It is intended that the different Orders shall be issued separately, but according to a uniform plan, so that the whole may eventually be combined, and form a permanent record, and as complete a Catalogue as present knowledge will allow, of the Insect Fauna of the United Kingdom. A work of this magnitude must necessarily occupy a considerable time. In the case of the Coleoptera and Lepidoptera, which have most frequently and recently been handled, there is less urgent need for a Catalogue than in the case of the other Orders, and it is hoped that a commencement may be made with the Hemiptera, Hymenoptera or Neuroptera. The Council cannot hold out the expectation of very speedy progress; but the fact that Messrs. G. R. Crotch, Doubleday, Douglas, Eaton, Sir John Lubbock, M'Lachlan, Rev. T. A. Marshall, Scott, Dr. Sharp, F. Smith, Stainton and Walker are already engaged upon various groups will be sufficient to show that the work has been undertaken in earnest, and has been entrusted to competent workers.

Finally, the Council for 1867 can only repeat what its predecessors have said before, that with greater resources the Society could do much greater good. The action of the Executive is continually impeded by want of funds. No one has yet been bold enough to suggest a larger annual contribution. To increase our income we must increase the number of our Members. How long shall it be said that the Entomological Society of London, in spite of its pleasant Meetings, its useful Library, its costly publications, its almost microscopic subscription, can barely muster a couple of hundred supporters?

January 27, 1868.

The following were elected Members of the Council for 1868:—Messrs. Bates, Dunning, Grut, Sir John Lubbock, M'Lachlan, Salvin, G. S. Saunders, W. W. Saunders, F. Smith, Stainton, S. Stevens, Trimen and Westwood.

The following Officers for 1868 were afterwards elected:—President, Mr. H. W. Bates; Treasurer, Mr. S. Stevens; Secretaries, Messrs. Dunning and M'Lachlan; Librarian, Mr. E. W. Janson.

Sir John Lubbock read the following Address:—

THE PRESIDENT'S ADDRESS.

GENTLEMEN,

The labours of Entomologists have been neither less earnest nor less successful during the past year than in those which have preceded it; and it would be utterly impossible for me, within the limits of our Annual Address, even if in other respects I were capable of doing so, to give an account of all the various works and memoirs on our Science which have appeared since our last Anniversary.

We may fairly congratulate ourselves both on the number and the value of the communications read before our own Society, the power

of publishing which we mainly owe, as you have already heard, to the great liberality of our very excellent Secretary, Mr. Dunning, to whom the Society is in other ways also so much indebted.

The memoirs read before the Society during the past year have been as follows :—

1867.

JANUARY 7.—Choreutidæ and Crambina collected in Egypt in 1864, and Crambina, Pterophorina and Alucitina collected in Palestine in 1865, by the Rev. O. Pickard-Cambridge; determined and the new species described by Professor Zeller.

A Monograph of the Genus Hestia; with a tabular view of the Danaidæ. By Mr. A. G. Butler, F.Z.S.

FEBY. 4.—On some Variation observed in Bombyx Cynthia in 1866. By Dr. Wallace.

„ 18.—On the Pieridæ of the Indian and Australian Regions. By Mr. A. R. Wallace.

On the Distribution of Lepidoptera in Great Britain and Ireland. B Mr. Herbert Jenner Fust, jun.

New Species of Buprestidæ collected by Mr. Lamb in Penang. By Mr. E. Saunders.

MARCH 4.—Notes on the Genus Raphidia. By Dr. Hagen.

Description of a new Carabideous Insect from Japan (Damaster auricollis, n. sp.) By Mr. C. O. Waterhouse.

Note on a Genus of Dynastid-Lamellicorns, belonging to the Family Pimelopidæ (Genus Dipelicus, *Hope*). By Mr. C. O. Waterhouse.

„ 18.—Descriptions of new Species of Cryptoceridæ. By Mr. F. Smith.

On Species and Varieties. By Capt. Thomas Hutton, F.G.S.

APRIL 1.—Descriptions of new Species of Mantispidæ in the Oxford and British Museums. By Professor Westwood.

MAY 6.—On a Collection of Butterflies formed by Thomas Belt, Esq., in the interior of the Province of Maranham, Brazil. By Mr. H. W. Bates.

JULY 1.—Observations on Dzierzon's Theory of Reproduction in the Honey-bee. By Mr. John Lowe.

A Catalogue of the Cetoniidæ of the Malayan Archipelago, with Descriptions of the new Species. By Mr. A. R. Wallace.

NOV. 4.—A Revision of the Australian Buprestidæ described by the late Rev. F. W. Hope. By Mr. E. Saunders.

Descriptions of some new Species of Diurnal Lepidoptera. By Mr. W. C. Hewitson.

A Monograph of the Genus Thais of the Family Papilionidæ. By the Rev. Douglas C. Timins.

DEC. 2.—Contributions to a Knowledge of the Coleoptera, Part 1. By Mr. Pascoe.

On some undescribed Species of South-African Butterflies, including a new Genus of Lycænidæ. By Mr. Roland Trimen.

I need not dwell on these memoirs, nor on the numerous entomological contributions which have appeared in the 'Zoologist,' the 'Entomologist,' the 'Entomologist's Monthly Magazine,' or Mr. Stainton's 'Annual,' because they are in the hands of all our members.

The 'Journal of the Linnean Society' also contains entomological memoirs by Messrs. Pascoe (2), Butler, M'Lachlan (2), Spruce, and Bates.

The 'Zeitschrift für Wissenshaftliche Zoologie' has been particularly rich this year in entomological communications.

Dr. H. Landois has published in it a very interesting memoir* on the sounds produced by insects. He commences with a short historical sketch of the subject, referring especially to the observations of Aristotle, "the greatest of naturalists;" he might almost have said "the greatest of men." He then describes successively the mechanism by means of which sound is produced among the Orthoptera, Coleoptera, Diptera, Homoptera, Lepidoptera, Hymenoptera and Neuroptera.

The number of insects which emit audible sounds is very large, and there can be no doubt that many more produce tones which, though inaudible to us, are perceptible to one another. This is shown by the fact that many species which are apparently silent possess arrangements evidently intended for the production of sound.

The familiar sounds of the Orthoptera have no claim to be regarded as a voice, but are produced by rubbing one part of the body against another. A few, but very few, of the Lepidoptera emit sounds, which are made by rubbing the palpi against the trunk, and cease if the palpi are removed.

Among the Coleoptera also sounds are generally produced by friction, and the wings often produce a humming noise during flight. In the genus Melolontha there is a second source of sound, which may almost be called a voice. In the large trachea, immediately behind each spiracle, is a chitinous process or tongue, which is thrown into vibration by the air during respiration, and thus produces a humming noise.

Similar structures occur in many Diptera, Hymenoptera, Neuroptera

* Zeits. f. Wiss. Zool. Vol. xvii. Pt. 1.

and Homoptera, and to them, even more than to the vibrations of the wings, the characteristic sounds produced by so many of these insects are ascribable. The "song" of the Cicada, for instance, is thus produced by the metathoracic ganglia, but without the assistance of figures it would be difficult to give any idea of the machinery which is described in detail by Dr. Landois, and of which I will here only observe that it differs considerably in different insects.

In the Diptera and Libellulina it is by the four thoracic spiracles that the sounds are produced, while in Hymenoptera, as for instance in Bombus, the abdominal spiracles are also musical. The sounds produced by the wings are constant in each species, excepting where there are (as in Bombus) individuals of very different sizes. In these the larger specimens give generally a higher note. Thus the male of Bombus terrestris hums in A′, while the large female is a whole octave higher. There are, however, small species which give a deeper note than larger ones, on account of the wing-vibrations not being of the same number in a given time.

Moreover, a tired insect produces a somewhat different note from one that is fresh, on account of the vibrations being slower.

Indeed, from the note produced we can calculate the rapidity of the vibration. Thus the house-fly, which produces the sound of F, vibrates its wings 21,120 times in a minute, and the bee, which makes the sound of A′, as many as 26,400 times, or 440 times in a second. On the contrary a tired bee hums on E′, and therefore vibrates its wings only 330 times in a second.

This difference is probably involuntary, but the change of "tone" is evidently under the command of the will, and thus offers another point of similarity to a true "voice." A bee in the pursuit of honey hums continually and contentedly on A′, but if it is excited or angry it produces a very different note. Thus, then, the sounds of insects do not merely serve to bring the sexes together; they are not merely "love-songs," but also serve, like any true language, to express the feelings.

Dr. Landois describes the muscles by means of which the form of the organ is altered, and the tone is, no doubt voluntarily, affected. We can indeed only in few cases distinguish the differences thus produced; but as even we, far removed as we are in organization, habits and sentiments, from a fly or a bee, can yet feel the difference between a contented hum and an angry buzz, it is highly improbable that their power of expressing their feelings should stop here. One can scarcely

doubt but that they have thus the power of conveying other sentiments and ideas to one another.

In conjunction with M. Thelen, Dr. H. Landois has also communicated to the Zeits. f. Wiss. Zool. another memoir, on the means by which the spiracles, or rather the tracheæ immediately behind the spiracles, are opened or closed. The mechanism consists of four principal parts, the bow (verschlussbugel), the lever (verschlusskegel), the band (verschlussband), and the muscle (verschlussmuskel). The contraction of the latter, acting on the lever, causes the band and bow to meet, and thus close the passage. When the muscle relaxes, the natural elasticity of the parts causes them to separate again, and thus leave the tracheal tube open. They describe the details of the apparatus in a considerable number of species.*

Dr. H. Landois has also published a memoir on the ocelli of caterpillars. After describing them in detail, he comes to the conclusion that they do not essentially differ from compound eyes, and that if many of them were grouped together they could hardly be distinguished from compound eyes. In each so-called ocellus the cornea is divided into three lenses, corresponding to three nerves, each with a separate terminal enlargement forming the so-called crystalline bodies. Each ocellus therefore might be regarded as in reality composed of three. On the other hand, the three arches of the cornea are so closely connected together that they give the impression of forming a single cornea. The three lenses also are very closely pressed, and the three nerves unite into one. Under these circumstances Dr. Landois regards the ocelli of caterpillars as a connecting-link between single and compound eyes, and proposes for them the name of 'ocelli compositi.'†

Dr. August Weissmann‡ has published a long and interesting memoir on the metamorphoses of Corethra plumicornis. The larva of this fly is the beautiful transparent creature, about half an inch in length, which all lovers of Natural History must have watched floating horizontally among the green vegetation of our clear ponds, and ready, in spite of its apparent delicacy and crystalline transparency, to pounce on any little unwary victim which may come within its reach. At

* Zeits. f. Wiss. Zool. 1867, Vol. xvii. Pt. 2.
† Zeits. f. Wiss. Zool. Vol. xvi. Part 1. ‡ Id.

each end of the body are two kidney-shaped air-vesicles, which serve partly no doubt for respiration, but partly also as floats.

From its extreme transparency this beautiful larva offers a very favourable object for study, and Dr. Weissmann has described the changes which the different organs pass through. His descriptions also are illustrated by numerous figures. It will be impossible for me to recapitulate his observations, but I will cursorily refer to a few of those which have struck me as being most interesting.

The large black eye of the full-grown larva, and which is also that of the imago, does not exist at birth. The eye of the embryo and young larva becomes, as in many Crustacea, only a secondary optical organ.

In opposition to the views of M. Lacaze-Duthiers, Dr. Weissmann regards the external sexual organs as appendages, and not as the representatives of segments. The internal sexual organs, as appears to be the case in all insects, are present even at birth. So also are the rudiments of the tracheæ, which however do not contain, and indeed are not in a condition to contain air. It is still more surprising that some even of the muscles of the imago, as for instance the wing-muscles, are distinctly indicated, not indeed by true muscles, but by bands of undifferentiated tissue, which gradually enlarge and acquire the character of true muscle.

Dr. Weissmann describes minutely the gradual formation and enlargement of the different organs. This is effected by an infolding of the hypodermis or cellular layer of the skin, so that the new organ does not, as in most other cases, lie inside the old one, but is formed by an inverted fold of skin lying inside the body. The new organs also arise in the same manner, the thickening and subsequently the inversion of the skin taking place beneath one of the sensitive hairs. The neurilemma of the nerve proceeding to this hair develops itself, according to Dr. Weissmann, into all the soft parts of the new organ, whether muscle, trachea or tendon. In the formation of pupal air-vesicles, however, a trachea fulfils this function. The external appendages of the imago, such as the wings and legs, are formed, though not of course fully developed, during the larva stage; and Dr. Weissmann refers the position of the antennæ to a muscular act on their part, for which he brings forward strong reasons, though it is the first time, so far as I am aware, that any movement in the external organs of the imago has been observed during the pupal condition. From

the high development reached by the antennæ, as well as the legs of Corethra, during the larva state, there seems no great improbability in this view.

From a pupa of this kind to a pro-imago, as it has been called, of Ephemera or Chloeon, there is but a step, even if so much.

In fact the so-called pupa of Corethra ought to be called a pro-imago rather than a pupa. Its functions, with one single exception, are in full activity. Though it does not feed, it swims and appears as active and vivacious as the larva. It can see perfectly well, and on the approach of danger darts rapidly to a place of greater security.

Thus, then, it affords a remarkable illustration of the arguments I have elsewhere brought forward with the view of proving that the so-called larvæ and pupæ are not homologous terms in different insects. Even among the Diptera, while in Corethra the wings and legs of the imago are already formed, and the mouth parts only require a slight final modification when the so-called larva turns into a pupa, at the corresponding period in Musca the very reverse is the case, and the head itself can scarcely be said to have any existence.

Dr. Weissmann concludes his valuable memoir by a comparison of the development of Corethra with that of Musca.

In Corethra the larval segments develop themselves directly into those of the imago, and the appendages of the head into the corresponding organs of the perfect insect. The thoracic appendages are formed during the last stage of the larva, by outgrowths of the hypodermis round a nerve or a trachea, from the cellular envelope of which the cellular tissues in the interior of the organ are formed. The larval muscles in the abdomen are received almost unaltered into the imago. The muscles peculiar to the imago develop themselves, in the last larval state, from indifferent cellular bands, which are present even in the egg. The genital glands date from the embryo, and develop gradually; all the other systems of organs pass directly, with little or no change, into the imago. The fatty tissue is small. The pupa condition is short and active.

In Musca the thorax and head rise independently from the corresponding parts of the hypodermis of the larva, and the abdomen only through direct alteration of the eight last abdominal segments. The thorax and head develop themselves from "imaginal disks" which have their origin in the embryo. First, after the formation of the

pupal barrel-like envelope from the chitin skin of the larva, the imaginal disks develop themselves into the head and thorax. There is a destruction of all the organic systems, which are re-formed at the expense of the fat body. The genital glands are present in the embryo, and develop themselves gradually. The pupa condition is protracted, and the insect is inactive.

It is remarkable that even in the same Order such great differences in development should occur. Similar cases, however, are well known in other parts of the animal kingdom.

The principal difference between Corethra and Musca resides in the imaginal disks, and Dr. Weissmann proposes therefore to divide the metabolic insects into two divisions, "Adiscota" and "Discota." He admits, however, that between these two extremes all possible intermediate stages are to be met with.

The same journal contains a short paper by M. Mecznikow, on the Embryology of Hemiptera, and a memoir by M. W. Brasius, on the loss of weight of Lepidoptera during the change from the larva to the imago.

Dr. C. Kupfer has published a short memoir on the early stages of development in Chironomus, as to which he does not altogether agree with the views of Weissmann.

M. Hensen* has published a memoir on the auditory organ of Locusta, in which he confirms the description given by Von Siebold. He also endeavours to prove that there is an identity of plan between this organ and the ear of Crustacea, comparing the auditory rods of the former with the hairs of the latter. He admits that the rods have at their apex a large cell, of which the hairs show no trace; but he argues that the rods of Locusta are primary structures, while the auditory hairs of Crustacea have never been examined until after several changes of skin; and he thinks that if the auditory hairs were examined before the first moult, corresponding cells might probably be found at their apex. In any case he does not think that the mere presence of these cells is sufficient to destroy the analogy.

He concludes therefore that these auditory rods, like the auditory hairs of Crustacea, are thrown into vibration, when they are fitted, by

* Zeits. f. Wiss. Zool. Vol. xvi. Pt. 2.

their form and elasticity, to vibrate in a period corresponding to the exciting sound.

I must confess, however, that they appear to me very ill adapted for any such function, and I am disposed to regard them, not as hairs, but as modified nerve-terminations, corresponding to the rods in the eye of insects.

The fourth number of the sixteenth volume of the same journal is entirely composed of a very admirable paper by M. E. Mecznikow. This young naturalist, already one of our most zealous observers, promises to take a high rank among biologists, and the memoirs which he has already produced justify us in expecting great things from him. In the present memoir, after some introductory observations, he describes the development, first of Simulia, secondly of Miastor, thirdly of Corixa, fourthly of Aphis rosæ, and lastly of Coccus (Aspidiotus) nerii.

Both in the viviparous Cecidomyia and in Aphis M. Mecznikow has satisfied himself that the germinal vesicle divides and subdivides itself, the cells thus formed arranging themselves in a layer around the yolk, and thus forming the blastoderm. M. Weissmann, on the contrary, maintained that the blastodermic cells arose independently in the outer layer of the yolk: M. Mecznikow's statement is, however, most probable in itself, and is fully corroborated by his figure, the accuracy of which there is no reason to doubt. It is true that he did not actually see the division take place either in Cecidomyia or in Aphis. He relies on the absolute similarity of the first two cells with the germinal vesicles, and their unlikeness to anything else in the egg; secondly, on their absence as long as the seminal vesicle is present, and their presence as soon as it has disappeared. I must, however, confess that I have never found in any insect egg any trace of this process, nor was Prof. Huxley more fortunate. Moreover, according to Leuckart, the blastodermic cells in Aphis arise successively not by division of, but by budding from, the germinal vesicle. As soon as the blastodermic cells have arranged themselves round the yolk, the hindmost of them increases in size, becomes darkened by granular contents, and thus forms a "pole-cell" or "directive vesicle," similar to those which have been observed in so many animals that we may almost regard their presence as general at this stage throughout the animal kingdom.

It is true that in this very paper M. Mecznikow expressly states no such body exists in Corixa, in Aspidiotus or in Aphis. It is, however, difficult to believe that so fundamental a difference should exist in the embryology of animals belonging to the same class, and in fact I might appeal to one of M. Mecznikow's own figures (pl. xxviii. fig. 11) to prove that, in direct opposition to his statement, pole-cells do occur in Aphis. In that figure the blastoderm is represented, no doubt correctly, as a single layer of cells, except at the hinder end, where there are three extra cells. These three extra cells appear to me to be the pole-cells, in confirmation of which I would only ask any one to compare this figure with pl. xxiv. fig. 11, which represents the corresponding stage in Cecidomyia. It is true that the pole-cells of Aphis are not so dark or so large as those of Cecidomyia, but these are not essential characteristics, and on the other hand the part played by the blastoderm at this spot offers so much similarity, as we shall see, with that of the pole-cells of Cecidomyia as to leave very little room for doubt.

The dark colour and large size of the pole-cells in Cecidomyia are, however, favourable conditions which have enabled M. Mecznikow to throw light on their history and functions, concerning which we have hitherto been in complete ignorance. Guesses have indeed been hazarded, but, as is usual in Science, they have all been wrong. The pole-cell, which is at first single, divides into two, and these again subdivide into four similar but smaller cells. In the mean time the blastodermic cells have formed themselves into a regular membrane enclosing the yolk on all sides, and for some little time the pole-cells lie completely outside this membrane. Soon, however, they re-enter, in what manner is not stated, but are still easily distinguishable by their dark colour. They remain for some time without further change, and even when the embryo has largely increased in size, and thus become opaque, they can at any time be brought into view by a slight pressure.

When at length the segments of the body are indicated, the œsophagus and rectum formed, and the rudiments of the mandibles and two pairs of maxillæ are already evident, the four pole-cells separate themselves into two groups of two, without, however, having undergone any further change. In embryos somewhat farther advanced, each pair of pole-cells is found to be enclosed in a special organ occupying a definite position in the embryo. These organs are of an oval form and are composed of small cells, which do not differ

either in form, size or contents from the ordinary embryonal cells. At one end of each gland is a short duct, which at first consists of a single row of embryonal cells. Subsequently the pole-cells commence to divide themselves anew, and thus form the vitelligenous and germinal vesicles, while the walls of the organ and its epithelial cells are composed of ordinary embryonal cells.

It appears then, in short, from these remarkable observations, that the pole-cells, after remaining for some time outside the blastoderm, re-enter it, collect round themselves a sufficient mass of the ordinary embryonal cells, and thus form the rudiments of the new generative organs.

To judge from M. Mecznikow's description and figures, very much the same thing appears to happen in Aphis. The cells, indeed, which I suppose to be the pole-cells do not differ from the rest either in size or colour, and cannot therefore be traced throughout the developmental changes, as in Cecidomyia. The blastoderm, however, in their neighbourhood—*i. e.* at the hinder end of the egg—projects into the yolk and forms the pseudovitellus and the rudiment of the future generative organs, as was first described by Huxley in his celebrated memoir on this subject. We see, then, not only that the generative organs are present in the embryo, but even *that they are the very first organs to make their appearance*. Before a single appendage is indicated, before the mouth or any one of the internal organs is traced out, the essential parts of the generative organs are already in their place.

It is true that the two cases in which this remarkable fact has been observed are both instances of agamic reproduction. I have, however, shown, in my papers published in the 'Philosophical Transactions' for 1857, 1858 and 1861, which appear to have escaped M. Mecznikow's notice, that the agamic reproduction in insects closely resembles that by means of impregnated eggs, and I can hardly therefore suppose that there would be any fundamental difference in the development of the generative organs themselves.

It will be observed that there is nothing in M. Mecznikow's observations to confirm the remarkable statements of M. Balbiani, to which I alluded in my last Address. It is satisfactory to know that this gentleman is about to publish his memoir in full, with figures.

Considerations of time and space prevent me from referring to many other parts of M. Mecznikow's memoir which are of great

interest, but there are one or two points which I cannot pass over altogether in silence.

In opposition to the views generally held by entomologists (see, for instance, Westwood's 'Modern Classification of Insects,' vol. ii. p. 414), he denies that the needle-like organs contained in the labium of Homoptera represent the mandibles and maxillæ, though he admits that they do so in the Heteroptera. He describes the larva of Teleas, a minute species allied to Pteromalus, which oviposits in the eggs of Gerris, as much resembling, both in its first form and also in its remarkable changes, the extraordinary larva of Rhynchites, which was discovered by Dr. Filippi.* In the viviparous Cecidomyia he confirms the interesting observation, first made by Zaddach in Mystacides, that the antenna of the larva is originally post-oval. Lastly, I may mention that Mecznikow declines to accept Weissmann's division of metabolic insects into "Discota" and "Adiscota."

Dr. Möller has published a memoir on the influence exercised upon insects by external conditions. One of the most interesting parts is that in which he gives cases where the colour of a species depends on that of its habitat. Thus, for instance, Elaphrus riparius, he says, in sandy districts, is of a clear brown colour; in meadow lands, on the contrary, green. Again, the larva of Amphidasys betularia is yellowish green when it lives on the birch; ashy gray when on the oak; yellowish brown when on the elm; yellowish green clouded with rust-colour when on willows or poplars. He also gives a list of the species which he has observed in ants' nests.†

The Ann. des Sci. Nat., 5th ser., t. vii., contains a paper by M. Claparède (which has also been translated in the 'Annals and Magazine of Natural History' for May last) on the "Reproduction of Aphides." M. Claparède pronounces decidedly against M. Balbiani's theory of the hermaphroditism of Aphides, as to which I ventured to express my own doubts in my Address of last year. M. Claparède appears to have overlooked the fact that M. Balbiani's so-called "testis" had been already observed by Huxley. In reply to this criticism M. Balbiani (*lib. cit.* p. 30) promises shortly to publish his memoir *in extenso*.

* Ann. d. Sci. Nat. 1851.

† 'Die Abhängigkeit der Insecten von Ihrer Umgebung,' v. Dr. L. Möller.

Dr. E. Bessels has a memoir in the Zeits. f. W. Zool. for 1867, p. 545, on the development of the sexual organs in Lepidoptera. He does not appear to have seen my papers on the same subject in the 'Philosophical Transactions.' He mentions that a friend of his bred a specimen of Lasiocampa catax, which remained no less than seven years in the pupa state.

Mr. Lowe, at one of our Meetings, read a paper on Dzierzon's theory of the agamic character of the drone-producing eggs of the bee, and exhibited some drones produced by a Ligurian queen which had been impregnated by an ordinary drone. He argued that if impregnated eggs produced females only and the drones were always descended from unimpregnated eggs, then a queen thus impregnated ought to produce hybrid workers, but pure drones, while those which he exhibited certainly differed in many respects from pure Ligurian males. This observation, however, is not so conclusive as it appears at first sight. The alteration of climate and of food might influence the colour of the drones, or it might be supposed that the queen, though apparently pure, contained some German blood, which thus showed itself. Moreover, we know cases, both in animals and plants, where the ovary is deeply affected by the influence of the male. And, lastly, it is stated that the pure Italian drones show considerable variability.

The most probable explanation of the phenomenon, however, is I think, that these drones are the produce of the workers, which, being descended from a marriage of an Italian mother with a German father, would naturally produce a mixed offspring.

Dr. H. Landois, in a short paper on the development of the sexes in insects, also combats the views of Dzierzon as to the parthenogenesis of bees. He maintains that the sex of the bee depends on the character not of the egg, but of the nourishment. In support of this he asserts that he has removed eggs from drone-cells and placed them in those of workers, and that invariably the grubs hatched from them have produced, not drones, but ordinary workers. He also refers to the well-known possibility of developing young worker-larvæ into queens, which, however, I need hardly observe is not a case of change of sex; and also the difficulty presented by the cross between the common and the Italian bee. When, however, Dr. Landois observes that the females of insects require a longer time for their development

than the males, on account of their more complete development, he forgets that in the hive bee the queen comes to maturity in sixteen days, while the workers require twenty-one, and the drones twenty-four. Of course if Dr. Landois were correct in his statement that the sex of an insect depends upon its nourishment, it follows that it must be undetermined even until some time after the hatching of the egg. No one indeed has yet ascertained that, in the case of the bee, the sex is determined in the embryo, but from analogy it is most probable that this is the case.

Moreover, as Prof. Siebold has pointed out (Zeit. f. Wiss. Zool. 1867, p. 525), the food of all bee-larvæ is the same for the first six days, and that of the drones and workers even longer—a fact which seems fatal to M. Landois' theory. M. Siebold expresses, in courteous language, a doubt, which I think most naturalists will share, whether there is not perhaps some mistake in M. Landois' experiment.

In the same number of the 'Zeitschrift' M. Kleine also makes some remarks on M. Landois' theory. He also points out that the food of workers and drones is identical; and as regards the difficulty presented by the crossing of the Italian bee with an ordinary drone, he observes that Italian drones under any circumstances vary considerably, and that even when of pure breed many of them cannot be distinguished from the northern variety. He adds, moreover, that before the introduction of the Italian variety, drones closely resembling Italians sometimes made their appearance.

Moreover, as long ago as 1862, Berlepsch had performed Landois' experiment of transferring eggs, but with very different results. He took six eggs out of drone-cells and placed them in ordinary cells. Two perished, but four produced drones. Again he transferred six other eggs from ordinary cells into drone-cells. One perished, the other five produced larvæ which reached a certain size, and were then destroyed by the bees. Berlepsch examined them and found that they were males. It is evident, therefore, that the transference of eggs from male cells to female cells, or *vice versâ*, does not have any effect on the sex.

M. E. Bessels * has also taken great pains to settle this interesting question. In spite of several attempts, made with the greatest care, he was unable successfully to perform the transference experiment. In every case the bees removed the obnoxious egg. By varying the experiment, however, which he did in a very ingenious manner, he induced the

* Zeits. f. Wiss. Zool., Vol. xviii. Pt. 1.

queen bee to perform it for him. He took an ordinary queen and placed her in a hive with a comb containing drone-cells only. She was for some time disturbed by this unusual state of things, but after awhile made a virtue of necessity, and commenced laying her eggs in the drone-cells. These eggs in due time produced ordinary workers.

Again, M. Bessels took a young virgin queen, and by clipping her wings rendered her incapable of marriage. He then placed her in a hive with a comb which had no drone-cells, in spite of which her eggs produced nothing but drones. As far as they go, these two experiments, ingenious as they are, seem to me less conclusive than those of Berlepsch. Under ordinary circumstances the bees appear to regulate the food of the young larva according to the nature of the cell in which it is placed, but we cannot take for granted that they would do so under such exceptional conditions as when all the cells were of the same character.

M. Bessels' next experiment, however, is not open to this objection. He took combs which contained drone-cells only, and placed them in a hive which he deprived of its queen. The bees, in the usual manner, selected two or three of the larvæ, altered the form of the cells, and commenced feeding them with royal food. The drone larvæ, however, did not thrive under this unnatural treatment, but perished; not, however, until the generative organs were sufficiently developed to show that they were true males. This experiment he repeated three times, always with a similar result.

M. Bessels does not seem to have been aware that Huber had already made this experiment. Huber could not indeed induce an ordinary queen, during her course of laying workers' eggs, to lay in a drone-cell, but he did cause a "retarded," or, as we should say, virgin queen, to lay in worker cells and even in royal ones. In these cases the workers fed the larvæ respectively with worker food and royal food, but Huber expressly tells us that males only were produced, though in the former case they were of small size from insufficient nourishment. This experiment of Huber's, which seems conclusive, appears to have been overlooked by Dr. Landois as well as by his opponents.

In the 'Comptes Rendus' for November is a short notice of a memoir, by M. Lespès,* on blind Coleoptera. He has examined the nervous system of Aphænops Leschenaultii (one of the Carabidæ), of Adelops

* 'Comptes Rendus,' 1867, p. 890.

pyrenæus and Pholeuon Querilhaci (Silphidæ), of Claviger Duvalii, and of Langelandia anophthalma. He finds not only the optic nerve has disappeared, but also that the brain itself is profoundly altered, for as he expresses it, "Les ganglions cérébroides, au lieu de former une sorte de masse transversalement disposée dans la tête, ont la forme de deux corps ovales allongés placés presque parallèlement."

In the 'Geological Magazine' for September last is a short but interesting paper by Mr. Dawson on palæozoic insects. The first belongs to the carboniferous period. Insects representing the Orders Neuroptera, Orthoptera and Coleoptera were long ago observed in the coal-fields of England and Westphalia. Until last year, however, though the coal-beds of Nova Scotia are rich in vegetable remains, no remains of insects had been observed in them. The species now described by Mr. Scudder, under the name of Haplophlebium Barnesii, after its finder, is referred to the Ephemerina, and must have measured no less than seven inches across the wings. "We can easily understand," says Mr. Dawson, "that the swamps and creeks of carboniferous Acadia, with its probably mild and equable climate, must have been especially favourable to such creatures, and we can imagine the larvæ of these gigantic Ephemeras swarming on the deep black mud of the ponds in these swamps, and furnishing a great part of the food of the fishes inhabiting them, while the perfect insects, emerging from the waters to enjoy their brief space of aërial life, would flit in millions over the quiet pools and through the dense thickets of the coal-swamps."

Mr. Scudder describes four insects from the Devonian shales of New Brunswick, under the names of Platephemera antiqua, Homothetus fossilis, Lithentomum Harttii and Xenoneura antiquorum. These are the oldest insects yet known to us, but Mr. Scudder is satisfied from the plants with which they are associated, that there can be no doubt of their belonging to the Devonian period. They are all Neuropterous, and allied to the Ephemeridæ. In the opinion of Mr. Scudder, however, they show a "remarkable union of characters now found in distinct orders of insects," and he lays special stress on the presence in Xenoneura of a stridulating or musical apparatus, much like that of the cricket. In addition to the interest of finding such an organ among the Neuroptera, this observation brings before our imagination, as Mr. Scudder says, "the thrill and hum of insect-life that enlivened the solitudes of these strange old forests."

Mr. Kirkby also, in the 'Geological Magazine,' describes three insect-wings from the coal-measures of Durham, and considers that they probably belonged to insects allied to the Blattidæ.

Psyche helix is well known to all entomologists as being one of those interesting species of which the males long remained unknown. From the time of Réaumur, naturalists have sought for it in vain. Von Siebold especially examined a hundred and fifty specimens, which all proved to be females. Latterly, indeed, one or two entomologists have described insects which they supposed to be the males of P. helix, but there has always been a certain amount of doubt about it. Prof. Clauss appears to have been more fortunate. The larval case of the male (Zeits. f. Wiss. Zool. vol. xvii. p. 470) is smaller than that of the female, and somewhat different in form. The larva itself is very similar in the two sexes, while, on the contrary, the pupæ differ considerably. Prof. Clauss gives a description and figure of the male, and whatever doubt may attach to the supposed discovery of this sex by other observers, we may now, I think, congratulate ourselves that the male of this curious species has been at last discovered.

The last number of the Zeitschrift f. Wiss. Zool.* contains a short paper by M. F. Ratzel on the egg of an Ephemera. He describes and figures two curious hemispherical appendages which are attached to their flat sides, one to each end of the egg. Leuckart, in his celebrated memoir, "Ueber die Micropyle und den feineren Bau der Schalenhaut bei den Insecteneiern," had already observed a somewhat similar appendage to the eggs of the Ephemeras examined by him, as indeed Swammerdam had also done long before; but he considered it to be a mass of spermatozoa, one end of which was engaged in the micropyle opening. M. Ratzel has, however, observed the formation of the appendages in the ovary, which proves that they belong to the egg itself. The eggs examined by M. Ratzel have another curious peculiarity. A number of fibrous cords, each ending in a circular disk, are attached to the egg along two zones, which divide it into three subequal parts. He suggests that the object of these curious structures is to prevent the eggs from being carried away by the current.

The 'Comptes Rendus' for June last contain an interesting paper by MM. Balbiani and Signoret, on Periphyllus testudinatus, which

* Vol. xviii. p. 99.

has been translated in the 'Annals and Magazine of Natural History' for August. This insect, known here as the leaf-insect or brown Aphis of the maple, was discovered by Mr. Thornton in 1852, and described under the name of Phyllophorus testudinatus. In 1858 Mr. Lane Clark changed the generic name to Chelymorpha, Phyllophorus having been already used. Chelymorpha, however, is in the same position, and M. Van der Hoeven therefore replaced it by Periphyllus. The insect is a minute form of Aphis, about one twenty-fifth of an inch in length, flat, and brown. It is characterised by "the extraordinary development and unusual appearance of the tegumentary system. Thus their surface is no longer furnished only with simple hairs, but also and principally with scaly transparent lamellæ, more or less rounded or oblong, and traversed by divergent and ramified nervures. These lamellæ occupy especially the anterior margin of the head, the first joint of the antennæ (which is very stout and protuberant), the outer edge of the tibiæ of the two anterior pairs of legs, and the lateral and posterior margins of the abdomen. Moreover the whole dorsal surface of the latter and of the last thoracic segment is covered with a design having the aspect of a mosaic, composed of hexagonal compartments, and which is not without analogy to the pattern formed by the scaly plates of the carapace of tortoises.". . . . . "Another remarkable character of these abnormal individuals of Aphis Aceris is the rudimentary state of their generative apparatus. This is reduced to a few groups of small, pale, and scarcely visible cells, none of which arrives at maturity to become transformed into an embryo: and it retains this character as long as it is possible to observe the animal. The functions of nutrition, also, are performed in them in a very unenergetic manner; for from the moment of their birth until that at which we cease to observe them, they increase but little in size, attaining scarcely 1 millimètre. They undergo no change of skin, never acquire wings like the reproductive individuals, and their antennæ always retain the five joints which they present in all young Aphides before the first moult. Nevertheless they possess a well-developed rostrum and an intestinal canal, the peristaltic contractions of which we have distinctly observed."

This curious Aphis turns out to be, not, as was at first supposed, the larva of a new species, but a special form of the well-known Aphis aceris. MM. Balbiani and Signoret consider that they have placed this remarkable fact beyond the possibility of doubt.

The question naturally arose, What was the signification "of these

abnormal individuals of the Aphis of the maple, and what part did they fulfil in the reproductive functions of the species to which they belong? They are evidently not males, since their generative apparatus retains the same rudimentary form at whatever epoch we examine them. Moreover, in no known species of Aphis are the males produced at the same time as the viviparous individuals, which are not the true females of the species. There is therefore no other alternative but to regard them as a modification of the specific type constantly reproduced, with the same characters, by the successive normal generations."

This, I confess, seems to me no satisfactory explanation of the constant production in a species of a form, very abnormal in appearance, which does not reproduce itself, which scarcely grows at all, is almost stationary, and, after living for several months, dies with the leaf on which it was born. This curious instance of Dimorphism seems to offer a very promising field for further study, and I would specially recommend it to the attention of the Members of our Society.

In conclusion, gentlemen, I cannot quit this chair without thanking you for the constant courtesy and support which I have met with from all during the two years that I have had the honour of presiding over you; more especially my thanks are due to the members of Council, and, above all, to my friend Mr. Dunning.

It is a great satisfaction to me to feel that I shall be succeeded by my friend Mr. Bates, of whom we are all proud, by whose labours our Science has been so much advanced, and under whose Presidency our Society is, I think, sure to prosper.

Mr. Pascoe proposed a vote of thanks to Sir John Lubbock for his conduct in the chair throughout his tenure of the Presidency, accompanied by a request that the admirable Address just delivered might be published in the Society's 'Journal of Proceedings.' This was seconded by Mr. Grut, and carried by acclamation.

Sir J. Lubbock returned thanks, and acceded to the request.

The thanks of the Society were also voted to the other Officers, the Auditors, and the Members of Council for 1867, and were acknowledged by Mr. S. Stevens, Mr. Dunning, Mr. Janson and Mr. J. Jenner Weir.