

of examiners than the scientific outlook. In these circumstances our author goes forward very straightly. If he has to omit the tragedy of Hudson's ending, he inspires us by a good map of Amundsen's North-West passage, which is far less known, because it belongs to recent history. He cannot trifle with examiners by betraying emotion at the "revolutions of the globe," but he gives a good geographic account of the Ice age in America (illustrated by a map of the moraine-front and by an entirely inappropriate one of medial and lateral moraines in Switzerland), and he moves us effectively by his excellent choice of illustrations. The South American section opens an unfamiliar field before the reader. The dangerous dunes on the Mollendo-Arequipa line, and the fascinating glimpse of the Patagonian ranges, may be cited from these interesting pages. The unique nitrate-deposits of Chile (p. 258) might have received fuller mention, since the material is exported, not "for the preparation of various chemicals," but for the increase of the food supply of the nations, and its local refining and foreign distribution are among the romances of geography.

G A. J. C.

*Carburettors, Vaporisers, and Distributing Valves used in Internal Combustion Engines.* By Edward Butler. Second edition, revised and enlarged. Pp. viii+288. (London: Charles Griffin and Co., Ltd., 1919.) Price 12s. 6d. net.

IN the hundred or so pages of this work devoted to carburettors the author has scarcely done justice to the modern outlook, although he gives an interesting description of various types. The omission of the double Venturi form is remarkable. No mention is made of aero work, yet it was aviation which opened our eyes to efficiency.

Carburettor design is at last emerging out of the embryo stage, and the rule-of-thumb method of the inventor is giving place to scientific measurement. Instead of a list of carburettor patents, as given in the book, we should prefer some experimental figures establishing the order of merit of the different types and the justification of the claims of the inventors. Thus, if a simple carburettor of the Zenith or Claudel type does all that is claimed for it, why go to the trouble of fitting all sorts of extra air-valves? It would be interesting to know why complicated designs can persist side by side with simple ones.

The remaining pages of the work are devoted to vaporisers and injectors (suitable for stationary engines under fairly constant load), and to the consideration of types of valve gear. In this connection we think that the advantages of the sleeve valve gear are overrated.

Treating of valve gear, we should have expected some reference to the importance of turbulence of the charge for high-speed work. Also the design of induction pipes for multi-cylinder engines, and the vibration of air in such systems (affecting distribution and carburettor characteristics) are matters of importance and deserve some comment.

W. J. S.

## LETTERS TO THE EDITOR.

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### Wild Birds and Distasteful Insect Larvæ.

IN NATURE of July 24 is a letter from Dr. Walter E. Collinge entitled "Wild Birds and Distasteful Insect Larvæ." This letter starts with a statement with regard to the distasteful qualities of the larva and imago of the currant moth (*Abraxas grossulariata*, Steph.), an insect which, of all others, has probably been studied most in this connection. So long ago as 1889 Prof. E. B. Poulton, in his classic work on "The Colours of Animals," states (p. 169):—"All observers agree that birds, lizards, frogs, and spiders either refuse this species altogether, or exhibit signs of the most intense disgust after tasting it."

Experiments of more recent date have done nothing to refute this observation, and, what is more, the larva of this moth differs widely from other Geometrid or "Looper" caterpillars in making itself conspicuous by means of a gregarious habit and of the position which is assumed when at rest, in contradistinction to protective resemblance to twigs of trees, to the eaten edges of leaves, etc., exhibited by most other members of the family.

Further, from his observations upon the case of song-thrushes feeding their young upon the caterpillars of this moth, and from the fact that the latter, after their destruction by the birds had ceased, were found to be parasitised, Dr. Collinge raises a question of the possibility of the parasitised larvæ alone being rejected by birds.

It is true that parasitic insects, when depositing their eggs in the interior of caterpillars, sometimes cause an exudation of blood which dries over the wound and produces a mark which acts as a warning to other parasites not to oviposit in the same larva, but, in the case of a spotted insect like the present one, it is neither probable that such a mark would be noticed by a bird, nor is it likely that all the caterpillars experimented with by entomologists were similarly parasitised, even though insects which enjoy protection through conspicuity of warning colours are naturally subject to great persecution by their parasitic enemies.

A simpler and more logical explanation is applicable to Dr. Collinge's observations. In the first place, no insect, however well protected, is completely immune from attack by enemies, and in times of stress birds have long been known to subsist upon insects with highly distasteful qualities. Of the eight birds mentioned by Dr. Collinge as containing currant-moth larvæ in their gizzards, the great tit, the house-sparrow, and the cuckoo are known to eat bees from hives in winter or in spring, when food is very scarce. The blue tit, flycatcher, and chaffinch are also addicted occasionally to this habit of eating an insect with a powerful sting.

A habit, probably of local origin, is exhibited by the chaffinch when large numbers of humble-bees, and even wasps, are attracted to the fragrant blossom of the weeping white lime-tree (*Tilia petiolata*) in August. These insects are provided both with weapons of defence in the stings of workers and queens, and with warning colours in the shape of yellow and red bands interspersed with black, but all these protections break down when they have sipped the nectar from the flowers.

Queens, workers, and males alike are caught by the chaffinch, which usually, with a peck from its beak, first destroys the tail, dropping the latter to the ground, eats out the contents of the abdomen, then breaks into the thorax, and finally drops the hollow remains of the insect to the ground.

In 1912 young birds of a late brood accompanied their parents to two trees in Hertfordshire, but showed fear of the bees, and would eat them only when caught and offered by their parents.

The blue tit is said to treat hive-bees in much the same manner (Cheshire, "Bees and Bee-keeping," vol. ii., pp. 578-79, 1886).

The srike, or "butcher-bird," pierces queen humble-bees through the side of the thorax, after catching them on the wing in its beak, apparently with the view of causing general paralysis before impalation upon the thorn during formation of the "larder."

Toads are known to feed voraciously upon hive-bees, swallowing them whole, and it is at present very doubtful if any of the birds mentioned are affected by the stings of bees; but the method of avoidance of being stung cannot be completely overlooked in the cases described for birds.

The cuckoo is especially addicted to feeding upon caterpillars provided with irritant hairs, and with this we have a rough series showing the downfall of distasteful qualities or defensive weapons in face of selective adaptation in enemies, which for generations must have been kept at bay by such protection in their would-be victims.

The currant-moth larva, then, has merely been eaten by the thrush, and possibly by the other birds mentioned by Dr. Collinge (save for the cuckoo, which is now adapted to eating distasteful insects), when the stress of having to feed a family has made such a practice a necessity. In the case of the song-thrush and its young, the stress has disappeared after a period of seven days with the arrival on the scene of more palatable food.

The presence of parasites in the caterpillars left after this period can scarcely be more than a coincidence, and there is no proof that the caterpillars which the thrushes ate were not also parasitised. This explanation would seem more acceptable than Dr. Collinge's paradox based on the assumption that the larvæ of the currant moth are not unpalatable to the majority of birds in ordinary times.

EDWARD R. SPEYER.

New College, Oxford, July 29.

#### Luminous Worms.

THE paper by Dr. Gilchrist published in the Transactions of the Royal Society of South Africa, and referred to in NATURE of July 31, p. 433, should be of service in reviving interest in this country in the question: Do our indigenous Oligochæts display luminosity? So long ago as 1893 I directed attention to the subject in these columns (NATURE, vol. xlvii., p. 462), and in more recent years I have endeavoured to elicit information of a trustworthy nature on the question with but little success. The following worms which have been reported as exhibiting luminosity are common in this country:—Brandling (*Allolobophora (Eisenia) foetida*), *Enchytraeus albidus*, and *Henlea nasuta*. *Microscolex phosphoreus* or an ally is an importation. Another worm, which is large, common, and easily observed, is *Octolasmus*. It has a steel-blue body, clay-coloured girdle, and yellow tail filled with fat cells which are often attended by gregarines. Various questions await solution. Of what service, for instance, can luminosity be to creatures which

have no eyes? *Helodrilus oculatus* is the only Lumbricid found in England possessing organs of vision, and these are rudimentary. They have been reported by Eisen as occurring in *Sparganophilus* also, two species of which, as I recently showed, occur in this country. Is it possible that light can influence Annelids in some way, and so facilitate sexual processes? It was affirmed by Flaugergues in 1771 that luminosity disappears in certain cases after copulation, and if that observation is trustworthy it is most suggestive. Dr. Gilchrist, in his paper on luminosity referred to above, suggests that luminosity is a protective device so far as South African worms are concerned, and his argument is very plausible. I believe that the yellow extremities of *Octolasmus* serve the purpose of dazzling underground foes by emitting light.

The reports made years ago to the British Association of luminous worms found in Liverpool and in the bogs of Ireland have never led to any satisfactory issue. As I am now writing my monograph of British Oligochæts for the Ray Society, it would greatly interest and help me to receive living specimens of worms which betray phosphorescent properties, or any well-authenticated facts relating to the subject which could be used for purposes of publication or investigation.

HILDERIC FRIEND.

"Cathay," Solihull, July 21.

#### Protective Coloration of Birds and Eggs.

WHILE collecting information on the use of colour-protection among birds, my attention has been directed to what appears to be a very interesting generalisation, viz. that among birds which nest on the moors, seashores, and similar open places, (1) those which have the habit of remaining on their nests when danger threatens generally wear camouflaged uniforms, but their eggs seldom show any signs of colour-protection; while (2) those which are very shy and leave their eggs readily are generally conspicuously coloured, but their eggs are usually camouflaged.

Amongst the first class are capercaillie, nightjar, partridge, wild duck, and bittern; and amongst the shy ones with camouflaged eggs are lapwing, curlew, oyster-catcher, terns, ringed plover, and golden plover.

I do not remember to have seen this point mentioned explicitly in any book or paper, and should be greatly obliged to any reader of NATURE interested in birds who would give me any further information on the subject.

GEO. GRACE.

The Museum, Keighley.

#### Teeth of Sea-Otter.

IT is commonly stated that the sea-otter (*Latax lutris*) differs from other carnivora in having only two incisor teeth in the lower jaw. Through the kindness of an old Etonian, Mr. Ernest Edwards, our school museum has become possessed of a fine stuffed head of this animal. I was surprised, however, to note that this specimen has three incisors on both sides. In the books of reference to which I have access I can find no such case recorded, and I shall be grateful if any of your readers can give me information on the point.

M. D. HILL.

Eton College, Windsor, July 29.

#### The Late Sir Edward Stirling.

IN NATURE of April 3, p. 87, the late Sir Edward Stirling is referred to as director of the South Australian Museum. Sir Edward resigned from the directorate in 1913, and was succeeded by Mr. Edgar R.