instances in various parts of the world in which *Papilio* of certain groups are the objects of mimicry. Although Mr. Scudder has never seen a bird capture a butterfly, others have been more fortunate, and they thus throw much light on the theory of mimicry. It is not improbable, from the rarity of mimicry in the temperate zone, that the few cases which exist may have been produced under the more favourable climatal and organic conditions of the semi-tropical epochs anterior to the glacial period.

ALFRED R. WALLACE

The Difficulties of Natural Selection

The papers read by me before the Entomological Society on the Relation between the Colour and the Edibility of Lepidoptera and their Larva having been noticed and commented upon by Mr. A. W. Bennett and others in *Nature*, I have deemed it desirable to offer a few remarks on the subject.

The object I had in making the experiments was to ascertain whether there could be proved to exist any relation between the colours of larvae and their edibility.

The disciples of Mr. Darwin argued that the brilliant colours of so many male birds arose from sexual selection, and that the equally striking colours of flowers were but guides to insects, to enable them to distinguish, at some distance, the flowers from the leaves, and thus insure fertilisation by the interchange of pollen. Such remarks are quite to the point, and account for the bright colours of the sexual larvae of many Lepidoptera, several species of which are banded and striped with blue, yellow, and red; colours which instead of concealing them by harmonising with the leaves on which they feed, are often in complete contrast with them.

Now Mr. Wallace had a theory that these gaily coloured larvae were unedible to birds, and that their gay colours were protective, because if they were indistinguishable from eatable species they would be seized by birds, and though rejected afterwards, would be so much injured that the probability of their becoming imagos would be very remote, even if they were not at once killed.

But how are we to believe this? In my experiments extending over many years, and most carefully made with several species of birds, I have not met with one instance in which a strikingly-coloured larva was eaten. In most cases they were not even regarded when thrown into the aviary, although I had several birds always on the watch for the eatable species, with which I constantly fed them; while these latter were seized immediately they were seen.

The larva of the *Cecropia* is conspicuously coloured black and yellow, and feeds without any attempt at concealment on several species of Verbascum. I placed the plants in the aviary, and fed the *Cecropia* upon them until every leaf was devoured, and the caterpillars gnawed holes in the stem; but not one was in the slightest degree injured, yet at the same time other species were greedily eaten.

On the other hand, I found that all larvae were eagerly eaten which have soft smooth bodies and dull colours, while the hairy larvae are rejected entirely.

These eatable species are protected in various ways; some are nocturnal in their habits, descending to the ground during the day; some feeding on the under sides of the leaves; others arrange their bodies in a line with the shoots of the plants and look like a streak of the bark; some are of precisely the colour of the leaves, or even of the corolla of the plant on which they feed; others roll themselves up in leaves, the larva of the *Geometridae* are often exactly like twigs, with the terminal and side buds imitated.

The first conclusion is so complete that, after being thirty years an entomologist, I was deceived myself, and took out my pruning scissors to cut from a plum-tree a spur which I thought I had overlooked. This turned out to be a larva of a Geometer two inches long. I showed it to several members of my family, and the leaves I had cut for nothing in which it was to be seen; but none of them could see that it was a caterpillar. Surely this was a case of protective mimicry.

All the eatable larvae agree in not moving when there appears the least danger, and very rarely move until the day is nearly over.

Even if there were no cases of protective mimicry in the larval states of Lepidoptera, I do not think that would be any argument against the existence of such in the perfect state. It appears to me rather that as so few specimens become imagines, proportionately to the eggs produced, the more need there is that these few should survive.

I cannot, therefore, agree with Dr. Scudder in thinking that mimicry has been supposed to exist where it is least wanted, viz., in the perfect state of Lepidoptera. Nor can I coincide with Mr. Bennett that it is a matter of indifference to the supporters of the theory of Natural Selection who the twig-like caterpillars are eaten by birds or not. My point is that they are often so like twigs that they are passed over as such by insectivorous birds, and that the closer the resemblance the better their chance of escape. I may suppose that Mr. Wallace did not mean to imply that even be benefited by the criticisms of its opponents; but what I do dread is the injury it may receive from the false arguments of some of its illogical supporters.

Let me incidentally place myself in the latter category, I will bring my remarks to a close.

J. JENNER WEIR

6, Haddo Villas, Blackheath, S.E.

Butterflies and Birds

A correspondent in *Nature*, Dec. 22, states that after fifteen years' experience in butterfly hunting, he has never seen one in a bird's bill. I was not aware the circumstance was unusual, for I have frequently seen the common sparrow chase and capture such butterflies as *P. urticae* and *P. rapae*. It is quite a rare and greyhound affair, the butterfly often eluding; for some time the swift pounce of its pursuer, so that the bird may be long one.

T. G. B.

St. John's College, Cambridge

Ceratodus Forsteri

SIR PHILIP GREGG EBERTON presents his compliments to the Editor, and will esteem it a favour if he would insert the following paragraphs, from two letters recently received from Professor Agassiz, in an early number of *Nature*. It will be gratifying to all men of science to know that the distinguished Professor has so far recovered from his late severe illness as to be able again to interest himself in scientific pursuits.

Oulton Park, Tarporley.

"Cambridge, November 9.

"I am slowly recovering, and find myself gradually returning to the ways of active life. As I wake anew to feel an interest in scientific pursuits, there is nothing for which I have a greater longing than the fossil fishes. If I could leave my house I would fly to you to resume the examination of your and Lord Emmisken's collections. The recent discovery of Krefft has added fuel to the fire, and I feel the most intense desire to revise the facts bearing upon the relations of the Ganoids and Selachians in general, and more particularly those of the Coelacanth, to which, from the examination of the skeleton sent me by Krefft, I find his *Ceratodus Forsteri* belongs. It will no doubt turn out that the Dipterini are close relations. In this connection I am reminded of what you once wrote to me of the teeth of *C. cæsareus*. Will you now have the kindness to give me all the particulars? I am having sections of the teeth of *Ceratodus Forsteri* and some of the fossil species made for comparison. I have little doubt already that this genus will turn out to be one of the most curious synthetic types (I call them) in the animal kingdom, exhibiting characters of Placoids (Selachians) in the teeth, Ganoids in the scales, their embryonic characters in the preservation of a dorsal chord, instead of distinct bony vertebræ, and finally hollow bones as in birds."


"I take it some of your naturalists will crow over what they will be pleased to call my stupendous mistake in referring the teeth of *Ceratodus* to the Selachians, when the fish proves to have large imbricated scales; but I have never been more pleased than when I learned the fact, for it settles beyond dispute the existence in nature of types, to which I have long ago called attention, under the name of synthetic types (see my *Comparative Cladistics*). How grandly true it is, that if a creature is taken little or no notice. When I described the teeth of *Ceratodus* as those of a distinct genus among the Cestracionides, I was led to do so by appearances which secured for this association the assent of all naturalists. As I have nowhere published it, nobody questioned the relationship. Owen himself, in his 'Onology,' mentions the teeth of *Ceratodus* and their structure, and has not a shadow of a doubt that I am right in placing that genus near Cestracion; and now comes the discovery that *C. cæsareus* also referred to the Cestracionides, is based upon the dental plate of a bony fish, closely allied to the one recently discovered by Krefft, and referred by him to
the genus Ceratodon. Is not all this the most palpable evidence that there exist in nature types which combine structural features that are entirely separate in other types? and it is to such types I have applied the name of synthetic types."

Lumière Credence

It may perhaps be of some interest to you to know that the phenomena of "Lumière credence" was distinctly seen in Surrey on the evening of the 25th inst., between 4 and 5 P.M. With the aid of an opera-glass, I saw clearly the whole of the dark portion of the moon and found to be of the form of a sphere with a naked eye at the time were able to see it with the naked eye.

Trinity College, Cambridge, Dec. 27

H. G. S. Smith

Measurement of Mass

With reference to the very favourable notice in your last number of my edition of Deschanel's "Traité de Physique," will you allow me to remark that my reason for rewriting the section on massa (§ 42) was that Deschanel, in accordance with what has been till recent years an almost universal custom, employs a variable unit of force, and, as depending upon this, a variable unit of mass, so that the number denoting the mass of one and the same body is diminished as the body is carried from the equator to the poles. It would increase up to infinity if the body fell to the centre of the earth.

The reviewer says, "the conception of massa is always a difficult one for a beginner." This is doubtless true when the conception is harped on with the inconsistencies arising from this vicious system of measurement; but I do not think, the conception of a "found or ground of matter presents much difficulty, and these are the units in which, according to the best modern usage, I have indicated that mass is to be expressed.

As regards the coefficient of absorption of ammonia, the reviewer is right. A mistake was committed in extracting the number from a table, of which, if I may judge by his initials, the reviewer is the author. In future, I would entreat him to make his tables more easy of reference.

J. D. Everett

Belfast, December 26

Hailstones

In Nature of the 15th there is an account of hailstones of a form deviating considerably from the spherical. Hailstones are formed, according to a meteorologist familiar with this process, by the condensation of the moisture in the atmosphere, followed by the conversion of the liquid into a solid state. The process is known as "coagulation."

The reviewer says that the hailstone is a sphere, which is not strictly true, as the hailstone is generally an ellipsoid, consisting of a combination of a sphere and an oblate spheroid.

JOSEPH JOHN MURPHY

Old Forge, Dumurrny, Co. Antrim, Dec. 30

Darlingtonia Californica

Mr. Robinson's suggestion, reported at page 159, as to the cultivation of this plant in England, has been anticipated by Mrs. M. V. Screech, who have grown the plant for a considerable time in their houses at Chelsea.

In London, as in California, this curious plant possesses the same irresistible attraction to insects, as I have repeatedly examined living plants at Chelsea, perhaps the following notes taken in connection with those printed in your last number may have some interest.

This so-called "pitcher plant," when fully grown, resembles in shape the upraised head and body of an ancient cobra, with a very long tail, and a very large tongue. The pitcher is filled with liquid, and the mouth is open at the top. The insects are attracted by the color and shape of the pitcher, and are eventually killed by the chemical contents of the liquid. The plant is also able to trap other small animals, such as spiders, snails, and millipedes.

The author of this account, "Darlingtonia," was a native of California, and is named after the English botanist, John Darlington. The plant is known for its showy flowers and its ability to trap insects.

In places, the pitchers are sometimes used as drinking vessels. The liquid is clear and sweet, and is said to have medicinal properties.

WORTHINGTON G. SMITH

Aurora Arcs in the East

I am inclined to agree with Dr. Burder as to the invisibility of Auroras by daylight, yet I can confidently assure him that I have many times seen the arch "almost due east," that is when the extremities point N.N.W. and S.S.E. When such a phenomenon occurred in Newfoundland, some of the old weathermen and storm forecasters would tell me that it was falling west (or north by west) on the following day, as the Northern Lights were in the south. But I am sorry to say that I did not note how often the Aurora appeared as above, but I did note that snow fell on seventy-eight consecutive days in the autumn of 1867 and commencement of the winter of 1868.

HENRY REEKS

The Milky Way

In the number of Nature for November 17, Mr. John Jeromiah states that "Heel y Gwydion" is the only proper Welsh name for the Milky Way. Such is far from being the case. I am acquainted with no less than nine other names, equally proper for that luminous appearance, such as y lebwy y gwystaf, y forlad bat, llew y gwynt, galadaf, liðrízewd, y forlad bat, llew y gwynt, galadaf, liðrízewd, y forlad bat, llew y gwynt, galadaf, liðrízewd, y forlad bat, llew y gwynt, galadaf, liðrízewd, y forlad bat, llew y gwynt, galadaf, liðrízewd, y forlad bat, llew y gwynt, galadaf, liðrízewd.

Of these, y lebwy y gwystaf, y forlad bat, and y forlad bat answer precisely to Milky Way; llew y gwynt (common enough in Cymrhrenish) is synonymous with llew y gwynt; galadaf (from galad, milk) corresponds with gelad, signifies a bright circle; and liðrízewd a white cluster. To caer Gwydion (the mural enclosure of Gwydion) belongs a tale, which may be compared with the stories of classical antiquity on the same subject. Gwydion is a noted character in early Welsh romance, in which he is presented as an astronomer and an expert in the use of the compass.

He is said to have been instructed in magical arts by Math ab Mathonwy, and in the Mabinogi, or tale which bears the name of the latter, his achievements are detailed at length. According to some of the Welsh records he was buried at Morfa Dinlle, on the seashore near Carnarvon.

Gwydion is not the only one of the family of Don whose name is associated with astronomy. Don himself gave his name to the constellation of Cassiopeia, which is called in Welsh Llys Don, the Court of Don; and Caer Aranwed, the Corona Borealis or Northern Crown, is so called after his daughter Aranwed. Llewy Olwen (the path or course of Olwen) refers to another distinguished character in Welsh mythology. Olwen was the daughter of Ysbytydalen Bencaw, a prince of the Northern Britons, who lived in the sixth century. Her beauty and the prominence of her name among the early Welsh names are associated with the subject of the Mabinogi of Cilhew and Olwen, which will be found printed, with an English translation, in Lady Charlotte Guest's "Mabinogion," i, 297, 249.

What connection the other name, llew y mah aforasian (the path or course of the prodigal son), may have with the