

separate breeding is long continued, incompatibility in all these respects tends gradually to arise; but it is manifest that incompatibility of industrial habits implies diversity in the forms of natural selection that shape each portion. I therefore maintain that separation which necessarily includes the cessation of reflex selection between the portions separated is a cause of segregation and divergence, and that it introduces diversity of natural selection, which is a still further cause of divergence.

Unless the separated portions of a species possess exactly the same average character (which we must believe is seldom, if ever, the case), separation must, from the first, be more or less segregative; and even in cases where the portions completely correspond in character (if there are any such cases), the cessation of reflex selection which is involved in the separate breeding, must result in segregation as soon as the power of heredity begins to weaken; and this is in due time followed by other forms of intensive segregation. I therefore conclude that indiscriminate separation may be regarded as a preliminary form of segregation (*i.e.* discriminate separation), and that in the nomenclature we ordinarily use both principles may be called "segregation" without confusion.

26, Concession, Osaka, Japan.

JOHN T. GULICK.

The Affinities of *Heliopora cœrulea*.

IN Prof. Moseley's admirable account of the structure and affinities of *Heliopora*, published in the Transactions of the Royal Society, 1876, and afterwards in the *Challenger* Reports, there occurs the following passage: ". . . directly the coral (*i.e.* *Heliopora*) was left at rest a swarm of a species of *Leucodora*, closely resembling *Leucodora nasuta*, which infests the coral and perforates it all over, expanded themselves at once."

This will probably explain the cause of the curious mistake that Mr. Saville Kent has made, in his letter published in last week's NATURE (p. 340), in supposing that *Heliopora* is a tubicolous annelid. *Heliopora* is not a tubicolous annelid, nor does it belong to the "Hydrozoic division of the Coelenterata," but it is, without a shadow of doubt, as Moseley described it to be, an Alcyonarian.

When I was preparing my paper on the "Siphonoglyphe in the stomodæum of Alcyonarians" in 1883, Prof. Moseley kindly placed at my disposal his preparations of *Heliopora*, and I was able then fully to confirm his conclusions as to the Alcyonarian nature of this interesting coral.

During my visits to the coral reefs on the coasts of North Celebes and the adjacent islands, I came across many large and beautiful specimens of *Heliopora*, some of which I carefully preserved for further investigation at home. I never found the polyps fully expanded with the eight pinnate tentacles standing out from the disk like the petals of a flower, but in the few instances when I saw the polyps protruded $\frac{1}{2}$ inch or thereabouts from the surface of the coral the tentacles were partially withdrawn, so that their characteristic features were hidden.

Since my return from Celebes I have made a large number of sections of the material I brought back with me with a view to the publication of a short paper on some further details of its anatomy, and I have recently been able to supplement this by a series of preparations I have made from the excellent material given to me by Prof. Haddon, who found *Heliopora* in abundance in Torres Straits.

I will not venture, in the present state of my investigation, to state my opinion as to the position that *Heliopora* should occupy in the group to which it undoubtedly belongs; I merely wish to call the attention of the readers of NATURE to the fact that its Alcyonarian characters are beyond dispute.

Downing College, August 9.

SYDNEY J. HICKSON.

Meteors.

LAST night, between 11.12 and 11.52, I and another observer saw altogether eighty-three meteors, eighty of which were Perseids. Some of them were very brilliant, especially those near the neighbourhood of Aquila.

The remaining three meteors had different paths, one having a direction exactly opposite to that of the Perseids.

The other observer was watching the radiant point and the region around it, while I observed the south-west quadrant.

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More observations would have been made, but were interrupted by clouds.

W. J. LOCKYER.

Observatory House, Westgate-on-Sea, August 12.

A LIQUID COMPOUND OF NICKEL AND CARBON MONOXIDE.

IN the August number of the Journal of the Chemical Society a full account is given of the remarkable new compound described by Mr. Mond, in conjunction with Drs. Langer and Quincke, at the last meeting of the Chemical Society. The following is an outline of the main facts described in their communication.

Carbon monoxide is found to be affected in a very curious manner when passed over finely divided metallic nickel heated to a temperature of 350°–450° C. The metal becomes converted into a black amorphous powder containing nickel and carbon, the carbon monoxide becoming at the same time changed into the dioxide owing to the loss of carbon. A comparatively small amount of nickel is capable of decomposing a very large quantity of carbon monoxide, and at the commencement of the operation the gas may be passed over at a very rapid rate without any escaping decomposition. As the operation continues, the change becomes less and less complete, but even after numerous repetitions of the experiment carbonic anhydride continues to be formed. The solid product of the reaction appears to vary in composition somewhat widely according to the temperature and the time during which the operation is carried on. The highest proportion of carbon found was 85 per cent. Some time ago MM. Gautier and Hallopeau obtained a similar product, containing 80 per cent. of carbon, by the action of carbon bisulphide upon metallic nickel. The nickel is only partially removed by acids, for even after repeated extraction the whole of the nickel is not found in solution.

When this black substance was allowed to cool in the current of carbon monoxide another change was found to occur, with production of some volatile substance, whose vapour rendered a non-luminous Bunsen gas flame placed in its path highly luminous. Further, on heating a portion of the tube near the exit a mirror of metallic nickel was obtained mixed with a little carbon. Evidently a gaseous substance containing nickel was contained in the issuing gas, a circumstance of considerable importance in view of the non-volatility of the ordinary known compounds of nickel. Experiments were then made with the idea of obtaining larger quantities of the new substance and isolating it from the other gaseous products. It was eventually found that when finely divided nickel, obtained by reducing nickel oxide in a current of hydrogen at a temperature of about 400°, is allowed to cool in a slow stream of carbonic oxide, the latter gas is very readily absorbed as soon as the temperature has fallen to about 100°. If the current of carbon monoxide is continued, or if that gas is replaced by an inert gas, such as carbon dioxide, nitrogen, or even hydrogen or air, the issuing gas carries away with it large quantities of the new nickel-containing vapour. After about an hour the quantity of this vapour evolved becomes less, and finally its evolution ceases. The property of the nickel to produce it is restored by heating it to 400° again and allowing once more to cool; indeed, up to a certain limit it forms the compound more abundantly after repeated use. If the issuing gas is collected and heated to 150°, its volume is found to largely increase, nickel more or less contaminated with carbon being deposited. At a temperature of 180° the nickel deposited was found to be quite free from carbon.

The new volatile compound was eventually isolated by leading the mixed issuing gases through condensers placed in a freezing mixture of ice and salt, in which the vapours condensed to a colourless mobile liquid of very high refractive power.

The final arrangement adopted for the preparation of the liquid is as follows. A quantity of nickel oxide is placed in a combustion tube, and reduced at about 400° by the passage of a current of hydrogen gas. The tube and contents are then cooled down to about 30°, and pure dry carbon monoxide instead of hydrogen passed through the tube without further heating it. The issuing gas is caused to pass through a Y tube surrounded by ice and salt. The lower end of the Y tube projects through the vessel containing the freezing mixture into a small flask in which the liquid collects. The gas leaving the Y tube still retains about 5 per cent. of the new body, and is therefore collected, dried, and again passed over the nickel until no more liquid condenses. The tube containing the nickel is then re-heated to 400° in a slow current of hydrogen, again cooled, and the operation recommenced. In this manner it is easy to obtain ten to fifteen grams of the liquid in each operation.

The liquid boils at 43° under a pressure of 751 mm. Its specific gravity is 1.3185 at 17°. At -25° it solidifies to a mass of needle-shaped crystals. The liquid is soluble in alcohol, and even more readily in benzene and chloroform. It is perfectly indifferent to dilute acids and alkalis, and is not attacked by concentrated hydrochloric acid. Strong nitric acid oxidizes it readily. As regards its composition, the nickel was estimated by weighing the nickel deposited on passing repeatedly through a heated tube, and the carbon by passing the vapour mixed with air over copper oxide, and absorbing and weighing the carbon dioxide produced. The following numbers were obtained :—

	I.	II.	Calculated f.r Ni(CO) ₄ .
Nickel ...	33.35	33.37	34.34
CO ...	66.60	65.99	65.66

Its composition, therefore, appears to be represented by the formula Ni(CO)₄. Its vapour density, the first density determination of a nickel compound, was determined by Victor Meyer's method at 50°. The value obtained was 6.01. Ni(CO)₄ corresponds to the density 5.9. At 60° the vapour was found to explode with considerable violence.

Vapour of nickel-carbon oxide, as its discoverers term it, reduces an ammoniacal solution of cuprous chloride, first decolorizing it and subsequently precipitating from it metallic copper. It also precipitates metallic silver from ammoniacal solutions of silver chloride. Chlorine decomposes it with production of nickelous chloride, NiCl₂, and carbon oxychloride, COCl₂. Bromine reacts in a precisely similar manner. The electric spark decomposes it slowly into nickel and carbon monoxide.

Experiments have also been made to ascertain the possibility or otherwise of preparing a similar compound of cobalt and carbon monoxide. It was found, however, that cobalt does not form such a compound; indeed, it is quite possible to separate nickel from cobalt by reacting with carbon monoxide in the above manner, the nickel only being removed. The metallic mirrors obtained by the decomposition of nickel-carbon oxide by heat were found to consist of unusually pure nickel, containing no traces of cobalt. They consisted of a grey metallic powder of specific gravity 8.2834 at 15°4.

It became interesting, therefore, to ascertain the atomic weight of this pure nickel, especially in view of the recent work of Drs. Krüss and Schmidt. Accordingly, a series of three determinations were made, with the following results:—If O = 16, Ni = 58.58, 58.64, and 58.52. These numbers are sufficiently close to the value 58.74, long ago obtained by Dr. Russell, to justify the conclusion that nickel, as we have known it, is indeed a simple substance, whose atomic weight lies very near to the figure hitherto accepted—a conclusion which is further supported by the determination of the vapour density of this remarkable new compound, nickel-carbon oxide.

A. E. TUTTON.

BRITISH MUSEUM NATURAL HISTORY PUBLICATIONS.¹

THE present Part (IV.) concludes Mr. Lydekker's "Catalogue of the Fossil Reptilia and Amphibia in the British Museum (Natural History)," the four volumes making together a work of 1247 pages. In Part I. the author records the Ornithosauria, the Crocodilia, the Dinosauria, the Squamata, the Rhynchocephalia, and the Proterosauria; Part II. contains the Ichthyopterygia and Saurpterygia; Part III. embraces the Chelonia; and Part IV. the anomalous group of the Placodontia, the Anomodontia, and the class Amphibia,



FIG. 1.—*Cyamodus (Placodus) laticeps*, Owen. A, palatal aspect; B, frontal aspect of cranium; from the Muschelkalk of Baireuth, Germany.

including the Ecaudata, the Caudata, and the Labyrinthodontia, with supplementary notes and additions to the preceding orders. The earlier parts having been already noticed in NATURE, we shall confine our attention to Part IV.

Amongst the rare remains of Reptilia met with in the Muschelkalk of Baireuth, Bavaria, none are of more interest than those belonging to the anomalous group of the Placodontia, the ordinal position of which is still uncertain. The skull and teeth of one of these reptiles

¹ "Catalogue of the Fossil Reptilia and Amphibia in the British Museum (Natural History), Cromwell Road, S.W." Part IV., containing the Orders Anomodontia, Ecaudata, Caudata, and Labyrinthodontia; and Supplement. By Richard Lydekker, B.A., F.G.S., &c. Pp. 295 and xxiv. With Index to the entire Work. Illustrated by 66 Woodcuts. (London: Printed by Order of the Trustees: and sold by Longmans and Co.; B. Quaritch; Asher and Co.; Kegan Paul, Trench, Trübner, and Co., &c., 1890).