

atoms, similarly endowed, the successive stages of creation were accomplished. There is so much resemblance between Gassendi's account of the appearance of the different animal forms, and the Miltonic narrative of the time when "the grassy sods now calved," that the question suggests itself whether the "Paradise Lost," which appeared in 1667, might not have been influenced by the *Syntagma Philosophicum*, its predecessor by some twenty years? From the side of Atomism Gassendi seeks to explain the Divine cessation from labour after the six stages of creation. Besides the atoms which, when endowed with kinetic energy, gave rise to the primordial plants and animals, there remained others in which their characteristic motions and affinities still continued potential, and which had been subject to distribution only. These account on the one hand for the seminal reproduction of plants and animals, and on the other for the phenomena of so-called spontaneous generation. On this view, as may be supposed, spontaneous generation presents few difficulties to Gassendi. He needs but the hypothesis of the endurance from the creation of the atoms special to any peculiar form of life. Then, when their potential motions and affinities become kinetic, they must of necessity issue in the forms of life which by their concurrence they were destined to produce. Two points are worthy of notice in this connection—Gassendi's definition of spontaneous generation, and his list of animals produced spontaneously. Spontaneous generation is not generation "sine seminibus" (germs), but "sine parentibus." Amongst his "animalia sponte nascentia" are enumerated "mures, vermes, ranæ, muscæ, aliaque insecta."

In a theory such as this is there no evolution, no selection. The atoms themselves are unchangeable, and so are the specific characters of the aggregates which they build up. Plants and animals, as they now are, are but copies of the primitive forms, be they produced by gamogenesis or spontaneously. The natural conditions also by which floral and faunal habitats and distribution are regulated, Gassendi seems to regard as having been fixed once for all at the creation. Reading "Deus" for "Natura," Virgil's lines express Gassendi's views on this point—

"Continuo has leges, æternæque fœdera certis
Imposuit Natura locis."—(Geo. i., vv. 63, 64.)

There is a sort of superficial resemblance between Gassendi's atoms and Mr. Spencer's "physiological units," but with capital points of difference. In both theories the molecules of each species of plant and animal have distinctive characteristics, and an inherent power of arranging themselves in the form of the organism to which they appertain. But while Gassendi's atoms are simple and indivisible, as one of their synonyms, *corpuscula inscissilia*, connotes, Mr. Spencer's physiological units are complex. While Gassendi's atoms are specific creations and endowed with unalterable properties, Mr. Spencer's physiological units are themselves the products of evolution, and are perpetually undergoing adaptation to equilibrate the action of forces internal and external.

I am inclined to suspect that Maupertuis may have, in the main, borrowed the atomic theory contained in the "Système de la Nature" from Gassendi. The materialism which led Maupertuis to make perception a fundamental property of his atoms is, however, all his own; at any rate it is not Gassendi's.

In Physics as in Ethics, the nearest affinity of the philosophy of Gassendi is to that of Epicurus. It is Epicurianism modernised, and modified so as not to clash, openly at least, with Christianity and with the dogmas of the current theology. By his want of originality he was led to base his philosophy on an already established system, and by his adoption of Bacon's method he was attracted to Epicurus, for that philosopher and his school were the sole ancient representatives of the new *a posteriori* philosophy. De Gerando thinks that an additional link between Gassendi and Epicurus existed in the similarity of their views on the physical doctrines of a vacuum and of atoms. But it seems at least as probable that the French philosopher adopted these conceptions from the Greek, as that he reached them by his own independent thought. While, however, he was essentially an Epicurean, Gassendi was careful not to commit himself to any doctrines which might cause his orthodoxy to be questioned; in fact, he more than once clearly expresses this determination.

"How far back can traces of the great theory of Darwin and Spencer be discovered?" As I showed in my letter on Maupertuis, in *NATURE*, vol. vii. p. 402, the doctrine is discoverable in that writer; but De Maillet, with whom Mr. Spencer begins his historical sketch, is a quarter of a century

earlier than Maupertuis. My examination of Gassendi leads me to the conclusion that the doctrine of Natural Selection is not to be found in his works, and further that his views, as far as I understand them, effectually preclude his holding the theory under any form.

W. H. BREWER

P.S.—On looking back over what I have written, I find that I have omitted to point out the different attitudes of Gassendi towards the two distinct portions of his cosmological views. When he is borrowing from the Mosaic account of the creation, all his assertions are positive, for here we have "quod Fides et Sacre Literæ docent." When, however, he is borrowing from Atomism his views take a hypothetical form, and are introduced by the phrase "nihil vetat supponere."

Grace's Road, Camberwell

Care of Monkeys for their Dead

As a supplement to the extract from James Forbes' "Oriental Memoirs," given by Dr. Gulliver in *NATURE* (vol. viii. page 103), the following incident, recorded by Capt. Johnson, deserves republication:—

"I was one of a party at Jeekarry, in the Bahar district; our tents were pitched in a large mango garden, and our horses were picketed in the same garden at a little distance off. When we were at dinner, a Syce came to us complaining that some of the horses had broken loose in consequence of being frightened by monkeys (*i.e. Macacus Rhesus*) on the trees. . . . As soon as dinner was over, I went out with my gun to drive them off, and I fired with small shot at one of them, which instantly ran down to the lowest branch of the tree, as if he were going to fly at me, stopped suddenly, and coolly put his paw to the part wounded, covered with blood, and held it out for me to see. I was so much hurt at the time that it has left an impression never to be effaced, and I have never since fired a gun at any of the tribe.

"Almost immediately on my return to the party, before I had fully described what had passed, a Syce came to inform us that the monkey was dead. We ordered the Syce to bring it to us, but by the time he returned, the other monkeys had carried the dead one off, and none of them could anywhere be seen."

G. J. R.

The Intellect of Porpoises

IN Prof. Huxley's admirable criticism of "Mr. Darwin's Critics,"* the following passage occurs:—"The brain of a porpoise is quite wonderful for its mass, and for the development of the cerebral convolutions. And yet, since we have ceased to credit the story of Arion, it is hard to believe that porpoises are much troubled with intellect."

I have no doubt that Prof. Huxley will agree with me in further concluding that "it is hard to believe" that the remarkably developed cerebral hemispheres of the porpoise with their deep and numerous convolutions perform no more exalted functions than the smooth pair of mere pimples that stand behind the olfactory ganglia of a cod-fish, and constitute the whole of his claim to a cerebrum proper.

The psychology of the porpoise (and also that of the dolphin and other cetaceans with similar brains) is thus a subject of primary interest to the student of cerebral physiology. As a contribution to the subject I offer the following facts:—

Many years ago I made the voyage from Constantinople to London in a small schooner laden with box-wood, &c. The passage was very slow, occupying fully two months, including the whole of August, and parts of July and September. We were often becalmed, with porpoises playing about the ship. The sailors assured me that no sharks were in the neighbourhood while the porpoises were near, and accepting this generalisation I frequently plunged overboard and swam towards the porpoises. They usually surrounded me in a nearly circular shoal or company, and directed towards their unusual visitor an amount of attention which I may venture to dignify with the title of curiosity. Their respiratory necessities precluded any long-continued scrutiny, but after dashing upwards for their customary snort, they commonly resumed their investigations, sometimes approaching uncomfortably near and then darting off to the circumference of the attendant circle. I am not able to describe the expression on the features of a porpoise, but my recollection of that of the eyes of my swimming companions is very different

* *Contemporary Review*, 1871. Reprinted in "Critiques and Addresses."

from what I have since seen on the large vacant orbs of aquarium cod-fishes, &c.

I have not yet seen the porpoises in the Brighton Aquarium, but suspect that if they contrive to "make themselves at home" there, a careful study of their habits will remove some of the difficulty which Prof. Huxley experiences in believing in their intelligence.

W. MATTIEU WILLIAMS

Instinct

A DIFFICULTY occurred to me on reading Mr. Lewes's interesting and instructive article on "Instinct" in NATURE of April 10—and as no satisfactory answer offers itself to me, I venture to trouble you with it.

Wherein lies the difference in kind between the actions performed instinctively by animals for the preservation of themselves or their young, and those actions performed by plants with the same result?

For instance; the Ivy *Linaria* grows on an old wall; its flowers and the flower-stalks stand out for the sun and insects to visit the little "snap-dragon." But no sooner does the corolla fall, than the peduncle begins to curve inwards to the wall, and usually contrives to tuck its seed-vessel well into the brickwork again. We cannot say of such an action that there is "no alternative open to it;" and even if we do, it does not explain it to call it "impulsive," and yet one is not prepared to accept it as an instance of instinct. I shall be grateful for any elucidation.

M.

Grus vipio

I OBSERVE that in your report of the meeting of the Zoological Society on the 6th ult., in your issue of the 15th, it is stated, with reference to *Grus vipio* (*sen leucauchen*), that "no example of this fine species, so far as was known, had previously been brought alive to Europe." Last autumn, when going over the Zoological Gardens at Amsterdam with the superintendent, Mr. Hegt, I saw there a splendid pair of these birds, which had been purchased for 140*l.*, and had bred the same spring, and reared successfully a fine young bird, about two-thirds grown when I saw it in September, destined, as I was informed by Mr. Hegt, for the Berlin Gardens. The collection of cranes at Amsterdam is exceedingly rich, far surpassing either London or Antwerp in this respect. It contained, when I saw it, fourteen out of the fifteen valid species of *Grus*, comprising, besides the above-mentioned, *G. vipio*, a splendid pair of *G. viridirostris*, a fine *G. leucogeranus*, *G. carunculatus*, *G. canadensis*, *G. Americana*, *G. torquata*, &c., the desideratum being *G. monacha*, of Japan.

W. A. FORBES

Culverlea, Winchester, June 2

ON THE SYNTHESIS OF MARSH-GAS AND FORMIC ACID, AND ON THE ELECTRIC DECOMPOSITION OF CARBONIC OXIDE *

IN connection with the investigation on the electric decomposition of carbonic-acid gas referred to in a previous communication to the Society, I was led to submit a mixture of hydrogen and carbonic-oxide gas to the action of electricity in the induction-tube, the mixed gases being circulated through the tube by means of an apparatus which I will not now describe. A contraction was soon observed to have taken place, which at the end of an hour amounted to 10 cub. centims. The rate of contraction steadily diminished, and during the fifth hour of the duration of the experiment amounted to only 2 cub. centims. The experiment was stopped, and the gas analyzed with the following results in two several analyses:—

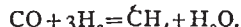
I.		II.	
Carbonic oxide . . .	61.65	Carbonic oxide . . .	61.35
Hydrogen	32.16	Hydrogen	32.34
Marsh-gas	6.14	Marsh-gas	5.31
100.00		100.00	

A small quantity (about 2 per cent.) of nitrogen was

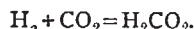
* A paper read at the Royal Society by Sir B. C. Brodie, Bart., D.C.L., F.R.S., late Waynflete Professor of Chemistry in the University of Oxford.

also contained in the gas, together with a trace of oxygen, which have been omitted from the calculation.

The result of this reaction is expressed in the following equation:—



This fundamental experiment, which constitutes the basis of a new method of chemical synthesis, susceptible of the most varied applications, and of peculiar interest in reference to the explication of natural phenomena, was commenced by me on the 10th of January last at Oxford, in the laboratory of my friend and successor in the Chair of Chemistry, Prof. Odling; two analyses of the gas were completed, and the results attained in the course of a week from that date. In a similar experiment made with a mixture of hydrogen and carbonic-acid gas, a contraction also occurred, attended with the formation of water. The gas which resulted from the experiment was found to consist (after the absorption of carbonic acid) of hydrogen and carbonic oxide, together with a little marsh-gas. Traces of oxygen and nitrogen were also present. Minute drops, too, of an oily liquid appeared in the tube. This liquid, after the conclusion of the experiment, was dissolved in a small quantity of water. The solution was strongly acid and had a pungent taste. It reduced an alkaline solution of terchloride of gold and an ammoniacal solution of nitrate of silver. These reactions are the characteristic properties of formic acid, of which we may infer the synthesis to have been effected according to the equation



I may avail myself of the present opportunity to place on record the following important facts in reference to the action of electricity on carbonic-oxide gas.

When pure and dry carbonic oxide is circulated through the induction-tube, and there submitted to the action of electricity, a decomposition of the gas occurs, attended with a gradual and regular contraction, which, in the form assumed in my experiments, occurred at the regular rate of about 5 cub. centims. in an hour. Carbonic acid is formed, and simultaneously with its formation a solid deposit may be observed in the induction-tube. This deposit appears as a transparent film of a red-brown colour, lining the walls of the tube. It is perfectly soluble in water, which is strongly coloured by it. The solution has an intensely acid reaction.

The solid deposit in the tube, in the dry condition before it has been in contact with water, is an oxide of carbon. Samples, however, made in different experiments do not present precisely the same composition; but nevertheless they appear to belong to a certain limited number of forms which repeatedly occur, and may invariably be referred to the same general order or system. This system is, or appears to be, what I may term a homologous series of "oxycarbons," of which the unit of carbon with the weight 12 may be regarded as the first term, and of which the adjacent terms differ by an increment of carbonic oxide (CO) weighing 28, precisely as homologous series of hydrocarbons differ by the increment CH_2 with the weight 14. I have succeeded in identifying by analysis two at least of these substances, namely, the adjacent terms C_4O_2 and C_5O_4 . From this point of view these peculiar bodies are members of a series of oxycarbons analogous in the oxycarbon system to the series of hydrocarbons of which the unit of carbon is the first and the unit of acetylene C_2H_2 is the second term, the oxycarbon C_4O_3 being represented in that series by the hydrocarbon crotonylene C_4H_6 , and the oxycarbon C_5O_4 by the hydrocarbon valerylene C_5H_8 .

THE LAW OF STORMS DEVELOPED *

III.

FROM the Cape of Good Hope, in a straight line toward the projecting eastern coasts of Brazil, mariners have found a peculiar streak] of south-easterly winds.

* Continued from p. 148.