of in the ordinary winter temperature. Most of the nymphæ passed the winter even in hothouses or in heated rooms, and produced *V. levana* in the spring. Similar researches were made by Weismann with another common day-butterfly species, *Pieris napi*.

Weismann thinks that the winter form of these butterflies was the original one, which existed alone and in a single annual generation in Europe, during the so-called ice period. As the summers became longer and warmer, a second and finally a third annual generation could be produced, and these were changed to the *Prorsa* form by the higher temperature. The return of the colder season then always caused a return to the original form (*Atavism*), just as it occurred in the experiments. To confirm this view, Weismann quotes the fact that in Lapland and in the upper Alps only a winter form of *P. napi* exists. As with an incomplete return to the original form intermediate forms result, the varying aspects of which prove that the change of the original form always takes place in a certain direction, Weismann thinks that the change of temperature might certainly have given the impulse for a change of form, but that the particular direction of the same lies in the constitution of the animal in question. We may certainly consider as a result of these investigations, that a change of climate, together with other causes, may have directly produced a great number of different species of butterflies.

Another fact mentioned by Weismann refers to the above, and is no less interesting. There is one of the lower Crustaceæ, *Leptodora hyalina* (Siebold's and Köliker's *Zeitschrift für Wissenschaftliche Zoologie*, 1875), which is remarkable in many ways. This animal, according to the observations of the Norwegian Sars, shows similar phenomena, as the winter breed is differently developed from the summer breed, although the perfect forms are not so widely different as those of the butterflies.

ZOOLOGICAL NONSENSE

NOT many months since a controversy which had been raging for several weeks in the columns of the so-called "leading journal" was suddenly and completely put an end to by a well-known writer in a contemporary calmly and dispassionately pointing out that both disputants had been uttering what was absolute nonsense. "I use the word nonsense," he went on to say, "not as it is often used as a vague term of disapproval, but with a strict specific meaning, as contradistinguished from sense. All words—all articulate words—must be either sense or nonsense. They are sense if their meaning can be imagined, conceived, represented in some way or other to the mind. They are nonsense if their meaning cannot be imagined, conceived, or represented in any way to the mind. When a man says, 'I saw six men and two women walking down such a street, dressed in such a way, and heard them talking on such a subject,' anyone can understand, whether he believes it or not. The speaker is talking sense, whether truly or falsely. If he were to say he saw two crooked straight lines standing in the five corners of a square, you would say he was talking nonsense, that his words were neither true nor false, and that he might as well keep silence, or utter any other unmeaning sounds. The difference between these two examples consists solely in this, that the first assertion can, whereas the last cannot, be pictured to the mind. Each particular word by itself is as clear in the one case as in the other."

What the question then under discussion was, does not signify. Enough that it was nothing which had to do with natural science. But we are sorry to say that nonsense is still occasionally spoken or written by those who, if they do not exactly profess to be scientific, yet pretend to treat of things that clearly belong to the domain of science, and so make some approach to that character. Moreover, they are looked up to by some well-meaning though imperfectly instructed persons as authorities worthy of consideration. There was a time when there was a good deal of nonsense written by naturalists, and especially by zoologists, but we had been in hopes that the practice was entirely given up. It seems, however, that we are disappointed. Here is a melancholy instance to which our attention has lately been called :—

"I have never seen any reason to doubt, *first*, that the Vertebrata, or more properly 'Endosteata,' are the central group of the animal kingdom, the others being the Exosteates (or Articulates), the Anosteates (or Molluscs), and the Actiniates (or Radiates); *secondly*, that the Sucklers are the central group of Endosteates, the other groups being Birds, Reptiles, and Fishes; the Sucklers are connected with Birds through the Bats, with Reptiles through Pangolins and Armadillos, and with Fishes through Porpoises and Whales. The pectoral sucklers (Primates) are central, and MAN is the centre of these—not a mere unit on the circumference of the system."

There is no need to name the writer of this passage or the publication in which it appeared within the last few weeks, because our business is with the matter, not with the man, though we can hardly do otherwise than marvel at his style of easy assurance—"I have never seen any reason to doubt." We at first almost fear a platitude, then catching a glimpse of what is coming, we begin to think we are on the verge of a great discovery, or perhaps shall be brought face to face with intelligence itself. Sad is our disappointment as the sentence proceeds. The unwonted word "Endosteata" jars our bones within us, but we recover as we best can, and so far suppose it is all right; the expression of a "central group" may pass as a metaphor, and we feel a sense of relief and obligation at having the extraordinary names of the other groups translated for us; but then we thought we had somewhere been taught the Radiates had no existence. However, we hail a friendly semicolon, and find that we are arrived at the end of the author's first article of faith, which, though obscured by the metaphor, is yet intelligible. Now, then, for his "secondly." The word "Sucklers" strikes us as singular, but we discover that whatever it means forms another "central group," this time of "Endosteates"; so, to meet metaphor by metaphor, we exclaim "wheels within wheels," and it is a comfort to find that the surrounding groups are our old friends Birds, Reptiles, and Fishes; Amphibians, we suppose, being packed between the two latter. The next part of the sentence, however, is absolutely shocking: "Sucklers" connected with Birds through Bats, with Reptiles through Pangolins and Armadillos, and so on. Why, what is a zoological connection? Is it of affinity or analogy? Can the author have ever seen or examined the structure of the animals he mentions? We are taken back to the dark ages of zoology, if not to ages almost prehistoric. Needless to say that our confidence is gone. Then we have the concluding sentence with the old metaphor once more, and a new one; or is it that no metaphor is intended after all? that these concentric circles forming a system with a circumference on which man is *not* a unit —we wonder who ever said he was—exist in the author's mind? In our own we are free to say they do not. We are sure that they do not exist in nature, and we are so unimaginative that we cannot picture a representation of them to ourselves. Accordingly there is no help for it but to conclude that all this is clear, unmistakable, undeniable nonsense, as much so as the two crooked straight lines standing in the five corners of a square. These "circles," with their unit-bearing circumference, are, in the words of the writer from whom we first quoted, "the nonsensical shreds of exploded metaphysics"—relics of that silly "circular system" with its mystical numbers, its fives or its sevens—the will-o'-the-wisp of fancy that once

led men's minds astray from the path where only they could find the truth they were earnestly seeking.

Those who desire to believe nonsense at all hazards and in the face of the clearest possible proofs, and indeed like it rather the better because it is so, can of course continue in their fool's paradise. Who can doubt that they see the paragon of animals in the author of the passage we have been criticising, and that he sits at the centre—the "focal point" is the choice expression, we believe—of a select circle of admiring "pectoral sucklers" the very "hub of the universe," as our American friends might say? The Report of the last Local Examination Syndicate of one of our Universities speaks of Zoology as follows:—"The general character of the work in this subject is, perhaps, even worse than it was last year. In many cases the teaching appears to have been faulty or defective; there was a general ignorance of the principles of zoological classification; and a great number of candidates sent up answers so full of confusion and error as to lead to the opinion that they had only prepared for the examination by a hurried attempt to learn portions of a text-book by rote." Who can wonder at this prevalent "ignorance of the principles of classification" when a zoologist in a position to give instruction to youth and encourage their devotion to the study of nature utters absurdities such as we have just been noticing? We fear that he is not alone in his mischievous folly,

*LECTURES AT THE ZOOLOGICAL GARDENS**

VII.

June 10.—*Prof. Mivart on Kangaroos.*

AFTER pointing out the external and osteological characters of the Kangaroo, the lecturer proceeded to consider the question, What is a Kangaroo? what its place in the scale of animated beings; as also its relations to space and time? At birth the Kangaroo is strangely different from what it ultimately becomes. It is customary to speak of the human infant as exceptionally helpless at birth and after it, but it is at once capable of vigorous sucking, and very early learns to seek the nipple. The great Kangaroo, standing some six feet high, is at birth scarcely more than an inch long. Born in such a feeble and imperfect condition, the young Kangaroo is not able to suck of its own accord. The mother places it on one of the nipples and squeezes its own milk-gland by means of a muscle which covers it, in such a way that the fluid enters the mouth of the young one. In most animals, man included, the air-passage opens into the floor of the mouth behind the tongue, and *in front* of the opening of the gullet. Each particle of food as it goes towards the gullet passes over the entrance to the windpipe, but is prevented from falling in by the action of the epiglottis, which stands up in front of the opening and closes over it when food is passing. But in the young Kangaroo, the milk being introduced, not by any voluntary act of the recipient, but by the action of the mother, it is evident that some special mechanism is necessary to prevent choking. This is found in the elongation of the upper part of the windpipe, which projects up into the nasal passage, and is embraced by the soft palate in such a manner that the food passes on each side of it, whilst the air does not enter the mouth at all.

The Kangaroo browses on the herbage and bushes of more or less open country; and, when feeding, commonly applies its front limbs to the ground. It readily, however, raises itself on its hind limbs and strong tail, as on a tripod, when any sound, sight, or smell alarms its natural timidity. Mr. Gould tells us that the natives sometimes hunt them by forming a great circle around them, gradually converging upon them and so frightening them by cries that they become an easy prey to their clubs. The Kangaroo is said to be able to clear even more than fifteen feet at one bound. It breeds freely in the Society's Gardens, many being reared to maturity. They have been also more or less acclimatised in the grounds of Glastonbury Abbey, in the parks of Lord Hill and the Duke of Marlborough, and elsewhere.

It is just upon one hundred and five years since the Kangaroo was first distinctly seen by Englishmen. At the recommendation and request of the Royal Society, Capt. (then Lieutenant) Cook set sail in 1768, in the ship *Endeavour*, on a voyage of exploration, and for the observation of the Transit of Venus of the year 1769. In the spring of the following year the ship steered from New Zealand to the eastern coast of New Holland, visiting, among other places, Botany Bay. Afterwards, when detained in Endeavour River, an animal as large as a greyhound, of a slender make, a mouse colour, and extremely swift, was seen more than once. On July 14, "Mr. Gore, who went out with his gun, had the good fortune to kill one of these animals," adding, "This animal is called by the natives *Kangaroo*." Kangaroos, however, had been seen by earlier travellers, and these may even be the animals referred to by Dampier when he tells us that on the 12th of August, 1699, "two or three of my seamen saw creatures not unlike wolves, but so lean that they looked like mere skeletons."

The whole animal population of the globe is termed the Animal Kingdom, in contrast with the world of plants, or Vegetable Kingdom. The highest sub-kingdom of this is that of the Vertebrata, of which the Mammalia form the highest class, to which class the Kangaroos belong. Of these animals there are many species arranged in some four genera; the true Kangaroos forming a genus, *Macropus*, which is very nearly allied to three others, namely, *Dorcopsis*, with a very large first grinding tooth; *Dendrolagus* (Tree Kangaroo), which frequents the branches of trees, and has the fore limbs but little shorter than the hind; and *Hypsiprymnus* (Rat Kangaroo), which has the first upper grinder compressed and vertically grooved. The species all inhabit Australia and the adjacent islands. They all agree in having the second and third toes slender and united in a common fold of skin; the hind limbs longer than the fore limbs; no inner metatarsal bone; all the fore toes provided with claws; and six upper together with two lower incisors. These five characters coexist in no other animal.

The family Macropodidæ is one of six which, together with it, make up the larger Kangaroo Order, the exact relations of which necessitate a cursory view of the others being taken. The Bandicoot plainly differs from the Kangaroo in external appearance, but resembles it in having the hind limbs longer than the fore, and also in the structure of the hind feet, which are similarly modified, but to a less degree, a rudimentary inner toe being present. It is an example of the family Peramelidæ, one member of which, *Chœropus*, is very exceptional, in that the hind toes, except the fourth, are exceedingly reduced and functionless, at the same time that its anterior digits are only two in number. The Phalanger is a type of the Phalangistidæ, arboreal, nocturnal animals, in which the limbs are of nearly equal length, with the second and third hind toes united, and a large opposable thumb. Some have prehensile tails, others expansions of the skin in the flanks to act as a parachute in leaping. The Koala (*Phascolarctus*) and *Tarsipes* are aberrant members; the former without a tail, the latter with minute and few teeth. The genus *Cuscus* is found in New Guinea and Timor. The Wombat (*Phascolomys*) forms a distinct family. It is a burrowing, nocturnal animal, the size of a badger, with a rudimentary tail, as well as peculiar feet and rodent-like teeth.

The Dasyuridæ, or family of the native cat, wolf, and

* Continued from p. 114.