daylight. The penguin uses its wings in the water for swimming.

FIFTH MEETING: 8th August, 1894.

Sir James Hector in the chair.

New Member.—Major E. H. M. Elliot.

Papers.—1. "On Ceremonial Language," by E. Tregear, F.R.G.S. (*Transactions*, p. 593.)

Mr. Maskell said he was not an admirer of Mr. Tregear's theories, but he was one of the men who had done most to lay before the Society facts which without his industry would not have been known to those south of the line. He believed every fact brought to our notice by Mr. Tregear, but he did not agree with the theories he founded his facts on. There might, perhaps, be an explanation of the ceremonial language that had not occurred to Mr. Tregear—namely, that in the human heart there lies an essential acceptance of the fact, which is denied by modern liberalism, that all men are not equal; and this may account for the universal prevalence of class distinctions, inferior and superior.

Mr. Coleman Phillips said that if any one saw the chiefs and the common people on the islands they would observe that they are quite different. The common people look like slaves and the chiefs like nobles in comparison, both physically and mentally; and their language is quite different. This will be seen in their old songs; but the dialect has altered much, as in England. Is it in the alteration of the dialect that the difference in language arises? The people remain the same, but the language has altered in course of time.

Sir James Hector suggested that one cause for the gradual change in language was due to the fact that certain words became *tapu*—as, for instance, the name of a fish or bird—on the death of a chief who was called by the same name.

Mr. Tregear, in reply, said it was true, as Sir James Hector had said, that words got out of use through being *tapu* when forming parts of chiefs' names. This is the custom throughout the whole Pacific, and it is likely (as explained in the paper) that after a time the disused words might grow into a kind of chiefs' language, not to be used by the common people. It happened, however, that the *tapu* on such words only exists during the life of the chief in whose name they appear. The substituted words are not gibberish or foreign words; they are pure Polynesian, and without historical interest. It is a fact, as Mr. Phillips has said, that in some of the islands the chiefs are invariably superior in physique to the common people, but there is no substantial ground for the theory that these men are aristocracy because representing the conquering race, as the Normans did in England. The chiefs' families are people having large bodies (sometimes far too fat), because they are better fed than the others, and their direct forefathers have also been well fed. No hereditary racial difference between them and the common people has been established. Ceremonial language could not certainly be attributed to the cause suggested by Mr. Maskell—namely, that there was an inherent and instinctive division of mankind into superior people and inferior, necessitating that language should adapt itself to such feelings. These

courtly languages under discussion were comparatively modern inventions. Those of the Malay Archipelago savoured more of the influence of the priest than of the soldier. As India shows to us, when a language outgrows active life it fossilizes; it becomes the property of the religious bodies, and its more sprightly children are adopted by the people. In Java this shows out plainly, where we find the original native words superseded by the Sanscrit and Pali brought by the priests of Buddha, in its turn overlapped by the Arabic of the Moslem. If Polynesians passed through the Malay Archipelago, as they almost certainly did, they passed through long before the courtly language of Java was invented, and consequently could not have acquired it from the islanders.

2. "On the Milk-supply of Wellington," by C. Hulke.

Mr. Maskell said we owed a debt of gratitude to Mr. Hulke for his able and interesting paper. He thought it was a matter for congratulation that nothing worse than adulteration by pure water had been discovered in the analyses of the various milks. He had feared that our milk contained deleterious substances of various kinds. He would like to know how the ordinary consumer could discover when milk was adulterated.

Mr. C. T. Richardson said that, as the majority of young New Zealanders were brought up on cows' milk, it was certainly not beneficial to them if adulterated with water.

Mr. R. J. Barnes would like to know if it would be possible to adulterate milk with mutton or other fat, as he had heard of this being done to obtain a supposed heavier cream.

Sir James Hector said the elaborate chemical tests so ably described by Mr. Hulke might be necessary for enforcing legal proceedings, but the simple test of the proportion of cream by means of a graduated tube was enough for ordinary purposes. The danger arising from adding water to milk depended on possible impurity of the water used. He had seen aquatic larvæ of blow-flies introduced into milk in this way. Low specific gravity does not always indicate bad or watered milk, as the amount of nourishment in the grass at different seasons greatly affects the quality, and especially the proportion of butter-fat it contains.

Mr. Hulke, in replying, stated that he had not said that the milk was adulterated with *pure* water. The question about mutton or other fats being used need not be entertained at all. Mr. Hulke wished farmers, dairymen, and milkmen generally to be educated up to the fact that the cow was a machine, man the manufacturer, and it depended upon the goodness of the machine or the material put into it as to what the manufacturer would get out of it. He would like to see a clause in the Bill now before Parliament altered to read "normal-quality milk" instead of "pure milk," as so-called pure milk may often be very poor milk, and not good for butter; and the standard quality should be fixed at from 11 to 12 per cent.

A number of exhibits were shown at the meeting by Sir James Hector; and Mr. T. Kirk exhibited a collection of mosses, and also a beautiful yellow flower, a new arrival in New Zealand, from Mr. Duncan's nursery at Porirua—(*Euryops abrotanifolius*, DC.)—a native of the Cape of Good Hope. It produces its bright flowers in vast abundance during the winter months—June to September.