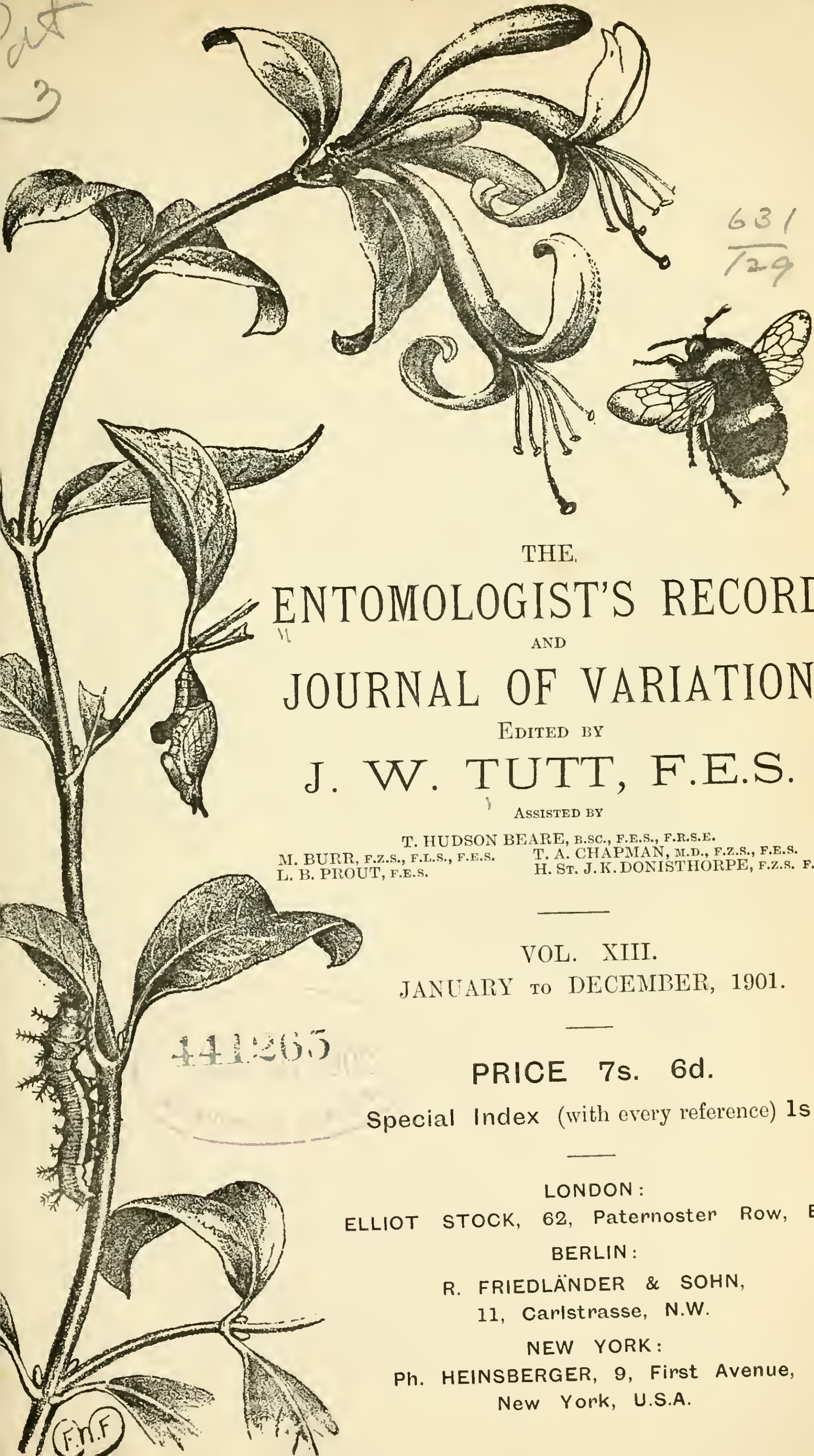


THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S.
T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S.
H. ST. J. K. DONISTHORPE, F.Z.S. F.E.S.

VOL. XIII.
JANUARY TO DECEMBER, 1901.

PRICE 7s. 6d.

Special Index (with every reference) 1s.

LONDON:
ELLIOT STOCK, 62, Paternoster Row, E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, Carlstrasse, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, First Avenue,
New York, U.S.A.

PREFACE TO VOL. XIII.

At the conclusion of Vol. XIII., we have again to tender our hearty thanks to our subscribers and contributors. The current volume is, we believe, more bulky than any of its predecessors, and the contents possibly more varied.

The feature of this volume has been undoubtedly the series of "Century" articles that were printed in the first two numbers, and which gave a general review of the progress made in various branches of entomological science during the century just past. These articles, written by the first specialists in their respective branches of study, have attracted considerable attention both at home and abroad, and were undoubtedly much appreciated by entomological students as careful surveys of confessedly wide and difficult subjects.

We are greatly indebted to Mr. Burr, Mr. J. A. Clark, Mr. J. Edwards and the Hon. N. C. Rothschild for help in the publication of the plates that have been given with the various numbers. Mr. J. A. Clark's plate, illustrating "*Peronea cristana* and its aberrations," will be absolutely indispensable to all future workers at this species.

The help of the assistant-editors is here gratefully acknowledged. The section devoted to Coleoptera under Professor Beare and Mr. Donisthorpe shows a considerable increase, and that of Orthoptera, although not showing so many contributors as may be desired, is steadily maintained by Mr. Burr. The share taken by Dr. Chapman and Mr. Prout in the successful management of the magazine is too well known to need comment.

To Mr. G. B. Routledge and Mr. Burr we have again to off[illegible] best thanks for the preparation of the "Special Index." It [illegible] of the greatest satisfaction to know that our insis[illegible] estimable value of such an Index has resulted [illegible] of most of our current entomological literature.

We propose making no serious change in th[illegible] conduct of the magazine for the forthcoming year. [illegible] specially ask for short notes, relating to observations on th[illegible] of insects in confinement or in the field; details of insects as animated beings are, perhaps, of all forms of entomological study, most interesting, most desirable, and yet most difficult to obtain. All short field notes are also gratefully received, as they often have a strong bearing on the peculiarities of distribution, and are of the greatest value in compiling a standard work, in which accurate detail is everything.

To each and everyone who has in any way helped to make the olume a success we tender our heartiest thanks.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

Vol. XIII. No. 1. January 15th, 1901.

Our Century Number.

It has occurred to us that the end of the nineteenth century was a very fit and proper time to give a brief review of the entomological work that has been done during the past hundred years, and for this purpose we have asked some of our leading working entomologists to contribute a short article on what each considered the more important factors of progress in his own particular line of study. To our request we have had a generous response, and this number is the result.

In order to recognise the progress made in entomological science during the century, it is necessary to consider what goes to the making of entomological science, and even a superficial consideration will show that the work comprised falls pretty clearly into the following lines: (1) The alphabet work of describing and naming the material with which one has to deal. (2) The study of the material with a view to its proper genealogical arrangement. (3) The accumulation of facts by experiment and observation. (4) The collection of isolated facts into systematic order and the deduction of sound generalisations relating to the phenomena of life from these facts. The intelligent observer and the capable reasoner are undoubtedly the two factors that make most for the advancement of science; the proper arrangement and classification of the facts observed and the clear setting forth of the conclusions reached, may then be added.

There can be no doubt, whatever, that the progress of systematic work will be the feature by which the nineteenth century will be specially known to future generations of naturalists. In 1758 the known number of lepidoptera in the world was 535, by the end of the last century it had reached 2100, *i.e.*, just about the number of species now known to inhabit the British Islands; at the present time the number of described species of lepidoptera can be little short of 80,000, and the work in other orders has been in this direction as hugely progressive. This work is necessarily of the greatest importance, and much more has still to be done in the same direction, yet one cannot but feel that it has been largely mechanical, that, in fact, the work of the century has been particularly dominated by what we may term the Linnean entomology. We have had since Herold scarcely anyone to compare with Reaumur, Swammerdam, or Sepp, particularly in Britain, unless one can mention Newport, Spuler, Walter, Lowne and Miall with these old masters, and this, in spite of the parallel development and perfection of those appliances—microscopes, dissecting instruments, &c.—that go to aid more perfect work in the biological branches of our science. We have been overpowered, as it were, through the greater part of the century with the Linnean shibboleths, and every embryo entomologist has been taught that the be-all and end-all of entomological science was the easy determination of known, and the detection of unknown, species. The study of the wider phenomena of nature has been carried on by comparatively few, and these have done it not because of, but in spite of, their environment, yet it was clear that, by the middle of the century, many British lepidopterists felt that a continuance of the application of Linnean methods to the work done, so far as the study of British lepidoptera was concerned, was largely wasted time. Haworth, Stephens, and finally Stainton, in the *Manual*, had catalogued the British lepidoptera on the Linnean lines in the most complete manner, and Stainton evidently felt that the further waiting for species to place in the catalogue was indefensible, and that the placing could be done when the species were found. The transference of his energies to biological work in *The natural history of the Tineina* was an evident result, and the slow growth of similar work, mostly very superficial and useless biologically, in the newly-fledged magazines, was due to a similar cause. It is only quite at the end of the century that Dyar, Chapman, and others have taught us the lines on which this work may be most usefully done, and one may expect in this direction a vast expansion of our work in the immediate future, the field being so vast.

Has the overwhelming preponderance of attention that has hitherto been given to systematic entomology reached its high-water mark? There can be no doubt that an affirmative answer can be given with only few qualms of doubt in the case of the study of the so-called macro-lepidoptera, and evidence is not wanting that the students of odonata and coleoptera are following suit, but the students of orthoptera, hymenoptera, diptera and certain branches of hemiptera, are still in the gestation period, although signs are forthcoming that some are hastening to a wider scientific birth. There is, however, much yet to be done in the systematic work relating to exotic micro-lepidoptera, in which branch, undoubtedly, Walsingham and Durrant are the most successful and intelligent workers. On the whole, lepidopterists have been most moved by the possibilities that Darwin opened out to biological science, and for a quarter of a century they have been in the van of forward movement, proving by close and detailed observations, and testing by careful experiment, the theories brought forward to account for the phenomena of life. Prominent in this direction among entomologists are Weismann, who stands practically alone on the continent, and Wallace, who is happily still with us—the king of all. Otherwise the leading position is held by the American and English specialists—Bateson, Bodine, Chapman, Comstock, Dixey, Dyar, Jordan, Mayer, Meldola, Packard, Poulton, and Trimen—whilst among the experimenters Merrifield and Standfuss hold the premier place. It is a remarkable fact that these men are, as a rule, only systematists in the most limited sense. Nor must Scudder be omitted, although his work is more distinctly systematic than that of the others, for he combines with an excellence in systematic work rarely attained, a marvellous power in dealing with biological problems, and occupies a position on his own side of the Atlantic only reached by Packard, and, on this side, only approached by Chapman who possibly excels all lepidopterists of the present day as an observer both in the field and study, and whose conclusions are almost always sound in spite of their wide-reaching character and the distance they travel from any previously trodden route. Leaving out our leading systematists—Marshall, Cameron, Verrall, Saunders, McLachlan, &c.—who can be mentioned in the same breath with these men among those who study the other orders? Sharp, Miall, Newstead, and who else? Lord Avebury has almost ceased work as an entomologist, and most of the remaining leading coleopterists, hymenopterists, hemipterists, orthopterists, and dipterists, may be classed at once on the same level as possibly two or three hundred lepidopterists, who can name, with more or less accuracy, the British insects of the order studied, and can go little or no further. One trusts that Lameere's recently published work on the classification of coleoptera will urge some intelligent British coleopterists to leave the old track.

Now comparisons are proverbially odious, and we suggest that the Century number of this magazine will definitely show whether or not our conclusions are just. We take it that the series of articles in this number represent fairly the views of the more advanced students in each branch, the writers having been asked to give a brief summary of what they considered the most marked factors of progress in their own special line of study during the century. The results will, we doubt not, be as interesting to our readers as to ourselves.

In conclusion there are one or two points we should like to urge with regard to the future of entomological science in this country. We shall all, probably, be agreed that the failing points of scientific progress may be marked as: (1) An accumulation of wasted effort in collecting material. (2) Want of initiative in striking out new lines of work. (3) Want of perseverance in following up certain definite lines of experiment and observation. (4) Ignorance of work already done. (5) Inability to recognise the requirements of modern science in methods of work. These are so self-evident that there is no need to waste space in discussing them, and one can only look forward to a time when the conditions of modern life, which are all in favour just now of the sciences which are purely utilitarian, shall not act against the true scientific enquirer, but put him in the same satisfactory position for real scientific work, as that in which they at present place his more fortunate brethren, the students of chemistry and physics.

Review of the Progress of the Study of Orthoptera in the Nineteenth Century.

By MALCOLM BURR, F.L.S., F.Z.S., F.E.S.

At the commencement of the nineteenth century the study of orthoptera was in a condition of chaos similar to that of most other orders of insects. Exotic species were only known when they attracted attention by their curious forms or beautiful colours, and, with the exception of the common and widely distributed species, the European fauna was familiar to nobody. This was little felt in the British Islands, where orthoptera are few, and it is naturally not in Britain that we must seek the first specialist. Donovan[1], it is true, gave good plates of several species, but though his chatty remarks are entertaining and agreeable, he is rarely quoted nowadays, for he gives no localities. But one classic of the preceding century, though not a systematic work, must be included in the bibliography of orthoptera. *Blatta orientalis*, L., was to Gilbert White[2] "an unusual insect," and he was one of the earliest, if not the first, to make this insect familiar to others than housewives and kitchenmaids. His charming observations upon our three best known crickets are well-known to everybody. This lasted until 1835, when Stephens'[3] work was published. His account of our orthoptera, although, of course, containing many inaccuracies and mistakes, has lasted almost to the present day as a basis for British students of the group. Stephens' great mistake, which was a fault rather of the period than of the individual, was that he failed to discriminate species, and was at sea with the intricacies of the genus *Stenobothrus*. For example, he makes four species of *Forficula auricularia*, L. His "*Gryllidae*" (=*Locustodea*), with the exception of course of the nomenclature, is accurate, but his "*Locustidae*" (=*Acridiodea*) contain many errors. He includes no less than eighteen species in *Stenobothrus*, in several instances, *e.g.*, *haemorrhoidalis*, Charp., *miniatus*, Charp., *montana*, Charp., he wrongly identifies forms described by Charpentier in 1825. The colour-varieties, too, of *Gomphocerus maculatus*, Thunb., he raises to specific rank.

The work of Charpentier[4], above referred to, is the first important account of the European orthoptera, and his descriptions are excellent, far in advance of their age. The only influence that this publication had upon the study of British orthoptera, was, as we have seen, that Stephens misunderstood it. Stephens refers also to Serville's[5] *Revue méthodique des Orthoptères*, a precursor of his later and far more important work[6], which appeared in 1839. In this book he monographs the orthoptera of the world, as then known, and his descriptions are admirable. Simultaneously there appeared Burmeister's classical *Handbuch*[7], in the second volume of which he treats the orthoptera. His system is good, but his descriptions are very brief, and often unrecognisable. In a later paper[8] he compares these two great works, which had appeared within a few weeks of each other. But neither Serville, nor Burmeister, nor even Fischer de Waldheim, were much used on the rare occasions that entomologists in Britain turned their attention to orthoptera. Fischer de Waldheim's monograph[9] of the orthoptera of Russia is one of the most important of the century, and

---

[1] Donovan, Edw., *The Natural History of British Insects*, &c., vols. i-xvi., with 576 coloured plates, 1792-1813.

[2] Gilbert White, *The Natural History and Antiquities of Selborne*, 1788.

[3] Stephens, *Illustrations of British Entomology*, *Mand.*, vi., 1835.

[4] Charpentier, T. de., *Horae Entomologicae*, Wratislaviae, 1825.

[5] Serville, "Revue méthodique des Orthoptères" (*Ann. de sci. natur. zool.*, xxii., 1831).

[6] Serville, *Histoire Naturelle des Insectes: Orthoptères*, Paris, 1839.

[7] Burmeister, *Handbuch der Entomologie*, ii., Berlin, 1839.

[8] Burmeister, *Audinet-Serville's Histoire naturelle des Orthoptères, verglichen mit Burmeister's Handb. der Entom.*, &c. (*Germar's Zeitschr.*, 1840, T. ii., p. lat.).

[9] Fischer de Waldheim, *Entomographie de la Russie*, i-iv. (vol. iv., "Les Orthoptères de la Russie," with 37 plates, 1843).

is illustrated by thirty-seven good coloured plates, but it was an expensive work, difficult to obtain, and, treating the fauna of a distant land, had little influence upon the entomologists of Great Britain. De Haan's[10] folio is still indispensable to students of the orthoptera of the Oriental Region, but may be considered as being beyond the scope of a purely British entomologist. In 1853 Fischer of Fribourg brought out his *Orthoptera Europaea*[11], which cannot be too highly praised. But still we search in vain for reference to them in the scanty observations upon our British orthoptera. John Curtis' *British Entomology*[12] gave excellent plates of some of our British species, and was doubtless an important aid to identification, though he adopts many of Stephens' mistakes. Reference must not be omitted to Walker's[13] *Catalogues* which began shortly to be published by the British Museum. They are a monument of wasted labour and expense, and the highest compliment that we can pay to his descriptions is to say that some of them are recognisable. Still, they referred but incidentally to our British fauna, while on the continent they gave rise to strongly-worded letters from Brunner von Wattenwyl and de Saussure, to the Director of the Museum. These letters have been published in French and German, and freely discussed, and although the importance of a scientific catalogue is recognised, many authorities deny the volumes of Walker the right to the name.

About this time, two authors began to publish large monographs upon the orthoptera. Henri de Saussure gave us the first fascicule of his monumental *Mélanges orthoptérologiques*, in 1863, and in the following year *Mémoires pour servir à l'Histoire naturelle du Mexique, des Antilles et des Etats-Unis. Orthoptères*, Livr. iii and iv, *Blattides*, *Genève*, 1864. The importance of these publications can hardly be overestimated, but from their scope, they had, of course, no influence upon the study of British orthoptera. In the five following fascicules of the *Mélanges orthoptérologiques*, &c., de Saussure treated various groups, but especially the *Mantodea* (Fasc. iii) and the *Gryllodea* (Fasc. v-vi). This latter remains to this day the only monograph of the crickets of the world. De Saussure's various other large works, for instance his account of the *Blattodea* and *Mantodea* of Madagascar (in Grandidier), and the *Blattodea*, *Mantodea*, *Locustodea* and *Gryllodea* in the *Biologia Centrali-Americana* are also beyond the range of this article.

An author who comes nearer home to us, however, who commenced publishing about the same time as de Saussure, and who has made himself the final and highest authority upon the orthoptera of the world, is Brunner von Wattenwyl. He set the model of monographs of families in his *Nouveau Système des Blattaires*[14], followed by a monograph of the *Phaneropteridae*[15] in 1878. The work which

[10] Haan, Dr. W. de, "Bijdragen tot de Kennis der Orthoptera" (*Verhandl. over de natuurlijke Geschiednis der Nederlandsche overzeesche Bezittingen*, 1842).

[11] Fischer, Fr., *Orthoptera Europaea*, Tab., xviii., Lipsiae, 1853.

[12] Curtis, John, *British Entomology*, &c., vols. i-xvi., 770 pl., London, 1823-40.

[13] Walker, F., *Catalogue of the Blattariae in the collection of the British Museum*, 1868. Id., *Catalogue of the Dermaptera Saltatoria in the collection of the British Museum*, vols. i-v., 1869-71.

[14] Vienna, 1865.

[15] *Verh. k. k. zool.-bot. Ges. Wien.*, 1878. This has been followed by similar

concerns us most is his famous *Prodromus der europäischen Orthopteren*, Leipzig, 1882, which contains a complete monograph of the orthoptera of the European fauna and the neighbouring regions, Algeria, Syria, and Asia Minor, but so little had our orthoptera been studied in the eighties that we search in vain for a recognition of this work until the appearance of Mr. Eland Shaw's *Synopsis of the British Orthoptera*[16] in 1889-90. The publication of Brunner's *Prodromus* was followed by a flood of small faunistic papers from various parts of Europe, and gave a very pronounced impetus to the study of the group, which was becoming daily more popular. Finot also was elucidating the fauna of France, Algeria and Tunis, whilst Bolivar was hard at work in Spain, though by no means confining his attention to Palæarctic forms, and various important memoirs on the orthoptera of Europe and the world were contributed by Krauss, Karsch, Kirby, Pictet, Scudder, and various American authors. The best commentary upon the stagnant condition of the study of our knowledge of the order in Great Britain, is that Brunner had only Stephens' work to quote for species occurring in our islands.

The first special study of the British orthoptera, is the *Synopsis* of Mr. Eland Shaw, above referred to. From a systematic point of view, it is a mere adaptation of Brunner's *Prodromus*, but the general information given, and the various additions to our knowledge of their distribution are important and interesting. This *Synopsis* marks the commencement of the modern epoch of the study of British orthoptera, as the *Prodromus* marked it in Europe, for Fischer's great work in 1853, which also marked an era in Europe, was unfelt in Britain. During the last ten years, British entomologists have paid more and more attention to orthoptera, and from being a rarity, letters upon the subject have become frequent in the magazines. In 1889, a sketchy and not very useful paper appeared in the *Entomologist*, by Edward Ingleby Miller, who quotes Fischer and Brunner, it is true, but appears to have profited little by them. In recent years, observations upon orthoptera have appeared from time to time from the pens of Messrs. Dale, Briggs, Porritt, Lucas and myself. In 1897, I produced a small handbook entitled *British Orthoptera*[17], which brought Eland Shaw's *Synopsis* up to date, and gave many general additions. We are at last well in line with the continental authors, but, on looking back, how many species have been added to our list since Stephens' time? Several exotic *Forficularia* and *Blattodea*, but only a single indigenous species, *Forficula lesnei*, Fin. *Oecanthus pellucens*, Scop., *Oedipoda caerulescens*, Linn., *Psophus stridulus*, Linn., *Xiphidium fuscum*, Fabr., have been rejected and many of his names reduced to the position of synonyms; a fair number of new localities have been added, but the fact remains, that during the last sixty-five years, only a single fresh endemic species has been discovered. Our fauna is poor, it is true, but there may well be further species to find. *Tettix fuliginosus*, Zett., should occur in Scotland, and possibly *Podisma frigida*, Boh., *Stenobothrus biguttulus*, Linn., and *S. longicornis*, Latr., in the southern

---

monographs of the *Stenopelmatidae* and *Gryllacridae* (1888), *Proscopidae* (1890), *Additamenta* to the *Phaneropteridae* (1891), *Pseudophyllidae* (1894), and a great *Révision* of the entire system of the *Orthoptera* (Genoa, 1878).

[16] *Ent. Mo. Mag.*, 1889-90.

[17] Reprinted from the *Naturalist's Journal*, Huddersfield, 1897.

counties of England; possibly *Platycleis bicolor*, Charp., or *Sphingonotus cyanopterus*, Charp., a northern form, known to occur in Sweden, Germany, and north central France. All this should encourage British orthopterists to further energies, and much remains to be discovered in distribution, especially in Ireland; in the south of that island, fresh and interesting forms might well occur. British entomologists are rapidly losing the insular prejudices that interfered so much with real work in the past, but they should remember, and orthopterists more especially, that our fauna is not a whole, but geographically an unimportant part of the fauna of Europe. Remembering this, our orthoptera become far more comprehensible, and it is always as an outlying part of the fauna of northern and central Europe that it must be regarded. The six species that we have of *Stenobothrus* may well puzzle the orthopterist at the beginning of his studies, but it should be remembered that they represent four very distinct divisions of the genus, which has about sixty species in Europe alone. If the synoptical *Prodromus* of Brunner, with its German and entomological Latin, be hard to understand, and this is very true, one may recommend the excellent work, most useful even for the British orthopterist, Finot's *Faune de la France, Insectes Orthoptères*, Paris, 1889, written of course, in French, which gives an excellent illustration of almost every British species, and pages of useful and instructive information.

The task of the last few years has been, and rightly, rejection. The work of the next decade must be addition.

The progress of our knowledge of the Odonata (Dragonflies) during a century and a half.

By W. F. KIRBY, F.L.S., F.E.S., &c.

At the request of my friend Mr. Tutt, I have much pleasure in laying before the readers of the *Entomologist's Record* a sketch of the growth of our present knowledge of the dragonflies, a group which has attracted a considerably increased amount of attention during the last ten years. For convenience I will use the nomenclature of my catalogue of 1890 throughout.

PART I.—LINNEAN AND FABRICIAN PERIOD (1758-1798).—In 1758 Linné published the 10th edition of his *Systema Naturae*, and introduced the binomial system of nomenclature in a permanent form, and thus rendered the modern system of classification possible. He then included all the dragonflies known to him under the genus *Libellula*, and enumerated only eighteen species, thirteen of which were Swedish, and the rest exotic. With the exception of *vulgatissimus* and *forcipata* (*Gomphinae*), *aenea* (*Cordulinae*), *grandis* and *juncea* (*Aeschninae*), *virgo* (*Agrioninae*), and *puella* (*Coenagrioninae*), all these belonged to the subfamily *Libellulinae*, and, in the 12th edition of the *Systema* (1767), three more *Libellulinae* were added, bringing up the total number of species to 21. On turning to the works of Fabricius, we find that in his *Systema Entomologiae* of 1775, he was already able to raise the 21 species described by Linné to 30, divided into three genera; *Libellula* (25 species); *Aeshna* (4 species); and *Agrion* (2 species, *virgo* and *puella*), but by the end of the century (his *Entomologia Systematica*, vol. ii., appeared in 1793, and the Supplement in 1798) the number had been more than doubled, and stood at 69 (*Libellula*, 54, *Æshna*, 7, *Agrion*, 8). Apart from the epoch-making works of Linné and Fabricius, comparatively little was done in odonata in the 18th century. A few species were figured and described by Drury, De Geer, Sulzer, &c., but there are only two authors whose works demand our special attention, Müller, who enumerated 23 Danish species in his *Fauna Fridrichsdalina* (1764), to which he added one or two more in his subsequent works; and Harris, who laid the foundation of our knowledge of the British dragonflies by figuring 16 species (more than any other English author except Evans, has done till the last year of the nineteenth century), in his *Exposition of English Insects*, published in 1776. We must not, however, omit to notice the work of Roesel von Rosenhof, the miniature painter of Nuremberg, who published a series of ten plates of odonata, in the second volume of his *Insecten-Belustigung*, which bears date 1749, and is consequently pre-Linnean. Especially considering the time at which they were produced, Roesel's coloured plates are excellent, and his illustrations of the transformations of European dragonflies still form one of the best series that has been published. It is a curious illustration of the total ignorance of German in England at the end of the 18th century, that Donovan (*Brit. Ins.*, vol. v., p. 103, 1796) writes: "We have introduced on the annexed plate (177), figures of the caterpillars of *Phalaena pini*, copied from the works of the two most accurate entomologists that have described or figured the insects of any part of the European continent, and though, unfortunately, the descriptions are written in a language so little understood as to be wholly useless, the figures are very interesting." Later still, we find J. F. Stephens lamenting bitterly that Ochsenheimer and Treitschke's great work *Die Schmetterlinge von Europa*, was written in German instead of Latin, even though Stephens himself was writing his own book in English.

Part II.—General works on Odonata.—(1801-1900).—We have seen that in the last works of Fabricius, the total number of described species of dragonflies stood at 69. In 1839, Burmeister published the latter part of the second volume of his *Handbuch der Entomologie*, a book which marked an epoch in the study of most of the orders of insects included in it, and raised the number to 174 species, divided among six genera as follows:—*Agrion* (32), *Calopteryx* (17), *Diastatomma* (9), *Aeschna* (26), *Epophthalmia* (9), and *Libellula* (81). In 1842, Rambur in his *Histoire naturelle des Insectes, Névroptères*, divided the odonata into a great number of genera, mostly new, and raised the number of species to 248, of which 139 were placed under *Libellula* alone. In my own *Synonymic Catalogue of Neuroptera Odonata*, published in 1890, I estimated the number of species then known as about 1800, and the number has since been considerably increased. I will now deal with works on the separate families and subfamilies according to my book.

Libellulidae.—*Libellulinae.*—Dr. Brauer published a synopsis of the families and genera of odonata in vol. xviii., of the *Verhandlungen der k. k. Zoolog. Botan. Gesellschaft in Wien* (1868), and gave a list of the species of *Libellulinae* and *Cordulinae* with localities. This work is mentioned here because it is mainly of importance for the study of the *Libellulinae*. He admitted 40 genera, which I raised to 85 in my "Revision of the subfamily *Libellulinae*, with descriptions of new genera and species," published in the *Transactions of the Linnean Society, Zoology*, ser. 2, vol. xii., pt. ix (August, 1889). Dr. Karsch subsequently published an exhaustive criticism in the *Berliner Entomologische Zeitschrift*, vol. xxxiii (1890). LIBELLULIDAE.—*Cordulinae.*—On this and all the following subfamilies Baron de Selys-Longchamps has published a series of monographs, either alone or in combination with Dr. H. A. Hagen, either as independent works, or more frequently, in various Belgian periodicals. As regards the *Cordulinae*, an abstract appeared in the *Comptes Rendus de la Société Entomologique de Belge*, for November, 1870, and in the following year (1871) he published a "Synopsis des Cordulines" in the *Bulletin de l'Academie de Belgique*, ser. 2, vol. xxxi., and two series of additions in the same journal (ser. 2, vols. xxxvii., and xlv., 1874 and 1878 respectively). ÆSHNIDAE.—*Gomphinae.*—In 1854, Baron de Selys-Longchamps published a "Synopsis des Gomphines," *Bull. Acad. Belg.*, vol. xxi., pt. 2, which was followed, in collaboration with Dr. Hagen, by a "Monographie des Gomphines," in the *Mémoires de la Société des Sciences de Liège*, vol. lxi, and by several series of "additions" in *Bull. Acad. Belg.*, ser. 2, vol. vii (1859); (2) xxviii (1869); (2) xxxv and xxxvi (1873); and (2) xlvi (1878). ÆSHNIDAE.—*Æschninae.*—One of the principal works on this subfamily is a "Synopsis des Æschnines" by Baron E. de Selys-Longchamps in *Bull. Acad. Belg.*, (3), vol. v (1883). It is a revision of genera and subgenera, but has not yet been supplemented by a synopsis of species. AGRIONIDAE.—*Agrioninae.*—Baron de Selys-Longchamps published a "Synopsis des Calopterygines" in *Bull. Acad. Belg.*, for 1853-1854; and a "Monographie des Calopterygines" (in conjunction with Dr. Hagen) in *Mém. Soc. Sci. Liège*, ix (1854). "Additions" have also appeared in *Bull. Acad. Belg.* (2), vii (1859); (2), xxvii (1869); (2), xxxv and xxxvi (1873); and (2) xlvii (1879). AGRIONIDAE.—*Coenagrioninae.*—The second subfamily of *Agrionidae* is divided by Baron de Selys-Longchamps into "Légions" and what he calls "Grand genres," which are really sections treated as large genera, and divided into genera and subgenera. All these have been fully monographed by him in a series of papers in *Bull. Acad. Belg.* as follows:—*Synopsis des Agrionines*, Première légion, *Pseudostigma* (2), x (1860); Dernière légion, *Protoneura* (2), x (1860); Séconde légion, *Lestes* (2), xiii (1862); Troisiéme légion, *Podagrion* (2), xiv (1862); Quatriéme légion, *Platycnemis* (2), xvi (1863); Cinquiéme légion, *Agrion:* Grandes genres—*Argia* (2), xx (1865); *Agrion* (2), xli, xlii (1876); *Telebasis*, *Argiocnemis*, *Hemiphlebia* (2), xliii (1877). A revision subsequently appeared in the 8vo. series of *Mémoires Couronnées*, xxxiii (1886).

WORKS RELATING TO EUROPEAN ODONATA.—The following works are the most important which have appeared relative to the European odonata as a whole:—In 1825 was published *Monographiae Libellulinarum Europaearum Specimen* auctore P. L. Vander Linden (Bruxelles), pp. 42. The total number of species described is 37, distributed under 3 genera as follows—*Libellula*, 14, *Æshna*, 11, *Agrion*, 12. In 1840, three very important works appeared—(1) *Libellulinae Europaeae descriptae ac depictae*, a Toussaint de Charpentier. Cum tabulis xlviii coloratis. 180 pp. (Lipsiae).—This is a handsome quarto volume, in which 60 species are described and beautifully figured, somewhat above life-size. (2) *Synonymia Libellularum Europaearum.* Dissertatio inauguralis. Auctor H. A. Hagen, pp. 84 (Regimontii Prussorum).—Seventy-eight species are here enumerated, with full synonymy. (3) *Monographie des Libellulidées d'Europe*, par Edm. de Selys-Longchamps, pp. 220, pl. 4

(details).—Sixty species are here enumerated. This work appeared before Hagen's, mentioned above. It was recast, and republished in 1850 under the title of *Revue des Odonates ou Libellules d'Europe*, par Edm. de Selys-Longchamps, avec la collaboration de M. le docteur H. A. Hagen. It formed vol. vi. of *Mém. Sci. Liège* (pp. 408, and 11 plates of details); 97 European species are here enumerated, and 23 more from Asia Minor and Algeria; or reputed European species. Lists of the odonata of various parts of Europe are scattered through various periodicals, but separate works are not numerous. I mention here only a few of the more important publications. In 1837-1838 Boyer de Fonscolombe published some important papers under the title of "Monographie des Libellulines des environs d'Aix," with 8 coloured plates, in the *Annales de la Société Entomologique de France*, vols. vi. and vii. Dr. Brauer, in his *Neuroptera Austriaca* (Vienna, 1857), enumerates 63 species as found in Austria. Dr. R. Tümpel is now publishing a work on *Die Hautflügler Mitteleuropas*. Of this, the first four parts, published at Eisenach in 1898-1899, include the dragonflies, with 10 coloured and 1 plain plate.

Works relating to British Odonata.—The works of Harris (*vide, anteà*); Donovan (*British Insects*, 1792-1813, 14 species); Leach (*Edinburgh Encyclopaedia*, vol. ix., 1815, 9 genera and 12 species enumerated); and Samouelle's *Entomologist's Useful Compendium*, 1819 (9 genera enumerated, with types); Stephens (*Illustrations of British Entomology, Mandibulata*, vol. vi., 1836, 50 nominal species); and Curtis (*British Entomology*, 1836-1839, 3 plates, and list of 32 species), have been fully discussed by Mr. W. J. Lucas in the *Entomologist* for 1900. In the first volume of the *Entomological Magazine*, October, 1833, pp. 511-514, Edward Newman proposed some new genera and species of British *Libellulinae* which Dr. Hagen subsequently refused to recognise, because the periodical was not accessible in Germany! In 1845, W. F. Evans issued a little book entitled, *British Libellulinae or Dragonflies*, illustrated in a series of lithograph drawings, with a brief description of the insects, times of appearance, &c. Printed for private circulation (8vo., pp. 28, pls. 21, 1 and 2 plain details, the rest coloured), in which the number of nominal species is raised to 52. The letterpress is rather meagre, and consists mostly of synonymy, no full descriptions being given, though one new genus *Brachytron*, is established at p. 22 for *Æshna vernalis*, Vander Linden. Of this book, as Mr. Evans has informed me, only 100 copies were issued. In vol. xviii. of the first series of the *Annals and Magazine of Natural History* (October, 1846, pp. 217-227), Baron de Selys-Longchamps published a *Revision of the British Libellulidae*, reducing Stephens' list to 46 species, of which 8 were regarded as more or less doubtful. The next important publication was Hagen's "Synopsis of British Dragonflies," published in the *Entomologist's Annual*, for 1857, pp. 39-60. He briefly described the genera and species, retaining the British species at 46, but adding descriptions of several continental species which might possibly prove to be British. The wide circulation of the *Annual* gave considerable encouragement to the collecting of dragonflies in England. In 1890, a small popular work entitled, *An Illustrated Handbook of British Dragonflies*, by the Editor of the *Naturalists' Gazette* (W. Harcourt Bath), was published at Birmingham. In 1894, Mr. W. H. Nunney published an article on the transformations of British dragonflies, in *Science Gossip*. In 1900 appeared the best and most complete work which we possess on the general subject, *British Dragonflies* (*Odonata*), by W. J. Lucas, B.A., F.E.S., illustrated with coloured plates and black and white drawings (Upcott Gill). 20 genera, and 39 species are here described and figured, and 7 (or rather 9) species are relegated to the reputed British list. It is hardly likely that our meagre list of British dragonflies will suffer any further shrinkage ; in fact we believe that one or two of Mr. Lucas' "reputed" species have already been reinstated since the publication of his book.

Works on American Odonata.—In 1861 Dr. H. A. Hagen's *Synopsis of the Neuroptera of North America, with a list of the South American species*, was published as a volume of the Smithsonian Miscellaneous Collections. A later synopsis of the odonata of America, by Hagen (except the *Agrionidae*) will be found in the *Proceedings of the Boston Society of Natural History*, vol. xviii (1875). Much has been done by Hagen, Scudder, Cabot, and Calvert to elucidate the North American odonatid fauna, but their work is much scattered. Students who need information on the odonata of any extra-European country, will probably find references to all that they require in my *Catalogue* of 1890, supplemented by the later volumes of the *Zoological Record*.

While this paper has been passing through the press, I have received notice of the death of the venerable Baron Michel Edmond de Selys-Longchamps, who was born at Paris on the 25th of May, 1813, and died at Liège on the 11th of December, 1900, thus completing his long and useful life within the century. There is no need to do more than to allude to the value of his entomological works, which those who have had occasion to consult them will fully appreciate ; but apart from this, we are sure that all who have had the honour of his personal acquaintance, however slightly, must have felt the charm of his extreme courtesy and kindness, and will desire to record their sincere sympathy with his surviving relatives in the loss which they have sustained.

Dipterology of the Nineteenth Century.

By G. H. VERRALL, President Ent. Soc. London.

Dipterology as a science can hardly be said to have existed until the publication in 1818, of the first volume of Meigen's "*Systematische Beschreibung der bekannten Europäischen zweiflügeligen Insekten*." Of course there were describers of diptera in the eighteenth century such as Linné, De Geer, Geoffroy, Fabricius, Müller, &c., but all their attempts to arrange the species scientifically were most empirical. With the beginning of the nineteenth century, Latreille began to indicate families, while Meigen indicated genera, but practically all this work was tentative and ought to be treated as tentative and not serious scientific work.

In 1810, Fallén published a small pamphlet of 26 pages in which he much more clearly indicated the families of diptera, and then by his *Diptera Suecica*, which consisted of a series of pamphlets on separate families, the lines were founded upon which subsequent authors could build. Meigen's classic work mentioned above appeared in seven volumes (1818-1838) and dealt systematically with the whole of the known European diptera, and the lines laid down by him have never been seriously diverged from, although of course modifications have occurred.

Contemporaneously with Meigen, though practically as his followers, came Wiedemann and Macquart, who dealt also very extensively with exotic diptera.

In 1840, Loew appeared on the scene in a small pamphlet on the *Diptera of Posen*, and while Meigen firmly founded the arrangement of diptera, Loew specialised it, and it has been through Loew's marvellous work both in European and exotic diptera from 1840 to 1879 that the scientific study of the order is now firmly established on a sound basis. There is still, however, a vast amount of work required in some of the less known families, and the knowledge of the species in these families is far below the least known families of lepidoptera coleoptera, &c.

The next epoch-marking work was Zetterstedt's *Diptera Scandinariae*, which was published in fourteen volumes from 1842 to 1860, after which came Schiner's *Fauna Austriaca Diptera* in two volumes (1862-1864), which finally condensed the European species up to that date, though of course many workers had published papers and monographs in the meantime, and to Baron R. Osten-Sacken must be given the credit of a most masterly arrangement of the North American *Tipulidae*, an arrangement which has thoroughly stood the test of the whole species of the world for nearly forty years. Rondani wrote from 1840 to 1880, at first on Italian diptera, but subsequently on both Italian and exotic diptera, and although, at first sight, his work appeared to be hasty and superficial, it is not so, as it will bear, in most cases, close testing. There have been many writers on the order, in quite recent times, but nearly always through small monographs and notes.

There appears to be a curious coincidence that whereas the early writers on diptera were nearly all northern, *e.g.*, Linné, De Geer, Fabricius, Müller, &c., the next set of writers were mid-European, *e.g.*, Meigen, Macquart, &c., and, after them, authors became still more southern, *e.g.*, Schiner, Brauer, Rondani, Mik, Kowarzc, so that there was scarcely a south European worker (except Rossi) until 1840, while there has not been a north European worker (except Bergroth in a limited group) since Zetterstedt (unless notice need be taken of Bonsdorff); though of course Van der Wulp has been working in the Netherlands. The result is that modern writers on diptera have practically no acquaintance with the northern species except through descriptions.

The Century's work among the Aculeate Hymenoptera.

By (Rev.) F. D. MORICE, M.A., F.E.S.

It is not without misgivings that I accede to the request that I should attempt a slight sketch of the progress made during the closing century in our knowledge of the Aculeate Hymenoptera. To treat such a subject otherwise than most superficially, would require a knowledge to which I cannot pretend, of an enormous mass of literature in many languages, whilst many branches of it, including all the copious American literature (Cresson, Ashmead, Fox, &c.), I must perforce ignore, since I have never paid attention to other than Palæarctic insects. However, since no more competent writer stands forth for the work, I will state what little is known to me about the general outlines of the subject.

Two books lie before me (Fabricius's supplement to his *Entomologia Systematica*, 1798, and an anonymous *Epitome Entomologiae Fabricianae*, Leipzig, 1797), which may perhaps be taken to represent the stock of knowledge at the commencement of the century. These between them enumerate twenty genera of aculeates for the whole world, *viz.*, five bees, two wasps, two ants, and nine fossores. How many genera are actually known at present in these four groups I cannot say precisely, but, combining v. Dalla Torre's *Catalogue*, 1897, with Kohl's *Spheyiden-Gattungen*, 1896, I arrive at a total for the last of them—the fossores—of 120 described genera; while of bees we know 28 genera from England alone (Saunders, 1896), and about 40 from Europe; of wasps, 3 genera from England and nearly 20 from Europe; of ants, 12 from England and about 40 from Europe. How many exotic genera might be added to swell these figures I dare not even conjecture, but enough has been said to show how immense has been the progress since Fabricius's times.

The writers who have contributed to the result are innumerable, and must mostly be here passed over in unmerited silence. We can boast, however, in this country of one author, the Rev. William Kirby, (*Mon. Apum Angliae*, 1802), to whom students of the *Anthophila* (bees) owe a debt that can never be forgotten. He first detected and described (unluckily without "naming" them) by far the greater part of the groups and genera still recognised. A little later (1807) Jurine greatly advanced the classification of all hymenoptera by introducing his neuration-system, which still in the main holds the field, though it can no longer be employed as the sole criterion for distinguishing genera. Thomson's *Hymenoptera Scandinaviae* (1872-1874), Dahlbom's *Sphex* (1843-1845), and the works of many living authors, Kohl and Handlirsch (fossores), de Saussure (wasps), Perez, Schmiedeknecht, and Friese (bees), Mayr, Forel and Emery (ants), must be mentioned in any list, however short, of books which have really advanced our knowledge of the aculeates. Lepeletier de St. Fargeau's work on the hymenoptera is now of little use to students, but in its day it was of value, and it is far too famous to be left unmentioned here.

As to the travellers abroad and the workers in museums, &c., who have raised the number of known species year by year throughout the century, I can say only that their name is legion. Nor can I attempt to reckon all the monographs (often valuable) of the aculeate-fauna in particular districts—Morawitz was one of the most eminent workers in this field, and Schenck, Costa, Dours, etc., are names that suggest themselves in the same connection. Other monographists have elucidated with more or less success particular genera. It is almost useless to give names, but I may mention a few which have helped me while arranging my own collections, such as Förster (*Prosopis*), Gerstaecker (*Xylocopa*, &c.), von Hagens (*Sphecodes*), Schletterer (*Cerceris*), Vachal, Ducke, &c., besides others already named in the present paper.

The microscopic anatomy of aculeates has been studied in this century, and results of considerable interest have been attained by Dufour, Lacaze-Duthiers, Janet, Lubbock and others. On their habits and instinct we have been enlightened by the charming popular works of Huber, Fabre, and Lubbock, whilst Shuckard and Smith have also published many exceedingly interesting observations, though as literature their writings cannot be compared with those of the eloquent authors just mentioned.

The study of British aculeates during this century has been carried on by a succession of workers, only a few of whom naturally have achieved fame beyond the Channel and the Atlantic. Exceptions are, of course, the immortal Kirby, Shuckard ("oculatissimus Shuckardius" as Dahlbom calls him) our first great authority on *Fossores*, Fred. Smith of the British Museum who was writing constantly from about 1839 to 1879, and produced important works—with descriptions of many new genera and species—dealing with the National Collections. The only living English writer who has produced large and important works on the subject, is my friend Mr. Edward Saunders, whom I shall not be so impertinent as to praise in language of my own, but of whose last work, *Hymenoptera Aculeata of the British Islands*, I find the following description in a new publication by Frey-Gessner of Geneva (carum et venerabile nomen!):—"Ein vortreffliches Werk, welches über eine Reihe Unsicherheiten früherer Autoren, besonders auch über die Ansichten Fred. Smith's Klarheit bringt."

The Century's work among the Chrysidae.

By (Rev.) F. D. MORICE, M.A., F.E.S.

The progress made in the study of Chrysids during the nineteenth century is so fully recorded by Mocsàry (1889) in the *Recensio critica* prefixed to his well known Monograph, that no special research into entomological antiquities is required from the present writer.

In 1801 the name *Chrysis* (denoting, however, rather a group than a true genus) had been known just 40 years. It was due to Linné (1761), who applied it to five species, the first of which he had first described as a bee—*Apis* (sic) *ignita*—in 1735. During those 40 years "new species" had been accumulating at the rate of not quite one per annum. The grand total stood, in fact, at about 30, when the century commenced. Now, at its close, we know about 30 times 30—nearly if not quite 900!

Among the many authors who have contributed to this result the name which claims first mention is certainly that of Dahlbom. Beginning (1829) by describing the Chrysids of his own country, he pursued his studies with ever increasing ardour, till, in 1854, they resulted in a work on which, as on a foundation, all succeeding writers have built. This was his *Chrysis in sensu Linnaeano*—the second volume of *Hymenoptera Borealia*. No praises can be too high for the vigour, the industry, and the originality displayed in this truly epoch-making book. Indeed it is only *too* original, for, in his intense devotion to his own researches, he neglected to enquire what contemporary entomologists, many of them by no means deserving such neglect, were doing in the same field. Hence a considerable proportion of his "names" have had to sink as synonyms. But he had the eye for structure of a Kirby or a Thomson, he was a master in the art of constructing synoptic tabulations, he was indefatigable in visiting and studying the "types" preserved in public and private collections throughout Europe, he either drew or caused to be drawn figures of really remarkable excellence, and he had the power of writing in the liveliest and most lucid manner imaginable a sort of wonderful dog-Latin, as audacious and original as was all his work—a sort of Latin which would make a grammarian's hair stand on end, but which conveys his meaning on all subjects fully, clearly, briefly, and precisely. He describes (most admirably) over 200 species, many really new; he points out nearly all the details of structure on which systematists still rely, and he gives much valuable information, based on his own examination of the types, as to names employed by Fabricius, Spinola, and other venerable ancients.

We must deal more briefly with the other authors dead and living who have increased our knowledge of the Chrysids during this century, but two great works deserve especially to be mentioned (1) Mocsàry's exhaustive Monograph on the Chrysids of the whole world—a work strongest perhaps where Dahlbom was weakest, *viz.*, as summarizing completely the existing literature of the subject, though it contains also much that is the author's own. This work (1889) deals with 733 species, the characters, distribution, synonymy, &c., of each being fully and carefully examined. (2) Vicomte R. du Buysson's excellent contribution (vol. vi., 1891-1896) to André's "Species." Though limited to the Palæarctic fauna, this embraces above 400 species, many of them previously unknown, and, along with yet later publications of these two authors, brings up the total of recorded species to something not far short of the 900 at which we estimated them above.

Besides these great general works, a few dealing with the Chrysids of particular districts deserve more notice than our space permits—*e.g.*, those of Abeille du Perrin (France, 1879), Lucas (Algeria), Chevrier and Frey Gessner (Switzerland), Schenck (Germany), Radoszkovsky (Russia), Wesmael (Belgium), Thomson (Sweden), Borries (Denmark), &c., to say nothing of "exotics" (America, India, &c.).

In England, comparatively little has been done since Shuckard (1837) whose work on the British Chrysids was as good as anything published before the days of Dahlbom, and who added two new species from this country to the European list; Smith (1862) hardly improved on Shuckard's work, and Walker, though he described Chrysids fearlessly, shows no knowledge whatever of their structure—"ut qui Dahlbomi opus nunquam viderit" says Mocsàry.

It is to be hoped that in the next century English entomologists may play a somewhat more conspicuous part than they have done in that just closing, among the advancers of learning in this small but attractive branch of study.

Evolution of our knowledge of the Ichneumonidae during the Nineteenth Century.

By CLAUDE MORLEY, F.E.S., etc.

At the dawn of the present century we find *Ichneumonidae*, in the later and more restricted sense, in but sorry plight. No work had yet been entirely devoted to their elucidation, and whatever pretence there then existed at classification was wholly based upon the mere colour diagnoses of Linné and Fabricius, with a few species supplemented by Fourcroy, Gmelin, Villers, Schrank, Christ, and Panzer. In Britain no attention had been given the subject though Moufet had, as early as 1634, drawn attention to a "*Musca*," undoubtedly our *Pimpla* *instigator*, and Marsham (1797) had read a learned paper before the Linnean Society upon the economy of *Ichneumon manifestator;* a few isolated species had, besides, been described by Albin (1720), Ray (1710), and Forster (1771).

The century had, however, hardly set in before progress became marked; in 1802, Schrank's *Fauna Boica*, and, in 1803, Latreille's *Dictionnaire* greatly assisted Fabricius in the first ichneumon book, *Systema Piezatorum* (1804). Many works bearing more or less upon the subject were published upon the continent during the following years for which we have here no space, nor is it necessary to individually notice them since such knowledge of these insects, as at that time existed, is excellently summed up in Gravenhorst's three thick volumes of the *Ichneumonologia Europaea* in 1827, an account of whose system had already been published in his *Conspectus Ichneumonidum* (1818). The later work constitutes the foundation of all subsequent discoveries, and it is only within quite the last few years we have dared to depart from the mode of classification therein laid down to any appreciable extent.

The peculiar difficulty experienced by the student of these parasites is the extreme similarity in structure of specimens which are obviously specifically distinct; and hence Gravenhorst resorted in a great measure to the always unsatisfactory guide of colour for his differences; indeed such structural points as exist are so minute as to be quite worthless to an early writer who could not, of course, possibly rely, for lack of observations, upon their constancy. In truth, the subject appears to be fraught with so many obstacles that, until the present decade no second comprehensive work upon the group has been attempted, but more or less complete monographs have, from time to time, appeared in various countries. The first of these worthy of note is Wesmael's fine contribution to the *Nouv. Mém. Ac. Bruxelles*, of a synopsis of Gravenhorst's first subfamily, the *Ichneumonidae* (*sensu stricto*), which is here subdivided and tabulated by a master hand. To this the author issued seven valuable supplements during the following fifteen years and, in 1849, a capital method, with many descriptions, of classifying Jurine's genus *Anomalon*, in Gravenhorst's third family. Where Wesmael had left the subject it was taken up by Holmgren, who not only completed and collected it, but considerably augmented it in his three vols. of *Ichneumonologia Suecica* (1864-71-89). Gravenhorst had divided the whole group into five great families—the *Ichneumonidae* (treated of by Wesmael), the *Cryptidae*, *Ophionidae*, *Tryphonidae* and *Pimplidae*. Of the last three, Holmgren very greatly assisted in the comprehensive classification in his Swedish *Monographiae*, in the *Sv. Ak. Handlingar*, in 1858, 1859, and 1860 respectively; besides more detailed *Dispositiones* of Gravenhorst's genera *Exochus* (1873), *Campoplex* (1872), and *Mesoleptus, partim* (1876).

We must next turn momentarily to the numerous works of Förster, which both entangled and untangled this difficult subject. His *Monographie der Gattung Pezomachus* (1850-51) is a rule of thumb, by which to distinguish the extremely closely allied species of one of Gravenhorst's genera of the second family; in this, however, the former is very difficult to follow satisfactorily, many of his species are mere colour varieties, and his main (costal) division has since been relinquished. There followed equally important and more satisfactory monographs upon the *Gattungen—Ichneumon* (1868), *Campoplex* (id.), and *Plectiscus* (1871) ; but it is in the erection of genera that the Professor was especially prolific, and he issued a conspectus of the entire group in this manner, which was not, however, adopted for a very great many years*, but has recently come to the front as being, if more difficult to follow, at least of much greater scientific worth than was that of Gravenhorst.

Space forbids more than bare mention of present-day workers—Brischke, Boie, Kriechbaumer and Schmiedeknecht in Germany, Tschek in Austria, Berthoumieu and Perris in France, Tosquinet in Belgium, the late Van Vollenhoven in Holland, Motschulsky and Woldstedt in Russia, Ashmead and Cresson in the United States, Provancher in Canada, and a host of others are at length bringing the study to something resembling the comparative perfection achieved in the other orders of insects.

This perfection, or rather, perhaps, a knowledge of such perfection as exists, has recently—within the last year or two—been brought clearly before us by the great systematist, the late Professor Thomson, in his *Opuscula Entomologica* (1869-97), the most noteworthy points of which (so far as it concerns us) are his divisions of Gravenhorst's second family, which, with the exception of Taschenberg's revision of the actual types in 1865, had remained nearly in its primitive condition and his further subdivision of the cumbersome genus *Ichneumon*, of which Holmgren had described 123 species from Sweden alone in his first volume, while 143 are recorded from Britain. Thomson was a prolific author, as is evidenced in his very original *resumé* of various genera (*e.g.*, *Metopius*, *Mesochorus*, *Ichneumon*, &c.), in the *Deut. Ent. Zeitschrift*, and *Ann. Soc. Ent. France*.

But what have we done in Britain? Viewing our work impartially, it has been, to say the least, spasmodic. Curtis, Stephens and Haliday (1823-40), working entirely on the Gravenhorstian system, described a few new species and many old ones in *Illustrations Brit. Entomology*, and the *Ann. Nat. History*. After a lapse of about sixteen years, Desvignes published a catalogue of those species he had arranged (after Gravenhorst) in the British Museum, and in 1862, descriptions of a dozen species of *Bassus* (*Tryphonidae*), not found in Gravenhorst's work, five of which had already been recognised by Holmgren. Another eight years and Marshall gave us his *Catalogues*, containing but bare names of the British species; two years later appeared his 1872 *Synonymic Catalogue*, laying firm the foundation upon which to place such kinds as were then known to occur with us. Therewith assisted, Bridgman and Fitch commenced in 1880, in the *Entomologist*, to present a series of analytical tables of our species with meagre details, which, nevertheless, were of the greatest assistance to isolated students, but they were unfortunately unable to complete the series which abruptly terminates in the middle of Gravenhorst's third family. Contemporaneously with the above, Bridgman published, from time to time in the *Trans. Ent. Soc. London*, descriptions of a few new species and

* So little, indeed, was it known that Bridgman described the genus *Phrudus* as new (cf. *Trans. Ent. Soc. London*, 1886, p. 361), upon the suggestion of Professor Thomson, who was evidently unaware of Förster's erection (*Verh. pr. Rheinl.*, 1868, p. 196).

mention of many others not before recorded from Britain. In 1890, he gave us a capital *précis* of the genus *Glypta* (*Pimplidae*) and four years later a list of the species of the group in Norfolk, which, with that for South Devon in 1898, further swells our very meagre and imperfect small insular catalogue.

In an excellent paper in the *Proc. U.S. Museum*, Ashmead has just summed up the known genera of the world, and from this we learn that from darkness early in the nineteenth century, we may hope for light early in the twentieth, and we trust new Holmgrens and Thomsons shall ere long present it to us.

Notes on Phytophagous Hymenoptera, 1800—1900.

By (Rev.) E. N. BLOOMFIELD, M.A., F.E.S.

I have been asked to write a paper on the progress made in the knowledge of the Phytophagous Hymenoptera during the century now just drawing to a close. This I am not able to do, for, living in the country, I have no large library at hand, and do not myself possess the works necessary for reference. Perhaps, however, I may be allowed to give a few notes on the subject, principally drawn from Cameron's works, and regret I am unable to do more.

The Phytophagous Hymenoptera for the most part belong to the two families, TENTHREDINIDAE and CYNIPIDAE, commonly called sawflies and gallflies. Of these the former seems to have been scarcely studied in this country until the time of Leach, who gave a classification of most of those which were then known (*cf.*, W. E. Leach, *Zoological Miscellany*, 1814-17). In 1835 J. F. Stephens, in his *Illustrations*, described the kinds known by him to inhabit Britain; the work, however, was done very imperfectly. His collections show that he confounded many species, and, I believe, described slight varieties as distinct, though his plates are very accurate and beautiful. Soon afterwards Westwood classified the *Tenthredinidae* in groups of subfamilies, carefully distinguishing between them (*cf.*, *Mod. Class. Ins.*, 1839-40). In 1882-90 the Ray Society published Cameron's *Monograph of British Phytophagous Hymenoptera* in 4 volumes. This marks a great advance in the knowledge of the family in this country, and now it is easy to determine the more conspicuous species in the imago and often in the larval state, though many of his names fall before previous ones adopted on the continent. This family had been carefully studied on the continent by J. C. F. Klug and others earlier in the century, and more recently by Pastor Konow, some of the results of whose researches are given by Cameron in his fourth volume.

One of the most interesting points about the *Tenthredinidae* discovered in the last few years is the occurrence of complete or incomplete parthenogenesis. In some few species no male has as yet been found; in many of these the females are common, and have also been reared from the eggs laid by parthenogenetic females. In other cases, though males occur, the unimpregnated females deposit eggs which usually produce males only. Many observers have recently paid especial attention to parthenogenesis in the *Tenthredinidae*, among others, Messrs. J. E. Fletcher, Bridgman, and Dr. Osborne. Few species remain known in one sex only, but the proportion of the sexes of most species is peculiarly disproportionate, and it is generally found that eggs laid by a ♀ in whose ovary no trace of spermatozoa is discernible, will produce imagines at the rate of, in some cases, 172 ♂ s to a single ♀, and often a whole brood will produce no ♀ at all. Occasionally, however, parthenogenetically deposited ova prove infertile, and at other times, after the first generation, there is usually increased mortality, and in those kinds having the sexes fairly equally divided in the first, ♂ s will be greatly in preponderance in the second generation. Kirby and Spence first discovered this phenomenon, and interesting papers have subsequently been published upon the subject by Professor Owen (*Parthenogenesis*, 1849), Huxley (*Reproduction of Aphis*, *Trans. Linn. Soc.*, vol. xxii.), Von Siebold (*Essay on Parthenogenesis*, Leipzig, 1871, &c.), Geddes and Thompson (*Evolution of Sex*), Cameron (*l.c.*), &c.

Although the *Tenthredinidae* seem to have been so greatly neglected before the present century, this was not the case with the gall insects, or rather with the galls caused by them. Our own countryman, Sir Thomas Browne, about the middle of the seventeenth century, seems to have paid much attention to the galls, more especially those of the oak, as appears from his letters to Dr. Merritt, the author of *Pinax rerum Naturalium Britannicarum* (London, 1666). A good proportion of the galls mentioned by him are easily recognisable. But the first person who gave an accurate description of galls appears to have been Malpighi, who published his book (*De Gallis*) in 1686, while Dr. Derham, Canon of Windsor, soon after compared Malpighi's account with the galls found by him in England. Until long after this, however, little seems to have been done in the classification of the makers of the galls, till in the middle of the present century great improvements were made in this respect by Hartig, of Brunswick, 1840-43. He not only revised the classification, but carefully distinguished, first the real gall makers, secondly the inquilines, or guest-flies, which live on the substance of the gall, though not upon the Cynipid larvæ, and thirdly the parasites which feed on the latter.

Since that time the interesting discovery has been made of an alternation of generations in many species of gall-flies. It was always a puzzle what, in many cases, became of the flies when disclosed from the galls. Thus, for example, the imago leaves the currant gall early in the summer, yet no more currant galls are seen until late in the following spring, and not only is this the case, but in many supposed species none but females were known. In 1877 Hermann Adler began his investigations, and proved that there were alternate generations, the insect from the currant gall causing the common spangle gall, while the insect from this gall, being disclosed in the spring, was the maker of the currant gall. Again, one of these generations consisted of both males and females, the other of females only, while the insect of one generation differed so materially from that of the other that they had been considered to belong to different genera. Adler continued his investigations, and proved that this was true of many other species. Thus was it shown that there were alternations of generations and dimorphous females (*cf.*, Adler, *La génération alternante chez les Cynipides*, 1881). It is not so, however, with all the Cynips gall-makers. In some cases there appears to be one generation, and that of females only, hence we have here complete parthenogenesis and an apparently endless succession of females.

Another curious fact with respect to the galls still awaits explanation. Each gall-fly produces a gall peculiar to itself, always the same for any one species, yet greatly differing from that made by any other species even when the two species are very closely allied. How the mere oviposition in the leaf or bud should cause such a different growth when pierced by different species is a great mystery, of which nothing certain appears to be known at present, the different explanations which have been given from time to time being very far from convincing. Anyone interested in this subject would do well to consult Hermann Adler's book, *Alternating Generations*, translated and edited by Charles R. Straton, Oxford Clarendon Press, 1894. I cannot conclude without acknowledging my obligations to Mr. Claude Morley for kindly looking out some of the references, and also for drawing my attention to several interesting particulars which I had at first omitted.

The Lepidopterological Books of the Nineteenth Century.

By LOUIS B. PROUT, F.E.S.

Probably there is no other branch of entomology in which such gigantic strides have been made during the past century as in the study of the lepidoptera. From being the most superficial and least scientific of all entomologists, the workers at this order have risen to an admittedly high—indeed, some would affirm, to a premier position as regards the comprehensiveness of their work and the importance of their contributions towards the elucidation of general biological and evolutionary problems. Of course it is not maintained that they have had any monopoly in this respect; on the contrary, one is struck with the fact that the great majority of the students of the anatomy, physiology, &c., of insects, have been specialists rather in these branches of work than in any particular order; by no stretch of imagination can such a pioneer in anatomical investigation as George Newport be claimed as a specialist in the lepidoptera, nor can it be forgotten that Weismann's first important discoveries as to histolysis and histogenesis were made in connection with diptera. Nevertheless, a survey of our literature will perhaps show that lepidopterists have been more ready than other entomologists to avail themselves of, and to follow up in their own studies, the work which has been done in this direction. The reasons are not far to seek. In the first place, the attractiveness of the order and the consequently large army of its devotees have resulted in a very rapid advance in the merely systematic and superficially descriptive work, and have placed us in the position to attend to further developments; a mere list of the names of writers on the lepidoptera during the century would fill more space than I have at command for this entire article. In the second place, the comparative ease with which lepidoptera can be reared *ab ovo* has given exceptional facilities for the study of the problems connected with ontogeny and its probable elucidation of phylogeny and evolutionary relationships; and it would be a disgrace to us, indeed, if we had shown ourselves totally unwilling to avail ourselves of such facilities.

In order to judge of the position of lepidopterology at the commencement of the nineteenth century, and so to estimate better the progress made, it will be well to consider briefly what were the standard books, and what were the principal works in progress, in the year 1801*. Fabricius had recently (1798) completed his general systematic work with his "Supplementum," and was devoting his attention to separate orders. Whatever may have been his grip of some of these, and whatever he may have had in store for lepidopterists in his unpublished *Systemata Glossatorum*, his published work on this order is of an extremely slight and superficial kind; yet it obtained a very wide following, and indeed was probably more used than any other system, though a few German lepidopterists worked rather from Borkhausen's *Naturgeschichte der Europäischen Schmetterlinge* (completed 1794). "Specialisation" as regards separate orders was just beginning to assert itself; Hübner, who seems to have taken little if any interest in insects other than lepidopterous, had already made a good reputation, and was engaged upon two of his great works, the *Sammlung* and the *Geschichte* (larvæ). Two other large iconographic works were also in progress, *viz.*, Herbst's continuation of Jablonsky's *Natursystem*, which was completed in 1804 (Rhopalocera only) and is not without some systematic value, and Esper's *Die Schmetterlinge in Abbildungen*, which had been publishing since 1777 or the very end of 1776, and of which about 403 plates (by far the greater part) had already appeared. In England, the works of Wilkes and Harris on the lepidoptera were already getting somewhat antiquated, but probably served as the basis of Matthew Martin's *Aurelian's Vade-Mecum* (1785), of the lepidopterological portion of Berkenhout's *Synopsis*, &c. Lepidopterists were, however, waking up, and the commencement of the publication of *Transactions* in 1791 by the recently-founded Linnean Society gave opportunity for the production of some useful papers by Marsham and others, while the "Aurelian Society" witnessed the birth of the energies which were soon to give us Haworth's *Lepidoptera Britannica* (1803-28). Lewin's *Papilios of Great Britain* (1795), may also be mentioned; but the principal entomological book which was in progress at the dawn of our century was not confined to the lepidoptera—I refer to Donovan's *Natural History of British Insects*, of which the 9th volume was apparently published from about July, 1800, to June, 1801.

None of the works of this period contain anything which is of much use to the more philosophically-minded student of the order; almost their sole object was to make known species, although the gradual accumulation of data as to localities, early stages, &c., was already providing some material which would later prove of more value than was yet realised. The earlier years of the present century, troubled by many political agitations, did not conduce to any particular increase of activity in the pursuit of natural history; indeed I have been much struck by the falling-off of entomological publications during that period, and, as the works which appeared still showed the same objects as those of the Fabrician period, they need not be very fully discussed. Many attempts, most of which have stood the test of time, were made to subdivide the very inadequate Fabrician genera, although the workers in this direction—with the notable exception of Hübner, and perhaps also of Laspeyres—were not specialists in the lepidoptera, nor are their

* A good bird's-eye view of natural history literature at that period may be obtained from a perusal of the article on pp. 298-492 of the *Revision der Literatur für die Jahre 1785-1800 in Ergänzungsblättern zur Allgemeine Literatur-Zeitung, fünften Jahrgangs erster Band* (Halle and Leipsic, 1805).

books mostly devoted to this order alone; I refer of course to Monet de Lamarck, Latreille, Schrank and Germar. The last-named, however, published one work devoted exclusively to lepidopterology—his *Systematis Glossatorum Prodromus* or *Dissertatio sistens Bombycum Species*, two parts, 1811 (?1810)-1812, while Laspeyres set an altogether praiseworthy example in monographing, according to the best light he had, certain separate small groups—*Sesiae Europaeae*, 1801; *Gattung Platypteryx*, 1803. Hübner, in his classificatory schemes, attempted a much more elaborate subdivision of genera than any of his contemporaries, and, although his generic diagnoses are mostly superficial in the extreme, yet his almost intuitive perception of relationships seems to have stood him in good stead, and many lepidopterists to-day tell us that he was nearly a century in advance of his times. Even in his earlier works he showed a predilection for inventing classificatory terms, but as they were used in the plural—"Geometrae Amplissimae, A, B, C," &c.—they had no influence on nomenclature. About the year 1805 or 1806, however, perhaps when contemplating the commencement of his *Sammlung Exotischer Schmetterlinge*, he evolved a regular system of Stirpes, Familiae and Coitus, of which he presented the first outline (of the Stirpes only) to his subscribers in the much-discussed *Tentamen*; most unfortunately, he published the names of these in singular as well as plural form, and in true binomial combination with their special types, and so forced them upon the notice of nomenclators, notwithstanding that he forthwith (1806) commenced his *Exotische Schmetterlinge* and therein unfolded a little more of his scheme, using such names as *Papilio Princeps dominans demoleus* (*Princeps*=the *Tentamen* "Stirps," *dominans* the "Familia" of the later *Verzeichniss*, *demoleus* the species). In his *Verzeichniss aller bekannter Schmetterlinge* (cir. 1816-26), and in the *Zuträge zur Samml. Exot.* (1818, &c.) he introduces his Coitus, which are properly-constituted "genera" in the modern sense and applied binomially.

With the exception of Hübner's, I believe no catalogues of the lepidoptera of the whole world were published between the time of Fabricius and the British Museum Lists of Doubleday, Gray, and Walker (1844-66). The writers of the first half of our century were chiefly engaged with local faunæ—varying in extent from Ochsenheimer and Treitschke's great *Schmetterlinge von Europa* (10 vols., 1807-35) to Cantener's little *Lépidoptères du Var* (1833); with descriptive works, either of new species (as in Poey's *Centurie des Lépidoptères de Cuba*, 1832, &c.) or of early stages (as in Boisduval's *Collection Iconographique des Chenilles*, 1832, &c.; Duponchel and Guenée's parallel work, &c.); with systematic ones, not generally limited to the lepidoptera (*e.g.*, the writings of Macleay, Swainson, Westwood, and many others); with monographs of special groups—such as Dalman's *Monographia Castniae* (1825), or Boisduval's *Monographie des Zygénides* (1829); with museum catalogues and the like—often including valuable systematic work, as in Horsfield's *Descriptive Catalogue of Lepidopterous Insects in the Museum of the East India Company* (1828-29); or with merely popular handbooks, of which a great number were now beginning to appear, and of which Meigen's *Handbuch* (1827), Treitschke's *Hülfsbuch* (1834), &c., in Germany, or Ingpen's *Instructions* (1827), Jermyn's *Vade Mecum* (1827), &c., in this country, may be taken as examples.

A few of the most important books of this period must be mentioned, as they served a useful purpose in the diffusion of the knowledge of the lepidoptera, although they do not mark any new departure in method. In England our two great writers following Haworth were Curtis and Stephens, but neither of them confined his attention to the lepidoptera; both did some good work in classification, and one of Stephens' works—the "Haustellata" portion of his *Illustrations* (4 vols., 1827-35)—comes legitimately within the scope of our article; it formed to a large extent the basis of Westwood's work on the order, and of Wood's useful *Index Entomologicus* (1833-39), and, in fact, was one of the principal authorities in this country until the appearance of Stainton's *Manual.*

In France, Latreille and Godart's important contributions to the *Encyclopédie Méthodique* (1819-23), the *Histoire Naturelle des Lépidoptères* of Godart and Duponchel (1821-42), De Villiers and Guenée's *Tableaux Synoptiques* (1835), and a little later (1836, 1852-57, 1875) Boisduval and Guenée's *Spécies Général*, were the chief works produced; but some of the same authors (Boisduval, Duponchel and Guenée) also brought out some systematic catalogues in which various new genera were proposed, and new arrangements made; unfortunately they saw fit to neglect the work of Hübner, and have burdened generic nomenclature with a great number of synonyms.

In Germany, Ochsenheimer and Treitschke were almost universally followed until Herrich-Schäffer and Speyer began their studies; these writers and Lederer began to use structural characters in their determination of genera much more largely than their predecessors had done, and may be said to have brought lepidopterology up to the level of the other branches of entomology, though there was still wanting the impulse of Darwinism, and of the workers of his school to carry it to any very high position as a science. Lederer's classification—undoubtedly good in many respects—has obtained far wider currency than it deserves through having been that chosen by Dr. Staudinger for the arrangement of his collection and his *Catalog.* Herrich-Schäffer's latest work, as given to us in his *Sammlung Aussereuropäischer Schmetterlinge* (1850-69), depends largely upon neuration, and has formed to a great extent the basis of the work of Meyrick and Hampson.

At the same period German lepidopterists were still busy with iconographic works, some of them of a very high order of merit, and often incidentally giving valuable help in the elucidation of life-histories, &c. Hübner's *Sammlung*, his *Exot. Schmett.* and *Zuträge*, were all continued after his death (in 1826) by Geyer, and valuable text and supplements were added by Fischer von Röslerstamm (1834-43) and Herrich-Schäffer (1845-56). Freyer's two works, the small *Beiträge* (1828-30), and the much more extended *Neuere Beiträge* (1833-58) also deserve a word of mention.

Scandinavia in the earlier part of the present century scarcely seems to have maintained the prominent position which it had occupied in the latter part of the eighteenth; perhaps the principal luminary of the time was Dalman, whose *Försök till Systematisk Uppställning af Sveriges Fjärilar* (*Vet. Ak. Handl.*, xxxvii., 1816) has given us some generic names which are now current. In Russia at the beginning of the century Boeber seems to have collected diligently but published little; some of his newly-discovered species were communicated to Fabricius and Esper, and he also contributed lists of his captures to Georgi's

Beschreibung des Russischen Reichs, Theil iii., Bd. vi (1800), but his new species are without description—"nomina nuda." He did, however, publish some descriptions of Rhopalocera in the *Mémoires* of the Moscow Society (vols. 2 and 3). But very few books devoted to lepidoptera seem to have been published in Russia; Eversmann's *Fauna Lepidopterologica Volgo-Uralensis* (1844), and a little later several useful contributions by Ménétriés are among the principal things.

So little of importance was done in the south of Europe that we need not dwell upon it at all; and as regards the study of the lepidoptera of the other continents, it will suffice to say that it was mostly very unsystematic and fragmentary—chiefly lists of species obtained during scientific voyages or travels, and worked out by eminent entomologists such as Latreille, Boisduval, Guérin-Méneville, Klug, Eschscholtz, &c. Boisduval, however, also published one or two independent works, such as his *Faune Entomologique de Madagascar* (1833), and (together with Leconte) the *Histoire Générale et Iconographique des Lépidoptères de l'Amerique Septentrionale* (1829-42).

Mention of the last work, which dealt with butterflies only, and is very incomplete, reminds me that I must emphasise the singular dearth of American work of any importance in this order during the early part of the century—a fact all the more remarkable in view of the way in which our friends across the Atlantic have overtaken and outstripped us of late years. Excepting Say's *American Entomology* (1817-28) and Harris' *Report on the Insects of Massachusetts, &c.* (1841), I know of really nothing worth mentioning. Indeed, the great obstacles with which lepidopterists like Packard had to contend in taking up the study so recently as 40 years ago would hardly be realised apart from such quotations as our editor gave us in *Entom. Record*, x., p. 159.

Side by side with the mass of descriptive and classificatory work of which the above summary will give but a faint idea, we find at first very little earnest biological research among lepidopterists. The microscopical, anatomical, and physiological writings which they had received as a legacy from the 17th and 18th centuries were, to be sure, meagre enough and in some cases crude enough; but yet they should have proved sufficient to stimulate further investigation. Though mostly not strictly lepidopterological, the principal titles may be just mentioned, in order to indicate their general nature; Redi, *Esperienze Intorno alla Generazione degl' Insetti* (1668); Malpighi, *Dissertatio de Bombyce* (1669); Muralto, *Anatomia Pediculi* (1682); Martinet, *Respiratio Insectorum* (1753); Reyger, *Generatio Aphidum* (1754); Reaumur, *Mémoires*, &c. (1734-42); Swammerdam, *Bybel der Natuure* (1737-38); De Geer, *Mémoires*, &c. (1752-78); Lyonet, *Traité Anatomique*, &c. (1762—on *Cossus*); besides microscopical investigations by Leeuwenhoek, Gleichen and others. Perhaps the only lepidopterist of the early nineteenth century who has achieved any lasting fame in following up, and at the same time correcting, the work of his predecessors was Herold, whose laborious studies on *Pieris brassicae* (published in *Entwicklungsgeschichte*, &c., 1815) enabled him to overthrow the primitive notion of the encasement of the imago within the larva. Of Gaede's *Beyträge zur Anatomie der Insekten*, published in the same year, I know practically nothing; he only used two lepidopterous species for his investigations, *Lasiocampa quercûs* and *Arctia caia*. Ramdohr, one of the earliest writers on digestion in insects (1811), also studied several of the lepidoptera, and Suckow in his *Anatomisch-physiologische Untersuchungen* (1818) included *Dendrolimus pini*. Lyonet's important work *Recherches sur l'Anatomie et les metamorphoses d'Insectes*, though written a good deal before these, was not published till considerably after them—being brought out posthumously in 1832.

But whatever the nature of the early work, whether iconographic, systematic, anatomical or what not, it lacked the coherence and unity which are born of the recognition of some great underlying principle. Such exact work as, for instance, Newport's on the anatomy of *Sphinx ligustri*, or the whole of his article "Insecta" in Todd's *Cyclopaedia*, must indeed be considered as work for all time; but it is not surprising to find the bulk of the effort of the first half century culminating in such books (admirable in their way) as those of Guenée (1852-57), Stainton's *Manual* (1857-59), Heinemann's *Schmetterlinge Deutschlands* (1859, &c.), and the like—or, in another direction, as Speyer's *Geographische Verbreitung* (1858-62). It needed the advent of Darwinism to give the needful impulse in the direction of further developments; and it was most opportune that the *Origin of Species* appeared just at the time when the systematisation of some of our principal faunæ had been placed on so satisfactory a basis. To be sure, Darwinism has had to encounter a good deal of opposition from lepidopterists, from the inane attacks of the Rev. F. O. Morris to the important *Schach der Darwinismus!* of Schilde (forming Bd. xxxiv., of the *Berl. Ent. Zeit.*), and the subtle attempts of that excellent Dutch entomologist, Piepers, to undermine it in certain vital points, while Gabriel Koch (the author of three well-known books on lepidoptera) could get no further than the pious but not very philosophical reflection that "God gave them their protective coloration in order that they might not have to struggle for existence"; but nevertheless most readers will agree with me that it is not "checkmated" yet, but that it has been of incalculable service to many of our lepidopterists, in enabling them to correlate the enormous number of facts with which they are called upon to deal, and in guiding them into profitable fields of enquiry and research.

It was not long before Bates turned Darwin's theories to account in a new direction in formulating his theory of "mimicry"—first made known before the Linnean Society in 1861; and lepidopterists may congratulate themselves that it was material provided by their favourite objects of study which furnished him with the data upon which his theory rested; in other words, that it was the lepidoptera which contributed the first new confirmation of the theory of evolution. Space forbids my following out the history of mimicry as further studied by Wallace, Fritz Müller, Meldola, Poulton, Belt, Trimen, Finn and many others; but it has continued to be a subject mainly—though not exclusively—worked out by lepidopterists.

Subsequent theories and experiments based on the acceptance of the principles of "natural selection" have been so many and so diversified that they have permeated and almost revolutionised our later nineteenth century literature and leave me in a state of considerable bewilderment as to what I ought to say and what to leave unsaid. But as I have already far overstepped the limits which might reasonably have been expected of me for this article, and as the readers of the *Entomologist's Record* have been kept pretty well *au fait* with the recent work, and as moreover I am hoping to read in our "century number" the records of some of our living evolutionists and biologists, I conclude that my wisest course will be to leave nearly everything "unsaid." But in order to substantiate my opening assertions as to the enormous advance made in our lepidopterological books of late, I feel that it will be necessary just to remind my readers of the titles of a few of the most noteworthy.

Weismann (whose important works cannot be cited as purely lepidopterological) and his rival Eimer (*Artbildung and Verwandtschaft bei den Schmetterlingen*, 1889-95; *Orthogenesis der Schmetterlinge*, 1898) both unite in firmly upholding the principle of evolution in some form. Dorfmeister, Fischer, Standfuss, Merrifield and others, have given us most valuable works on the results of temperature-experiments. Walther has made a special study of the "Palpus maxillaris" and the morphology of the mouth-parts in lepidoptera (Jena, "*Zeitschrift für Naturwissenschaft*, xviii., 1894, &c.); Spuler (*Zeitschr. für Wissensch. Zool.*, Bd. liii., 1892) has produced an important paper on neuration and quite recently (*SB. Phys. med. Soc. Erlangen*, xxx., 1899) a "Systema Tinearum"; Schroeder has published a book on *Entwicklung der Raupenzeichnung*, &c. (1894); Petersen deals with lepidopterous morphology in the volume of *Mém. Acad. St. Pétersbourg* for 1900; Portchinsky had a series of important biological papers in the *Horae* from 1885-93; Reuter's *Ueber die Palpen der Rhopaloceren* has already been recommended to readers of the *Record*. In our own country, the work of Poulton, Dixey, Chapman, Tutt, Jordan and others, is too well known to need more than a passing word. In America there has been marvellous activity of late years, and almost all the best work is steeped in the modern scientific principles. Apart from his invaluable general works and innumerable short papers, &c., Dr. Packard has given us a fine production in his *Monograph of the Bombycine Moths of North America* (1895). Scudder's *Butterflies of the Eastern United States and Canada* is admirable, and so are the lepidopterological works of Fernald. The writings of Dyar, who has made himself a specialist in the study of larval tubercles, and also of certain "Bombycine" families, of Mayer (*Development of wing-scales and their Pigment*, &c.), and others of recent date, will be fresh within the memory of my readers. With such a vast accumulation of valuable material within a few years, one is tempted to ask, What will be the product of the new century, and how will the mind of man ever be able to take it in?

Experimental Entomology.

By FREDERIC MERRIFIELD, F.E.S.

The Editor has asked me to give him some account of the development of the experimental side of entomology during the century that is just closing. My knowledge is not sufficient to enable me to attempt this. All I can hope to do is to describe some examples of this development that have come under my observation, and, perhaps, to indicate some of the directions in which the tendency to experimentation is making itself felt in entomology. I suppose systematic experiment may be described in a general way as the testing of inferences or conjectures arising from the observations of ourselves or others. There are, of course, many current propositions that do not even purport to be founded on observation, and there is little use in attempting to test these. It is with observation that experimentation is especially concerned, and the development of the one is therefore in practice closely related to that of the other. The growth in recent times of observation is illustrated by the increasing number of serial and other publications chiefly devoted to it, to descriptions of form and structure, external and internal, set forth in terms of scientific precision. It is, however, to another class of observations, that connected with functions, instincts and habits, that I would direct special attention, urging that we should have an increase in the supply of these from contributors who will make their observations systematic and complete.

No entomologist can fail to appreciate a good collection, but the strangely multiform objects, often surprisingly beautiful in colour and attractive in form, that we admire and study in our cabinets, are nothing more than decorative corpses. They represent so much only as can be preserved of the outcome of the life which constructed them, which is their *raison d'être*, and gives them their supreme claim to be investigated. We may speak of life as a succession of functions, and the investigation of these functions is consequently of the very highest interest. It is not an easy task. The something that is called life we have indeed in common with the insects; some of their senses, some of their external and internal organs in many fundamental particulars resemble our own, but the points of difference are innumerable and profound, affording abundant scope for imagination and conjecture, of the opportunity for which advantage has been abundantly taken. Happily the scientific spirit is gaining in all that pretends to be knowledge, and, whenever a theory that is merely plausible can be verified by actual experiment, insists that it shall be so verified. Accordingly we find that experimentation is making way in entomology, as it is doing in other departments of knowledge, and the latter part of the century has witnessed a remarkable increase in the application to entomology of this touchstone of truth, which is at the same time a source of light.

An enumeration of the kinds of functions and habits our knowledge of which has been greatly extended by the researches of recent years, would be a lengthy one. Among them may be mentioned the functions of the antennæ, those elaborate organs that seem to belong to another world of sense, the methods by which insects travel over smooth surfaces, the process by which the legless pupa climbs out of its larval skin to find a point of attachment above, the manner in which wings are formed and expanded and the scales upon them are evolved, the mechanism of flight, the nature of stings and the operation of the poisons they contain, the source and nature of the pigmental and other colours, the nature and scope of the visual perception of insects, their sense of taste, the faculty we call "scent," which enables them to discover objects at great distances, where neither light nor sound can assist in the discovery, the wonderful variety of apparatus for generating and diffusing scent, urtication by larvæ and whether it is assisted by a specific poison as asserted by M. Fabre, the luminosity of many species, and the strange situation and structure of organs of hearing, and of the machinery for stridulation with which many are provided.

Mr. Packard's *Text Book of Entomology* contains references to most of the authorities on these subjects up to the date of publication (1898), and much additional information on them will be found in Dr. Sharp's two volumes on *Insects*, in the *Cambridge Natural History*. The veteran J. H. Fabre continues the fascinating story of his own observations and experiments on the habits and instincts of insects, and his example has been effectively followed by Mr. and Mrs. Peckham in North America. Lord Avebury's experiments on the social species are too well known and appreciated to need more than a passing reference.

Nature, "so careful of the type," may in a sense be said, like the British nation in difficulties, to "blunder through somehow," and with a similar carnage of individual lives, but with complete success in the preservation and development of species in infinite variety. It is the "somehow" that we want to know. She moves in a crowd, in surroundings so numerous and changeful that in order to be sure that we ascribe results to their proper causes it is often necessary to resort to experiment, by which elements that might disturb are excluded. In relation to the functions of organs of living animals, which add their own active personality to the other factors, the complication is often increased. In this kind of investigation much valuable work has been done. The more recent volumes of the *Transactions of the Entomological Society of London* bear testimony to the growth of experimental work in entomology. Quite a large class of experiments showing the direct effect of their surroundings on the aspect of larvæ and of pupæ, has been conducted with great patience and skill by Professor Poulton, whose observations make a substantial advance in the solution of some of the mysteries of the variability of their colours, and he has been seconded by other observers. The results obtained by him are strongly indicative of the protection afforded by those colours which are provided by natural surroundings, but he bears testimony to his sense of the value of experimental confirmation on all points by the careful observations he has recently been making on the actual extent to which pupæ under various circumstances have been found to be in fact protected by the special colouring from being carried off by birds and other enemies.

A striking illustration of the loose methods once in vogue for dealing with natural phenomena, as compared with the modern scientific one, is seen in the treatment of the question of the mode in which a soft and fluffy moth (*Dicranura vinula*) penetrates its horny cocoon. I remember about half a century ago being presented with a book on insects, published under the auspices of a very pretentious society of the time. Its author was lost in admiration of the process of softening, which he said was performed by means of an acid so potent that it ought to be contained in a vessel of glass, whereas this insect had only a membranous bag. In 1892 Mr. Oswald Latter, of Charterhouse, instead of taking things for granted, looked into them himself, and demonstrated that the fluid was not an acid at all, but an alkali, potassium hydroxide, and that the insect was also furnished with a pair of sharply pointed organs for piercing the softened material, and a shield for protecting its downy head and thorax from injury in the process of pushing through.

A large series of experiments has established that temperature in the pupal period is one cause of the variation in colour of lepidoptera.

The pioneers in these researches were Dorfmeister in Austria, W. H. Edwards of West Virginia, and Professor Weismann of Freiburg. Of late years Professor Max Standfuss, of Zurich, has conducted experiments of this kind on a colossal scale, and Dr. E. Fischer, of Zurich, has published some results obtained in a similar way by the application of high and low temperatures to the pupæ. Similar experiments of my own are recorded in the *Transactions* and *Proceedings of the Entomological Society of London*, and it may be taken as now established that not only can the form appropriate to one season be, by the application of temperatures, usually, but not always, extreme ones, converted into that appropriate to the other season, but that by this process the markings and the colouring of lepidoptera not seasonally dimorphic can be materially changed. Professor Bachmetjew of Sofia has lately published experiments as to the critical temperature point. So far as my present knowledge goes, no such change as pure melanism or pure albinism has thus been induced. M. de Nicéville has recorded similar changes produced by exposing pupæ in India to conditions of dryness and moisture. It is much to be desired that these experiments should be tried on many more species, especially on the wonderfully different seasonal forms of species of the African genus *Precis*, carefully excluding temperature influences. In hybridisation very complete experiments have been made by Professor Standfuss, throwing light on the origination of species.

Speaking of the subject generally, there is need for observations on a wider range of subjects and on a larger scale than have yet been attempted. The number of observers in entomology is great, as is shown by the voluminous contributions to transactions and magazines, metropolitan and provincial, English and foreign. Many of these contributions are accounts of excursions and their resulting captures, and as such are very interesting to the experienced field naturalist. The mere enumeration of the species captured evokes the recollection of some of the most delightful experiences of one's life—the spring visits to the flowering sallows, the showering down from the trees of quaint and beautiful larvæ, the swarms of downy creatures with glowing eyes lightly settled on the sugared tree-trunks, the poise of the shapely hawkmoths over flowers, the return walk on summer nights over the hills studded with glowworms, the circling of the sunset light in the sky till it reached the north and its arrival there was signalised by the striking of midnight from the clocks of the distant town, the warm nights when we rested on heather waiting for the dawn the approach of which was heralded by the song of the skylarks from their point of vantage far above, the sudden discovery at rest on a leaf of some fairy-like creature of exquisite form and colour never seen before. Recollections so awakened have an indescribable charm, and it may be hoped that the magazines will long continue to find place for the chronicle of the "mere collector," and that that much criticised person, if he be one who pursues his task in the fields, will continue his delightful work, including the records of it. The devotion to such work seems at least as harmless as that which is dedicated to golf, and often has an utility extending beyond the enjoyment it gives to its devotee. It is of special utility in providing the additional materials so much required by the systematist, who so often laments the imperfection of his work for want of them. Any one leading structural feature, such, for example, as the neuration of the wings in lepidoptera, valuable as it is as a means of classification, necessarily only covers a small part of a complicated question. We want to know not only the structure of that framework and of the bodily organs, external and internal, but all that was distinctive in the life of a species, before we can assign to it its proper place in nature. We ought to know, for example, about the egg and its contained embryo, how it is fertilised, where it is deposited, the cause of the fantastic shape it in some species assumes, whether it is laid singly or in clusters, whether naked or provided with a downy covering, and what purpose this serves. We want to know of the larvæ and of the changes, sometimes of startling magnitude, that they undergo in their ecdyses, the special food-plants to which they are attached, generally, or at different periods of their lives, their habits as regards exposure or concealment, their selection of places for pupation, the nature of the covering they provide for the pupa, and the mode of extrication from it. We want to know all that throws light on the limitations and the perplexing uncertainties of double-broodedness, the varying extent to which different pupæ respond by rapidity of development to a heightened temperature, while some obstinately resist it. We want to learn the habits of the imago, its mode and time of flight, the nature of its enemies, and the extent of their ravages; what is the stimulus which, after a pupa has rested through the summer and autumn, causes it to emerge on some day in the middle of winter and leaves other pupæ to remain for years in that stage, how so many winter moths come to have apterous or semi-apterous females, while all their males have ample wings, what special protection they enjoy by concealment or mimicry or by flaunted nauseousness. The remarkable results obtained by some careful and accurate observers in recent times show how much there is in these and similar investigations to reward careful observation, which to be entirely useful should be very precise and detailed.

Few subjects connected with entomology occasion more discussion or are of greater economic importance than the relative abundance or scarcity of some species of insects and their variable time of appearance. A vast number of interesting records on these points are scattered through the entomological magazines for many years; these would be much increased in value if a statement of the circumstances which may have influenced the numbers or time of appearance of the insects accompanied the records, for example, the temperature prevailing some time before, the character of the preceding period, which in our variable climate must often be such as to throw the seasons out of gear and cause a species to be born at an untimely period. Even in the work of some leading observers there is often a remarkable omission to state temperature, when the whole importance of the observation depends on it. For example, we are told precisely what the duration of the egg or pupal period was, information which is usually of small value unless we know the prevailing temperature; for experiment has shown that a diminution of 6 degrees F., *i.e.*, from 62° to 56°, may lengthen the duration of the pupal period in some Vansseids from 20-22 days to 40 days.

To conclude, I revert to the unassailable position that it is the life of an insect in all its stages which makes it of supreme interest. The animal, endowed with "the little living will that made it stir on the shore," is, speaking generally, far more interesting than its chitinous covering, as a man, also speaking generally, is more interesting than his clothes; and it is to careful observation of the living animal, prompted and sustained by rational conjecture, and checked by exhaustive experiment, that I venture to think we have mainly to look for progress in all branches of entomology, not excepting that which is the special province of the systematist, whose work, invaluable as it is, has to be comprehensive if it is to approach completeness or finality.

Sidelights on the Lepidopterological Work of the Nineteenth Century.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

The Editor commandeers me to say something about the present position of entomology, in relation to the progress made during the nineteenth century, in almost any or every direction except what belongs to the strictly systematic side. I am certainly quite incompetent to do so, the subject is immense, long study would be involved, if merely in verifying references, and a most meagre exposition would require several volumes. I became less restive under the demand on finding that only a page or two were wanted, since if I could avoid palpable blunders, the limitations of space would explain all other errors, whether of total omission*, or of broad statements that are not really true without various qualifications. Nevertheless it is certain that I am very like that man who exhibited a brick or two, by way of proving what a noble city he came from. Why the systematic aspect is denied me, I do not quite understand, not that I want to enlarge my field of view, but simply because now we are all systematists. Though we must all specialise, nothing is clearer at present, whatever it may have been at the beginning of the century, than that any entomological work of any scientific value, whether it be done in the field, in the study, or in the laboratory, derives much of its interest and the greater part of its value, from the bearing it has on systematic conclusions, that no work in fact is without such bearing. Even such researches as those of P. Lyonet in the last century or of Miall, Hammond, or Lowne, more recently, in the anatomy of a single species have not only great intrinsic interest, but are most valuable as standpoints, from which systematic conclusions can be drawn, whenever any similar anatomical data are available about other species.

There can be no question that the note of the century in entomology, as in all other branches of natural history, is to be found in the different position taken up, as a consequence of the acceptance of Darwin's teaching. At the end of the century, we may say, I think, that that acceptance is complete; I know there are still many obscurantists and irreconcilables, but their number amongst those with any scientific knowledge or education is negligeable. There are also others, no doubt, who appear to think that some small variety, offshoot, or side issue of Darwin's great generalisation, is a new and distinct species, which they have had the good fortune to invent or discover. If such an idea will give them the necessary stimulus to do good work, let us pardon them their little vanity, without fear of their disturbing the solid foundations on which Darwin builds.

* An Irishman might justly remark that the whole paper consisted of omissions.

Vanity and jealousy will not soon be unknown amongst men of science, any more than in the natural man, but I think there is considerable evidence amongst entomologists that Darwin's teaching and example have done something to produce a greater brotherhood amongst us, and have diminished very much the expressions of contempt that were not uncommonly used by workers in one field about those in another. "A mere systematist," "a mere collector," are expressions not felt by those who use them or hear them to have now any stronger meaning than a little petulance, and in fact are heard much less frequently than they were a score or more years ago. "The mere collector" has his uses, in gathering material, and is perhaps more numerous than formerly, in so far as we may define him as having as his chief aim getting together a lot of handsome and rare specimens, in order to outvie other collectors. "The mere systematist," on the other hand is extinct, *i.e.*, the man who wants to range things in a line and seizes to do so the most obvious, rather than the most important, characters. The object of the systematist is now seen to be to discover the precise line of descent of each species. This is, in fact, now, a mere truism. The work of every entomologist, who is not an avowed systematist, is at least to amass knowledge to further this purpose. No doubt many entomologists have no other desire than to enjoy the pleasure of observation, and to marvel at the wonderful facts unfolded before them, and they have no further conscious object; yet these often add most important items to our knowledge.

Perhaps the fact, that few systematic works appear, without a phylogenetic table, a genealogical tree, or some such definite means of showing precisely the conclusions the author considers probable, indicates unmistakably the point of view that is now taken. Such tables have met with much ridicule. There are few now who ridicule the whole idea as absurd. That that comes from those who disagree with the conclusions set out, is also diminishing, because the critics have themselves felt the necessity of handling the subject in the same way and have realised the difficulties involved. The difficulty arises chiefly in this form, that before you begin to make the table you think you understand the whole matter clearly, but you do not proceed far before you find you have involved yourself in some obvious contradiction, and have to begin again ; nor have I met with any tables, the subject of which I knew enough of to understand them, that did not appear to me to contain such contradictions. They are excellent things for defining precisely what our systematic knowledge of their subject is worth. Those who now avoid giving them, merely show that discretion that is the better part of valour. Probably a hundred years hence our detailed phylogenetic trees, will be regarded as miserably inadequate. There is considerable reason already to suspect that just as a tree founded on British species only, would in not a few cases be hopelessly wrong, when an attempt is made to apply it to all the species of the world, so, our present tables founded on a few characters, will need much alteration when our knowledge is more complete. Even now we find such trees are rather contradictory when constructed from different data by different people ; yet there are many items of structure and habit that have not yet been used for this purpose, when they are, no doubt further instances of contradiction will arise. Yet all such trees must, in a sense, be correct. No doubt there is much error from "convergence," *i.e.*, the close resemblance in one or more characters of widely separated species, which adds much to the difficulties experienced. It is common in comparing schemes of descent based on different characters, to be tempted to suppose that the two lines mingled again by some sort of crossing. This is, of course, absurd, but it shows that the real line of descent is more lengthy and complicated than either of our separate tables contemplated. Such approach as we may ultimately make to a knowledge of the true phyletic lines, will of course be founded on researches into many more characters that are yet available, and will be correspondingly more lengthy and complicated.

I do not wish to overlook the fact that a knowledge of evolution was more than foreshadowed at the beginning of the century, or even twenty centuries since, but the change in our attitude towards it could hardly be greater than it is, were it then unheard of. We are not satisfied to know simply that species A has a white mark, while species B has a black one. We must find out in what the difference consists structurally, by what organic changes the present structure might have been reached from one previously common to both, what forces may have acted on each to produce such changes, what the uses are of the differences, how long they took for their production, how stable they may be, how far they are variable; these and many other similar questions can rarely be fully answered, but they suggest many observations and experiments to be made on the structure, habits, &c., of both species, and of many others related or not related to them.

It would not perhaps be a very laborious matter to index and classify all the entomological work of this character that was available at the beginning of the century. We may perhaps take Kirby and Spence's *Introduction*, as containing, with other matters, a very full summary of everything that was then known, perhaps a thousand volumes would not set forth our present knowledge in equal amplitude. This greater extent of our present knowledge, which compels each of us to take but a fractional part of the whole field in which to disport himself, is not however entirely, not perhaps even very greatly, to be attributed to the stimulus of having a satisfactory theory to guide our work. The records of research of all sorts accumulate not in arithmetical but in geometrical progression. On the physiological and anatomical side this may be attributed to the great advance in microscopical technique as the most important element, but in that and other fields, it depends on the same causes as all other progress during the century. Increase of population, in wealth, and in education, facilities of travel, and of intercommunication, have led to more persons working on material from all over the world, easily publishing and comparing results, affording new starting-points to fresh workers and so on. Up till the last twenty years Germany probably led us in most researches on habits, structure, distribution and everything else related to entomology generally, and to the modern aspects of the subject, but now there is little question that America is going to the front. Much of the American work no doubt has an economic character as its base, and has corresponding limitations. Much of it is also no doubt systematic in the limited sense of merely adding to the lists of known species, inevitable in the exploration of so great an area of new ground. Still, it is quite clear that America challenges for the first place, when we call to mind only a few of her leading explorers in this field, such as Packard, Scudder, Dyar, Kellogg, Chambers, Comstock, &c. There can be little doubt that this lead will be still further increased as America enlarges her resources of all sorts at a rate that it is hopeless for European states to emulate. Though England, France and Russia are falling comparatively behind, they have no reason to be ashamed of the position they yet hold, though in England we can hardly hope to sustain the prestige given us by Darwin and Wallace.

A perfunctory glance at some actual researches is all that space permits, and I may select those in lepidoptera as best known to me. We may place in the front rank those that are of a definite experimental character, such as have been made by Merrifield, Poulton, Bateson and others in England, where these investigations have been more closely followed than elsewhere, though the names of Weismann and Standfuss remind us that Germany and Switzerland, if not in front, are never far behind. Experimental work such as these investigators have followed, is, I think characteristic not only of the century, but quite of its later decades. Those of Merrifield in pedigree moth-breeding on *Selenia tetralunaria*, have very much extended our knowledge as to the kind of information that can be gained in this way, and of how to acquire it, and have afforded much material of value on questions of heredity and variation. His experiments in the effects of temperature on development have opened large fields for further experiment, and have shown us that temperature may have various effects according to the different constitution of different species, and may afford strong evidence as to whether a species has been derived from an ancestry of more northern or more southern habitat than it now occupies, whilst the more extreme temperatures produce effects that result from profound disturbance of physiological processes, from which we already gather something, and may hope to gather more as to the nature of these processes, in the development of form and colour in lepidoptera. Merrifield's experiments on the effects of surroundings on the colour of exposed pupæ, and those of Poulton on these, and on larvæ on variously coloured resting-places, have resulted in an immense increase in our knowledge in these directions, many of the facts being really marvellous, although these investigators have made us so familiar with them that we take them now as almost commonplace. The experiments of Bateson and Standfuss in crossing of more or less definitely fixed varieties, and of closely allied species, have given some curious results, the precise teaching of which is not yet perhaps fully elucidated. Many of these experiments require very persistent and constant attention, and to produce the best results should be continued for a considerable number of years with unchanging resolution. It is therefore remarkable that so much should have been done by individual effort. What is really necessary for pushing the researches more fully and completely is a biological station founded on some permanent basis. In these days when "saintly millionaires" are to be had for the asking, may we not hope to have several such stations instituted before the new century is very old. The results to be looked for are not only of interest to entomologists, but bear most directly on all those questions of a physiological and biological character, such as the direct and indirect effect of environment, individually and racially, the factors that go to produce or modify variation and heredity and many others of less importance. The answers to these questions are of the most profound importance to man in their social and political teaching, as regards his own race, and are valuable, but much less so, as regards his domestic plants and animals, and indeed all organic nature with which he is constantly in contact. The hoped-for results can be reached much more rapidly in dealing with insects with an annual periodicity than by experiments on higher animals of a much longer and more complicated existence.

The enormous increase in our knowledge of the earlier stages in the lepidoptera is perhaps a notable feature of the century's work. If we confine ourselves to the palæarctic fauna, it has far exceeded the growth of the number of known species, but if we include exotic species where much less has been done, it may be doubtful whether we know the earlier history of a larger proportion of recorded species than we did at the beginning of the century. Nor must we forget that much excellent work was then already done, a list of the authors up to 1800 would indeed be a long one. Though not the earliest, Swammerdam and Reaumur stand out as landmarks at the end of the 17th and beginning of the 18th centuries, nor should we forget the work of Madame M. S. Merian at the same early date, not only amongst European but also tropical insects. The work of Roesel and Sepp at the end of last century, on the life-histories of lepidoptera, is as excellent as any to be found until we reach quite the end of the 19th. As regards larvæ, we must go to America for our present standpoint. The careful descriptions of Packard, Scudder, Dyar, and others, of the larvæ at all stages, from hatching onwards, omitting no feature and especially noting the structure and distribution of the tubercles, has led to Dyar formulating a clear scheme of the evolution of the tubercles, both as to their positions and armatures. Granting this may want further elaboration and even correction, it is an immense advance. I might mention that though the work of Buckler and Hellins gives no indication that they attached any special importance to such details as the tubercles, Mr. Hellins, towards the end of his career, was much impressed with the idea that a close attention to the character and disposition of the tubercles would afford useful clues to relationships of larvæ and families of lepidoptera, and wished he had attended to them in his earlier work ; this subject is more than once referred to in my corespondence with him. Hellins was, I think, the only Englishman who got even so far, before Dyar showed us where we ought to be.

It is a feature of quite the end of the century to prepare monographs of the morphology of special parts and organs throughout larger and smaller groups. As careful and elaborate treatises one may refer to Reuter's on the "Palpi of Rhopalocera" and Dr. Karl Jordan's on the "Antennæ of butterflies." Dr. Dixey's work on the *Pieridae* and other butterflies best classifies itself here. The earliest work of this character is probably that on the male genital appendages, and the use made of these by M'Lachlan in his great work on the European trichoptera, an order in which they are, fortunately, more easily examined than in the lepidoptera, is perhaps the earliest instance of their being fully examined throughout a large group of species, and of their immense value in distinguishing species. In the same work the neuration of the order is examined with equal completeness, and its value similarly demonstrated. In neither of these matters was

M'Lachlan the pioneer, but his work stands out as the earliest of equal importance. I do not know the precise evolution of the study of the neuration in the lepidoptera, and I do not know that we have any separate monographs of the subject. The whole subject is a development of the present century, and it is not quite easy to classify such work as that of Spuler and others as being embryological or morphological; Comstock and other American authors have given us valuable data over a wide area, whilst the detailed use of it for classification is most ably displayed by such English masters as Meyrick and Hampson. There is still wanting the close investigation of the development of the various types of neuration in the imagines from the primitive outline that exists in the pupa. There is some reason to believe that when this is done, some forms that are apparently identical will be found not to be so, but to be convergent examples of unrelated descent.

Improvements in the technique of the laboratory have also led to a great advancement in the extent of our knowledge of embryology and development. Such matters as the segmentation of the embryo, as pointing to the nature of insect ancestors, the true structure of the insect head as consisting of primitive segments, and many others, cannot be dealt with briefly. Perhaps it may be admissible, in view of our vain-gloriousness, which is one of the characteristics of our age, to note how one of our discoveries, that of imaginal discs, and the processes of development which their name may shortly typify, really leads us, as a brief epitome of the subject, precisely to the conclusions as to the nature of metamorphosis that were arrived at by Swammerdam, yet we go back to Swammerdam, not one, but more than two, centuries. Swammerdam's view was that the butterfly already existed in the caterpillar, even in the youngest caterpillar, though the parts were very small, very soft, bathed in fluid, and obscured by parts belonging to the caterpillar. He is short of the words embryonic cells and imaginal discs, but he expresses very fairly the facts. It is very curious to find that he expressly combats the theory that the chrysalis is like an egg within which the butterfly develops, and that the same erroneous idea had some acceptance when Weismann's researches on diptera pupæ first became known; the fact being, of course, that the necessary embryonic cells do not have to develop from a germinal vesicle, &c., but are all already distributed in their proper places and differentiated so that each group represents only the organ or organs which will arise from it. One no doubt realises a little difficulty in accepting Swammerdam's view that the young caterpillar had ready all the skins he had to cast, and that getting rid of these disclosed the butterfly, which was all the time growing in preparation for the event. We know, of course, that each skin is really a cutaneous secretion, which does not exist until shortly before it is wanted, but if we take the view of some modern authorities that the chitin lost at moults is not merely a secretion, but an excretion, Swammerdam must again score even here very decidedly. What we may well marvel at is that Swammerdam arrived at his conclusions from some very simple observations. They were, however, carefully made, frequently repeated, looked at on all sides, and weighed and pondered with a love of Nature and a genius for understanding her which can never fail to have their reward.

A century of larval descriptions.

By HARRISON G. DYAR, Ph.D.

At the beginning of the century there were extant the results of some twenty-five workers on lepidopterous larvæ, covering a period of about fifty years, from the writings of Rösel von Rosenhof (1746) to Hübner and Sepp, whose works were not finished till well into the century. The descriptions and figures of this period refer mainly to European lepidoptera, though references are not wanting to those of other parts of the world. The characterisations are mostly, as would be expected, of a general descriptive nature, varying from a few words only, as those of Linné and Fabricius, to fairly complete ones, some of which, as Dr. Ernst Hofmann remarks (preface to *Raupen Gross-Schmett. Europas*, 1893) would pass muster to-day.

During the hundred years that have elapsed since, about a hundred additional authors have written on lepidopterous larvæ. The principal result of their efforts has been to make known the general appearance and habits of a considerable portion of the species inhabiting Europe and North America. Those of the other parts of the world are now about as nearly unknown as they were at the beginning of the century, though some progress has been made in India and Australia.

In Europe the percentage of known larvæ in 1800 did not exceed 10%; to-day it has increased to about 70%. In North America the increase has been from 1½% to 20%. In general the larger butterflies and the smaller Tineids have been best worked up. The former from their large size and comparative fewness of species, the latter because they are best collected as larvæ. With the Tineids, however, many of the descriptions are not more than records of habits and food-plants, since the small size of the larvæ and their obscure modes of life render them difficult of observation. As to the fauna of the world, but a small beginning has been made. We note from Hampson's first volume of the *Catalogue Lep. Phalaenae Brit. Mus.* (on the *Syntomidae* of the world) that only 2% of the species are known in their larval stages. All the European forms are known (allowing for the species of *Dysauxes*, which are not referred to by Hampson, though known) and 50% of the North American, while less than 1% from other parts of the world have been observed. In the second volume (*Nolidae and Lithosiidae*) there is a somewhat better showing, 3½% of the world species being referred to, but less than 1% from regions outside Europe and North America. There is certainly a great field here for students, especially when travelling in foreign lands.

The completeness with which the larvæ have been described has varied greatly with the ideas of different authors. Some, even to-day, have scarcely advanced beyond the diagnoses of Linné, while others have published very full and complete descriptions. Advance has been most marked in this direction in the last ten years. As used simply for purposes of recognition, it depends much upon the family or genus of a given insect as to how full a description is needed. Many of the larger and conspicuously coloured larvæ are so different from each other that a comparatively few words will define them, while others, if not absolutely identical, are yet so similar, that the utmost care and detail are required to differentiate them. These circumstances should be, but unfortunately have not always been, reflected in the descriptions. It results from this that, while ostensibly a certain portion of our larvæ are "known", a part of these are insufficiently described, opening again a field for the student of the twentieth century.

An important advance which has been made is the growing practice of describing separately each stage of larval life. This often records interesting and important characters which appear and disappear during ontogeny, and it is of course the only proper way to describe a larva.

Descriptions of larvæ should serve other purposes than that of mere recognition. We need an accurate and detailed record of these organisms for the use of students of the general subject and for future comparisons. Much advance has been made in this direction, the increased detail of descriptions, but unfortunately it has not become the general rule. Under this view it is often important to record many characters which are of no value from the point of view of recognition, as they are common to large groups. It is, however, sufficient if a standard of reference has been established, to do this briefly by referring to the character in question as "normal" to the group. A most commendable advance is the custom of giving enlarged figures of the larva or of single segments; yet this needs more care than is usually given, as most of the published figures, especially of newly-hatched larvæ, are somewhat unreliable in detail. I refer more particularly to the exact number and position of the hairs.

As to the value in classification of the various larval characters that have so far been brought out, it cannot be doubted that some of them are considerable. The head and its appendages are so similar throughout the order that but little of general value has been drawn from it. The number of the body somites is practically invariable, only a slight difference in degree of consolidation of the last two being apparent. Yet where this is manifest, it indicates the relative degree of specialisation as shown by other characters. The shape of individual somites is occasionally subject to modification, yet these specialisations are sporadic and do not indicate any broad lines of phyletic differentiation. The number and modification of the larval hairs or setæ, though often showing striking characters, are likewise of an adaptive nature and are not conclusive. Still they yield certain indications in line with the general scheme.

The number of the abdominal prolegs is not a character of wide importance. It appears that the primitive lepidopteron must have acquired the normal proleg formula. Perhaps this was established even before the true lepidoptera arose. At any rate, the character is practically fixed throughout the order, except in the *Tineidae* where it is subject to a certain flexibility. Above this group, there is no modification, save a partial disappearance of the prolegs, and that is not even generally of family value, though occasionally it seems to be so. The *Megalopygidae* are superficially defined by the presence of extra abdominal prolegs, yet I have shown that these are secondary, are superposed upon the normal pedal structures, and, therefore, a character of specialisation, not indicating a low position for this group, but the contrary.

The arrangement of the adhesive hooks or crochets of the abdominal prolegs shows a good character, as has long been known. Recently Karsch (*Ent. Nachrichten*) has carried to an extreme a classification based on this, which naturally includes certain absurdities, as any one-character classification must do. Still the two types of structure are of value, though subject somewhat to adaptation, since the circle type tends to become the line type with the change in habits from an enclosed-feeding to an exposed-feeding mode of life.

The relative positions of the hair-bearing tubercles seems to be a character of some importance, especially as regards the postspiracular and subspiracular tubercles, or the prespiracular (of *Sphingidae*), tubercles iv and v. These characters are but seldom subjected to adaptive modifications. They show three types of structure which divide the order somewhat broadly. The lowest type has tubercles iv and v in line or nearly so, or united. The character is somewhat flexible in the *Tineidae*, as nearly all larval characters seem to be in this primitive group, and occasionally one of the higher types is indicated ; but it holds very generally. The butterflies and Saturnians have a similar tubercular formula, but may be differentiated by other marked characters. The second type is characteristic of the *Noctuidae* and allies, tubercle iv being behind the spiracle. In some of the lower families (*e.g.*, *Epiplemidae* and *Lasiocampidae**) it is not, or but weakly, shown, but it holds generally throughout this large group. The third type is characteristic of the *Sphingidae*, tubercle v before the spiracle. It holds perfectly even the aberrant African Sphingid, *Lophostethus dumolinii*, which is covered with spines like a Saturnian, but is nevertheless a true Sphingid and not related to the group that it superficially resembles. Indeed I know of no exception to the structure in this comparatively small family. The tubercular arrangement is, therefore, of some importance, and should be accurately stated in descriptions. Unfortunately, it has been, till recently, very generally neglected. Dr. Wilhelm Müller first called attention to it (1886) but he was interested to show that the same general arrangement held throughout the order, rather than to find the differences in detail which indicate groups. In describing the full succession of larval stages, much stress should be laid on the first one, that after exclusion from the egg. Scudder has remarked how markedly generalised are the characters of newly-hatched butterfly larvæ. This is conspicuous in the butterflies, since the first stage has the structures of a low moth type which are suddenly replaced at the first moult by the full or nearly full characters of a highly specialised butterfly larva. Nevertheless, the phylogenetic interval represented by the first ecdysis is equally as great in many moths. It is somewhat strange that this embryonic first stage may be lacking without the fact being of importance in classification. Naturally it indicates a specialisation, and usually a subfamily or family group; yet this difference may occur within the limits of a single genus (*e.g.*, *Apatela*), if the facts have been correctly observed. Many interesting instances of the partial disappearance of the primitive first stage by the crowding back of later characters are shown in the *Arctiidae*. The two principal differences between the primitive first stage and the later ones are: (1) The

* I am glad to accept Mr. Tutt's correction to my suggestion that the position of tubercles iv and v in the *Lasiocampidae* is secondary. Mr. Tutt claims it to be primary ; now, if so, this is a point in favour of the value of the tubercles in classification, since it shows the *Lasiocampidae* to be a generalised group, a conclusion reached on other grounds.

absence of certain tubercles, namely iii and v of mesothorax and vi of abdomen, according to my numbering, perhaps not the most natural numbering, as Dr. O. Hofmann pointed out. I have called these subprimary tubercles. (2) The presence of only single hairs on tubercles which in later stages bear several hairs in the particular species. The violation of either of these points shows the disappearance of the primitive first stage.

I would remark briefly concerning Dr. O. Hofmann's criticism of my numbering of the larval tubercles, that, in proposing the numbers, I did not consider the tubercles of thorax and abdomen as homologous, and consequently numbered them differently. Using the mature larva as a basis I numbered in sequence from the dorsal line towards the feet. The first four thoracic setæ, being often closely grouped in pairs, I thought to be doubled setæ and gave them the same numbers, distinguishing them by letters. Except for the presence of the thoracic shield, which offers difficulties by carrying enough setæ to indicate an additional somite, I now agree with Dr. Hofmann that the thoracic and abdominal setæ are homologous as follows:

i a of thorax = i of abdomen and should be called i.
i b of thorax = ii of abdomen and should be called ii.
ii a of thorax = iii of abdomen and should be called iii.
ii b of thorax = iv of abdomen and should be called iv.
iii of thorax is subprimary, not represented on abdomen; it might be called v a.
iv of thorax = v of abdomen and should be called v.
v of thorax = vi of abdomen, being subprimary in both cases, should not bear a separate number, but might be called v b.
vi of thorax = vii of abdomen and should be called vi; it is frequently multiple, universally so on the abdomen.

However, I shall not make these changes in future descriptions, as uniformity in nomenclature is more desirable than a strict indication of homology. Any change would create confusion, which must be avoided. The anal plate does not offer a difficulty like that of the cervical shield. It bears enough setæ for a somite distinct from the 9th abdominal, but this is clearly shown to be the fact on other grounds, the anal plate representing the 10th abdominal segment.

It has been suggested to me by several that it would be a help to students to give a model for the description of larvæ. I do not fully agree with this view for the reason that in following such a scheme one would be likely to think that the points there indicated were all that it was necessary to observe and thus individual initiative would be discouraged in the discovery of new, and perhaps more valuable characters than any yet recorded. However I venture to offer the following as showing the points usually covered in descriptions at the end of the nineteenth century, with the implication that a larva should not be considered fully described if these have not been noted.

The head: Its shape, whether higher than wide or the reverse, proportions of the lobes, relations of clypeus and paraclypeal pieces, comparative length of antennæ, any abnormality in number of ocelli, development of setæ or peculiar processes, presence of secondary hairs; coloration, describing spots or bands; position of head at rest, whether erect or flat, free or retractile in prothorax.

The body: Its shape, whether cylindrical or flattened or otherwise modified, noting any humps or peculiar prominences; segments short or long drawn out and slender; incisions distinct or otherwise or the segments moniliform; degree of coalescence of the last two abdominal segments. It is preferable to speak of the 1st to 3rd thoracic and the 1st to 10th abdominal segments, though it is perhaps most usual to number the body segments from 2 to 13, counting the head as "joint 1," and not numbering separately the anal plate and prolegs (10th abdominal segment). Number and position of prolegs; size of thoracic legs and description of the crochets of abdominal prolegs; relative development of cervical shield, anal plate and leg shields; the tubercles, their development and modification; their position, especially that of iv of abdomen and i*a* of thorax; number and modifications of setæ; presence of any secondary setæ. The latter points to be especially detailed in stage 1. In *Noctuidae* the exact position of tubercle iv in relation to the spiracle on the successive segments promises to be a good character. Coloration in detail, the position of the lines to be defined by their relation to the tubercles, spiracles, and feet. Coloration and finer structure of the setæ, including description of any specially modified or poisonous hairs; sculpturing of the skin; presence of any eversible glands or scent organs, more especially the ventral neck gland.

The Century and the Lepidopterist.

By Professor A. RADCLIFFE GROTE, M.A.

In the beginning of the nineteenth century the lepidopterist is chiefly collector, hoarding coveted treasures and devoting odd times to looking up their counterfeits in the books of the eighteenth century pictorialists. At the close he has become scientific. Considering Malpighi and Ray, Swammerdam and Roesel, he had plenty of precedent, besides the inalienable right of becoming what he wanted to be, but he was then satisfied with catching his flies, or appears to us so to have been. The heights to which he rose were attained in putting the new species in the books. Now the demon of enquiry and the vanity of the world possess him. So much of the time as could be spared by mankind from the occupations of robbery and murder has been given, during the departed hundred years, to Science, and, in the final results to knowledge, directly by observation and experiment, indirectly through hypotheses proven, the collector of lepidoptera has his share. To Wallace and Darwin he may be particularly grateful—the middle of the century connects the lepidopterist with the biologist most firmly. At the close of the century the increasing division of social labour breeds specialists everywhere, but the specialist in the lepidoptera does not narrow, despite commercialism and categorism he remains biologist. Herein lies the gradual change. He has passed from his peaceful passivity and simple ambition, to an active stumbling among fragmentary facts, combined with the difficulty of expressing experience in unbroken English; and upon him, too, rests the burden of the new view of Nature—his increasing movements excite increased antagonism. The methods of study have deepened and widened. In the beginning of the century Hübner is satisfied with describing the colour, shape and markings of butterfly wings, but then comes Herrich-Schäffer scraping off the scales to study the underlying and supporting nervures, paying for his curiosity with a more fretful existence. Afterwards Redtenbacher homologises the neural structure of all the insects, and then comes Comstock to reform the nomenclature and give us a philosophy of the neuration; whilst I try to show the movements of the shifting nervures in the butterflies, to use these movements in separating the older from the younger types, to push the vehicle of classification along the road of phylogeny. For the correctness of the theory some palæontological evidence is then adduced by Rebel. So much may in parenthesis illustrate the deepening in the methods of the lepidopterist's work. As to the general view of nature he has been obliged to relinquish the conception that his specimens are simply curios; he now sees them to be part of the sorry scheme—though as to whether this be really a scheme and who is the schemer we be not resolved. The Pot, of Hebrew, Greek or Persian origin, more openly resents his make, and now looks angrily for the Potter—he must mend himself or destroy the pattern.

The century has brought improved means to the lepidopterist. Microscopy and photography offer aid. The value of the latter became clear to me in the seventies in picturing butterflies, though my first attempts were scoffed at. Improved ways are now generally utilised, and that photography will be more largely used by the lepidopterist in the future can no longer be doubted. This art has also influenced a philosophical view of the world. By proving the existence of unseen light rays in the spectrum it has developed the Baconian axiom that Nature excels the fineness of our senses and understanding. Hegel, with his notion that Nature lags behind the idea, declines.

No retrospect of any branch can ignore what in America we called Practical Entomology. In the United States the effort reaches back to Harris and beyond. It took more determinate form with the founding of the *Practical Entomologist* just before the war, when the notion of appealing to the State for aid became general. Herein were the entomologists practical—that they demanded pay for their services. Although Buffon's animal "Infusoria" and Schleiden's botanical "Bausteine" be successfully identified with Schwann's "Cell," and thus the way into the past be shown where man and the tree took their parting, the differences between plants and animals are obvious to the beholder. To accomplish their life-processes, plants need the warmth of the sun's rays, whereas animals radiate heat received through their food. The plant stores up heat which is set free when its cells are resolved in the stomach of the animal. Plants are relatively stationary and, fortunately for them, have no central consciousness, else could they perceive the pain which their mode of growth evidently brings with it. They are not aware and make no defence when attacked by caterpillars and worms. These not only kill the plant but destroy the profit also. This is the "rub" which has set agricultural communities indignantly in motion. They asked the advice of science and a body of men were found to give it when paid for. The labourer is worthy of his hire. Still there are good women to be found who give excellent entomological advice gratis. The nineteenth century has set Practical Entomology on its feet. America had need of all the help entomologists could give—as usual, her worst enemies are imported from Europe. Those interested should read the Rev. Dr. Bethune's paper on recent work in economic entomology, both for the facts and their presentation.

In theoretical work the century may have occasionally shocked the average lepidopterist, but at the close no great harm is done. The great Linnean groups may be interiorly rearranged, but the groups themselves remain. At the most, the necessity for altering the position of certain families: *e.g.*, *Cossidae*, *Sesiadae*, *Anthroceridae*, *Cochlidionidae*, may be thought to be sufficiently demonstrated. Practical considerations, inseparable from catalogues and collections, should preclude any alteration in the Linnean general sequence, for which no exact scientific excuse can indeed be offered. It is mere eccentricity to start with moths, putting the butterflies in the middle, and eccentricities may not endure. In the meantime the new edition of Staudinger's *Catalogue of the Palaearctic fauna* will keep us safe for a while.

The student of the new century must seek in a new faunal work, like that of Tutt's *British Lepidoptera*, for the record of what has been thought and observed on the lepidoptera in the years. It will save him immense labour, here performed for him. It may be that, as time goes on, the biologist will be satisfied with structural types and neglect species which are mere repetitions of the phase. On the other hand the varieties may increase in interest. Some economy will be practised, in selecting forms bearing on the question of the changes in appearance and structure. Great collections, like that of the British Museum, will give the student "Ueberblick," and, I have no doubt, food for thought and comment. Within those venerated halls they have apparently just woke up to the fact that Herrich-Schäffer and Lederer existed. In the new century they may arrive at Redtenbacher and Comstock. I wish they had been as conservative with type collections.

Theoretical entomology has still preserved the idealist, who, despite the brutality of nature and his own hard fate, draws pleasing pictures on his prison doors. Our old friend the collector of the beginning of the century, in his dusty naturalist's shop, gloating over his treasures, is his ancestor also, whose occupation is to beautify the fact. For now Haeckel has told us all, that man appears so late in the sequence of matter and the world, he cannot be in reason considered as the prime object in creation or evolution either, and that man's consciousness is so bodily conditioned, it cannot be held as an independent spiritual entity. Against these conclusions we can only place the fact that man presents the highest specialisation of the psychic principle. By this he is enabled to overlook himself and the world and to judge both. May he regard the lepidopterist favourably in the future, whose weakest point is to be compelled to kill his butterflies.

In the competition for favour, the lepidoptera hold their own. To religion they have given a figure, to art a likeness, and their blending colours and outlined markings may suggest new conventionalism in drawing, to please the Fancy. Art goes its own way, the butterfly collectors theirs, but there are points of possible meeting which should not be blindly passed. The century has been kind to the lepidopterist. It has advanced his importance and multiplied his treasures. His soul's content—*ne te quaesireris extra*—he must for ever seek within himself. And, after all, this is the only possible and thinkable world, full though it be of negative pleasure and positive pain.

Weismannism and Entomology.

By A. W. BACOT.

No century number of an entomological magazine would be complete without some reference to the work of Professor August Weismann, and I can fully appreciate our editor's desire to have an article dealing with his work. What I do not understand is why he should have asked me to write it, my only qualification, so far as I am aware, being that I hold Weismann's theories of heredity in preference to any other with which I am acquainted. My knowledge of his work is largely limited to *The Germ Plasm*, the lecture before the International Congress of Zoologists at Leyden, September, 1895, on *Germinal Selection*, and a series of experiments on different species of rhopalocera, a translation of which appeared a short time since in *The Entomologist*. Of these last, which all entomologists must have perused with interest, it is quite unnecessary to speak, but a few notes on the two former may serve to recall the attention of readers of *The Record* to the subject.

It seems strange that work so important to zoology as a whole, by an entomologist, should not have received enthusiastic welcome at the hands of the general body of students of the last-named science. Personally, I have found only a minority of my entomological friends interested, and still fewer appreciative of the work; while, for the most part, they seemed as distrustful of these theories as primitive man might be supposed to have been of fire on its first inauguration as a help to mankind. There is little doubt that the study of the complex problems offered by the life-cycles of the specialised insecta largely influenced Professor Weismann in his theories. The puzzling phenomena connected with the sharply-defined and divergent metamorphosis of some orders, the possession of a so-called neuter sex in others, and the phenomena of hybridisation, demand elaborated theories if they are ever to receive intelligent explanation. And it is with these, and problems of similar complexity, that Weismann's work will probably bear good fruit in the future, even if it only acts as a stimulus to a fresh generation of workers. Personally, however, I should expect the main lines of Weismann's theories to form the foundation of future work in heredity.

The difficulties of finding stable theories (commonly called "natural laws") to fit and account for the orderly movements of the heavenly bodies with their slow and slight perturbations, occupied the best intellects of mankind for centuries, and even nowadays slight alterations and adjustments of the theories are needed to account for the facts discovered by later and more accurate observations. We cannot, therefore, expect that a complete and permanent theory to account for the immense range of relatively unstable phenomena arising from the infinitesimal scrap of protoplasm, which is the essential factor of heredity, will be attained without generations, if not centuries, of devoted labour and co-operation on the part of biological students. This, however, is no excuse for not using the tools, admittedly imperfect though they may be, supplied ready to our hands by the pioneers in this branch of research, for I take it that a scientific theory is essentially a tool, and its use much the same as that of any other tool, *i.e.*, as a labour-saving appliance. Even when sufficiently stable and supported by so large a consensus of opinion as to be termed a "natural law," it still retains its subjectivity to man, and remains, as Professor Karl Pearson puts it, "only a shorthand method of resuming a wide field of sense impressions in one short formula," in other words, a labour-saving appliance for the economy of thought.

Those who have read the modest, yet outspoken preface to *Germinal Selection* will bear me out in saying that Professor Weismann is perfectly conversant with the limitation of theories in general, and his own in particular, in this direction, and does not hold the exaggerated notions of their permanence and objectivity that some of his critics would appear to do. It has been urged as an objection to Weismann's theory of the "germ plasm," that he found it necessary to meet the attacks of his critics by a modification of the absolute unalterability of the germ plasm and the addition of the so-called new theory of "germinal selection." I have never been able to find that the absolute unalterability of the germinal substance was stated in *The Germ Plasm*, possibly it was so stated in one of his earlier essays that I have not seen, but, when reading *The Germ Plasm*, it appeared to me that it was taken as an accepted principle, if not explicitly stated, that the germ substance must increase and multiply through the assimilation of nutriment supplied by the soma or body which also forms its environment. Modification by the quality of the nutriment and the temperature and pressure of the surrounding soma would of course be not only possible but probable, but Weismann's view was that the germ plasm was unalterable, and had absolute immunity from any direct interference by, or inheritance from, the body as opposed to Darwin's "pangenesis."

In any case I cannot see how modifications or additions to the theory as first stated can be brought forward as objections to the theory as at present constituted; surely it must stand or fall on its present merits or demerits. It is surely rather a justification of the early publication of this theory that the wide-spread criticism to which it was at once subjected enabled its author to remedy its weakness by alteration and the addition of what is, strictly speaking, not a new theory but a further extension of the older theory of natural selection—as necessary to Weismann's *Theory of the germ plasm* as the acceptance of some scheme of heredity was to the *Origin of species by natural selection*. Just as we apply natural selection upwards from the struggle among individuals to the struggle of species and genera, or with man to the struggle of tribes, communities, or nations, with each other; so we may, with equal justice, apply it downwards to the struggle of the different parts or organs of a developing embryo (the "intra-selection" of George Romanes) and the "struggle of the ultimate living units" of which, according to Weismann, the germinal substance is theoretically composed. This last is "germinal selection," and if we accept "natural selection" in any form, we can only legitimately attack this theory by rejecting the subdivision of the germinal substance into separate living units. Weismann's assumption of ultimate units and their elaboration into organised groups or aggregations, units of higher order or "determinants" as he calls them, is, of course, equally as theoretical as the assumption of atoms and molecules by the physicist, and has the same justification. Unless we assume some subdivision of the germinal substance the whole phenomena of heredity become inexplicable. The simpler problems of entomology as presented in the larval, pupal, and imaginal stages become impossible of clear explanation, while the more complex ones become unthinkable, such as the varying number of moults of certain larvæ by the interpolation of an instar with a distinctive coat as Dr. Chapman found to be the case with *Jocheaera alni*, or, the entire independence of the pupal stages of some species from any influence of specialised larval characters, *e.g.*, *Stauropus fagi*, and the marked reversal of this principle in others, for instance, some Liparids and Pterophorids. Again how is it possible to account for the problems of hybridisation, unless on the theory of an elaborately organised germinal substance. In the hybrid larva of *Smerinthus ocellatus* ♂ and *populi* ♀, there is in the first stadium, a balance of the characters of the male parent, later the characters of the female parent become predominant, followed by an oscillation back towards the characters of the male parent. The genital organs of the male hybrids differ from those of both the parent species, but show no signs of inefficiency, those of a female specimen, however, were gynandromorphic, yet the external sexual organs of the pupa of both sexes show no tendency to any confusion of sex, nor differ in any respect from those of the parent species in the pupal stage. With a theoretic subdivision and organisation of the germ plasm, however, all these problems are easily explained, Weismann's theory allowing of an immense range of variability in its potentialities. His ultimate living units or biophors are necessarily larger than molecules, being composed of several at least of these inorganic bodies. Determinants or units of control are composed of definitely arranged aggregations of biophors, and are capable of setting up and controlling the growth aud activities of parts of a cell or group of cells. The controlling principle of the imaginal discs of a larva (*vide*, chapter on "Metamorphosis" in Tutt's *British Lepidoptera*, vol. ii), from which source the future legs, wings, or other organs of the imago will be developed, would consist of a group or sequence of determinants. Ids are units of the third or highest grade, are made up of a series of determinants, and contain all the potentialities for the development of the future organism. Weismann remarks that theoretically a single "id" would be sufficient for ontogeny.

Even in his rejection of the transmission of acquired characters, one would expect Weismann to meet with more support from entomologists than from students of the vertebrata for example. It is comparatively easy to understand how gemmules of increasing efficiency may be developed and given off from a developing muscle, nerve tissue or bone of a vertebrate, but what chance have the nervures, scales, wing-membrane, &c., of the wings of a butterfly of acquiring any characters by use, save baldness and raggedness, or of developing and transmitting improved gemmules once the wing has hardened sufficiently for flight? In this case, at any rate, progression must rely on the histonal selection of William Roux, the intra-selection of George Romanes, the germinal selection of Weismann, or panmixia, and not at all on use-inheritance, the organs in question being incapable of acquiring any characters during their period of active use.

In concluding I would commend Weismann's works to all entomologists who are not yet acquainted with them; they will at least enable them to see more clearly some of the difficulties of the problems connected with heredity, and stimulate to further work and discovery in this attractive field of research.

The Literature of British Coleoptera for the past Century.

By Professor T. HUDSON BEARE, B.Sc., F.R.S.E., F.E.S.

The literature of British coleoptera may be said to be a product of the 19th century only, as prior to 1801 nothing of any value had been published dealing with that branch of entomology, and, in fact, with the exception of Marsham's *Entomologica Britannica* (Lond. 1802), the first work was that classic, Kirby and Spence's *Introduction to Entomology*, which began to appear in 1822. Marsham's book is mainly of interest now, probably only to the systematist, on account of his copious references to the various authors by whom the original descriptions were given of the insects not first described by him; the genera adopted were Linnean, and it is curious to find the whole of our *Geodephaga* under two genera only, *Cicindela* and *Carabus*, the latter containing 109 species, so that our fauna was fairly well known even then. To the *Introduction to Entomology*, I, and I expect many another entomologist, owe my first love of the insect world. How greedily were its pages devoured when, then a boy at school, the first copy came into my hands, and what pleasure has it given whenever taken up since those early days. The first volume of my own copy is marked on the title page as 4th Edn. Lond. 1822, but the third and fourth volumes are marked 1st Edn. 1826, and I find a similar state of things in regard to the oldest copy in the library of the Entomological Society of London, I presume, therefore, that 1822 is the earliest date of all the existing complete sets. In the preface on p. vi. the authors point out how at that date there were only three works "professedly devoted to this object, which the English language can boast," and we may, therefore, rightly claim that the publication of this book marks the beginning of the scientific study in Great Britain, not only of coleoptera, but of entomology in general. The *Introduction* has too long occupied its position in the front rank of entomological literature to need any words of praise from me. The period with which we are now dealing was very prolific in entomological literature. On January 1st, 1824, appeared the first part of Curtis' great work on *British Entomology, being illustrations and descriptions of the Genera of Insects found in Great Britain and Ireland*, sixteen years elapsing before the publication was complete; volumes i and ii are devoted to coleoptera, and, at the end of vol. ii, is a systematic and alphabetical index of the genera dealt with. A mere glance at its contents is enough to show the enormous strides which had been made in the scientific side of entomology since 1801. The superb illustrations of these volumes still remain unsurpassed, well deserving the high encomium passed upon them by Cuvier. How unfavourably do our modern cheap plates compare with these masterpieces. Though Rye in *British Beetles*, p. 29, curtly says "the letterpress is of little use," I am by no means disposed to agree with him, I have found the letterpress very often useful for purposes of reference, and the mere handling of this book is a pleasure to a lover of books; would that in our own age the same loving care could be shown in every detail of a book and the same leisurely haste be shown to perfect it in every respect, how slovenly much of what is now published appears in contrast with these old works. With this work Curtis also published a *Guide to an arrangement of British Insects* (2nd Ed., Lond., 1837), a catalogue in fact for the use of students and collectors. In this 2nd Edn. (the 1st Edn. appeared about eight years earlier, 1829-1831), the first 79 pages are devoted to coleoptera. While dealing with Curtis' work, we may mention here, another in which an enormous amount of valuable information as to the life, habits, and breeding of many insects is given ; I refer to *Farm Insects*, first published in 1859. Curtis' papers published in the *Journal of the Royal Agricultural Society* from 1841 to 1857, descriptive of the natural history and economy of insects of all orders injurious to field crops, may be said to have originated the real study of economic entomology by British agriculturists; how well his work has been continued in this country by Miss Ormerod is well known. Work of this nature has been too much neglected by many of our coleopterists, and though, in consequence of the terrible confusion into which our lists were brought at one time, an immense amount of synonymic work was essential, the day for that has now almost gone by, and yet we see but little change in the methods of our workers. For how few after all, of our native coleoptera, have the life-histories been worked out, how little do we know of the economy and breeding-habits of even well-known insects! Granted that the work is difficult, still the masterly papers contributed by Dr. Chapman and Mr. Blandford to the pages of the *Entomologist's Monthly Magazine* show how much information, often of the greatest importance both from the scientific and from the practical side, can be obtained by patient investigation. Simultaneously with Curtis, Stephens was busy with his *Illustrations of British Entomology*, Lond., 1828-1846, the first five volumes of which were given up to coleoptera; in 1829 he published a systematic catalogue, and in 1839 (Lond.) his *Manual of British Coleoptera*. Much as we may admire his extraodinary industry, and the self-sacrificing spirit in which he worked, still it must be confessed that these works are full of blunders, and the nomenclature is in such a state of utter confusion that Stephens' works are of but little value to the modern worker. To the confusion into which Stephens reduced the nomenclature not only of beetles but of all orders, is in a large measure due the amount of valuable time which had to be given by the workers who followed him for many years to questions of synonymy, and to the labour of bringing our lists into some sort of reasonable agreement with those of the continent. To this necessary work is due much of the neglect of the other aspect of the study we have before mentioned. In 1839-40, Westwood gave to the world his masterpiece, *The Introduction to the modern classification of Insects*, a work which we may truly say is still unequalled in its own line, and which every worker ought to know as thoroughly as he generally knows his own list of captures. How often do we find our field-workers neglecting the literature of the science they are supposed to be studying. I assert most emphatically that field work is rendered not only more interesting, but much more valuable to all, by previous reading; a thorough knowledge of the chief works which have been written, and of the chief memoirs which have appeared on insects in the order we study, is essential to all real progress and advance, else are we like a man groping blindly in the dark, while close at his hand is the switch which will give him in a moment the full blaze of light. In the year 1840, appeared *British Coleoptera delineated*. The plates were by W. Spry and the editor was W. E. Shuckard (Librn. R.S.); this is an invaluable book for the beginner, especially when he has not the opportunity of consulting a public or fairly complete private collection, or the *British Coleoptera* of Canon Fowler. The plates (and figures are given for every known British genus) are superb and fully justify the boast of its editor in the preface "yet in careful accuracy I am convinced it is not by that even surpassed;" with their help the young student has no difficulty in assigning his captures to their respective genera.

Now comes a considerable interval of time in which but little was published in this country on coleoptera, the spell at length being broken by the appearance, in 1854, of Dawson's *Geodephaga Britannica* (Lond.); for this part of our order, always a favourite study, Dawson worked a complete revolution, all Stephens' imaginary species which had cumbered our lists and brought about such endless confusion were at once swept away, and in 1858-61, G. R. Waterhouse, in his *Catalogue of British Coleoptera*, dealt with the whole order in a similar fashion. These two books, therefore, mark the dividing line which separates our modern lists from the older confined conditions of Curtis and Stephens. Dallas' *Elements of Entomology* (Lond., 1857), a popular treatment of the science for beginners, devoted two chapters —v and vi—entirely to coleoptera, the first four chapters dealing with the structure, transformations, &c., of insects generally. The next catalogue after Waterhouse's was one published by Crotch (Camb., 1863) (a 2nd edition in 1866), whilst, in 1867, a joint paper by Crotch and Sharp was read before the Entomological Society of London, giving additions to the catalogue and describing in detail several new species. Between these publications there appeared, in 1866, Rye's *British Beetles* (Lond.), the book which has been, perhaps, of all those published in England, the most valuable to the young student, and the one to which many a worker owes his first introduction to the science. A catalogue was given at the end of the volume, but in a new edition lately published, edited by Canon Fowler, this has been, we regret to say, omitted; it would have been perfectly easy to reprint one of the modern catalogues, and thus have made the new edition more valuable to those purchasing it in order to begin the study of the order. In 1871, appeared Dr. Sharp's first *Catalogue* (a 2nd edition in 1883), and, in 1872, the monograph on the *Trichopterygidae*, by the Rev. A. Mathews, *Trichopterygia illustrata et descripta* (Lond.), another classic. If a collector is ever to identify his specimens of these minute genera it can only be done by patient use of this monograph, a model of what such a work should be, both in letterpress and plates. A supplementary volume, edited by Dr. Mason, has just been issued from the press (1900), the lamented author not living to see the completion of his devoted labours. Another step forward was taken when Cox's *Handbook of the Coleoptera of Great Britain and Ireland* appeared in two volumes in 1874, and, at last the student of our order had a trustworthy English work giving a description of every species, accompanied by excellent tabular arrangements of the species for each genus; by its aid it was possible, given a preliminary general knowledge of the order, to work out with fair prospect of success, the name of every capture. There were, however, no plates, structural or otherwise, and no localities were given, and very little information beyond the specific descriptions. Something further was still wanted, and our wants were not supplied till Canon Fowler began, in 1886, the publication in parts of his *Coleoptera of the British Islands*, eventually issued in five volumes. This work is the high water mark of our knowledge of the British coleoptera, for though year by year small additions to our lists are being made by the discoveries of new species, and gradually some of the synonymic tangles left still unravelled by Canon Fowler are being worked out, still, the whole of these could be easily dealt with in a small supplementary volume. Canon Fowler's book is remarkable for the great attention paid, for the first time, to the distribution of species, and for the structural details shown magnified on so many of the plates. Where genera and species are separated by obscure structural characters, often difficult to see, or requiring long verbal explanations to make them understood, a good enlarged drawing is of the utmost value to the student, and one often wishes that more of this kind of thing had been given in the plates of these five volumes. A book on such a scale was bound to have a few inaccuracies, and, at times, we find the tabular descriptions hardly fit in with the detailed descriptions of the species, but I have no hesitation in saying that Canon Fowler has greatly increased the number of workers in this field of science by the admirable text-book he has given us, and has enormously simplified the work of everyone; the knowledge of this must be some slight recompense for the severe labour involved in its preparation. I hope that, as this year marks the tenth anniversary of the publication of the concluding (fifth) volume, we may have the pleasure of hearing that Canon Fowler has on hand a supplement. My own copy is full of pencil notes, and so, too, I know are those of others, all of which will be gladly placed at the disposal of the author for his use while preparing a supplement. Canon Fowler and Dr. Sharp published jointly in 1893 a *Catalogue*, the last to appear during the century.

It is impossible in the space at my disposal to do justice to the serial entomological literature of Great Britain during the past 100 years, Mr. Capper in his presidential address to the Lancashire and Cheshire Entomological Society in 1898 (*Ent. Record*, x., p. 54) dealt fully with this subject. At Christmas, 1854, appeared the first volume of the *Entomologist's Annual*, a publication which appeared for twenty years, and is still a mine of valuable information to coleopterists. Much of Rye's best work appeared in its pages, in his annual reviews of the advances made both in knowledge of the science and of our indigenous beetle fauna. Here, too, appeared, in 1857 (p. 85) and 1858 (p. 78), E. W. Janson's well-known articles on myrmecophilous coleoptera, in which this interesting branch of work was first brought to the notice of British workers. Neglected again in great part for many years, Mr. Donisthorpe has during recent years taken up this subject, and his industry, patience, and knowledge of it are well shown in the numerous articles which have appeared during the last two years in the pages of this journal and in those of the *Ent. Mo. Magazine*. *The Annals of Natural History*, which first appeared in 1838; *The Entomologist*, which had a brief life in 1840-42, and then again reappeared to appear continuously from 1864 to the present date; *The*

Entomologist's Weekly Intelligencer (1856-61) ; *The Entomologist's Monthly Magazine*, which started in 1864 ; and *The Entomologist's Record*, in 1890, must all be diligently searched by the student who would make himself master of his subject and of the advance of entomological knowledge in this country during the past fifty years. The *Ent. Mo. Mag.* and the *Ent. Record* in particular are full of articles of the highest scientific value, apart altogether from the information they contain on the distribution and times of occurrence of our native species, information invaluable to those working at these aspects of the subject. Three valuable local lists I must say a few words about, *viz.*, "The Coleoptera of Norfolk," by James Edwards (*Trans. Norfolk and Norwich Nat. Soc.*, vol. v., 1893) ; "The Coleoptera of Suffolk," by C. Morley (Plymouth, 1879) ; and "The Coleoptera of the Rochester District," by J. J. Walker (*The Rochester Naturalist*, July 1897—July 1900). These lists are not mere columns of names, but are full of information as to habits, localities, times of appearance, &c., and, in fact, contain just those facts which make them indispensable to every worker. Lastly, I must mention the *Transactions of the Entomological Society of London*, where such epoch-making memoirs as Dr. Sharp's *Revision of the British Species of Homalota* first saw the light, and many another besides.

Many memoirs such as Dr. Sharp's "Aquatic Carnivorous Coleoptera" (*Trans. R.S. Dublin*, 1882) not dealing specially with our British coleoptera must be studied by anyone who is anxious, as all should be, to see the place our limited fauna holds in the greater European one.

Evolution of our knowledge of Myrmecophilous Coleoptera.

By HORACE ST. J. K. DONISTHORPE, F.Z.S., F.E.S.

The first reference which I can find to this interesting subject was made by Caspar von Schwenkfeld, of Leignitz, in 1603, when he referred[1] to a gold beetle in ants' nests under the name of "Cantharis formicaria latior," and described it as hatching from a white worm in ants' nests. The reference is undoubtedly to *Cetonia*. In 1687, Lockner gives a further account[2] of *Cetonia* in ants' nests, describing and figuring the larva, pupa, and pupa-case, whilst, in 1749, Roesel von Rosenhof mentions[3] the same species, beautifully figuring the beetle in all its stages. De Geer[4], in 1778, also calls attention to the presence of the larvæ of *Cetonia* in ant-hills, and remarks that they are tolerated by the ants. So much for the records previous to the present century. In 1817, Sahlberg described[5] *Lomechusa strumosa* as occurring with *Formica rubra* (=*F. sanguinea*), and, in 1818, Müller gives a very good account[6] of the habits of the genus *Claviger*, calling attention to the fact that the beetles secrete a sweet juice, eagerly devoured by the ants,

[1] *Theriotropheum Silesiae in quo animalum, hoc est quadrupedum, reptilium, avium, pisceum, insectorum natura, vis et usus sex libris perstringuntur*, Lignicii, 1603, Lib. iv., p. 521.

[2] *Ephem. Ac. Nat. Curios*, 1687, Decur. ii., An. vi., Observ. ccxv., pp. 436-441.

[3] *Der monatlich herausgegebenen Insecktenbelustigung*, Zweiter Theil, N. ii., pp. 11-16. 1749.

[4] *Abhandlungen zur Geschichte der Insekten*, Nürnberg, 1778, Bd. iv., p. 116.

[5] *Insecta Fennica, dissertationibus academicis annis*, 1817, p. 404.

[6] *Germar's Mag. Ent.*, iii., 1818, pp. 69-112.

who feed them in return. He records *Claviger foveolatus* with *Formica flava* and *C. longicornis* with *F. umbrata*. Other beetles mentioned by him in ants' nests are *Lomechusa strumosa* and *L. dentata* (=*Dinarda dentata*) with *Formica rufa* (=*F. sanguinea*), *L. paradoxa* (=*Atemeles paradoxus*) with *F. rubra* (=*Myrmica rubra*), *Nitidula marginata* (=*Amphotis marginata*) with *F. nigra* (=*Lasius fuliginosus*), and *Hister quadratus* (=*Hetaerius sesquicornis*) with *F. fusca*. In 1823, Wesmael, in a letter[7] to M. le comte de Dejean, describes *Claviger testaceus* living with *Lasius flavus* and the secretion obtained by the ants from the beetle. In 1835, Chevrolat mentions[8] the capture of *Lomechusa paradoxa* (=*Atemeles paradoxus*), *Hister globulus* (=*Abraeus globosus*), and *Pselaphus formicarius* (=*Batrisus venustus*) with ants; *Hister quadratus* (=*Hetaerius sesquicornis*) with *Myrmica unifasciata* (=*Leptothorax unifasciata*) and *F. rufa* (=*F. sanguinea*), *Lomechusa strumosa*, *L. dentata* (=*Dinarda dentata*) with *F. rufa* (=*F. sanguinea*), *Xantholinus*, sp.? (probably *atratus*), *Hister pygmaeus* (=*Dendrophilus pygmaeus*), *Monotoma conicicollis*, *M. formicetorum*, *Clythra* larvæ and cases, which he describes, and *Myrmechixenus* (=*Myrmecoxenus*) *subterraneus*, which he describes and figures, with *F. rufa*. In 1837, in an essay[9] on the genus *Monotoma*, Aubé says that *M. conicicollis* and *M. formicetorum* are found with *F. rufa* in the Bois de Boulogne. Erichson, in 1839, gives some useful notes[10] on ants' nest beetles, recording *Batrisus venustus* in company with *Euryusa sinuata* in an ants' nest in a hollow tree (probably *Lasius fuliginosus*), *Myrmedonia humeralis*, *M. funesta*, and *M. lugens* with *L. fuliginosus*, *M. limbata* with *L. flava*, *M. canaliculata* (=*Astilbus canaliculatus*) with ants, *Lomechusa paradoxa* (=*Atemeles paradoxus*) and *L. emarginata* (=*Atemeles emarginatus*) with *F. rubra*; *Hister quadratus* (=*Hetaerius sesquicornis*) with ants, and *Dendrophilus pygmaeus* with *F. rufa*. Stephens[11], in 1839, only mentions with ants, in England, *Claviger foveolatus* with *Formica flava*, *Atemeles paradoxus* (=*Atemeles emarginatus*) in nests of *F. rufa* and *Dinarda dentata* (=*D. maerkeli*) in ants' nests. In a paper[12] read before the Entomological Society of London on September 3rd, 1839, Mr. F. Smith records the capture of *Atemeles emarginatus*, which ran out of a nest of *F. rufa*. He says that species of *Pella* (=*Myrmedonia*) occur with ants, and that he has found *Pella humeralis* inthe nests of *F. rufa*. In 1841, Schmidt, in a paper[13] on *Clythra* 4-*punctata* and its nearest allies, describes the myrmecophilous habits of the larvæ. In 1841 Maerkel records[14] some 31 species of coleoptera found with ants; in a second paper[14a] he names some 284 species of insects found with ants, of which 274 are beetles. F. Smith, in 1843, records[15] the capture of *Claviger foveolatus* with *Lasius flavus* at Mickleham by himself, Doubleday, Ingall, and

---

[7] *Encyclop. Méth. Hist. Nat. Entom.*, T. x., p. 223, 1825.
[8] *Rev. Ent. Silbermann*, ii., 1835, p. 263.
[9] *Ann. Soc. Ent. Fran.*, 1837, p. 453-469.
[10] *Die Käfer der Mark Brandenburg*, Bd. i., Berlin, 1839.
[11] *A Manual of British Coleoptera*, London, 1839.
[12] *Trans. Ent. Soc. Lond.* (1), iii., 1842, p. 151-154.
[13] *Stett. Ent. Ztg.*, 1841, p. 146-155.
[14] *Germar's Zeitschr. f. Ent.*, iii., 1841, p. 203-225.
[14a] ,, ,, ,, ,, v., 1844, p. 192-271.
[15] *Zoologist*, i., 1843. p. 266-269.

Stevens; also *Astilbus canaliculatus* with the same ant, and *Atemeles acuminatus* with *F. fusca*. Kiesenwetter in 1843[16] first records *Myrmedonia cognata* and *M. lugens* with *L. fuliginosus*, also *M. funesta*, *M. laticollis*, and *M. humeralis* with the same ant. *Homalota anceps* with *F. rufa*, as well as *L. fuliginosus*, and describes *Dinarda maerkeli*, *Scophaeus pusillus*, and *Othious myrmecophilus* with *F. rufa*. In 1844, Boheman gives[17] a list of beetles taken by him with *F. rufa*, and, in the same year, Schioedte records[18] the myrmecophilous beetles captured by him in Denmark. In 1845, Grimm mentions[19] 67 species of coleoptera he has taken with ants near Berlin, and says the ants lick some of the species of *Staphylinidae*. In 1849, Kraatz also gives[20] a list of myrmecophilous beetles he has taken, referring to the work done by Grimm and others; and in 1851 he gives[21] a further list, and describes *Ptenidium formicetorum* which he took with *F. rufa* and *L. fuliginosus*. Bach, in 1851, records[22] *Chennium bituberculatum* with *Myrmica impura* (=*Tetramorium caespitum*), *Claviger longicornis* and *Batrisus venustus* with *Formica timida* (=*Lasius brunneus*) and *Claviger testaceus* with the last ant, as also *Formica fusca*. In 1852, Mr. Weaver exhibited at the Ent. Soc. meeting on Nov. 1st, *Cetonia aenea*, hatched from larvæ taken in *F. rufa* nests in Scotland, and said the larvæ fed on the pupæ of the ants. Fairmaire[23], in 1854, records the species of Coleoptera found with ants in France. In 1857, Janson, in a most useful paper[24] on "The Myrmecophilous Coleoptera of Britain," records the following species, with their respective hosts: *Trichonyx?* with *F. flava*, *Claviger testaceus* with *F. flava* and *F. fusca*, *Myrmedonia canaliculata* with *F. flava* and *M. rubra*, *M. limbata* with *F. flava* and *F. fuliginosa*, *M. humeralis* with *F. rufa*, *M. cognata*, *M. funesta*, *M. laticollis*, and *M. lugens* with *F. fuliginosa*, *M. haworthi* with *F. rufa* (?), *M. collaris* with *Myrmica rubra* (?), *Homalota flavipes* with *F. rufa*, *H. confusa* with *F. fuliginosa*, *H. anceps* with *F. rufa*, *Oxypoda vittata* with *F. fuliginosa*, *O. haemorrhoa* and *O. formiceticola* with *F. rufa*, *Aleochara ruficornis* with *F. fusca*, *Thiasophila angulata* with *F. rufa*, *Homoeusa acuminata* with *F. fusca*, *Dinarda maerkeli* with *F. rufa*, *Lomechusa strumosa* with *F. rufa*, *Atemeles paradoxus* with *F. fusca*, *A. emarginatus* with *F. fusca* and *M. rubra*, *Leptacinus formicetorum* with *F. rufa*, *Staphylinus latebricola* with *M. rubra*, *Quedius brevis* with *F. rufa*, *Hetaerius sesquicornis* with *F. fusca* and *F. flava*, *Dendrophilus punctatus* and *D. pygmaeus* with *F. rufa*, *Saprinus piceus* with *F. rufa*, *Amphotis marginata* with *F. fuliginosa*, *Cetonia aurata* (larva) with *F. rufa*, *Clythra 4-punctata* with *F. rufa*, *Monotoma conicicollis* and *M. angusticollis* with *F. rufa*. In 1857[25], the capture by Wollaston of *Nitidula marginata* (=*Amphotis*) with *Formica fuliginosa* at Pangbourne, and *Claviger testaceus* and *Homoeusa acuminata* with *F. fusca* near

---

16 *Stett. Ent. Ztg.*, 1843, p. 306-310.
17 *Oefvers. K. Sv. Vet. Ak. Förh.*, 1844, p. 155.
18 *Germar's Zeitschr. f. Ent.*, v., 1844, p. 473.
19 *Stett. Ent. Ztg.*, 1845, p. 123-136.
20 ,, ,, ,, 1849, p. 184-187.
21 ,, ,, ,, 1851, p. 166-170.
22 ,, ,, ,, 1851, p. 303-304.
23 *Faune Entom. Française. Coléopterès.* Paris, 1854.
24 *Ent. Annual*, 1857. p. 85-96.
25 *Ent. Week Intell.*, June 13th, 1857, p. 86.

Farnborough, is recorded. In 1858, Janson records[26] in addition to his former list, *Thiasophila inquilina* with *F. fuliginosa* in Kent, and *Dinarda dentata* with *F. fusca* at Plymouth. In 1859, Smith[27] records the capture of *Haploglossa gentilis* (=*Microglossa*) with *F. fuliginosa* at Hampstead, and, in 1862, Janson records[28] the capture of *Xantholinus atratus* with *F. rufa* near Highgate, and in the same year *Haploglossa pulla*, which he said[29] had been first taken by Mr. Gorham with ants in the Isle of Wight. In 1863, von Hagens divides[30] the beetle guests of ants into three classes (1) those which occur only during the larval period, (2) those not always found in the nests, and (3) those that live in or near the nests and seem to obtain their existence by the ants; he then illustrates these classes. In 1865, in a further[31] paper, von Hagens says it is now time to fix the species with their special hosts and define more sharply between the true and chance guests, and then proceeded to carry this out. In 1866, Rye records[32] the capture by Messrs. F. and E. Smith of *Myrmedonia plicata* with the ant *Tapinoma erratica* at Bournemouth, and in the same year he describes[33] *Oxypoda glabriventris* (=*Ilyobates*) from specimens taken by Dr. Power with *L. fuliginosus* at Mickleham. In 1868 Fauvel gives[34] some useful notes on the Myrmecophilous *Staphylinidae*. In 1869, Trimen in a letter[35] to the Ent. Soc., refers to the myrmecophilous habits of the genus *Paussidae* near Cape Town. In 1872, White gives a good account[36] of the inhabitants of the nests of *Formica rufa* in Scotland, recording for the first time the capture of *Quedius brevis* and *Dinarda maerkeli* in that country. In 1872 Rye describes[37] *Bythinus glabratus* from specimens taken by Messrs. Waterhouse with *Trichonyx maerkeli* and a small yellow *Myrmica* (=*L. flavus*) on Seaford Downs. In the same year, Bedel records[38] the capture of *Trichonyx sulcicollis* with *Ponera contracta* near Paris. In 1874 André gives[39] the first general list of all the creatures found with ants, comprising some 588 species, of which 542 are beetles. In 1876, Perris describes[40] the larva of *Abraeus globosus* which he took with *L. fuliginosus* and gives some general notes on the larvæ of myrmecophilous and parasitical coleoptera. In 1881, Carpentier records[41] the capture, in winter, in the nest of *F. rufa*, in the woods of La Villeneuve (Oise) of 25 species of beetles and the pupæ of *Cetonia aurata*, the nest being covered with snow, and the top part frozen hard. In 1883, Fauvel describes[42] *Machaerites falesiae* (=*Bythinus*) which he took with *L. alienus* in

---

26 *Ent. Annual*, 1858, p. 78, 84.
27 *Zoologist*, xviii., 1860, p. 7,024-7,026.
28 *Trans. Ent. Soc. Lond.*, 1862.
29 *Zoologist*, 1862, p. 7,862.
30 *Jahresber. Naturw. Ver. Elberf. Barmen*, 1863, p. 111-125.
31 *Berlin Ent. Ztschr.*, 1865, p. 105-112.
32 *Ent. Annual*, 1866, p. 65.
33 *Ent. Annual*, 1866, p. 67.
34 *Faune Gallo. Rhenane*, T. iii., 1868-70.
35 *Proc, Ent. Soc. Lond.*, 1870, p. iii.-iv.
36 *Scott. Nat.*, i., 1871-2, p. 258-263.
37 *Ent. Annual*, 1872, p. 53.
38 *Ann. Soc. Ent. Fr.*, 1872, p. 41.
39 *Rev. Mag. Zool.* (3), ii. 1874, p. 205-235.
40 *Ann. Soc. Linn. Lyon*, xxii., 1876.
41 *Bull. Soc. Linn. Nord d. l. Fr.*, 1881, p. 212-214.
42 *Rev. d'Ent.*, ii., 1883, p. 153.

Normandy in 1863. In 1882 Sir John Lubbock refers[43] to the habits of *Claviger* and *Lomechusa* with ants, and suggests that some of the myrmecophilous beetles may be kept by the ants as pets. In 1884 Fowler records[44] the capture of *Atemeles paradoxus* at Sandown, which was being carried by a small black ant, he also notes three specimens of *Trichonyx maerkeli* from the same spot. In 1886 Fauvel gives notes[45] on the myrmecophilous habits of species of Histers. We now come to the writings of Father Wasmann, of which, from 1886 to the present time, there are over 100 publications. It is, of course, absolutely impossible in this paper to even attempt to do them justice; 35 papers are on the habits alone of myrmecophilous insects, and we certainly owe the greater part of our knowledge to his industry, untiring energy, and unbounded knowledge of the subject. In 1887-1891, Fowler enumerates[46] 73 species of British beetles found with ants, of which 42 belong to the *Staphylinidae*. In 1888 Lewis records[47] the capture of "Formicarious *Histeridae*" in Spain, Algiers, and Tangiers. He says they are generally found feeding on the larvæ, and that the ants are either unconscious of or indifferent to their presence, and he considers they are physically incapable of freeing the nests of them. In 1888, Walker records[48] *Histeridae* and other myrmecophilous coleoptera, with notes on their habits, from Gibraltar and Tangiers. In the same year Hamilton gives[49] a list of all the species of myrmecophilous beetles, noted to date, in North America, with their hosts and the bibliography on the subject. In 1889, Schwarz[50] gives a small sketch of the work done in myrmecophilous coleoptera and a revised list of the myrmecophilous species of temperate North America. In 1891, Wasmann gives a catalogue[51] of the guests found with ants in Hollandish Limburg, in it he divides them into four classes, namely: (1) The regular guests of the ants; (2) the regular guest of another species of ant; (3) chance guests which are often found with ants; (4) chance guests not often found with ants. In 1892, Wickham adds[52] some further species to the above two lists of North American myrmecophilous beetles. In 1893, Rupertsberger records[53] the capture of the larvæ of *Opatrum sabulosum* in plenty with *F. fusca*, more rarely with *F. sanguinea*, and once with *Camponotus ligniperdus*; he considers they are undoubtedly tolerated guests of the first two species, he further records the larvæ of *Atemeles pubicollis* with *F. truncicola* and that of *A. emarginata* with *F. fusca*. In 1894, Wasmann[54] published a complete list of the creatures found with ants to date, comprising 1177 myrmecophilous species, of which 993 are coleoptera—a monumental work. In 1895, Donisthorpe, in a list[55] of British coleoptera found

---

43 *Ants, Bees, and Wasps.* 1882.
44 *Ent. Mo. Mag.*, xxi., 1884-5, p. 18.
45 *Rev. d'Ent.*, v., 1886, p. 152-213.
46 *Col. Brit. Isles*, vols. i-v., 1887-91.
47 *Entom.*, xxi., 1888, p. 289-294.
48 *Ent. Mo. Mag.*, xxv., 1888-9, p. 374-378.
49 *Canad. Ent.*, xx., 1888, No. 5, p. 161-166.
50 *Proc. Ent. Soc. Wash.*, i., June 25, 1889, p. 237-247.
51 *Tijdschr. v. Entom.*, xxx., 1891, p. 181, and xxxi., p. 242.
52 *Psyche*, vi., 1892, p. 321-323.
53 *Wien. Ent. Ztg.*, 1893, p. 247-249.
54 *Krit. Verz. d. Myr. u. Ter. Arth.*, Berlin, 1894.
55 *Ent. Mo. Mag.*, Aug., 1895.

with ants, records the capture of *Staphylinus stercorarius* with *Lasius flavus* and *Dendrophilus punctatus* with *Formica rufa*. In 1896, he further gives[56] a complete list to date of the British species of myrmecophilous coleoptera with their hosts, and, in 1897, in a list[57] of beetles taken with ants, records *Heterothops 4-punctula* with *Formica rufa* at Weybridge. In 1898 Wasmann publishes a most interesting paper[58] on the guests of ants and termites, going deeply into the life-history of the guests and their relation to their hosts. In 1899, the same author, in a paper[59] on the psychical capabilities of ants, deals with this intricate question by means of many ingenious experiments with ants and with their guests. In 1899, Harwood records[60] *Heterothops quadripunctula* with *F. rufa* and *Hister marginatus* with *F. rufa* and *L. fuliginosus*, both near Colchester. In 1899, Donisthorpe records[61] the capture of *Quedius mesomelinus* in numbers with *Lasius fuliginosus* at Chiddingfold, and in 1900 he notes[62] *Claviger testaceus* with *Lasius alienus* for the first time in England, gives some notes on the life-history of *Clythra 4-punctata*, considering it to be a "mimic" of *Coccinella distincta*, and also a table of all the British myrmecophilous coleoptera according to Wasmann's method as applied to those of Hollandish Limburg, and later in the year he records[63] the capture of *Myrmica collaris* and its larvæ in numbers with *Myrmica laevinodis* at Wicken Fen. In 1900, Walker records[64] the capture of *Staphylinus stercorarius* with *Myrmica ruginodis* at Rannoch.

[56] *Ent. Mo. Mag.*, Feb. and March, 1896.
[57] *Ent. Record*, Oct., 1897.
[58] *Illustr. Ztschr. f. Entom.*, Heft 10-16, 1898.
[59] *Zoologica*, Heft 26, Stuttgart, 1899.
[60] *Ent. Mo. Mag.*, March, 1899.
[61] *Ent. Record*, Oct., 1899.
[62] *Ent. Record*, July, 1900.
[63] *Ent. Record*, Oct., 1900.
[64] *Ent. Mo. Mag.*, Feb., 1900.

The last Christmas of the Nineteenth Century.

By SELWYN IMAGE, M.A., F.E.S.

The thin sands of the dwindling glass
Run swiftly. Ah! my soul, alas!
A single grain thou may'st not stay,
Nor one poor step retrace the way
Of unconsidered hours. For gain
Or loss the account stands fixed. In vain
Well bitter tears for things undone,
Or victories thou might'st have won,
Or falls that flung thee in the dust,
Or visions from thy pathway thrust
By meaner aims.
What might have been!
And lo! what is, now all is seen!

A withered branch for fruit and flower,
A heap of barren sand for dower
Of fair accomplishment, at best
A wraith of idle fancies, crest
On crest of unsubstantial foam!
What hast thou garnered in thy home?
Nor, piteous one, because the fight
Was stern, nor yet because the night
With storm fell oft upon thee, not
Because with mortal ills thy lot
Was circumstanced, thou hast to lay
Thy quivering face in dust to-day.

To-Day! Ah! listen on the air
Ring other notes than wan despair.
Let the dead bury their dead. But thou,
Though faintly throbs thy pulse, thy brow
With dust's defiled, lift up thine eyes:
The world's around thee yet, the sky's
Above thee! Not that thou should'st groan
Prostrate in helpless idle moan
The irrevocable Past breaks in,
Grim ghost of weariness and sin.

Look thou upon it, let it lie
The poor dead thing it is. "But I,"
Soul to thine inmost being say,
"Press onward where the new world's Day
"Holds work in store without complaint,
"And waits for sinner as for saint!"

Edm. de Selys Longchamps

On the progress in the study of the Coccidae.

By R. NEWSTEAD, F.E.S., Hon. M.R.H.S.

Important as the study of the *Coccidae* appears to-day, both from a biological and economic standpoint, we find no systematic study was given to the group until more than half of the nineteenth century had passed away. To begin with the chief authorities prior to 1850, there were Barensprung, Bouché, Fonscolomb, and Westwood, who described between them about 33 species, most of which are considered valid to-day, whilst Burmeister, Fabricius, Curtis, and some twenty others also contributed to the study, but the writings of all these men were of an intermittent character. They paid little or no attention to the anatomy of the insects, their diagnoses being chiefly drawn from external characters, which, however important for the subdivision of the group, were of little value for specific purposes.

In the year 1868 Dr. V. Signoret began his great work "Essai sur les Cochenilles" in the *Annales de la Société de France*, completing the work eight years later (1876). His valuable monograph, which can be had in separate book form, includes all the known Coccids of the world, which amounted to 69 genera and 258 species. Signoret paid great attention to the anatomy of the Coccids in his work, and had his microscopical preparations been made on modern principles, it is doubtful if so many of his species would have fallen into the long list of synonyms. As the result of his labours, there was a steady increase in the number of coccidologists; and within the last few years more attention has been paid to the Coccids than to all the rest of the homoptera together. In 1880-82, Professor J. H. Comstock, of the Cornell University, in the United States, issued his valuable *Reports on Scale Insects*, in which the author dealt chiefly with the subfamily *Diaspinae*, describing many hitherto unknown males, and a number of new species. He also showed us the importance of the study of the structural details of the pygidia of the ♀ *Diaspinae*, illustrating his descriptions of them with beautiful drawings, which were the first of their kind upon which the student could rely for accuracy of detail. Subsequently Dr. L. O. Howard and the late Professor C. V. Riley issued some important papers in the volumes of *Insect Life*, and now the workers in the United States are greater than those of any other country. Of these Professor T. D. A. Cockerell ranks first, and is looked upon as one of the greatest systematists of the day. Besides diagnosing nearly 150 species, his *Check Lists of the Coccidae* are a monument to his untiring energy, and of immense help to the student. Professor Cockerell has also done good work in Central America, as his list of the Coccids of that region will show*. The investigation of the group from that country has, however, also received attention from other workers.

New Zealand and Australia were worked by our late lamented colleague, Mr. W. M. Maskell, who diagnosed about 200 new and undescribed species from these countries, besides doing a vast amount of work in connection with the more or less obscure species of the earlier students. I believe his first contribution to our knowledge of the New Zealand Coccids was published in the *Transactions of the N.Z. Institute*, in 1878. In March, 1887, the "State Forest and Agricultural Department" published the *Account of the Scale Insects of New Zealand*: this work

* *Biologia Centrali Americana*, December. 1899.

was embellished with 23 coloured plates, and contained a chapter on the remedies against the *Coccidae*. It also contained the descriptions of 67 species, and much information concerning them that was then quite new to us. Subsequently, and up to the time of his death, Mr. Maskell continued to give us the the results of his labours, publishing them annually in the *Transactions* referred to above. Dr. W. W. Froggatt has thoroughly dealt with that remarkable group of Australian gall-making Coccids, forming the subfamily *Brachyscelinae*, most of which, if not all, are peculiar to the Eucalypti of that country. Other workers have contributed to our knowledge of this family but Dr. Froggatt's publications give the most complete account of these insects.

The Cingalese Coccids are now being monographed by Mr. E. E. Green, who has already published two parts of his elaborate work, to the end of the *Diaspinae*. Ceylon is evidently rich in its Coccid fauna, and it is impossible to say to what extent Mr. Green's work will run ; but I am certain of this, that his work in the end will prove a lasting memorial to his great skill and untiring energy, and that his delineations will leave nothing to be desired. A few other odd species have been described from the Oriental region by myself and other workers, but much remains to be done.

Africa has as yet received comparatively little attention at the hands of coccidologists. The Rev. A. E. Eaton made a small but interesting collection of Coccids in Algeria, which I described in the *Transactions of the Entomological Society of London*, in 1896. A few species have also passed through my hands from the West Coast, and from British Central Africa, and the Government entomologist at Cape Town, Mr. Lounsbury, is working out the species of the South.

In Europe, since the publication of Signoret's *Essai*, there have been comparatively few workers. Dr. Karel Sulc, of Bohemia, has worked at the Coccids of his own country, describing a few new genera and species, and we trust will continue his researches. Dr. Gustavo Leonardi, of the Royal School of Agriculture, Portici, Italy, has of recent years given us several most valuable contributions from his pen, the most noteworthy of which is his elaborate and exhaustive monograph on the genus *Aspidiotus**, which the author divides into several more or less natural subgenera. This work has much facilitated the study of this extensive genus. It should also be added that Dr. Leonardi has paid considerable attention to the physiology of the *Coccidae*, and has published elaborate work on the subject. In the Channel Isles Mr. W. A. Luff has discovered many interesting species, including the unique *Exeretopus formiceticola*, Newst., which at the time of its discovery was the only Coccid known to possess two-jointed tarsi. Mr. Cockerell has now described a Coccid possessing the same character.

Up to the year 1887 the English works were fragmentary and most inaccurate, but at that time Mr. J. W. Douglas began a series of articles on British and Foreign *Coccidae*, in the *Entomologist's Monthly Magazine*, which he continued till the year 1894, when he then completed his 27th article. Needless to add these were very thorough and contain a vast amount of valuable information to the student of the

* *Estrat. della Rivista d. Patologia Vegetale*, 1897, 1900.

British *Coccidae*. In 1891, under the able guidance of my ever helpful friend Mr. Douglas, I published the first results of my researches*. Since that time I have continued, chiefly through the same magazine, to publish my observations on this interesting group. In 1885 Mr. Douglas gave a list of twenty species as occurring in the British Isles. To-day we have about 100 species and varieties, many of them aliens, which from their destructiveness of plant-life call for as much, if not more, attention, than our indigenous species. I should here like to add some particulars with regard to the habits of some British *Coccidae*, but I should by so doing trespass upon my forthcoming work on the *Coccidae of the British Isles*†, which I sincerely trust will be the means of enlisting a few more workers in the study of our British species.

Looking back to the time of Signoret's *Essai* in 1876, we find that the total number of Coccids then known to science only reached the modest number of 258, numbers of which were only then described for the first time. Compare these figures with those in Mr. Cockerell's census‡ for 1899, and we find an increase of 861 species, which to-day will far exceed a thousand species, and, considering that all this recent work has been carried out by a small band of about 30 workers, in various parts of the world, we have some cause to congratulate ourselves on the satisfactory progress the study of this most difficult group has made during the closing years of the nineteenth century.

* *Ent. Mo. Mag.*, s.s. vol. ii., pp. 164-166, with a plate.

† Ray Society vol. for 1900.

‡ "First Supplement to the Check List of the *Coccidae*" (*Bull. Illin. State Lab.*, vol. v., 1899).

Evolution of our present knowledge of the British Rhynchota.

By G. W. KIRKALDY, F.E.S.

The revolution in the methods of regarding biological problems, effected during the past forty years, principally through the work of Charles Darwin, has been so complete and its effects so far-reaching, that it is not easy to transport oneself to the opening years of the now-expired century, and occupy the position of an early enquirer into the structure and history of Rhynchota. The British worker of that time would have found a general account scattered through Donovan's *Natural History of British Insects* (16 vols., 1792-1813), in de Geer's *Mémoires pour servir à l'histoire des Insectes* (7 vols., 1752-78), and in E. L. Geoffroy's *Histoire abrégée* (vol. i., 1762), and to identify his captures he would probably consult Turton's English compilation (1806) of the works of Linné and Fabricius. A charming account of the *Aphidae* would be found in the early "pre-Linnean" pages of Réaumur (1734-42). In some orders of insects, as, for example, the lepidoptera, we see an insular and self-contained British school arising and frequently carrying their independence of continental authorities to a disastrous extent. In this order a gradual evolution of systematic work, up to the practical high-water mark of Stainton, is observed. In the Rhynchota, and especially the heteroptera, on the other hand, the initiation of systematic work (as far as the British fauna is concerned) the fixation of that knowledge on a sure foundation, and the attainment of almost high-water mark, is practically due to the work of two men, Douglas and Scott, though revised and corrected lately by Edward Saunders. In the British Isles the study of the Rhynchota has always been sadly neglected ; at the present day, indeed, the number of men who take any real interest in this order—pre-eminent among the Insecta for the marvellous diversity of external structure displayed by its component forms, and the many profound biological problems, such for example as polymorphism in the organs of flight, afforded by many of its families—may certainly be numbered on the fingers of both hands and probably on those of one.

Up to 1865 there was no complete systematic work on the British heteroptera, while it was not till 1886 that we were in a similar position with regard to the auchenorrhynchous homoptera ; the *Aphidae* were revised in 1883, the *Psyllidae* in 1876, and the *Coccidae* in 1900.

Let us retrace our steps a little, and briefly run through the principal works of the century. It is a difficult and ungrateful task to discourse upon this progress, the nineteenth having been emphatically the "systematist's century," little else having been done than to marshal the few hundred forms into some sort of order, and it is left to the next to discover and relate their internal structure, their metamorphoses and their habits. In 1803 Fabricius admitted 45 genera of Rhynchota, of which about 33 contained species now recognised as British, while in 1892 Saunders accepted 174 genera of heteroptera alone, a by no means excessive allowance. In 1818 Leach monographed the British *Notonectidae* (which then included the *Corixidae*) and five years later Curtis commenced his *British Entomology* (16 vols., 1823-40) in which a few species were delineated with an excellence scarcely surpassed. In 1861 Fieber's *Europäischen Hemiptera*, in which an infinity of information is compressed into 444 crowded pages, paved the way for the publication, four years later, of Douglas and Scott's *British Hemiptera* (vol. i., heteroptera). The absence of analytical tables makes it unwieldy and difficult to work with, but the full descriptions and the excellent illustrations mark a new era for British students. Since then work on the heteroptera has consisted simply of minor revision, addition of new species, and the sinking of others too hastily proposed; in fact there would seem to be little else to do in the systematic treatment of the group. In 1870 the same authors published a *Catalogue of British Rhynchota*, and in 1875, Edward Saunders, now the principal British authority, contributed analytical tables and revised descriptions of the heteroptera (*Transactions of the Entomological Society of London*). The last-named author brought the subject up-to-date in 1892 in a separate work, *The Hemiptera and Heteroptera of the British Islands* (33 plates), and in 1898 Kirkaldy commenced a "Guide to the study of British water bugs" (*Entomologist*, 1898-1901). So much for the heteroptera.

A large amount of revisional work on various groups of homoptera was effected by Marshall and Scott, but the first monographic account of the Auchenorrhyncha ("Cicadaria") we owe to James Edwards in 1886 (*Transactions of the Entomological Society*), quickly followed by the volumes de luxe of Buckton (*Monograph of British Cicadae or Tettigidae*, 2 vols., 1890-1, 82 plates) and Edwards (*Hemiptera Homoptera of the British Isles*, 1894-6, 32 plates), the latter being a companion volume to Saunders' *Heteroptera*. Buckton had previously monographed the *Aphidae* (*Monograph of the British Aphides*, 4 vols., 1876-83, 147 coloured plates), and in the last year of the century Newstead is reported to have completed an account of the *Coccidae**, and Scott had already long ago revised the *Psyllidae*, so that now, at the threshold of the new century, we have a practically complete systematic account of the whole order. For the student of British forms, the work of the future undoubtedly lies in their anatomy and life-histories. Outside the *Coccidae*, *Aphidae* and *Psyllidae* (with the literature of which I regret I have not yet found leisure to make myself familiar), there is not, I believe, a single species of Rhynchota of whose life-history and metamorphoses we possess a knowledge in any way comparable with those we have of hundreds of lepidoptera, coleoptera, hymenoptera, odonata, and even of diptera. Mr. Enock, most careful of observers, is studying the biology of water bugs, but there is still an enormous field open for research.

To demonstrate the interesting character of some of the known habits of bugs, I will mention two of the more remarkable, *viz.*, the parental care of the Cimicid, *Elasmucha interstinctus*, shown by the female for her young, originally pointed out by de Geer and subsequently verified by Hellins (see, Saunders' *Hemiptera Heteroptera*, pp. 37-38), and the details of the copulation of *Gerris canalium* as narrated by Meinert and verified by Kirkaldy (see, *Entomologist*, 1899, pp. 201-2). As to anatomy, the most significant statement that can be made is that the standard work on the general subject is Dufour's *Récherches sur les Hémiptères* (1833, *Mém. Acad. Roy. Sci. France*, Savans. Etrang., pp. 129-462, 19 plates), published nearly 70 years ago. In 1899, Heymons of Berlin produced a most important work on the anatomy of Rhynchota ("Beiträge zur Morphol. und Entwickl. der Rhynchoten," in *Nova Acta*, *Leop.-Carol. Acad.*, lxxiv., pp. 349-446, 3 plates), which, however, is chiefly morphologico-embryological, and scarcely covers Dufour's ground.

In conclusion, if there be an enthusiastic young entomologist anywhere in the British Isles, who has plenty of time upon his hands, and is desirous of studying the Rhynchota, I venture to suggest that he collect and study one of the following genera, *viz*: *Gerris* or *Reduriolus* (*Nabis*, Saunders). In *Gerris* there are ten species, of which seven may be reasonably expected to reward his efforts in a fair district. Of these ten, four are nearly always macropterous, five are found fairly commonly in various condition of wing-development, and one is nearly always apterous. In *Reduriolus* there are ten or eleven species, of which eight or nine should be among the first or second season's spoils; of these, five species are nearly always apterous or very brachypterous, in four the condition of the wing development is somewhat varied, while one species is almost always macropterous, *Reduriolus* being thus a complete reverse of *Gerris*. The collection in considerable numbers and from diverse localities of the species of these genera, their comparative tabulation, the percentage of the various forms, &c., and moreover their rearing up *ex ovo*, with experiments to determine if possible what stimuli produce this "pterygopolymorphism," in other words, this occurrence of different forms of structure and development in the flight-organs of the same species,

* I have not yet seen the work, so regret that I can say nothing about this most interesting family.—G. W. K. [See *anteà*, p. 59.—Ed.]

and in different species of the same genus, and at what nymphal instar it is first apparent—these researches would, conducted with care and method, undoubtedly lead to discoveries of the highest importance in the mysterious biology of the Rhynchota.

Progress in the classification of the Sphingides during a century and a half.

By W. J. KAYE, F.E.S.

The growth of our knowledge of the Sphingides has not, except quite recently, made great strides, and, to obtain an idea of this fact, we may start with Linné, who, in 1758 (*Systema Naturae*, 10th ed.), diagnosed the group as follows: "*Sphinx*. Antennæ medio crassiores s. utraque extremitate attenuatæ, subprismaticæ. Alæ deflexæ (volatu graviore vespertino s. matutino)." Only two other groups of lepidoptera were diagnosed by Linné at this time—*Papilio* and *Phalaena*. Linné subdivided *Sphinx* into four sections:

(1) Legitimæ, alis angulatis—*ocellata*, *populi*, *nerii*, &c. (2) Legitimæ, alis integris ano simplici—*convolvuli*, *eelerio*, *atropos*, &c. (3) Legitimæ, integris ano barbato—*fuciformis*, *apiformis*, *culiciformis*, &c. (4) Adscitæ habitu et larva diversa—*filipendulae*, *phegea*, *cerbera*, *statices*, &c.

Seventeen years later, Fabricius (*Systema Entomologiae*, 1775) made use of other imaginal characters, and defined *Sphinx*, as: "Palpi duo reflexi pilosi, lingua spiralis plerisque exserta. Antennæ squammatæ," and separated and named the following groups from the Linnean *Sphinx*:

(1) *Sesia*.—Palpi reflexi, lingua exserta truncata. Antennæ cylindricæ, extrorsum crassiores—*hylas*, *fadus*, *stellatarum*, *culiciformis*, *vespiformis*, &c. (2) *Zygaena*.—Palpi reflexi, lingua exserta testacea. Antennæ sæpius medio-crassiores—*filipendulae*, *pugione*, *phegea*, &c.

Esper, also, in 1779, followed Linné in his classification, but evidently suspected that some of the groupings were not satisfactory as he mentions certain day-flying insects as being included in the same group as some night-flying species. The attitude of the *Sphinx* larva was now taken into account as a suitable character for classification, but the old arrangement was still adhered to. It was not, however, until 1816, when Hübner's *Verzeichniss bekannter Schmetterlinge* appeared, that a real step was made at subdivision. The *Sphingides* are to be found in this work in the third tribal section termed the *Sesiae*. This tribe is divided up into five stirpes with subdivisions of each into families and still further subdivisions of genera, the limitation of the tribe being as follows: "The antennæ thick, blunt; the palpi broader in front, short and leaf-like, at the tip almost bent back. Body thick and wings strong." The characters used by Hübner for the stirpes are those of the imago, in which frequent reference is made to the structure of the palpi, the shape of the body, the outline of the wings, &c. The family subdivisions are based on outline of wing, shape of abdomen, and even colour, whilst for generic characters, colour is almost invariably used. Viewing Hübner's knowledge of the Sphingides one sees that, although great strides were made by separating into smaller subdivisions, very little as yet was known of the real relationship existing between them.

Stephens, in his *Illustrations* in 1828, made the *Sphingidae* one of the four great families into which he subdivided the second division of the Lepidoptera-Heterocera, a division which comprised the *Crepuscularia* or twilight-flying insects, the four families being the *Zygaenidae*, *Sphingidae*, *Sesiidae* and *Aegeriidae*. This division (*Crepuscularia*) corresponds with the *Sphinx* of Linné, and Stephens separates the four families thus:

Palpi	breves: abdomen	ano imberbi ..	.. 2	*Sphingidae.*
		ano barbato ..	.. 3	*Sesiidae.*
	elongatæ: alæ	sæpissime hyalinæ..	4	*Aegeriidae.*
		squamis tectæ	.. 1	*Zygaenidae.*

It will be noticed that by this time primary generic divisions had come to be considered as families, and secondary divisions as genera, owing to the fact that subdivision left no alternative. The *Sphingides*, as now understood, comprised the *Sphingidae* and *Sesiidae* in the Stephensian subdivision. Into the *Sesiidae* were placed such species as *fuciformis* and *bombyliformis*. This subdivision, although perhaps from the modern standpoint too high a one, was, while not in name, yet, in fact, the beginning of the creation of subfamilies. The use of the name *Sesiidae* here must not be confounded with its present application, since Stephens used *Aegeriidae* for the internal-feeding "clearwings," *tipuliformis*, *apiformis*, &c. The limited family *Sphingidae* is thus defined by Stephens: "Antennæ prismatic, sometimes serrated towards the middle, ciliated slightly in the males, terminated by a scaly seta or naked filiform appendage. Palpi short, three-jointed, densely clothed with hair or scales; the terminal joint minute. Abdomen conical not tufted at the tip. Larvæ exposed, cylindrical and attenuated anteriorly, with a horn on the last segment, naked, sometimes granulated; the sides frequently with oblique or longitudinal stripes. Pupa subterranean or suffoliculated. Four genera are tabulated as follows:

Alæ	plus minusve angulatæ			*Smerinthus.*
	integræ, acutæ. Maxillæ	breves		*Acherontia.*
		elongatæ; antennæ	haud clavatæ	*Sphinx.*
			clavatæ ..	*Deilephila.*

Following Stephens came Herrich-Schäffer, who, in 1845, published the first part of the Heterocera in his work *Schmetterlinge von Europa*. The advent of this work marked an epoch in the advance of the classification of the lepidoptera generally, and the *Sphingides* were defined more satisfactorily than ever. The family (the 19th in series) was formed of the four genera *Macroglossa* (=*Sesia*, Stephens), *Sphinx*, *Acherontia* and *Smerinthus*, whilst the superfamily preceding the *Sphingides* was the *Thyridides* and that succeeding it the *Saturniades*. The *Sphingides* are as a family thus defined: "Quite large to fairly small, strongly built lepidoptera, with elongated fore-wings, with the outer margin slightly shorter than the inner margin; hindwings small. No ocelli, palpi three-jointed, heavily clothed with hair, lying close to the head, with inner surfaces hollowed out, in which lies the proboscis, externally convex, the second joint thicker than basal and the third extremely small, only slightly discernible above the hair of the second joint, frequently almost entirely enveloped in hair; the antennæ somewhat more slender near the base and at the tip, the thickening terminating in an angle which, viewed beneath, has a central longitudinal ridge; in the angle this bears two rows of bristles on each of the surfaces forming the middle ridge, the one at the front margin the other at the hind margin, which two rows unite together towards the outer margin; in the ♀ instead of this is only a short raised semi-oval curve. Forewings with 11 or 12 nervures, 1 free, 2-7 at equal distances from cell, 8 out of 7, 9 divided near apex of wing when 12 nervures are present; in the latter case, however, 10 is from 9, 11 from top of cell, 12 free; if nervure 9 be not forked 10 arises from front edge of cell and 11 is free; hindwings with 9 nervures, 1 free; the following with tolerably equal interspaces: 4 from apex of cell, 5 as a continuation of one of the weak dividing nervures of cell (the fold ?) or even further on towards the costa, 6 and 7 on a short footstalk, 8 from base sending back an oblique nervure to middle of front margin of cell." Two main divisions were then made of the *Sphingides*: I. Antennæ with the apex pencillated, hooked. II. Antennæ neither pencillated nor hooked.

The following classificatory table is then based on these two main divisions:

I. Antennæ with the apex pencillated, hooked.	
1. Abdomen with sides and anal segment barbed	*Macroglossa.*
2. Abdomen with sides and anal segment not barbed.	
a. Abdomen with anal segment acute	*Sphinx.*
b. Abdomen with anal segment obtuse	*Acherontia.*
II. Antennæ neither pencillated nor hooked	*Smerinthus.*

This classification appears to be a very natural one, and, in fact, has, with small modifications, as will be seen later, been used up to the present time. The four genera have since, owing to more detailed knowledge, been broken up into smaller natural genera and have thus come to have subfamily value. The characters derived from the neuration of the *Sphingides* as used by Herrich-Schäffer marked a great advance. Nervure 9 of the hind-wing (the cross nervure between 8 and the cell) was here for the first time used as a classificatory character and has proved to be most valuable and constant.

Stainton, twelve years later, in his *Manual of British Lepidoptera*, 1857, followed Stephens almost to the letter, both in his placing the *Zygaenidae*, *Aegeriidae* and *Sesiidae* with the *Sphingidae* in the division *Sphingina*, and also in the generic subdivision of the *Sphingidae*, except that Stainton used five as against the four genera of Stephens, the addition being *Choerocampa* characterised by the larva having the anterior segments retractile. Except for this character no other is used to differentiate the genus from *Deilephila*. The *Sesiidae* (*bombyliformis*, *fuciformis*, &c.) are separated into another subfamily. Although nearly 30 years subsequent to Stephens, Stainton failed to make any advance, indeed one must confess there was retrogression, as the palpi and other structures are not even used for classificatory purposes at all. Seeing that Herrich-Schäffer had only so recently classified the European lepidoptera, Stainton's total neglect to utilise his system is remarkable. Eighteen years after Stainton had published the *Manual*, Butler, in 1875, brought out his *Monograph of the Sphingidae*. In most respects this was a disappointing work, *e.g.*, (1) The general characters of the *Sphingidae* as a family are totally wanting. (2) No mention is made as to the affinities of the *Sphingidae* with other superfamilies, &c. Six subfamilies are noted, *Macroglossinae*, *Choerocampinae*, *Ambulicinae*, *Smerinthinae*, *Acherontiinae*, and *Sphinginae*. *Macroglossinae* is equal to the genus *Macroglossa* of earlier writers, and *Acherontiinae* to *Acherontia* of Herrich-Schäffer. The old comprehensive family of *Sphingidae* now became subdivided into *Sphinginae* and *Choerocampinae*, the subdivision being made chiefly on larval characters, the anterior segments of the larvæ of *Choerocampinae* being stated to be retractile while those of the *Sphinginae* are not so. The 5th segment in *Choerocampinae* is also noted as abruptly broader than the remaining segments. In the imago the head is said to be generally larger and the tongue shorter. The old genus *Smerinthus* is divided into the subfamilies *Smerinthinae* and *Ambulicinae*, the latter group being erected to receive those species that, in the larval state, have the anterior segment more tapering, and in the imaginal have slender antennæ in both sexes. Except for these two further divisions there was no advance on the work of Herrich-Schäffer, in point of fact the only real step was the separation of *Choerocampinae* from *Sphinginae*, for I doubt whether the *Ambulicinae* are separated from *Smerinthinae* on sufficiently important structural characters. The next important writer on the *Sphingidae* was Grote, who, in 1886, published the *Hawk-moths of North America*. The principal step made was the endeavour to show the relationship of the subfamilies *inter se*, and the relationship of the *Sphingidae* to other families. The *Smerinthinae* are given a central (basal) position, and Grote expresses the belief that the other groups may have arisen from its ancestors, while its present members are perhaps nearer the *Choerocampinae* than the *Sphinginae*. The *Smerinthinae* show characters to be found in all the groups and from this in part the above generalisation is deduced. The *Choerocampinae* are said to be related to the *Smerinthinae* through *Ambulyx* (*i.e.*, *Ambulicinae* of Butler), the *Sphinginae* through the genus *Ellema*, and the *Macroglossinae* through the genus *Deidamia*. Speaking of the relationship of the family *Sphingidae*, he discusses the anal horn of the larva found in *Bombyx mori* and also the distension of the anterior segments similar to that found in *Choerocampinae*. The membranous tongue of the *Smerinthinae* is also urged as giving support to the notion that the *Bombycidae* are a nearly related family. Because the Sphingid pupa has no silken cocoon, he considers this to be a low or derivative character, and that the crepuscular or nocturnal flight should be regarded in the same light. In conclusion the *Sphingidae* are said to be evolved from the ancestors of the *Ceratocampinae*, a subfamily of the *Bombycidae*. Following closely upon Grote, Smith in 1888, in the *Entomologia Americana*, discussed the relationship of the *Sphingidae*, and strongly insisted that no linear arrangement of the genera could give an accurate idea of the true relationships. Two main divisions of the family are given, the *Sphingides* with long corneous tongue and the *Smerinthides* to take all other species. The *Sphingides* are divided into two series by the shape and proportions of the antennæ, *Macroglossinae* forming one series and *Sphinginae* the other. Of the relationship of the *Sphingidae* to other families he says "I can find no close relationship with *Sesia* . . . . Sesiids resemble *Castniidae* and *Cossidae* in so far as the larvæ are endophytes." The conclusions of Grote are adhered to in tracing the relationship of the *Sphingidae* with the *Bombycidae* through the *Smerinthinae*.

The last work that we shall refer to is that done by Dr. Chapman and Mr. Tutt, and to be found in *British Lepidoptera*, vol. i., pp. 114-129, 1899. Of the detailed classification of the *Sphingides* one awaits information in a future volume, but its relationships to other superfamilies are discussed in a way that, to our knowledge, had not been previously done. The *Sphingides* are associated with other families from the following structural peculiarities:

(1) The possession of a flat egg (*i.e.*, with the long micropylar axis horizontal, and with a short vertical axis).
(2) The maintenance of the larval tubercles iv and v as sub-spiracular tubercles . . . . ; a tendency for i to form a many haired dorsal wart, and to form with iii and iv and v on either side a transverse row of warts on each segment; it tends very strongly (in some families) to become atrophied.

It is true, as the author points out, that the Sphingids form one of those specialised superfamilies of the Sphingo-Micropterygid stirps that exhibits great modification in the larval tubercles when compared with the allied families in the same stirps, particularly in the direction of atrophy, although the Sphingid larvæ are easily separated from all other larvæ by the peculiar movement of v to form a prespiracular tubercle. It is, therefore, with the greatest interest that we shall look for the detailed classification of this and the allied groups which has been promised in the next volume (iii) of Mr. Tutt's work. In vol. i, the *Sesiidae* and *Anthroceridae* (*Zygaenidae*) so long connected with the Sphingids are clearly shown by the very generalised embryological stages to be widely separated, although from their bearing certain ancestral characters in common (*e.g.*, a flat egg with horizontal micropylar axis) they are placed amongst the generalised families of the stirps of which the *Sphingides* and *Saturniades* are the most specialised. Tutt says (*loc. cit.*, p. 120): "The observations of Poulton and Weismann on the larvæ of *Aglia* and other Saturniids, and the comparison of these with the Sphingid larvæ, leave little room for doubt that these superfamilies are somewhat closely related." Although it is argued that the Saturniids and Sphingids have arisen from a common ancestral stock, yet they are regarded as forming very distinct superfamilies. A great step has been thus made in our knowledge of the evolution of these families, whilst the mode of inductive reasoning by which stirpes are formed, representing lines of descent based largely on embryological characters, thrown as far back in the existence of the insects as possible (*i.e.*, the use of the structural characters of the egg), also represents great advance. By the means here suggested the *Sphingides* (together with *Saturniades*) have been determined as the most specialised of the superfamilies forming Tutt's Sphingo-Micropterygid stirps, and we see that although the Saturniids are comparatively close to the Sphingids in oval, larval and pupal characters, the imagines have evolved along quite different lines. This thorough mode of application of embryonic characters strongly convinces one that the *Sphingides* have now been placed in a more approximately correct position than they have been at any period during the past century or previously.

Illustrations of Lepidoptera—being Imprints of Impressions.

By ALFRED SICH, F.E.S.

At Bologna, in 1602, Ulysses Aldrovandus published in his great work a very interesting volume, *De Animalibus Insectis*, partly devoted to insects. The figures on the plates are life size and decidedly good for the age, though of course rather crude—*Papilio machaon*, *Colias edusa*, *Euranessa antiopa*, *Callimorpha hera* and the larva of *Stauropus fagi* are all easily recognisable. In 1635 Johannes Goedaert's *De Insectis*, &c., was published at Middelburgh. This, according to Werneburg, contained coloured plates. The plain copies are interesting as they show figures of imagines, larvæ and pupæ with occasionally their parasites. Though not always true to nature they are easily recognised. Madam Maria Sybilla Merian published her book on larvæ under the title of *Der Raupen wunderbar Verwandelung*, at Amsterdam, 1679. Her copper plates show a decided improvement, and she is perhaps the first to embellish figures of lepidoptera by associating them with sprays of their food-plant, thus foreshadowing the beautiful combinations which in after years were to delight the entomologist. Her plate of *Macroglossa stellatarum* displays the moth, larva and a spray of *Galium verum*. From the dim light that feebly glows in the works of Aldrovandus and the other illustrators of the seventeenth century, we somewhat suddenly emerge into the dazzling sunshine which surrounds the masterpieces of Sepp and Roesel, for though Sepp's work is dated 1762 it appears that he began to publish as early as 1715. In 1720 Eleazar Albin published at London *A Natural History of English Insects with copper plates* ("*coloured for those who like it by the author*"), as he quaintly remarks. Each plate is dedicated to some celebrity. The figures are poor and flat, appearing as if the objects themselves had been pressed on to the paper, and the colouring is child-like.

Though Roesel von Rosenhof, a miniature painter, is inferior in some respects to Sepp, the two have much in common. They are both types of the old school of naturalists, who made minute and careful observations, patiently labouring on for the love of study, and bringing a kind of reverence to bear on their work. In those days the evil of synonymy had not crept serpent-like into the entomologist's paradise. There was no need to rush into publication for the sake of priority. These two artists drew their studies from the life. Their plates are illustrations of living insects, not of dried cabinet specimens. Roesel began to publish his *Insecten Belustigung* in 1746, at the famous old town of Nuremberg, issuing the work in monthly parts. The chief charm in his copper-plates is the life-like attitudes in which he depicts the insects and the wonderfully exact drawing of minutiæ. His figure, no. 3, on plate ii of the moths, is a marvel, and is still the most correctly drawn figure published of the larva of *Smerinthus tiliae*. Jan Christian Sepp's great work, *Beschouwing der Wonderen Gods in de minstgeachte Schepzelen, of Nederlandsche Insecten*, was published at Amsterdam and the first volume dated 1762. A glance at the plates, which, in this work, often exhibit the insects in all stages, including that of the ovum, grouped about the food-plant, makes it at once apparent that Sepp was an exquisite artist and an accurate observer. His figures are not all of the same excellence, but where he rises to the height of his power, they are of surpassing beauty. On opening out one of these old dull-looking papers containing a masterpiece, the eye is instantly caught by the figure and an exclamation of astonishment rises to the lips. Plate v, in the first volume (Bende) of night-moths, showing the life-history of *Dicranura vinula*, is highly artistic. The figures on the next plate to this, of *D. furcula* on the wing (fig. 8) and of the larva (fig. 4) are excellent, but certainly one of the very best figures is that representing the flying *Plusia gamma* (N.V., vol. ii., pl. i., fig. 5). Another beautiful figure (vol. ii., pl. vi., fig. 3) portrays the full-grown larva of *Notodonta trepida* clinging to a spray of oak while it stretches its head over its back. Besides the correctness of the best of Sepp's figures, there is an artistic refinement and lightness about them. They are not laboured and have just sufficient colour. Above all Sepp had the touch of life in his brush, and he succeeded in infusing that life into his best efforts. A quaint old book belonging to this period is *The Aurelian* (London, 1766), by Moses Harris, giving rather crude figures of lepidoptera in various stages with the food-plant. A curious feature in Jacob C. Schaeffer's very interesting *Icones Insectorum*, &c. (Regensburg, 1766), is that both sides of the plates carry figures, many of which are of great artistic merit. By no means to be despised are the copper plates of Drury in the *Illustrations of the Natural History of Exotic Insects* (London, 1770-82). His method of adding the shadow cast by the insect cannot be recommended. An amusing book by Benjamin Wilkes, with brightly-coloured figures, generally accompanied by the larva and food-plant, was published in London, 1773, and entitled *120 Copper Plates of English Butterflies and Moths*, &c.

Though Esper's eight volumes, *Die Schmetterlinge in Abbildungen*, &c. (Erlangen, 1777), form an important work, the plates have no particular charm, the drawing and colouring both being defective. Sometimes an insect will be coloured only on one pair of wings, the opposite pair being shown in outline only. In 1779 two important works saw the light. Pieter Cramer's *Papillons Exotiques* (Amsterdam, 1779-82), and the *Papillons d'Europe*, by Ernst with descriptions by Engramelle. Cramer's figures are of better quality, but both works on account of the great number of figures they contain, are useful. It is, however, a real pleasure to turn over any of the copper plates produced by the artist of Augsburg, Jacob Huebner. Though not so delicate nor so carefully drawn as are the figures of Sepp and Roesel, many of Huebner's are exceedingly beautiful. As a rule they are, however, a little overloaded with colour. The *Beitraege*, &c. (1786-90, Augsburg), and the *Sammlung Europaeischer Schmetterlinge* (1793-1827), as well as the *Sammlung Exotischer Schmetterlinge*, contain a great number of figures of imagines, while the *Geschichte europaeischer Schmetterlinge* is devoted to larvæ. The last work contains many very artistic figures, and holds the enviable position of being the work most often copied of all entomological literature. In later works of English, French and German authors Huebner's figures of larvæ are constantly reappearing.

Lewin, perhaps the first reliable writer on British butterflies, published his *Papilios of Great Britain* in 1795; the illustrations are very fair for the age. An artist of quite another school was painting figures in England, while Huebner issued his works in Germany. Though the German erred in excess of colour it was in the form of over-elaboration, but Edward Donovan loved colour and massed it on his figures. The plates of flowers and insects in his *Epitome of the*

Natural History of the Insects of China (London, 1798) form most brilliant designs.

The finest figures of British lepidoptera, are those of John Curtis in *British Entomology* (London, 1823-39). The effect of the plates is immensely heightened by the introduction of some beautifully painted botanical specimens. Many of the figures by C. M. Curtis in Stephens' *Illustrations of British Entomology* (1828-46) are good, but his drawing is better shown in *Horsfield's Catalogue of the Lepidoptera in the East India Company's Museum* (1828). In the *Schmetterlings Kalender*, published at Frankfort (1830), by Schott, the figures are so badly coloured that it is to be hoped they may ever be considered the worst of any age.

With regard to the figures the two best works of Boisduval are the *Icones Historiques des Lépidoptères* and the *Collection iconographique des Chenilles*, both published in Paris, and dated 1832. The first is very fair and the latter useful on account of the great number of larvæ represented. Amongst the best figures of the so-called microlepidoptera, must be mentioned those of Fischer Edler von Roeslerstamm in his *Abbildungen*, &c. (Leipzig, 1834-43). These are so much in the same style as the figures of Herrich-Schäffer, in his *Systematische Bearbeitung der Schmetterlinge von Europa* (Regensburg, 1843-56), that the same remarks will apply to both. As the drawing is sharp without being hard and the colouring clear though ample, the figures have a very neat appearance. Herrich-Schäffer's figure 418, showing the underside of *Argynnis alexandra*, is a masterpiece. His figures of the *Coleophorae* are particularly interesting, as enlarged drawings of the wings and basal portions of the antennæ, as well as figures of the larval cases, are given. This fine work must be considered as one of the gems of entomological literature. J. O. Westwood published a great number of illustrations both in popular and more scientific works. The gorgeous designs in the *Cabinet of Oriental Entomology* and in the *Arcana* (1845), remind one in their richness of Donovan.

Stainton, of happy memory, gives us some beautiful plates in his *Natural History of the Tineina* (London, 1855-72). The larvæ, especially, are noteworthy and the figures showing how they attack their special pabula, are of great use to the field naturalist. In *Insecta Britannica*, vol. iii., by this author, is a beautiful plate by W. Wing, of larvæ of the *Tineina*. After wading through the plates of Godart, Duponchel, Berce, and even Boisduval (Rambur is more interesting) it is very refreshing to come upon a work of such rare artistic merit as that of Millière. In his three volumes, *Iconographie et Déscription de Chenilles et Lépidoptères inédits* (Paris, 1859, &c.), we find once more a labour of love, and there is a richness in the beautiful designs for which we have looked almost in vain since the days of Sepp. The earlier plates are not so good as the later, but this is apparently the fault of the engraver and not that of the artist. The special talents of Millière shine brightest in the figures of the smaller moths; plate xlvi., depicting *Tortrix pronubana* and *Acrolepia smilaxella* with a spray of *Smilax*, is a charming example of his delicate work; plate cx., dated 1870, shows various species of the genus *Eupithecia*. The fineness of the markings and the clearness of the colour of these exquisite little moths is represented with marvellous truth. While Millière was raising the standard of entomological art in France, Snellen van Vollenhoven was upholding the high position which Holland had already won. His *Nederlandsche Insecten*, series ii (1860-77), a continuation of Sepp's work, contains some very beautiful figures, though more in the style of Millière than that of Sepp. During this period Hewitson was publishing figures in this country, but it cannot be said that he added any treasures to English art.

Among the host of excellent plates issued of late years perhaps those drawn by Mary Peart and published in W. H. Edward's noble work, *The Butterflies of North America* (Philadelphia, 1868-97), are the very best of their kind. The figures are crisp and yet soft, and there is, in the best plates, in both imagines and larvæ, an air of life. A truly exquisite plate is that representing *Apatura clyton* vars. *ocellata* and *prosperpina*, and it shows what may be achieved by means of lithography and also the advance that has been made in that art since the days of Sneefelder. Dr. A. G. Butler's *Catalogue of Diurnal Lepidoptera of the Family Satyridae* (London 1868), contains some very careful drawings of insects of that family.

As an instance of the best class of wood engraving, the earlier impressions of Edward Newman's *Natural History of the British Moths* (London, 1869), may be cited ; though uncoloured they are among the best figures we have of the larger British Heterocera. Many of the figures of imagines to be found in C. Oberthür's *Etudes d'Entomologie* (Rennes, 1876-99), are very charming, and especially interesting to those studying the lepidoptera of the Palæarctic region. Special attention may be drawn to the *Atlas de la Déscription Physique de la République Argentine* (Buenos Aires, 1879), by H. C. C. Burmeister. The feature of this book consists in a number of most beautifully drawn and coloured figures of most extraordinary larvæ belonging to the *Sphingidae* and *Saturniidae*, &c. Marshall and de Nicéville published their *Butterflies of India, Burmah* and *Ceylon*, at Calcutta, in 1882. The work is interesting as the plates are drawn by clever Indian artists. As a good example of fine Russian illustration the later volumes of N. M. Romanoff's *Mémoires sur les Lépidoptères* (St. Petersburg, 1884-97), may be consulted. The text is in French as well as Russian.

The most useful book of illustrations of British larvæ is undoubtedly Buckler's *Larvae of the British Butterflies and Moths* (Ray Society, London, 1886-99). The figures, as works of art, are not altogether pleasing, though Buckler's original drawings are very truthful. In the first volumes of the *Rhopalocera Exotica*, by Grose-Smith and W. F. Kirby (1887 *et seq.*) there are some beautiful hand-coloured plates of imagines. The *Butterflies from China, Japan and Corea* (London, 1892-4), by J. H. Leech, is a most valuable work, and the set of plates, bound separately, surpasses any other of its kind. These plates display figures of cabinet specimens, both sides of the wings being shown, one pair being detached from the body and reversed in the now so prevalent manner. The drawing of these figures is excellent and the colouring particularly rich and soft. It is a true delight to examine these beautiful lithographs.

Very instructive is Packard's *Monograph of the Bombycine Moths of America, north of Mexico*, part i., *Notodontidae* (Washington, 1895). The heliotypes of cabinet specimens are too realistic to be pleasant though eminently useful to the entomologist, while the figures of numerous larvæ, mostly of curious form and depicted in various stages, are well worth attention. The 48 plates of colour-photography in *The Butterfly Book*, by W. J. Holland (New York, 1898), are probably a move in the right direction. The great difficulty in this process is evidently how to deal with an insect's body and the bases of the wings. The *Rhopalocera Aethiopica*, by Chr. Aurivillius (Stockholm, 1898, text in German), contains some beautiful figures of African butterflies by Swedish artists. African lepidoptera are also very finely figured in Saalmueller's *Lepidoptera von Madagascar*, published at Frankfurt-am-Main, 1884-91. In the *Transactions of the Entomological Society of London*, a great many fine plates, mostly illustrative of new species, will be found.

The above remarks refer in nearly every case to the original edition of the work mentioned. In reissues, the plates are, as a rule, inferior. In the more important cases, two or more copies of a work have been examined. This was only possible, because the fine libraries of the Natural History Museum at South Kensington, and that of the Entomological Society of London, besides the shelves in private libraries, were open to inspection.

During the seventeenth century no very great strides were made in the art of portraying the lepidoptera, but while the eighteenth century was still young Sepp's light arose and shone with a power which has scarcely been equalled, and only very rarely approached. Roesel hardly reaches to this height but excels in the minuteness of his drawing. Towards the end of the century Germany produced another artist of high order, Jacob Huebner and endowed him with prolific energy. Had he lived earlier when entomology required less from her disciples he might have risen to a still greater height, but his great talents are extended as it were over an enormous mass of work rather than concentrated upon a smaller portion. These three, Sepp, Roesel and Huebner, give a glory to the eighteenth century, which even without the glamour shed on their work by age, outshines, it must be admitted, almost all the efforts of the nineteenth century. How the last century will ultimately be regarded from the standpoint of entomological art remains yet to be seen. Certain it is that we have not maintained the rapidity of advance made during the eighteenth century. Science in the eighteenth century was fast encroaching on art, and during the nineteenth, to judge by the large proportion of map-like pictures of imaginal wings produced to illustrate descriptive works, art is almost driven from the field. For the finest illustrations of the past century, we must search the works of Curtis, Herrich-Schäffer, Millière, Snellen van Vollenhoven, W. H. Edwards, Burmeister and Leech. The seventeenth century may be called in relation to entomological art, the age of wood-cuts, the eighteenth of copper-plates, and the nineteenth the age of lithography. Let us hope the twentieth century will not be an age of photography, or, if so, that the illustrations will be from the life. Kearton's vignette of *Catocala nupta* at sugar, *With Nature and a Camera*, p. 247, though a tattered old specimen, is pleasant to look upon, but photographs of dead cabinet specimens in all their deformities are hideous.

In conclusion I wish to acknowledge the great help received from Dr. A. G. Butler, who kindly provided every facility for examining the volumes under his charge in the Natural History Museum, from Mr.

W. F. Kirby, who allowed me to view the treasures of his own library, and from Mr. J. W. Tutt, who gave me much good advice.

The Influence of Darwin upon Entomology.

By Professor EDWARD B. POULTON, M.A., F.R.S., F.Z.S., &c.

The published letters of Charles Darwin show that he had a very poor opinion of systematic work in zoology. His labour in preparing the *Monograph on the Cirripedia* showed him that a large proportion of the descriptions of species are slovenly and superficial, and he thought that this bad work was encouraged by the custom of appending the describer's name to the species. Thus he wrote to Mr. Joseph Hooker, October 6th, 1848 :—"I have lately been trying to get up an agitation . . . . against the practice of naturalists appending for perpetuity the name of the *first* describer to species. I look on this as a direct premium to hasty work, to *naming* instead of describing. . . . Botany, I fancy, has not suffered so much as zoology from mere *naming*; the characters, fortunately, are more obscure. . . . Why should naturalists append their own names to new species when mineralogists and chemists do not do so to new substances?" (*Life and Letters*, London, 1887, vol. ii., pp. 364, 365.) A little later he carried on a correspondence with Hugh Strickland on the same subject. I quote a large part of his concluding letter. He writes on February 4th, 1849, "of the evil done by the 'mihi' attached to specific names; I can see most clearly the *excessive* evil it has caused; in mineralogy I have myself found there is no rage merely to name; a person does not take up the subject without he intends to work it out, as he knows that his only claim to merit rests on his work being ably done, and has no relation whatever to *naming*. . . . I think a very wrong spirit runs through all natural history, as if some merit was due to a man for merely naming and defining a species; I think scarcely any, or none is due; if he works out *minutely* and anatomically any one species, or systematically a whole group, credit is due, but I must think the mere defining a species is nothing, and that no *injustice* is done him if it be over-looked, though a great inconvenience to natural history is thus caused. I do not think more credit is due to a man for defining a species than to a carpenter for making a box. But I am foolish and rabid against species-mongers, or, rather, against their vanity; it is useful and necessary work which must be done; but they act as if they had actually made the species, and it was their own property" (*loc. cit.*, i., 370, 371). Again writing to Sir Joseph Hooker, on April 9th, 1894, he speaks of "the miserable and degrading passion of mere species-naming" (*loc. cit.*, i., 376). Although these strong opinions and expressions were roused in Darwin by the contemplation of bad systematic work in the Crustacea, the future student of the Insecta will find his task much lightened if they are considered to have a general bearing. Systematic labour is certainly "useful and necessary work which must be done," and there are reasons of expediency why the authorship of a name must be readily available (as Darwin himself felt compelled to admit). But if this "necessary" entomological work is not to lose much of its usefulness due regard must be paid to the warning conveyed in these early letters of our great English naturalist.

A few years later Darwin had done with his systematic monograph, and soon became entirely absorbed in the work which was to culminate in 1859 in the *Origin of Species*. These enquiries led him to believe that too exclusive attention to systematic work injures the reasoning faculties and the powers of generalising. Thus, he wrote to Sir Joseph Hooker, on September 25th, 1853, shortly before the appearance of the last *Cirripede* volumes: "How few generalisers there are among systematists; I really suspect there is something absolutely opposed to each other and hostile in the two frames of mind required for systematising and reasoning on large collections of facts" (*loc. cit.*, ii., 39, 40). Again, he wrote to A. R. Wallace, on December 22nd, 1857: "I am a firm believer that without speculation there is no good and original observation. . . . So few naturalists care for anything beyond the mere description of species" (*loc. cit.*, ii., 108). In a letter to Sir Joseph Hooker on November 21st, 1859, he emphasises the value of generalisation: "It is an old and firm conviction of mine that the naturalists who accumulate facts and make partial generalisations are the *real* benefactors of science. Those who merely accumulate facts I cannot very much respect" (*loc. cit.*, ii., 225). The same ideas are conveyed in a letter to H. W. Bates on December 3rd, 1861, referring to his paper on "Mimicry" in the *Trans. Linn. Soc.*: "I can understand that your reception at the British Museum would damp you; they are a very good set of men, but not the sort to appreciate your work. In fact, I have long thought that *too much* systematic work [and] description somehow blunts the faculties. The general public appreciates a good dose of reasoning, or generalisation, with new and curious remarks on habits, final causes, &c., far more than do the regular naturalists" (*loc. cit.*, ii., 379). He wrote again on November 20th, 1862, after reading the paper on "Mimicry": "Your paper is too good to be largely appreciated by the mob of naturalists without souls, but rely on it that it will have *lasting* value, and I cordially congratulate you on your first great work" (*loc. cit.*, ii., 393). Although the earlier reflections on systematic work came out of his study of the *Cirripedes*, the later were at any rate partially due to his experience of the students of insects. He seems, indeed, to have a somewhat poor opinion of entomological work, perhaps due to his experience with his own collections made on the "Beagle." At any rate, he wrote to Sir Joseph Hooker on September 2nd, 1860: ". . . . If you get to the top of Lebanon . . . . you ought to collect any beetles under stones there; but the entomologists are such slow coaches. I dare say no result could be made out of them. [They] have never worked the alpines of Britain" (*loc. cit.*, ii., 337). ["They"] in the last sentence is substituted for words of mock abuse, with no doubt a basis of truth intended to be expressed beneath the jest. Darwin evidently considered that the entomologists, as a whole, would be among the most uncompromising opponents of his views on evolution and natural selection. Thus he wrote to Sir Charles Lyell on March 17th, 1863, arguing that evolution would ultimately prevail: "But this result, I begin to see, will take two or three lifetimes. The entomologists are enough to keep the subject back for half a century" (*loc. cit.*, iii., 17). Such remarks in letters are, of course, not intended to be criticised as deliberate expressions of mature opinion, and there can be little doubt that in this case much too despondent an attitude is assumed. A study of the *Transactions of the Entomological Society of London* from 1858 onwards will reveal numerous papers by well-known adherents of the new views, such as H. W. Bates, A. R. Wallace, and Sir J. Lubbock. One paper of H. W. Bates on South American butterflies is of peculiar interest. It was written as a letter to Adam White, from Ega, on the Upper Amazon, on May 20th, 1857, over a year before the Darwin-Wallace paper on natural selection was read before the Linnean Society on July 1st, 1858. Mr. Bates' letter is published as the first paper in vol. v of series ii (1858-1861) of the *Transactions*. Speaking of the *Heliconiidae*, he says: "This family I look upon as mostly a modern creation, the species unfixed, very susceptible of change, in conjunction with the least modification of local circumstance; but these theoretical notions I suppose you do not care about." This must be one of the first, if not the very first expression of opinion in favour of evolution published by a London scientific society. Not only did the Entomological Society publish a large number of papers by these great pioneers, but again and again they filled the most important offices. Thus, although Bates was a corresponding member of the Society when he wrote the paper from which I have quoted, he was on the Council in 1864, 1866, 1867, 1872, 1877, was a Vice-President in 1870, 1873, 1876, 1879, 1880, and President in 1868, 1869, and 1878. Wallace was a member of Council in 1866, 1872, Vice-President in 1864, 1869, and President in 1870, 1871. Lubbock was a Vice-President in 1862, 1868, and 1881, and President in 1866, 1867, 1879, 1880. The majority of the senior members of the Society were undoubtedly opposed to the new views, but there was evidently no attempt to boycott those who were known as strong and convinced supporters of them.

Although Darwin had written in such depressing terms of the entomologists in 1863, only four years later he went to the opposite extreme in a letter to Professor Haeckel. Writing on May 21st, 1867, he said: "No body of men were at first so much opposed to my views as the members of the London Entomological Society, but now I am assured that, with the exception of two or three old men, all the members concur with me to a certain extent" (*loc. cit.*, iii., 69). The words "to a certain extent" are, of course, elastic, but, stretching them to the utmost, it must be conceded that this last letter is as optimistic as the former is pessimistic. The members of the Society were fair, and gave a hearing and an important position to an opponent; but he still remained an opponent. A convinced evolutionist did not feel himself in the congenial society of those who agreed with him in principle even if they differed in detail in 1867, nor, for that matter, in 1877. By 1887 an immense improvement had been effected, but Darwin's words could only be used of this date by those of a very sanguine temperament. However, the changes were well under weigh which were to make them entirely appropriate before the end of the next decade.

It is interesting to remember that the three epoch-making papers on mimicry by H. W. Bates, A. R. Wallace, and R. Trimen appeared respectively in 1862, 1866, and 1870, in the *Transactions of the Linnean Society* and not in those of the Entomological Society. This fact is no doubt partly due to the special suitability of the quarto form of publication for these monographs and partly to the appropriate channel afforded by the Society, which first gave natural selection to the world in 1858, but it probably also indicates that the Entomological Society was not at that date exactly a congenial home for the free discussion and subsequent publication of such hypotheses. I well remember, about the year 1875, when I was an undergraduate, the gravity and, indeed, almost consternation with which Professor Westwood, when he enquired what I was studying, received my reply that I was reading the *Origin of Species*. He told me that it was a book which so young a man ought not to read except under the most careful guidance, and he seemed to think that there was some failure of duty or, at any rate, some want of caution in my being allowed to have the book all!

The great change in relation to these opinions which has gradually come over the Society and over British entomology generally is especially due to the energy, zeal, and ability of a single man. Darwin described Huxley as his "general agent"; in relation to entomology his agent was Raphael Meldola. He became a member of the Society in 1872, was elected on the Council in 1874 and 1875, becoming Secretary in 1876, an office which he retained till 1880. In 1884 he was a Vice-President, and on the Council in 1885. During the whole of this period he was unremitting in his efforts to interest the Society in evolution and natural selection as applied to the problems of insect life and structure. Darwin received many letters from Dr. Fritz Müller containing most interesting and suggestive observations. These were translated by Meldola and brought before the Society. In 1879 he brought before the Society, and published in the *Proceedings* (p. xx), a translation of Fritz Müller's paper, which had only just appeared in *Kosmos* (May, 1879, p. 100), making known his suggestion as to the reason for resemblances between protected species in the hypothesis which has since been known as Müllerian mimicry, or the hypothesis of common warning or synaposematic colours. This new suggestion he sustained even against H. W. Bates, who had himself suggested the older theory of mimicry, and later against W. L. Distant. In 1882 (*Ann. Mag. Nat. Hist.*, Dec.) he extended the suggestion to explain broader resemblances between the species of distasteful groups generally. The outcome of his energy has been that the Müllerian suggestion has produced far more effect here than in its native country, and that the natural centre for controversy for the discussion of such questions shifted from the Linnean to the Entomological Society. In 1882 Meldola published a translation of Weismann's *Studies in the Theory of Descent*, which had also been brought before his notice by Darwin, who, indeed, suggested the English edition. This work has strong personal interest to the present writer inasmuch as it was the cause of his gradual absorption in the problems of insect bionomics, and abandonment of the histological researches on the lower mammalia upon which he had up to that time been engaged.

When we enquire as to the effect produced by these changes upon the direction and scope of entomological enquiry, the answer is both interesting and in many ways curious and unexpected. The result has been a return of the spirit which animated the older enquirers before zoological science became locked fast in the paralysing grip of pure systematics. When we read Réaumur or De Geer, the whole point of view is entirely familiar. In describing some of the wonderful means of defence of the larva of *Cerura vinula*, De Geer merely speaks of the "caterpillar of the sallow." Our sympathies are with Lyonnet, who carefully describes the anatomy of "the caterpillar which eats the wood of the willow." These men were *naturalists*, interested in the infinitely difficult and infinitely numerous problems presented by living nature. We find the same spirit in the early Darwinian writers; it shines forth clearly not only in the bionomic monographs, but also illuminates the systematic papers of Bates, Wallace, and Trimen, and now it has become the common heritage of entomology. Systematic work is as "useful and necessary" as ever, indeed even more so, for it becomes a necessity not only as an end in itself, but as the foundation for endless other inquiries. This, then, is the great gain which British entomology owes to Darwin's influence, received first through the early Darwinian writers, and then through the energy and ability of Raphael Meldola—that we are inspired to become naturalists and observers, rather than collectors, that we describe and distinguish species as the means for knowing more about them as living animals, and that endless new lines of observation are opened up to us from the high vantage ground which we occupy as firm believers in the doctrine of evolution and the process of natural selection as its motive cause.

A Century of Lepidopterology in North America.

By Professor C. H. FERNALD, M.A., Ph.D.

In the early part of the nineteenth century there were very few persons in the United States or Canada who paid any attention to entomology, nor had there been up to the commencement of the century any one belonging to this country who was doing any serious work on insects. Many collections had been made by travellers from time to time and sent to Europe where they were described by Linné, Fabricius, Drury, Zincken, Hübner, and others, during the latter half of the eighteenth century. John Abbot came to this country about 1790 for the purpose of collecting insects, but later he settled for some years in Georgia where he made very careful studies and drawings of lepidopterous insects, the results of which were published in conjunction with J. E. Smith, in 1797, in the *Lepidopterous Insects of Georgia*, in two folio volumes. A few scattered papers on the lepidoptera were published early in the century by Professor W. D. Peck and some others. The writings of Thomas Say on insects, extending from 1817 to 1839, although valuable descriptive papers, contain very little on the lepidoptera. Major John E. le Conte, in conjunction with M. Boisduval, published a work on the *Lepidoptera of North America and their Caterpillars* (1829-42). The entomological writings of Dr. T. W. Harris (1823-52) undoubtedly attracted more attention than those of any of his contemporaries. His *Insects Injurious to Vegetation* was an epoch-making book and is still a classic which can be found in the library of every economic entomologist in this country. When we consider the almost absolute isolation in which Dr. Harris lived and worked, so far as other entomologists were concerned, and the very meagre collection of books on entomology accessible to him, we may well marvel at the fulness, accuracy and amount of entomological work done by him while his time was so fully occupied with his regular duties. His isolation was so strongly felt, not only by himself but also by his pupils, that on the occasion of the visit of Mr. Edward Doubleday there was a very pronounced entomological flutter in Cambridge, but no more, perhaps, than would occur now should a prominent European entomologist visit the members of his profession in America.

The assistance rendered by the Smithsonian Institution "in the diffusion of knowledge," by publishing entomological works on different orders was exceedingly valuable. The appearance from this source of the *Synopsis of the Described Lepidoptera of North America*, by Dr. J. G. Morris, in 1862, gave many a young collector of butterflies and moths an impulse in the work of determining and arranging his captures and also sent him out into the fields after more with the blood tingling in his veins. Dr. Packard's *Guide to the Study of Insects*, appeared in 1869, and has had a very wide circulation but has long outlived its usefulness and been replaced by other works of this same author.

The science of entomology in this country has been greatly advanced by the reports of the State Entomologists who were appointed in some of the states, such as those of Fitch, Lintner and Felt of New York; Walsh, Le Barron, Thomas and Forbes of Illinois; and Riley of Missouri. We should also mention in this connection numerous articles in various scientific journals in this country devoted mainly to other departments of science, but special attention should be called to those journals devoted entirely to entomology and also to their editors who have influenced entomological thought in this country to a remarkable degree. What an influence Drs. Bethune and Saunders have wielded for good through the *Canadian Entomologist* since it first started in 1869, not only through the articles they personally wrote but also by the judicious use of the blue pencil. The same may be said of the influence of the *Proceedings of the Entomological Society of Philadelphia* (1861-67) and its successor, *The Transactions of the American Entomological Society* (1867 to date), *The Practical Entomologist* (1865-7), *The American Entomologist* (1868-70 and 80), *Psyche* (1874 to date), *Bulletin of the Brooklyn Entomological Club* (1875-85), *Papilio* (1881-84), the only American journal devoted entirely to the lepidoptera that I recall, *Entomologia Americana* (1885-90), *Insect Life* (1888-95), *Entomological News* (1890 to date). These journals probably did more to foster and encourage the general study of entomology and to arouse a spirit of investigation than all other existing agencies during the third quarter of the century.

The establishment of an Agricultural College in each of the States of the Union, late in the third quarter of the century, in which entomology was one of the branches taught, gave a new impetus to the study of this science, and when, in 1887, an Experiment Station was established in connection with each of these colleges, a new and decided impulse was given to the study of the life-histories and habits, particularly of our more common injurious and beneficial insects. So wide-spread has this influence become that courses in zoology, including entomology, have been introduced into many of the public high schools with laboratory work far more extended than was to be found in the Universities and Colleges twenty-five years ago.

The work of Mr. W. H. Edwards on our North American butterflies extending over many years, the first part of which appeared in 1868, created a wonderful interest in studies on the early stages not only of our butterflies but also of other groups of the lepidoptera, and when Dr. Scudder after years of careful investigation and study published his remarkable work on the *Butterflies of New England and Adjacent States*, it would have seemed to us that nothing remained to be done had he not himself in this most exquisitely illustrated and finely gotten up work, indicated the points requiring further investigation. Packard's *Bombycine Moths*, published in 1895, is, so far as it goes, a remarkable book, and we all sincerely hope that he will continue this excellent work. *A Text Book of Entomology* published in 1895 by this same author fills a long felt want for some modern and up-to-date work in English, on the external and internal anatomy, the physiology, embryology, and metamorphoses of insects. One of the most useful books of recent times on entomology is a *Manual for the Study of Insects*, by Professor Comstock and his accomplished wife, published in 1895. For a long time Professor Comstock has been studying the homology of the veins of insect wings of all orders, and has already given us most excellent help in the classification of the lepidoptera. By a very happy inspiration Dr. H. G. Dyar began the study of the lepidopterous larvæ, and discovered that the arrangement of the tubercles on the segments gave classificatory characters which coincided so fully with those given by Comstock and other investigators, as to attract very general attention to this means of determining the affinities of doubtful species.

The Noctuids of North America, when Professor A. R. Grote began his studies on them in 1860, formed a veritable *terra incognita*, and the amount of work done by him on that family was perfectly enormous. No one knows better than I what it means to break ground, as it were, in a family comprising so many species in a country where nearly all were unknown. It is true that Guénée and Walker had already described many from here, but this was of little assistance to the pioneer of those days. Professor J. B. Smith entered this field much later, and has also done an incredible amount on the Noctuids, as well as on other families, so that we look with pride upon the work accomplished in this family by these two gentlemen. The Geometrids attracted more or less attention but the first serious work on these insects in this country was *The Geometrid Moths*, published by Dr. Packard in 1876. This gave new enthusiasm to the collectors and students of those moths, and it was quickened again by the publications of the late Dr. G. D. Hulst, whose untimely death has prevented us from receiving a more complete and final work on this family which he had in contemplation. Very few North American micro-lepidoptera had been described when Dr. Clemens began his studies in 1859. He was the pioneer of the work on the Micros as was Grote of that on the Noctuids. After him, Grote and Robinson published on the Pyralids, and Robinson gave us a good paper on the Tortricids. In 1871 and for some years following Mr. V. T. Chambers described a large number of Tineids in the *The Canadian Entomologist* and other journals, but he did not live to revise his work, so that it does not have the value it otherwise might.

I have confined myself thus far to American workers, but I must make mention in connection with the micro-lepidoptera of the exceedingly valuable publications of Lord Walsingham on our *Pterophoridae*, *Tortricidae* and *Tineina*, as he advanced our knowledge of them in a very gratifying way. Miss Murtfeldt has also contributed much valuable information and described many new species of the micro-lepidoptera. In this brief *resumé* we are obliged to omit the mention of the names and works of many of our foremost entomologists, whose work in other orders of insects places them in the front rank of American entomologists.

From the entomological division of the Department of Agriculture in Washington, D.C., over which Dr. L. O. Howard so ably presides, from the Experiment Station of each State in the Union, and also from the Experiment Station in Ottawa, Canada, in which Dr. James Fletcher is the efficient entomologist, there is a constant issue of bulletins on entomology, which are distributed gratuitously over all the land to any and every person who expresses a desire for them. As these bulletins are growing more and more valuable because of the necessity of the greatest possible improvement in the Station entomologists themselves, since it is a case of "the survival of the fittest," what will be the development of entomological science in North America in the next century?

Obituary: Baron Michel Edmond de Selys-Longchamps

(*with photograph*).

Baron Michel Edmond de Selys-Longchamps passed away peacefully on the morning of Tuesday, December 11th, 1900, in his 87th year. In the veteran neuropterist, entomology has suffered a heavy loss. A fortnight before his death he left his home at Waremme to stay with his son, M. Raphael de Selys, at Liége; eight days before his death he took to his bed, where a long and busy life came to an end, from sheer old age. He was born in Paris, May 25th, 1813. His father had been Mayor of Liége under the French Republic, deputy for the department of Ourthe, and member of the National Belgian Congress. His family had long been connected with the politics of the principality of Liége, and was of Maestricht origin. The deceased baron's public career in his native land was a prominent one; successively communal councillor of Waremme in 1841, provincial councillor in 1846, representative of the arrondissement of Waremme in 1848, Senator of the same arrondissement from 1855, he was eventually elected President of the Senate from 1880 to 1884. He always took an important part in the discussions of the legislative body. On the occasion of the revision of the Constitution, he advocated universal suffrage in two degrees, uninomial scrutiny, the representation of minorities, the election of the Senate in two degrees, and other principles more familiar to Belgian than to English ears. He was, in fact, what is rare for a Belgian nobleman, a liberal democrat. The last survivor of the famous liberal Congress of June, 1846, he was also a Grand Cross of the Order of Leopold, and, in recognition of his scientific work, which was as prominent as his political labours, he was elected corresponding member of the Belgian Academy in 1841, full member of the same in 1846, and Honorary F.E.S. in 1871. His scientific labours are doubtless more familiar to the readers of the *Record*: over 250 articles and papers of varying length appeared from his pen, but by far the most important are his works upon the odonata, a group which he made peculiarly his own; among these may be specially mentioned *Monographie des Libellulides d'Europe*, Paris and Bruxelles, 1840, followed by an equally important supplement ten years later; numerous synopses and monographs of the families of odonata, treating not only the Palæarctic fauna, but that of the whole world. In orthoptera he confined his attention to the fauna of his native country. In 1862 appeared his *Catalogue raisonné des Orthoptères de Belgique*, at a date when these insects were little studied. A supplement was published in 1868, and finally, in 1888, there appeared in the *Annales de la Société entomologique de Belgique*, a *Catalogue raisonné des Orthoptères et des Nevroptères de Belgique.* His versatility is further illustrated by the titles of papers dealing with other subjects than his family of predeliction: "Tableau de la vegetation à Waremme," &c., 1874; "Observation sur d'anciennes constructions romaines à Waremme, au lieu dit Autuaxhe," 1843; "Additions à la récapitulation des Hybrides observés sans la famille des Anatides," 1856; "Observations sur la Pisciculture," 1861; "Discours sur la classification des Oiseaux, depuis Linné," 1879; "Révision des Poissons d'eau douce de la Faune Belge," 1887; *Faune Belge*, Ier Partie, "Indication méthodique des Mammifères, Oiseaux, Reptiles et Poissons observés jusqu'ici en Belgique," 1842; "Sur les formes de *Zygaena trifolii*, sur une notice de M. Briggs," 1872; "Les corbeaux au point de vue de l'Agriculture et de la Sylviculture," 1895; and various memoirs on mammals, birds, agriculture, pisciculture and entomology in different periodicals, in French, English, German and Italian. In recognition of the importance of his work, and more especially of that dealing with the odonata, he was elected Honorary Member of the Zoological Society of France, and of the Entomological Societies of Holland, Stettin, Berlin, Germany, Vienna, Florence, Switzerland, Sweden, and Helsingfors, in addition to the honours mentioned above.

With the exception of a slight deafness, he preserved his faculties until the end, and his activity seemed in no way impaired by his great age. His venerable figure, with snowy locks down to his shoulders, his geniality and old-world courtesy made him as beloved as he was respected by all who had the privilege to know him. All entomologists, especially those who were fortunate enough to know him personally, mourn the passing of a noble and venerable figure, prominent alike from his political and scientific career.

Luffia maggiella, n. sp.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

A *Luffia*, ♂ unknown, ♀, antennæ 12-jointed, tarsal formula 3.4.4, length of longest rod of ovipositor about 3·6mm., *not parthenogenetic*.

This differs from *L. lapidella* in precisely such characters as *L. ferchaultella* does, and is practically indistinguishable from that species excepting that it is *not parthenogenetic*. This is a distinct species, if *ferchaultella* be distinct from *lapidella*, it is intermediate between the two, and is either distinct, or with other forms, a link to show they are all one species; in any case it requires a name.

Habitat: Val Maggia, near Bignasco (Tessin), abundant, bred by Mr. Bacot and myself.

Field Work for February and March.

By J. W. TUTT, F.E.S.

1.—Mild evenings in February give larvæ of *Triphaena orbona*, *T. ianthina*, *Leucania lithargyria*, *Phlogophora meticulosa* at the base of hedges; they are easier to find now than later, the vegetation being less thick (Mathew).

2.—During February the larvæ of *Epunda lichenea* are to be found stretched on stems of dead grass, dock, twigs, &c., the smallest in a sphinx-like attitude, generally in small groups of five or six; those that were feeding ate dock, sorrel, chickweed, and a common sort of grass.

3.—*Dasypolia templi* hibernated females laid ova March 1st and 6th-13th. The latter emerged April 5th, transparent yellow with black head. Some burrowed into the leaf stem of *Heracleum sphondylium* (cow-parsnip), two others spun a slight silk protection and devoured the cuticle of a leaf. By April 13th nearly all were hidden in the leaf stems. On June 18th found a full-fed larvæ (stung, however, and full of a mass of small maggots) under a stone near Athlone. Howth is also a locality (Kane).

4.—Early hatching (January and February) eggs of *Asteroscopus sphinx* can be reared on birch catkins by cutting the latter open; the larvæ will not touch the catkins unless split (Greene).

5.—*Agrotis lucernea* larvæ hide in daytime in isolated tufts of grass growing in clefts on bare cliff faces. On February 12th they are large and not far from full-fed. Look for them at night with a lantern (Kane).

6.—From oak galls collected in February I bred a fine long series of *Heusimene fimbriana* and *Coccyx splendidulana* (Elisha).

7.—During February pull gently the last year's flower-stalks of ragwort, and you will find that when the root contains a larva of *Acrolepia aeneana*, the stem breaks off readily, leaving a piece about two inches high which is slightly webbed over the hole that leads down to the root. Dig up the roots, plant in pots or boxes, and bring indoors in May.

8.—To rear larvæ of *Agrotis agathina* plant in pots some shoots of *Erica cinerea*, surround the shoots with moss to serve as a hiding-place for the larvæ during the day, place 12-15 larvæ in each pot, cover the whole with a carefully fastened gauze bag, place the pot in a saucer full of water, and the whole out in the open air, a most important factor for success; leave the pots in the sun, but they must be protected against heavy rain. After about a fortnight they want attending to, the moss lifted and searched with care so that no hidden larvæ be thrown away, the grass cleared, fresh moss added, and the larvæ placed back. If the heath be too much eaten a fresh piece must be planted. When full-fed the larvæ prefer to spin up between the stems of the heath almost on the ground; once they have buried themselves the pot need not be watered regularly, it is sufficient to place it in a saucer full of water and replenish the latter about once a fortnight to prevent the earth drying up entirely. The pots should now be kept in the shade, and after July 20th carefully watched for the imagines, which emerge from this date till about September 8th (Léon de Joannis).

CURRENT NOTES.

For the current year the Rev. Canon W. W. Fowler, M.A., F.L.S., F.E.S., has been elected President of the Entomological Society of London. Mr. Louis B. Prout, F.E.S., has been re-elected President of the City of London Entomological and Natural History Society. Dr. Fremlin, F.E.S., has been elected President of the South London Entomological and Natural History Society. Mr. Millais Culpin, President of the North London Natural History Society.

In the January number of *The Annals of Scottish Natural History*, p. 24, the Rev. H. S. Gorham describes a species of *Stenolophus*, apparently new to Britain and to science. Two specimens were captured on the banks of the Clyde, near Greenock, by Mr. John Dunsmore. In identifying these specimens Mr. Gorham has discovered that the insect in the collection of the British Museum, standing under the name of *S. discophorus*, Fisch., agrees perfectly with them, but he is of opinion that it does not accord with Fischer's species. The Clyde insects and that of the British Museum (from S. France), belong, therefore, apparently to an undescribed species, for which Mr. Gorham proposes the name *S. plagiatus*. Most probably this insect has been confused for a long time with *S. discophorus*, which we gather is a northern insect, and we wish Mr. Gorham had been able to compare his Clyde insects with other southern foreign examples. We cannot agree with Mr. Gorham that there is every probability these specimens were not introduced, quite the contrary, we have had several cases of insects of similar habit taken near some large seaport, and nowhere else since in the country, which have undoubtedly been importations, and until further evidence is forthcoming we must consider this species also an importation.

The fine collection of coleoptera made by the late Mr. Lennon, in the extreme south-west of Scotland, mainly in the districts bordering the Solway Firth, has now become public property, having been purchased by The Edinburgh Museum of Science and Art. We saw the collection a few weeks ago; it is in good condition, and is to be used as the nucleus of a thoroughly representative collection of British coleoptera in the above Museum.

Professor Josef Redtenbacher has recentiy brought out a work entitled *Dermatopteren und Orthopteren von Osterreich-Ungarn und Deutschland*, with one plate. Vienna, 1900. It is a popular account of the Dermatoptera and Orthoptera of Germany and the Austro-Hungarian Empire; it includes no novelties, but should be of great assistance to collectors in these countries. There are twelve *Dematoptera*, sixteen *Blattodea*, only four *Mantodea*, and but one Phasmid included. Of *Acridiodea* there are seventy, and of *Locustodea* ninety-one species, while of *Gryllodea*, seventeen are mentioned. In spite of the extent of the districts included, it will be seen that the orthoptera-fauna is rather poor, as compared with that of Spain, a considerably smaller area, which, however, is exceptionally rich.

In the *Annales de la Société Entomologique de France*, lxviii., 1899 (dated 1900), Bolivar has completed his account of the orthoptera of St. Joseph's College, Trichinopoly. A large number of new forms, some very strange, are described and illustrated. It is an important contribution to our knowledge of the orthoptera-fauna of Southern India, which is very incomplete.

We did not suspect that we should have had such strong support to our views (*anteà*, p. 3) that the leading lepidopterists are collectively, and as scientific naturalists, far ahead of the leading students of other orders in this country, nor that it would be so soon suggested that a different standard is applied to their selection, either by implication as members of the Council or directly as President of the Entomological Society of London, but the ex-President in his address on January 16th, 1901, says: "While not saying one word against the valuable work done by British lepidopterists, I cannot help suggesting to many of the younger fellows of this society that if they are at all ambitious they can far more easily make a name for themselves if they will only take up the study of the less-known orders of insects. Had I been a lepidopterist I do not think that I should ever have been President of this Society, but through becoming fairly well-known as a student in the chaos of British diptera my name became more familiar, and I consider that it is through my having studied this comparatively unworked order that I was given the most honourable distinction that it is in the power of the society to confer."

The Entomological Club held its last meeting on the evening of January 15th, in the Entomological Salon, of the Holborn Restaurant, Mr. G. H. Verrall, the host, being in the chair. It proved to be quite one of the most successful meetings ever held, everybody who is anybody in the entomological world, and who was able to be in town being present, amongst others, Professors Bateson, Meldola, Poulton, Revs. Dr. Lang, E. C. N. Bloomfield, E. A. Eaton, F. N. Morice, C. Thornewill, Colonels Yerbury, Swinhoe, Messrs. Andrews, Austin, Bradley, H. R. Brown, Burr, Barrett, Blandford, Brunetti, Carrington, Collin, F. N. Clark, Distant, Donisthorpe, S. Edwards, Elwes, Fenn, W. H. B. Fletcher, Fremlin, Gahan, Goss, Harrison, Janson, Jacoby, A. H. Jones, Kirby, Kirkaldy, Montgomery, Morley, Step, Turner, Tutt, Wainwright, Waterhouse being noted. Of the other members of the club only Messrs. Adkin, Hall and Porritt, with Mr. F. Smith, an hon. member, were present. Mr. Jacoby and his son charmed the guests again with their delightful music, whilst Mr. Brunetti also played a selection of music on the pianoforte.

Mr. G. O. Day asks for help, as Dr. Dobie, Messrs. Arkle, R. Newstead and himself, are engaged on a revision of Mr. A. O. Walker's *List of the Macro-lepidoptera of the Chester district*, published in the *Proceedings of the Chester Society of Natural Science*, 1885. It is proposed to take in the micro-lepidoptera and to extend the district so as to include the whole of Cheshire, Flintshire, Denbighshire, Carnarvonshire and Anglesea. Records from any of these counties—especially the Welsh counties—should be sent to Mr. G. O. Day, Knutsford, Cheshire; or lists for marking will be sent to anyone who will apply for the same. We would urge all our readers who know any little part of this district to help, the fauna is exceedingly interesting from so many points of view.

It is with the greatest regret that we have to announce the death of our dear friend Mr. Herbert Williams, at Southend, on the morning of January 5th, last. He has long been ailing, although, for some time after he ceased to be the secretary of the South London Entomological and Natural History Society, and removed to Southend, he occasionally came to the meetings. A kindly-hearted young fellow, an excellent and careful field naturalist, he will be greatly missed by those who had the pleasure of his friendship. Mr. John H. Leech died on December 29th, 1900. Although he has done comparatively little entomological work himself, he has spent money freely on the collection of the fauna of outlying parts of the Palæarctic area, especially China and Japan, and his books, on the fauna of these districts, will, thanks largely to his scientific editor, Mr. R. South, long be standard works. He will be best remembered as becoming some eleven years ago the proprietor of *The Entomologist*, which he bought with the intention of publishing therein the systematic results of the collections that his collectors sent home from China and Japan. Such a storm of indignation, however, was aroused among British entomologists that the descriptions were soon abandoned, too late, however, to affect *The Record* which was started at the time. The Société Entomologique Namuroise has lost a colleague in M. Henri Verheggen, Chevalier de l'Ordre de Léopold, who died at Heure-lez-Marche, December 16th, 1900, aged 55.

Mr. McLachlan (*Ent. Mo. Mag.*) adds *Chrysopa dorsalis*, Burm., to the Neuropterid fauna of Britain, a very good example being taken at Oxshott, Surrey, July 7th, 1900. The species is much like *C. perla*, being "of the same form, with much black on the body, and the neuration very much mixed with black. *C. perla* can always be distinguished by the distinct blue-green colour of the pale parts, very conspicuous on the wing. In *C. dorsalis* the body colour is yellowish-green rather than blue-green," &c.

The Rev. F. D. Morice (*Ent. Mo. Mag.*) adds two sawflies to the British list, *Tomostethus gagathinus*, Klg., taken by the Rev. A. Thornley, June, 1898, near Lincoln, and *Tomostethus funereus*, Klg., taken by Mr. Beaumont in August, 1900, at Appledore, in Kent.

Mr. Andrews adds *Atherix cassipes*, Meig., to the list of British diptera. The specimens were taken in July, 1900, among some small alder bushes on the banks of the river Rother, near Ticehurst, in Sussex. Mr. Bradley records the following *Trypetidae* as additions to the British list: *Tephritis* (*Oxyna*) *elongatula*, Lw., swept in a field at Swanage, August 29th, 1900; *Tephritis ruralis*, Lw., ♀ June 29th, 1898, in New Forest; *Rhacochlaena toxoneura*, Lw., one ♀ on a window at Sutton Coldfield, May 22nd, 1897: *Tephritis tessellata*, Lw., one ♀ taken in July, 1894, in the New Forest, and later at West Runton, in Norfolk.

The South-Eastern Union of Scientific Societies will hold its next annual congress at Haslemere, during the first week in June. Papers relating to the natural history of the south-eastern counties are solicited, and their titles and scope should be submitted to Dr. G. Abbott, 33, Upper Grosvenor Road, Tunbridge Wells, as early as possible.

A. de Bormans

Auguste de Bormans (*with photograph*).

In November last there appeared the result of the life-work of Auguste de Bormans, a few months after the learned author had been incapacitated from further studies. With this notice, therefore, of his book, we are very pleased to give our readers a portrait of the eminent forficulist, and a brief account of his labours. Originally an officer in the French army, he retired a little over twenty years ago, and lived for some years in the sunny climate of Italy; he then settled for a period in Belgium, and moved later to the mountain air of Haute Savoie, where he resided until two years ago. Since then he has been living in Turin, finding the milder air of Piedmont more suitable to his failing health. A dangerous illness struck him down last summer, which theatened to be fatal, but the crisis passed and left him paralysed. Unable to do any further work, and almost incapacitated from writing, he has disposed of his unique collection of *Forficularia*, together with his drawings and manuscripts.

On first turning his attention to entomology, he made collections of almost every order of insects, confining his energies mainly to European forms. Orthoptera, however, were always his favourites, and he soon took his position among the authorities of the group. Articles and brochures appeared more or less frequently from his pen, dealing almost exclusively with orthoptera. Finding that earwigs were greatly neglected, he confined his energies more and more to the *Forficularia*, and was shortly recognised as the only and final authority. The collections of all the leading museums of Europe were submitted to him for determination, as well as those of private individuals. He thus, practically, created a monopoly, and amassed an unrivalled collection of the insects themselves, and knowledge of their classification, as far as it had been elucidated. His chief papers dealing with orthoptera generally, are *Liste des Orthoptères récueillis jusqu'ici en Ligurie*, published under the name Dubrony (*Ann. Mus. Cir. Gen.*, xii., p. 6, 1878), *Spedizione italiana nell' Africa equatoriale, Ortotteri*, 1881 and 1883, in the *Annales* of the Genoa Museum; *Faune orthoptérologique des Iles Hawaii ou Sandwich*, 1882, in the same publication, and various smaller articles dealing with collections of orthoptera from South Africa, Sardinia and Belgium. Owing to the relations he held for many years with his leading colleagues, he acquired an excellent representative collection of the orthoptera of Europe and the neighbouring regions, containing a large number of paratypes, and several original examples; he parted with this in 1896, and it was acquired in its entirety by the writer of this memoir. His articles upon the *Forficularia* have been more numerous and important. His maiden work upon the group was entitled *Essai sur le genre Chelidura*, also published under the name Dubrony, in the *Annales* of the Genoa Museum, in 1878. In the following year, under the same name, he worked out the earwigs of the Madrid Museum (*An. Soc. España, N.H.*, viii.), and the fine collections made by the Marquis Doria, Beccari and d'Albertis, published in the *Annales* of the Genoa Museum; a considerable number of novelties were described, each illustrated in the text by very clear outline drawings by Fea. In 1880 he published the result of his work upon the earwigs of the Brussels Museum, and later, in the same year, of the Warsaw Museum. In 1883 he published an important paper in the *Annales de la Société entomologique de Belgique*, giving a complete account of the collection of Brunner von Wattenwyl, one of the richest in existence. This was accompanied by a synoptical table of the genera, the first modification of Dohrn's system of the sixties. The system thus established has remained in vogue until his latest and most important work, though it was followed, but not superseded, by Kirby's *Revision* in 1890. In 1886 he examined de Haan's types in the Leyden Museum, and published a paper with descriptions of six novelties. In 1888 he gave us his first paper on Fea's collection from Burmah, followed, six years later, by a more complete and larger study of the same, both being published in the *Annales* of the Genoa Museum. Three years ago he completed the manuscript of a complete monograph of the *Forficularia* as known down to the end of 1896; this was afterwards brought up to the end of 1897, whilst his last work was a paper, again published at Genoa, in the spring of 1900, with descriptions of a number of novelties, and synoptical tables of several genera. At length, after an unavoidable delay of three years, his great monograph* has been published in *Das Tierreich*. Originally written in French, it has been translated into German by Krauss, who is the author of the few pages on the single species of *Hemimerus*.

This work, of which the importance can hardly be overestimated, is handicapped by the regulations of the great publication of which it forms a part. On opening it we are disappointed at not finding a longer introduction, in which the author could give us the benefit of his many years' experience of observation of this difficult group; it is also incomplete, owing to the length of time involved in publication, for it only includes forms known down to the end of 1897, since which date a considerable number of new forms have been described. It begins with a "Litteratur-Kurzungen." This is followed by a "Systematischer Index," which gives 31 genera and 308 species, not including several doubtful forms. There are a few *species incertae sedis*, and finally the *Hemimeridae*, with the unique species. The part dealing with *Forficulidae* proper occupies 129 pages. The introductory remarks upon structure are illustrated by a clear diagram showing the nomenclature of the parts, the tarsal segments are also figured considerably magnified, which should give assistance to students who are turning their attention to this group, for the shape of the second tarsal segment is one of the most important characters and is somewhat difficult to observe. A short paragraph treats of the development and of the distinction of the early stages from the imago, but no detailed mention is made of the remarkable post-embryonic development of *Diplatys*, described by Green. A few words are devoted to the habits of earwigs, and their distribution. De Bormans recognises 31 genera, 308 species, 20 subspecies, and one variety, with two uncertain genera and 31 uncertain species. An important synoptical table of the certain genera follows, thus definitely establishing the system of the *Forficulidae* as at present known, for the one genus too recently established for inclusion, *i.e.*, *Gonolabis*, easily falls into

---

* *Das Tierreich*, Eine Zusammenstellung und Kennzeichnung der rezenten Tierformen. 11. Lieferung. Orthoptera, Redakteur: H. Krauss. Forficulidae und Hemimeridae bearbeitet von A. de Bormans und H. Krauss. Mit 47 Abbildungen. Berlin. Friedländer. 1900.

position next to *Anisolabis*. The extraordinary form of the cerci or caudal setæ of the two forms of *Diplatys*, are referred to briefly in the diagnosis of the genus. The uncertain genus *Nannopygia*, Dohrn, is retained, and *N. dohrni*, Kirb., is included. I have shown in a paper not yet published that this is synonymous with *Carcinophora caeruleipennis*, Borm. The spelling *Apachyus* is retained, as being the original orthography of Serville, in deference apparently to the regulations of *Das Tierreich*, which do not admit corrections. *A. pascoei*, Kirb., is united with *A. feae*, Borm. We note that in the large genus *Pygidicrana*, the spelling *P. callipyga* is adopted; this we know is in direct opposition to the opinions of the author, who has strongly and energetically expressed his idea upon the subject in an unpublished note, where he writes "l'orthographie tel que l'a écrit le premier déscipteur ne peut être changée sous aucun pretexte," and again, "par cet enfantillage on arrive à augmenter la confusion et pas autre chose." *Cylindrogaster abnormis*, Borm., the real position of which has always caused the author considerable hesitation, is included in *Pygidicrana*; it is a very distinct species, and we are aware that he has wished to erect for it an entirely new genus. *Pyragra* is carefully distinguished from the allied *Pygidicrana*. It is a genus which has always puzzled systematists, as the scutellum has been authoritatively stated, on the one hand, to be distinct, and on the other, to be absent. The mystery is explained in a footnote, to the effect that, after an examination of 150 specimens, the author found that some had the scutellum distinct, and in others it was not present. The points by which it is discriminated from *Pygidicrana* are the form of the sternum, of the elytra, the last abdominal sternite in the male, and the femora. The difficult genus *Labidura* is definitely elucidated; *Demogorgon*, Kirb., is synonymous. *L. batesi*, Kirb., is given as distinct, though a possible variety of *L. riparia*, as also *L. bicolor*, Kirb., and *L. adelpha*, Kirb. No less than six subspecies of *L. riparia*, Pall., are distinguished in the table of species, these are the type form, and the subsp. *livida*, Borm., *pluvialis*, Kirb., *pallipes*, Fabr., *japonica*, Haan, and *erythrocephala*, Fabr. (nec Oliv.). *L. servillei* is considered as distinct, with two subspecies, and Dufour's name *lividipes* is restored for what is usually known as *meridionalis*, Serv. *L. clarki* is suggested as a form of *Pyragra*, and *L. morosa*, Kirb., as a female of *F. trispinosa*. In *Labidurodes*, *L.* ? *decipiens* is wrongly included, but the species was unknown to the author; it is more likely a *Spongiphora*, with a strong superficial resemblance to *Apterygida africana*, ♂, and *A. bipartita*, Kirb. It is certainly in every way very distinct from *Labidurodes robustus*, at least, judging from figures of the latter. *Caeruleipennis* is given as a new name for *Labidura femoralis*, Dubr., *in errore* (nec Dohrn); as above mentioned, this is synonymous with *Nannopygia dorhni*, Kirb., which name must stand. In *Anisolabis*, *Labidura advena*, Mein., is placed as synonymous with *A. maritima*. *A. variicornis*, Smith, with *A. annulipes*, Luc., and the species of the recently erected genus *Gonolabis* are included. The orthography *Spongiphora* is restored at the expense of *Spongophora*. The type species *S. croceipennis* is divided into the subspecies *croceipennis*, Serv., *parallela*, Westw., *lherminieri*, Serv., and *dysoni*, Kirb. *S. insignis*, Stal., and *S. punctipennis*, Stal., are identical. The 34 species of *Labia* are reduced to order, for which task alone the author would earn the gratitude of students. *Sparatta semifulva*, Borm., is removed to *Chaetospania*. The hitherto unknown male of *Chelisoches punctulatus*, Burr, is described. *C. modestus*, Stal., is reduced to a subspecies of *C. simulans*, Stal. *Sphingolabis? perplexa*, Kirb., is placed in *Ancistrogaster*, with the remark that it stands very close to *A. devians*, Dohrn, with which it may be identical. *Neolobophora ova*, Borm., is corrected to *Opisthocosmia hova*. *Chelidura* is enriched by *Forficula vara*, Scudd. We are glad to see that *Sphingolabis* is dropped in favour of *Apterygida*, Westw. *Apterygida gravidula*, Gerst., is separated from *A. arachidis*, Yers., on the strength of the form of the pygidium. In *Forficula* eight species are given which cannot be ranged in the system from being insufficiently described, or only known in the female. The doubtful species are *Chelisoches sobrius*, Borm. (type in bad condition), *Condylopalama agilis*, shown by Krauss to be almost certainly an Embiid larva, *Forficula capensis*, Thunb., and *F. doumerci*, Serv., *F. elongata*, Fabr., *F. fasciata*, Thunb., insufficiently described, and *Typhlolabia larva*, which is very probably as Kirby suggests, a *Japyx*. Two and a half pages are occupied by Krauss on *Hemimerus*, which is described in detail, with a few brief notes on its development and habits. An alphabetical index follows, giving all synonyms, with the genera, and the work is closed by a *Nomenclator generum et subgenerum*, giving the references to the original erections of the genera, and the derivations of some.

Thus at last entomologists have a complete and authoritative work upon the *Forficulidae*, and we hope that its appearance will give an impetus to the study of this neglected order. It is the work of a man who has specialised the group, almost to the exclusion of all other insects, and is the result of twenty years' study. There is a pathetic interest in the appearance of the book, when the author has ceased to work, and has parted even with his collections and his notes. So long ago as 1883, he wrote to Brunner von Wattenwyl, referring to his "Monograph," which he had already in view, little thinking that when it should eventually appear, seventeen years would have passed, and he would be himself unable to continue his beloved studies. Still, he must look with pride upon the work of his life, which marks a greater epoch in the history of our knowledge of his favourite group even than did H. Dohrn's *Versuch* of nearly forty years ago. However much our knowledge may progress upon this basis, de Borman's monograph must remain for very many years the sole and standard account of the *Forficulidae*, and we are sure that all orthopterists will heartily congratulate with all sympathy the author and his collaborator. —M. B.

Abundance of Lepidoptera at Gresy-sur-Aix in August, 1900.

By J. W. TUTT, F.E.S.

After having spent some time in the mountains of S.-E. France, I stayed for a few days (Aug. 18th-24th, 1900) at Aix-les-Bains, and worked most of the available time on the hills lying between Grésy and Lake Bourget. I was unfortunate, however, for after a summer of unusual heat and dryness, a south wind lasted all the time I was at Aix, and as this is the wet wind of the district, thunder and lightning were the order of the day. Not one day was wholly free from wet, and the torrential rain of three days out of six not only prevented one getting out but thoroughly destroyed most of the specimens already on the wing. This was the more regrettable as it was quite clear that it had been and still was a specially good butterfly year in the district, and on the two days I got any collecting I made quite large bags of fairly decent insects. In fact in the late forenoon and the afternoon of August 19th I saw in one little place such a multitude of insects that one rarely has the opportunity of witnessing even in very favoured regions. I do not know that there was anything specially rare, but many insects that I look upon as local here, and with which I am always glad to meet, were in unusual numbers. At the foot of the hills near the Grésy waterfall in damp meadows I found the delicate dragonflies, *Sympycna fusca* and *Lestes barbara* on August 20th.

I saw no *Apatura ilia* this year. I suspect I was altogether too late, but, at the level crossing where the steam trams cross the railway, I noticed quite intermediate forms of *Pararge egeria* among the beds of nettles, &c., by the railway side. There appeared to be no pupæ of *Euranessa antiopa*, full or empty, this year, but unless one hits the place where the colonies pupate, it is quite possible to miss the species altogether, still pupæ are generally common, both in the avenue leading to Grésy, and that leading to Lac Bourget. Once at the foot of the hills, however, multitudes of insects were at once apparent. *Brenthis dia* and *Melitaea* (?) *athalia*, evidently both second broods, abounded on every piece of waste ground and in every field, whilst more sparingly with them were *Melitaea phoebe*, *M. didyma* and *M. cinxia*. *Plebeius aegon* was not uncommon in the fields; I suspect a partial second brood of this species occurs here, and I also believe at Fontainebleau where I obtained it abundantly in late June, 1897, and again in late August, 1899, in perfect condition. *Polyommatus icarus*, *P. astrarche*, *P. corydon*, *P. hylas*, *P. bellargus*, were all observed in the very first field entered, and *Syrichthus sao*, *S. alveus*, *Pamphila comma*, *P. sylvanus* and *Nisoniades tages*, the two last-named in small numbers but good condition, probably also indicating a partial second brood. I did not see *Spilothyrus malvarum*, which, however, occurs here sparingly, although *S. althaeae* put in an appearance. The *Thymelicus thaumas* and *T. lineola* were too worn to take, but a pretty little blue, very like *Cyaniris argiolus* on the wing but dodging about the lucerne blossom proved to be *Everes argiades*, which was just emerging and in the most beautiful condition. *Leucophasia sinapis* flew lazily along the roadside and at the edges of the fields, and all three common whites—*Pieris brassicae*, *P. rapae*, *P. napi*—were abundant, the first perhaps the rarest, and we noticed *Pararge maera* at the corners of the path, a single *P. megaera*, and large numbers of *Epinephele tithonus*, but although *E. janira* was in large numbers, *E. lycaon*, usually very abundant, was almost entirely absent; a single *Pieris daplidice*, and several *Colias hyale*, *Colias edusa*, and var. *helice*, flying at rare speed in the sun, however, were noticed, and other species such as *Coenonympha pamphilus*, *Gonepteryx rhamni* &c. All these species were seen within a quarter of an hour of arrival on the ground, and, as one began to mount the path, the numbers of several increased whilst those of others decreased and fresh species soon showed themselves. *Callimorpha hera*, never a common insect here, was seated on almost every clump of *Eupatorium*, around which *Limenitis camilla* flew in its well-known graceful and inimitable style, and the zigzagging males of *Porthetria dispar* were abundant. Soon a huge dark satiny male *Enodia dryas* appeared, and then the larger and less intensely black female. Here, there, and everywhere, as one went on, this species was in unparalleled abundance, whilst a plant or two of *Eryngium* gave several *Hipparchia semele* and *H. arethusa*. The latter species soon became only just less abundant than *E. dryas* and a few good specimens of each were quickly pinned. In the path through the wood *Limenitis camilla* was also in unusual abundance, the males small, the females quite up to usual standard size, but both getting a little *passé*. *Coenonympha arcania* and *Lycaena arion* were both evidently over, but many things were netted along the pathway—*Minoa euphorbiata* amongst box, *Scodiona plumaria*, *Gnophos obscurata*, and huge pale *G. furrata*, quite unlike the dark ones from the Tyrol. Here, too, *Erebia aethiops* began to put in an appearance, increasing in numbers as one went on, and then a quick stroke made a prisoner of a fine male *Hipparchia briseis*. Standing back at a huge butterfly that darted almost straight at one, I found I had netted *Satyrus hermione*, an exceptionally large female, whilst as I proceeded I still picked out the blackest *E. dryas* and consigned them to the box. Once through the wood there are large clover fields. We hear of clover-sick land, but this ground has grown clover for some seven years to my knowledge and it still reaches well up to one's middle and no sign of failure. A small piece of waste ground on the side, however, perhaps 40-60 yards long, and 10-20 yards deep, rather grassy with some big bushes of lucerne, and here and there a walnut-tree, forms a corner that has long been a favourite place with me. One year it simply swarmed with Anthroceras—*A. lonicerae*, *A. carniolica*, *A. achilleae*, *A. transalpina*. I have seen no great numbers of these on it since. Another year small Geometers, *Acidalia ochrata*, *A. rufata*, *Aspilates gilvaria*, *Strenia clathrata*, &c., abounded. This year the lucerne was specially well-grown and the number of butterflies in this one little spot was simply incredible. Almost every species in the district must have congregated here on August 19th. They were literally in thousands—*Enodia dryas* on almost every flower-head. I netted over a hundred, of which I kept about a third, in about half an hour, and there was no apparent lessening in their numbers; *Erebia aethiops* large, exceedingly fine, and just out, almost as numerous, *Dryas paphia* and *Argynnis adippe* among the larger fritillaries, whilst on the tree-trunks, *Satyrus hermione* and *Hipparchia semele*, the latter often, however, coming to the flowers. With these *Callimorpha hera* got up at every step and lumped down a yard or two away on another flower-head, to doze or sleep again. But the common whites, *P. rapae*, *P. brassicae*, *P. napi* and *Leucophasia sinapis*, although abundant, were far outnumbered by the small fritillaries, blues and skippers, which kept the whole of the larger butterflies one seething mass of confusion, and the advent of a bustling *Colias hyale* was sure to disturb many. *Brenthis dia*, *Melitaea didyma*, *M. phoebe*, *M.* (?) *athalia*, were all common, and *M. cinxia* not rare, whilst to *Polyommatus corydon*, *P. bellargus*, *P. hylas*, *P. icarus*, *P. astrarche*, *P. aegon*, one has to add *Everes argiades*, which was here in greater numbers than I had ever before seen it, and *Nomiades semiargus* was not at all rare. *Epinephele ianira* was in thousands, so also was *E. tithonus*, and there was now a fair sprinkling of *E. lycaon*. *Melanargia galatea* was nearly over, and *Gonepteryx rhamni* was in rather fewer numbers than is usually the case in this district, where I have seen it literally in thousands. The feature of this butterfly corner was, however, the absence of Vanessids, a solitary *Pyrameis atalanta* being the sole visitor, although I saw a single *P. cardui* later. *Limenitis camilla* flew round the walnut trees and one or two huge *Papilio machaon* stayed for a moment on their evidently important journeys. Altogether it was a sight rarely to be witnessed and ever to be remembered. One can only regret that there were not more lepidopterists to take advantage of the unusual treat thus offered. The fields beyond gave *Hipparchia briseis*, and the Coliads were in moderate numbers, but so active and wary that one got but few specimens as a result of the maximum of exertion, and here, in the fields even, *E. dryas* kept up its marvellous numbers, whilst *H. semele* evidently liked the clover flowers; *Erebia aethiops*, too, was everywhere, whilst further on one came upon *H. arethusa* and *M. phoebe* again in numbers. As I have said scarcely any burnets were seen on this occasion, the few, however, adding brightness to a really lively and enchanting scene, and as I lingered on the higher slopes within sight of Lake Bourget, and the green woodpecker screamed out his mocking laugh, I felt that the cup of the naturalist might indeed be considered full, and suspected that I was as completely satisfied with my surroundings as he.

Notes on Luffias—with incidental remarks on the phenomenon of parthenogenesis.*

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

There is probably no genus of lepidoptera of such small extent, that presents so much matter of interest as *Luffia*. The genus was instituted by Tutt, and is fully dealt with by him in the second volume of the *British Lepidoptera*. Nevertheless I think it possible that it may be useful to present to you various facts connected with it, although certain new matter that seemed likely to be available, when I proposed this subject for my paper, has not proved to be so full and abundant as was expected.

The type of the genus, *Luffia lapidella*, is of much interest to us, in the first place, because no English example is known, and yet cases that are undoubtedly those of *Luffia lapidella* have been found on our southern coast. It is, therefore, a species that is at present of the most extreme rarity with us, yet exists, and may possibly easily be attained by anyone who chooses to search for it. Were a Noctuid or Geometrid in this position, how its probable habitats would be besieged. The other species of the genus, *L. ferchaultella*, is of interest from a similar point of view, it being apparently a species widely distributed in the south of England, and locally common, and which is yet hardly known from any other region. The genus interests us here especially, since nearly all the work that has been done on it, recently, and which has given us a grasp of it in many relationships that were previously quite wanting, has been done by our friend and colleague, Bacot. He has collected, bred, and examined these insects in a most careful and painstaking manner, and with just that amount of scientific imagination that enables him to make his observations in the right way and at the right time. It is a further

* Read February 5th, 1901, at the City of London Entomological Society.

circumstance, revealing his single-mindedness and magnanimous generosity, that he hands all the results over to Mr. Tutt* and myself to be used as our own or in any way we choose.

One of the most interesting points about the genus *Luffia* is that it consists of two species, very much alike and yet vastly different. One of them has the ordinary life-history common to most lepidoptera; the other is parthenogenetic, and only ♀s are known. Of the parthenogenetic species, *L. ferchaultella*, only ♀s are known, and though these are very like the ♀s of the other species, *L. lapidella*, they are much smaller and are distinguishable structurally. This does not, however, by any means exhaust this part of our subject; on the contrary, it opens up many curious questions which we are still far from being in a position to settle, but which we may discuss, perhaps with profit, in some of their aspects; at any rate, it may be permitted to bring together such facts as we have that may help us to understand some of the questions, though they may not lead us far towards the solutions. Many of these questions arise out of a main point for consideration, *viz*:—Are we correct in talking of two species? Are there, perchance, several species (I do not mean still to be discovered, but amongst those forms we already know)? or, again, Is it possible that there is only one species? Our facts are, unfortunately, still too meagre to enable us to come to any conclusions on these points, but they are sufficient to make it desirable to raise the questions.

Luffia lapidella appears to have very definite characters and to vary very little, whether the specimens come from Italy, Switzerland, France, or the Channel Islands; still we want longer series and from more localities before we can be confident that this statement always holds good, but, for the present, that seems to be the case. *L. ferchaultella*, however, is very variable in some directions. Typical *L. ferchaultella* is much smaller than *L. lapidella*, has fewer antennal joints, and has fewer tarsal joints; nevertheless, there are great differences in the formula of the tarsal joints in specimens from different localities. There are also great differences in the forms of the scales, which so characteristically clothe the segments in both species. Being parthenogenetic, there can be no crossing, and consequently it is easy to see that a separate race can hardly avoid resulting in each locality if there are any circumstances likely to cause variation. Whilst, then, we may assume that all these races have a common ancestry, it is purely a matter for individual consideration to decide how much difference between two races shall be sufficient to constitute it a distinct species. There is, however, another series of facts that cuts in quite the opposite direction. I found, two years ago, at Bignasco, in the Val Maggia, cases of *L. ferchaultella* in some abundance. The moths reared from these cases are distinctly *L. ferchaultella* in size and structure. Those I sent to Mr. Bacot, however, were definitely observed by him to "call," *i.e.*, to await in expectation of the male, and refused to lay eggs, whilst typical *L. ferchaultella* lays her eggs as soon as she emerges. I am sorry to say I did not observe so closely, but it is certain that no young larvæ appeared either amongst Mr. Bacot's or my specimens, whilst with typical *L. ferchaultella* the boxes would have swarmed with them.

* I should like to identify myself most absolutely with this sympathetic and just remark of Dr. Chapman. Such value as there may be in *British Lepidoptera* is due quite as much to Mr. Bacot, Dr. Chapman and Mr. Prout as to myself.—Ed.

On the other hand not one ♂ appeared amongst a total of several hundreds. Too much importance must not, however, be attached to this circumstance, since it is very common with many Psychids, and may be the case here, that towards pupation the male and female larvæ are apt to separate themselves into different places, so that we may happen to gather a number of cases, all males or all females owing to this habit, and not at all to the other sex being really less abundant. I had hoped by this to have had the male of this form, and will relate immediately how I failed to get it. Meantime I have described this form as a distinct species as *maggiella* (see, *antea*, vol. xii., p. 117; vol. xiii., p. 80); this ought perhaps puristically to be *majorella*, but I prefer the former form. The name of the valley it inhabits is "Val Maggia," and this seems the right name to start from, although the original name of the valley may have been "Vallis Major," and may at any rate be so latinised.

Luffia maggiella, *Ent. Rec.*, xii., p. 117; xiii., p. 80.—A *Luffia*, ♂ unknown, ♀ has all the characters of *L. ferchaultella*, except that it is not parthenogenetic. Case, larva and pupa as in *L. ferchaultella*. Habitat: The Val Maggia near Bignasco.

In the spring of 1900 I searched in the Val Maggia for cases of Luffias, and met with a great many, as well as empty cases of the previous year with male pupa-cases protruding. Most of these appeared to me to be smaller than they should be if they were *L. lapidella*. I sent some very small cases, as many as I could collect, they were very small and hidden away in cracks of the stones, to Mr. Bacot. Nothing came of them ultimately, but their history was that they kept slowly growing, until, being apparently full-grown, Mr. Bacot handed them over to my tender mercies at some date in August last. In my care they fed on for a time and then gradually died off during October and November, two or three living into December, but none changed to pupæ. It is certain that none go over a second year in their native habitat, but these obviously commenced an attempt to do so, but failed, either because they constitutionally could not do so, or because my care of them was against their well-being. I arrived, however, at the conclusion, before they perished, that they must be *L. lapidella* and not *L. maggiella*, on account of the great size to which they grew. This was to be accounted for by the fact that I had not got them at the habitat whence I got *L. maggiella*, but 10 or 12 miles lower down the valley, at a very similar station, and at a lower level, though only by about a hundred feet. The place was, however, only a few miles from Lake Maggiore, round which at Luino and Brione, *L. lapidella* occurs. Brione is, indeed, at an elevation above the lake, nearly equal to Bignasco, so that elevation is not the most important point of difference in the habitats of *L. lapidella* and *L. maggiella*. It so happens, however, that Mr. Bacot reared from these cases before he gave them to me two ♀s, probably in the week ending July 27th, his note on that date says: "One is calling, one is ovipositing, no males or male pupa-cases showing as yet." These were the only moths that appeared from the whole batch. Why did the others remain as larvæ? Probably because these two were *L. maggiella* and *L. ferchaultella* respectively, whilst the remainder were *L. lapidella*.

One point in connection with these groups of individuals from the continent may be now mentioned. Besides these supposed *L. maggiella*

I sent Mr. Bacot in March and April last, *Luffia* cases from Cannes, from Savona, and from Luino, these were all small, and it was then impossible to say what they were. Those from Cannes proved, however, to be *L. ferchaultella*. At the end of July Mr. Bacot found amongst these a ♀ moth and a number of newly-hatched larvæ, the remaining cases when I got them were practically dead in August. This date (mid-July) for emergence of *L. ferchaultella* is about right for England, possibly rather late for Cannes. The cases from Savona and Luino, proved to be *L. lapidella*, and produced ♀ moths from middle to end of September, and two males from Luino, one on September 25th, and one on October 1st, and two from Savona, one October 11th and the other on October 14th, some three months later than they would have done in the habitats from which they were brought; I ought, however, to say that I only judge so by comparison with the general habit of the species, as I never took the imagines in these localities; the *L. lapidella* from Val Maggia, as we have seen, were so belated as to perish. The *L. ferchaultella* suffered much less by being brought north than the *L. lapidella*. I suppose we are justified in correlating this with the different range of the species, *L. ferchaultella* existing commonly beyond the northern limit of *L. lapidella*.

To return for a moment to *L. maggiella*, I present this as a good species, and largely for this reason, that if it is not, the fact must go a long way to break down the specific distinctness of the two recognised species. I have but one more isolated fact that tends to support the view that *L. lapidella* and *L. ferchaultella* are really one species, or one may express it better by saying, perhaps, that the two species are so recently separated, *i.e.*, *L. ferchaultella* has been so recently derived from *L. lapidella*, that it still reverts occasionally to a form like *L. maggiella* that is intermediate. Amongst the British *L. ferchaultella* bred this year by Mr. Bacot were some from Lurgashall, of which he has the following notes on July 11th: "Nine out, 3 are calling, 6 are egg-laying, one that was calling on the 8th is still calling, all save this last-mentioned soon ceased calling (within 20 or 30 minutes) and started laying." On the 27th: "No males or any trace of male pupæ, swarms of young larvæ hatched out in the jars containing Sandown, Effingham, Brentwood and Lurgashall cases." We have here then in these Lurgashall *L. ferchaultella* a definite approach to the *L. lapidella* habit, in the case of 1 ♀ precisely the same as in that species or in *L. maggiella*.

Amongst the Lurgashall specimens which I received from Mr. Bacot is one still full of eggs, I assume this to be the specimen we have just been considering. It differs in no way, so far I can find, except in distension by eggs, from the other specimens from the same locality. My knowledge last year of the differences between *L. lapidella* and *L. ferchaultella*, as stated in Tutt's *British Lepidoptera*, vol. ii., pp. 233-234, showed that *L. lapidella* had always four joints to all the tarsi, but that *L. ferchaultella* varied in this respect but never had more than three on the first tarsus. This distinction now breaks down, *L. ferchaultella* from Lurgashall has four joints to all the tarsi, and so have the specimens from Cannes. I think the Lurgashall form has also thirteen joints to the antennæ, this is more difficult to say than might be supposed as there are usually one or two joints in an antenna that look like one dividing into two, or two fusing into one, and this in varying degrees. This circumstance in itself shows that variation in the number of antennal joints is actively going on, and deprives number of antennal joints of much of its value as a specific character. I have further measured the longest rods of the segments of the ovipositor and find that here again is a character that varies, but still supplies a distinction between the two species, but not a very strong one. Those of *L. ferchaultella* vary from 3·3mm. to 3·6mm. in length, those of *L. lapidella* from 3·8mm. to 4·3mm. The example with the shortest rods I have measured is that "calling" specimen from Lurgashall, 3·3mm., a parthenogenetic sister from the same locality is 3·4mm. The *L. lapidella* with the longest rods, 4·3mm., is a Guernsey specimen.

I may sum up the results of last season's investigations as follows:—(1) A form of *L. ferchaultella* occurs along the rocks of the shore at Cannes that is unquestionably parthenogenetic, but has oviposition rods of 3·6mm. long (shortest *L. lapidella* 3·8mm.) and has 4-jointed tarsi (4·4·4). Millière reports *L. lapidella* as occurring in the hills inland, and at 1000ft. or 2000ft. elevation, but not at Cannes; he knew nothing of *L. ferchaultella*. (2) A form of *L. ferchaultella* occurs at Lurgashall (Sussex), that has a tarsal formula of (4·4·4) and that occasionally calls, this is perhaps the most interesting of the results obtained. *L. lapidella* occurs on Dorset coast, but on the south coast and at all other English stations except Lurgashall, so far examined, *L. ferchaultella* has a tarsal formula varying from 3·4·4 to 3·3·3, and is not known to call. (3) Within a dozen miles of the habitat of *L. maggiella* (3·6mm. oviposition rods) *L. lapidella* and *L. ferchaultella* (or just possibly *L.maggiella*) occur together on the same ground.

None of these facts goes to show that all these forms are one and the same species, but they do show that *L. ferchaultella* has in different localities made very different amounts of progress in differentiating itself from *L. lapidella*. The absence of crossing makes it quite reasonable to make each of these forms different species, if it were worth while to do so, whilst on the other hand one can hardly help thinking that these "calling" specimens from Lurgashall might easily have been crossed with *L. lapidella*, and possibly absorbed into that species.

(*To be continued.*)

Over Three Passes—the Splugen, the Stelvio, and the Brenner—with some notes on the Butterflies by the way.

By H. ROWLAND BROWN, M.A., F.E.S.

(*Concluded from* vol. xii., p. 312.)

On July 18th my visit to Trafoi came to an end, and I took the stellwagon for another long drive to Meran. After leaving Spondinig the road skirts a wild, burnt-up-looking range of hills for some distance, bare, for the most part, of vegetation, but with occasional patches of thistle bloom and red *Centaurea*. The *Satyridi* were in great force here—*Satyrus hermione*, with *S. briseis* and *S. statilinus*, but the road was flat, and the pace of the "omnibus" left no opportunity for a descent. Passing a night at Botzen, I joined Mr. A. H. Jones on the 19th at Cortina, but here once more the luck deserted me, and the Ampezzo Thal will rank as one of the most disappointing localities I ever visited abroad—a wide, cultivated valley sloping gradually from walls of fiery rock, the famous Dolomites, treeless and without snow for the most part, and where fir-woods exist almost entirely without water, and destitute of flowering plants in a remarkable degree. It was really irritating to tramp the long hills all day and catch next to nothing, though flies of the family *Tabanus* would so persistently attack my companion that their depredations afforded us considerable excitement. Curiously enough, *Polyommatus pheretes* was again the ordinary blue, and a very dark form of *Pararge maera* occurred somewhat plentifully at intervals—long intervals. Above the Tre Croce, a sort of nek between Cortina and Schluderbach, and dignified by the name of Passo, the steeper flank of the Monte Cristallo falls away into a green valley clothed with wood and moor. At this particular spot *Erebia pharte* made amends for the barrenness of the fauna, and, appearing in some numbers, helped to swell our meagre bag. A small race of *Melitaea didyma*, with somewhat clay-coloured forewings, represented the fritillaries, while at, or near, this wood Mr. Jones secured a single specimen of *Lycaena amanda*. A solitary *Euranessa antiopa*, a few *Syrichthus*, *Papilio machaon* and *Limenitis camilla*, with *Erebia* var. *pitho*, and the too ubiquitous *Coenonympha satyrion* practically exhausts our list. But if Cortina lacked interest for me entomologically it has much to recommend it in other respects. The Dolomite is indeed a thing of beauty and a joy for ever, and the lovely effects of sunrise and sunset on these strange, jagged, and broken pinnacles once seen can never be forgotten. The "Aquila Nera," too, is an exceedingly comfortable hotel—moderate, clean, and with an excellent cuisine. So Cortina has its attractions, but they are to be recorded rather in the sketch-book and by the camera than in the bug-hunter's diary. Our next and last move was a piece of sheer luck: the highest available village on the Brenner railway is Brenner village, and after loitering in our Capua a few days longer we turned our faces thither. A long morning drive through glittering mountains, green pines, and glassy streams, brought us to Toblach, with only *Erebia ligea* to mark the journey. But the next day the fun began. We were marching down the pass from Brenner northwards. Not ten yards from the hotel insects were swarming, and the road carpeted with hundreds of *Erebiidi*, conspicuous among them *Erebia pharte*, *E. manto*, and *E. melampus*. In the meadows the larger fritillaries were flying in cheerful abundance with *Colias hyale* and *C. phicomone*, while it was not long before I netted a wasted specimen of *Brenthis thore*. We carefully worked the side of the mountains that border the little green Brenner See, but we could only take ancient examples of this pretty and local Argynnid, and were evidently a fortnight or more (this was July 27th) too late. By another fortunate accident we elected next day to walk up the Postealpe, an isolated grassy promontory between higher ranges, ending abruptly in a sheer drop of perhaps 300ft. to a valley below. At first through fir woods, and then over slopes gay with the alpenrosen, then to the usual "betwixt-and-between" of mountain moor, morass, and loose stones. Every zone had its particular insect, and here for the first time I made the acquaintance of *Melitaea asteria*. It is not easy to catch this little bee-like butterfly, with its semi-transparent wings suggesting an affinity to *M. parthenie* such as that displayed by *M.* var. *merope* to *M. aurinia*, whilst its habit of just skimming the ground makes it all the more indistinct and baffling to the eye. I took a fair number of males—none in first-rate order—but no females, though Mr. Jones on the following day, when I was not with him, succeeded in finding a spot where both sexes abounded. *Erebia epiphron* var. *cassiope* was also everywhere to the fore, and occasional specimens of *Œneis aello* kept legs and arms busy across the boulders. Among the blues, *Polyommatus optilete* and *P. pheretes* were common enough, while, at a lower elevation, the first perfect specimens of *Colias palaeno* fell to my net. *Brenthis pales*, a bright and characteristic form, with ab. *napaeae*, fluttered gaily up and down the hill-side, and *Pieris callidice* again put in a claim to be considered the commonest insect of the month. I subjoin a list of the Brenner insects, as the country does not appear to have been worked much by British collectors. No doubt a longer visit would discover many to add to the catalogue, but sixty odd species for three days is not a bad record, and made me register a mental vow, when opportunity offers, not to pass Brenner without another call: *Parnassius apollo*, *Aporia crataegi*, *Pieris brassicae*, *P. rapae*, *P. napi* var. *bryoniae*, wasted; *P. callidice*, abundant and fine; *Euchloë cardamines*, one torn male; *Leucophasia sinapis* ab. *diniensis*, a few; *Colias palaeno*, just coming out on the Postealpe; *C. phicomone*, *C. hyale*, generally common on the lower slopes; *Gonopteryx rhamni*, very fine; *Chrysophanus hippothoe* var. *eurybia*, below the village; *C. dorilis* var. *subalpina*, nearly over; *C. phlaeas*, *Polyommatus optilete*, Postealpe, not infrequent; *P. baton*, one fine male; *P. pheretes*, females occurring freely; *P. orbitulus*, *P. astrarche*, large form; *P. icarus*, *P. eumedon*, nearly over; *P. corydon*, *P. donzelii*, *Cupido minimus*, *Nomiades semiargus*, the commonest "Blue"; *Lycaena arion*, *Aglais urticae*, *Vanessa io*, *Melitaea aurinia* var. *merope*, worn; *M. phoebe*, *M. didyma*, *M. asteria*, on the Postealpe, hard to distinguish, males rather worn, females (taken by Mr. A. H. Jones) in better condition lower down at about 6000ft.; *Brenthis selene*, *B. euphrosyne*, *B. pales* and ab. *napaeae*, *B. amathusia*, *B. thore*, *Argynnis aglaia*, *A. niobe*, *A. paphia*, *A. adippe*, *Erebia cassiope* ab. *nelamus*, *E. melampus*, *E. pharte*, *E. manto*, *E. ceto*, *E. stygne*, *E. glacialis* (? on the Postealpe); *E. lappona*, *E. tyndarus*, *E. gorge* ab. *triopes*, *E. goante*, *E. pronoë* var. *pitho*, *E. aethiops* and ab. *leucotaenia*, *E. ligea*, *E. euryale*, *Oeneis aëllo*, *Satyrus semele*, a few very dark specimens seen; *Pararge maera*, *Epinephele ianira*, *Enodia hyperanthus*, *Coenonympha arcania*, *C.* var. *satyrion*, *C. pamphilus*, *Spilothyrus alceae*, *Syrichthus fritillum* var. *alveus*, *Thymelicus lineola*, *Pamphila comma*: 68 species in all. In conclusion, I may say that the only inn at Brenner is worked on somewhat original lines. You look after yourself until you have captured a meal, when, whether you are staying in the house or not, you are looked after by a waitress with the bill. The system of pay as you go along may simplify the books, but it is inconvenient, and the fact that Austria is struggling with a new coinage of kroner and heller in place of the florins and kreutzers of approximately double the value does not help to simplify matters.

Migration and Dispersal of Insects: Lepidoptera.

By J. W. TUTT, F.E.S.

The common European Pierids are, as we have just shown, notorious for their wide dispersal movements, and it is remarkable that the greater number of exotic species in which the migratory habit has been most frequently observed, belong either to the Pierids, Danaids, or Nymphalids. The records of migrating butterflies belonging to other groups are very rare indeed. It is quite impossible to deal with the large number of observations made by different authors concerning the migration of butterflies in eastern lands, and the few selected must be taken as being, on the whole, characteristic of a much greater number. Biggs (*Monthly Packet*, ii., pp. 186-187, 1881) speaks of *Delias dione* as the "common coasting butterfly" of India, and describes it as being sometimes observed in an "apparently endless stream," all following one direction, some 20 to 30 being in sight per minute at any one point, but altogether forming a belt several miles broad, extending far inland from the coast and from morning till night continuing to pass on for a fortnight or more. He adds: "It seems seldom to feed or alight during these migrations except at night or early morning, when, with dawn, it resumes its flight . . . . Now and then it gets into a *cul de sac*, formed by thick clumps of fruit-trees or the high walls of houses, against which it will dash itself repeatedly and recklessly, willing to persevere until death. This is especially apt to be the case, when a strong head wind is blowing against it." Thwaites also describes the migrations of the Pierids in Ceylon, and writes :—"At certain times of the year immense hosts of these butterflies, mostly of a white colour, or nearly white, may be observed during the hottest part of the day, pushing in an impetuous flight across the country, driven by some irresistible instinctive impulse, and impatient of any obstruction in their headlong course; even ascending hills of 6,000 feet in elevation and descending again, striking like animated snowflakes against anyone meeting them in their course, and then, after passing the obstruction, making on with the same pertinacity as before towards where they are hurrying, until the failure of sunshine arrests their progress for the day, to be continued probably on succeeding days until the wondrous furor has exhausted itself. By the superstitious natives these marvellous movements of white butterflies are attributed to a desire on the part of the insects to do homage to the footstep of Buddha on Adam's Peak, moved as the native himself is to do so at certain times of the year. But the phenomenal, apart from the native, idea is well worthy of study by anyone who has time and opportunity to devote to it. It would be interesting to ascertain, firstly, whence these butterfly hosts come, and where their feeding-grounds when in the larval state; secondly, to determine if the immense numbers of these butterflies which have halted for the night, wake up in the early morning to continue their course in exactly the same direction as on the previous day, and at what hour the resumed movement commences ; thirdly, to ascertain if during the time their progress is arrested by night, many fall a prey to the attacks of birds, bats, lizards, &c., to an extent to reduce their numbers very considerably, and, lastly, how their eventful disappearance is to be accounted for. I should remark that amongst the main body of these travelling white butterflies, small groups of half-a-dozen individuals or more may be observed, which, in strings of sequence, looking as if playing 'follow my leader,' have a pretty appearance. In some portions of the country in their line of flight, where shallow water may be lying, large numbers of these white butterflies may be seen quenching their thirst on the damp ground or flying up when disturbed in quite a startling cloud."

The periodical flights of butterflies in Ceylon appear to take place in April, shortly before the S.W. monsoon, and again in the middle of November. According to Holdsworth (*Field*, June 29th, 1872) the flight may be observed each year at Colombo in November, from south to north, whilst according to Radley (*Entomologist*, xxvi., p. 134) the flights in spring are from north to south. The latter says that the spring flights "usually occur shortly before the S.W. monsoon (about April). Occasionally, owing to cyclones in the Bay of Bengal, there are a few fine but very cold days during the wettest months of December and January, and then a small flight takes place, but during the big flight (April), which lasts about a week, the butterflies pass in millions, and for one or two days you can almost imagine that it is snowing, so thickly do they come. This flight is largely composed of *Catopsilia catilla*, and *C. crocale* with *C. pyranthe*, *Catophaga neombo* and *C. galene* in fewer numbers. Large flights of *Isamia asela*, usually accompanied by *Parantica ceylonica*, have also been observed in February." Radley further notes that large flights of yellow butterflies have been observed at sea, out of sight of land, off the coast of India and Ceylon, that he himself has noticed, when out dredging, *Isamia asela* flying out to sea, and when going to the Maldive Islands, in 1892, he saw two of the same species about 100 miles from the Maldives, that must have come from Ceylon and against the wind. Holdsworth observes that in November, most of the flights consist of white and yellow species, but also a great number of *Papilio hector*, and many of *Ornithoptera darsius* and that these flights almost invariably travel against the wind, the N.E. monsoon setting in early in November. Holdsworth adds that he believes there is a regular migration of *P. hector* from India to the north-west of Ceylon, that from the middle of February to the middle of April, he was usually at sea cruising in the neighbourhood of the Pearl Banks, that during three seasons he saw, at a distance of from ten to sixteen miles from the land, straggling parties of *P. hector* flying low and steadily towards the coast of Ceylon, in a direction nearly due east. They were more usually observed at the end of February, at the beginning of the short, calm season between the monsoons, the distance from India to the part of Ceylon to which these hundreds of butterflies were making being not less than sixty miles. Moss criticised (*The Field*) Holdsworth's statement that the flights of these migrating butterflies were against the wind, but Holdsworth (*loc. cit.*, December 28th) maintained his position, and notices that, on December 3rd, 1865, the Galle Face was almost overshadowed by a great cloud of yellow and white butterflies, flying in the direction of the port and making fair but unsteady progress against the N.E. monsoon, and he adds that, at the Galle Face Hotel, he has seen "scores of *Papilio hector* and *Ornithoptera darsius* in company with numbers of the smaller yellow and white species, struggling successfully to make head against the longshore wind, many of them keeping outside the belt of cocoa-nut trees and flying low and close to the beach." Mann observes (*Zool.*, 1895, p. 335) that in Ceylon there is, in March and April, a vast migration of *Catophaga galene*, Feld., from north-east to south-west, they appear not merely in hundreds, but in thousands, perhaps millions. The movement of countless numbers all going in one direction as of set purpose, was first noticed this year (1895) about March 15th, in the northern part of the island; and at a moist spot in the otherwise dry bed of a river, where they had apparently alighted to get moisture, the ground was quite white with their wings, reminding one of what one sees at home under the hawthorn trees when, after a sharp shower, the ground is strewn with may-blossoms. The migration, for such it appeared to be, commenced about 7 a.m., and lasted until noon, when there was a lull, or temporary cessation of flight, after which the movement recommenced, and the insects continued to pass on in swarms as before. Miss Cumming writes (*Two happy years in Ceylon*, vol. i., p, 208): "One of the mysteries of the isle is the annual migration, in November and December, and at intervals right on to February, of countless myriads of butterflies in vast flights; whence they come and whither going no one can guess. The migration commences with the setting in of the N.E. monsoon with its cool mornings and bright days; and when the stormy wind blows strongest, these delicate insects, impelled by some inexplicable instinct, force their way against it, and during a couple of months successive legions pass on like an overflowing stream. I have collected a few notes of observations made on this subject in different years. Thus, in 1884, swarms of dark-coloured butterflies passed over Kandy and Ratnapura on November 19th. On the following day these were succeeded by swarms of white and yellow ones. In 1887 Mr. Le Mesurier, writing from Nuwara Eliya, noted the first flight of the season on November 18th; the flight lasted the whole day; direction from due south-west to north; wind from south-west; colour of butterflies speckled dark-brown. The next flight he noticed was on November 21st, when two kinds of butterflies, white and sulphur, continued all day passing right over the summit of Pedro from north to due south; the direction of the wind was from the north-east. On December 10th, another observer stated that brown and white butterflies had been in flight for some days, flying south. In 1888, the migration northward in the teeth of the wind was observed at Colombo on November 18th, the great flight of white and yellow butterflies being mingled with some of a darker colour. In 1889, flights were observed in the mountain district of Dimbula, about the middle of October, and at Colombo on November 5th, when dark brown butterflies and yellowish-white ones flew in separate columns at a rate of about ten miles an hour. All the accounts (which might be multiplied by observations from all parts of the island, north, south, east, and west, from Manaar to Galle, and from Trincomalee to Negombo) speak only of brown, white, and yellow insects; hence I infer that the glorious butterflies which most delight us do not risk becoming food for fishes by any such venturesome flights." Tennent says in his *Nat. History of Ceylon*: "At times the extraordinary sight presents itself of flights of these delicate creatures, generally of a white or pale yellow hue, apparently miles in breadth, and of such prodigious extension as to occupy hours, and even days, uninterruptedly in their passage—whence coming no one knows, whither going no one can tell." He adds in a foot-note: "The butterflies I have seen in these wonderful migrations in Ceylon were mostly *Callidryas hilaria*, *C. alcmeone* and *C. pyranthe*, with straggling individuals of the genus *Euploea*—*E. corus* and *E. prothöe*. Their passage took place in April and May, generally in a north-easterly direction. A friend of mine travelling from Kandy to Kornegalle drove for nine miles through a cloud of white butterflies which were passing across the road by which he went." Mitford writes (*Zool.*, 1895, p. 388) of the movements of *Catophaga galene* in Ceylon: "In the month of November, at Colombo, a strong north wind blows daily along the seacoast, at which season clouds of white butterflies appear flying in a continual stream, extending far inland for days and weeks. They are all flying from the south and in the eye of the wind, and the stronger the wind blows the more rapid is their flight. I never witnessed this fact without the greatest astonishment. The locust, with its strong body and powerful wings, cannot make head against the wind, but drifts with it; yet that a butterfly with a body so slight as scarcely to gain a fulcrum for the wings to bear on, and with wings offering so broad a surface to the breeze that one would expect to see it drift like a snowflake, should possess the faculty of propulsion against a strong wind, gives us a clue to an aerostatic principle with which we are not yet acquainted. It is to be noticed that the action of the wings of these butterflies is not horizontal like that of the Admiral or the Tortoiseshell, nor is their flight even and continuous, but they are propelled in jerks, with the wings vertically closed and opened alternately, so as to offer the sharpest edge to the resistance of the wind. Thus the butterfly does not appear to propel itself, but to be driven forward by the action of the wind eddying round against the under surface of the wing presented to it, but how this is done it is not easy to demonstrate. As there is no land south of Ceylon, it seems evident that these butterflies deposit their eggs in the southern forests of this island previous to their starting on their migration, otherwise the annual flights could not be kept up. I notice, however, that Mr. Mann gives the months of March and April as the season of migration witnessed by him; but while he gives the direction of their flight from north-east to south-west, he does not state the direction of the wind. The S.W. monsoon usually commences in April, while the N.E. monsoon commences in October. I assume that these are the same flights returning after a circuit of the island, and flying against the southerly wind in the same manner as those seen by me in November were flying against the north wind. I cannot identify Navanghena, the place from whence Mr. Mann writes, and therefore do not speak confidently." Mitford's remark as to the "return" of the insects is quite inexplicable. He surely cannot think that the butterflies seen by thousands travelling from the north-east in March are the same as those he saw in November flying from the south, and that the insects spend these six months in a tour of the island. Aitken, the talented author of *Tribes on my frontier*, writes: "I have stood near one of the parade grounds at Poona and watched them (*Catopsilia*) with scarce a pause to rest their wings or sip a flower, from eight or nine o'clock until the afternoon. As far as eye could reach the host kept streaming past, like the fugitive Gauls after one of Cæsar's great battles," whilst yet another observer writes of *Catopsilia catilla*: "In the flights along the seacoast, beginning generally in November, two species of *Catopsilia* form about a third of the number, always travelling to the north, whilst the flights last for days, thousands of insects passing in an hour." Another most interesting record, relating, however, to the Danaid group, is culled from Moore's *Lepidoptera of Ceylon*, vol. i., p. 1, where we read: "On a fine sunny day when calm, or nearly so, amazing numbers of one or more species of *Euploea* may often be observed wending their way in one direction, as if floating upon the air a few feet from the ground with an apparently sluggish movement of their wings, though really making rapid progress. Resembling an army, in scattered open columns, they move on instinctively, regularly and simultaneously, as if animated by a true migratory impulse. They naturally suggest a most interesting enquiry as to whence these immense numbers come and whither they are tending, whether their course is a straight-ahead one, or is following a horizontal circular direction of greater or less diameter. These insects when thus moving in company show an unwillingness to be diverted from their course, and when attracted by a favourite plant in flower, it is only for a few minutes that they remain upon it, and, after regaling themselves, soon start off to resume their journey with their fellow travellers, moving again amongst them as before and bound for the same destination. It is curious to observe that butterflies of a totally different kind, when they happen to come within range of one of these moving columns are, for a period, carried away apparently by the same impulse and fly in company with it, but are soon seen to be moving off independently as at first."

COLEOPTERA.

THE COLEOPTERA OF THE "VICTORIAN HISTORY OF HAMPSHIRE."—"The county of Hampshire" is the first volume of this great work, yet published, and is a very charming book, got up in the very best style. It is, therefore, much to be regretted that the list of coleoptera contained therein should be such a poor production. For a county list to be of any use, it should be as complete as possible, an end not difficult to attain if the compiler will take the trouble to look up the records, and apply to those collectors who have worked the districts in question. Several county and local lists have recently been published, notably Mr. Morley's *Coleoptera of Suffolk*, and Mr. Walker's *Coleoptera of the Rochester district*, so that it would have been easy to have found a good model. In place of this, what do we find? A bare list of names with hardly any references of any kind, and not a single note of any of the creatures' habits in the list. One would have expected from such a county as Hampshire, including such a locality as the New Forest, the very best of lists, but this, alas! is not the case. It professes, however, to contain all the more local and rare species, which, as will be seen, is by no means the fact. In glancing through this list any coleopterist at all conversant with the distribution of our species will be at once struck by some of the following points:—(1) Of the rarer and local species, one searches in vain for *Phosphaenus hemipterus*, Geoff., which has only occurred in any numbers at Lewes and Southampton in this country. Mr. Gorham has taken it in plenty at times in his garden at Shirley Warren, Southampton. This is perhaps one of the most interesting, if not the most interesting, species found in this county. *Cionus longicollis*, Bris., taken by Mr. Moncreaff on *Verbascum thapsus*, at Portsdown, has not occurred anywhere else in England. *Odontaeus mobilicornis*, F., one of the rarest British Scarabæids, has been taken two or three times by Mr. Gorham at Shirley Warren, where it has flown into his windows to light; and Mr. and Mrs. Jackson, of Bournemouth, have both taken it in that town. *Carabus nitens* ab. *niger*, Semenow, has only been recorded from Denny Bog, in the New Forest. *Elaphrus uliginosus*, F., the rarest English *Elaphrus*, is common in Lymington salterns. Both the curious little species of *Aepus*, *A. marinus*, Ström, and *A. robinii*, Lab., are not uncommon in the salterns. *Harpalus griseus*, Panz., though considered a doubtful species, has certainly more claim to be considered British than *Onthophagus taurus*, L., and has been recorded from the New Forest. *Hydroporus palustris* ab. *tinctus*, Clark, was taken by old Charles Turner in the New Forest. *Lixus paraplectus*, L., occurs on *Sium latifolium* at Christchurch. *Halyzia 16-guttata*, L., which is rare in the south, is taken by beating in the New Forest. None of these rare and local insects are mentioned in this list. (2) Amongst other points which strike us are—*Myrmedonia plicata*, Er., marked with **. At the head of the list it says "Those marked ** have hitherto been taken *only* in the New Forest, as far as Britain is concerned." *M. plicata* has certainly never been taken in the New Forest. *Dinoderus substriatus*, Payk., should be written *Dinoderus minutus*, F. (*substriatus*, Steph.), which, as pointed out in the *Ent. Record* (January, 1900), is the species recorded by Stephens from the New Forest. (3) Among the numerous species which are common in the New Forest and which are omitted in this list, one notices *Bembidium tibiale*, Duft., abundant on the shingly reaches in the streams in the Forest, *Atemeles emarginatus*, Payk., common in the nests of species of *Myrmica* and *Formica fusca*, &c., in old stumps; *Silpha thoracica*, L., which occurs in profusion on bones and old dry carcases; *Athous vittatus*, F., very abundant by beating and sweeping bracken: and *Corymbites holosericeus*, F., not uncommon by beating hawthorn blossoms. However, as this is not intended as a supplementary list, enough has been said to show what a very indifferent record of the coleoptera of Hampshire the list under consideration is. Our friends, Mr. Bouskell (who is editing the coleoptera of Leicestershire, for the Victorian History of that county) and Mr. Gorham (who is editing that for Dorsetshire) are working on other lines, and we are glad to say that they are endeavouring to get together as complete lists as possible, so that we look forward with confidence to something much better and more useful.—H. St. J. K. Donisthorpe, F.Z.S., F.E.S., 58, Kensington Mansions, South Kensington. *December*, 1900.

Coleoptera in the Hastings district.—During the early part of the year (1900) I did a little collecting in the Hastings district, and the following are the results. Early in March there were some very considerable floods in the Pett marshes, and for once I managed to catch the refuse at just the right time. I brought home a large bag full which was swarming with life but very few species of real interest were found. Perhaps the very commonest insect of all was the type form of *Acupalpus exiguus*, which I very rarely see except in flood refuse. This time it must have been there in thousands. Single specimens of *Ocypus fuscatus* and *Aleochara tristis* were the only really good species found. The same rains flooded also a good part of the Rother valley, and an examination of this part of the district resulted in the capture of *Sunius intermedius*, *Platystethus nitens**, *Rhinoncus inconspectus*, *Baris lepidii* and swarms of *Carcinops minima*. *Acupalpus exiguus* type was again very much in evidence, and *Stenus nigritulus** was met with, but only singly. In April, by cutting tufts at Battle, I obtained plenty of *Bryaxis haematica*, *Sunius intermedius*, five, while *Badister peltatus* was represented by a single specimen in a very swampy place. One of my favourite hunting-places near Camber yielded fine series of *Bembidium fumigatum** and *Bidessus unistriatus**, while *Acupalpus dorsalis* and *Stenus incrassatus* also occurred. Professor Beare has given an account of our captures at Pett and Bodle Street; to that account I can add *Medon ripicolor** from the former locality at the roots of the yellow-horned poppy, and *Hydraena gracilis* from Bodle Street. Other species met with during the year include *Hydraena testacea*, Guestling and Minfield, *Actobius signaticornis*, Rye, *Gyrinus urinator* at Battle, and *Bagous nodulosus*, one, from Pevensey. Yesterday in Guestling Wood I took a fine series of *Lycoperdina boristae* from a species of *Lycoperdon*. The species marked * have not been previously recorded for the district. —W. H. Bennett, F.E.S., 15, Wellington Place, Hastings. *December 11th*, 1900.

The complete account of the Coleoptera from Glover's "History of Derbyshire," 1829.—Coleoptera, Order I.—*Lucanus cervus* (Great stag-beetle). Of a dark brown colour with the exception of the jaws which are frequently as red as coral. The mandibles are so strong that it can pinch with them severely. *Scarabaeus auratus* (Rosechaffer), appears the beginning of June. *Scarabaeus solsit* (Hoary beetle), appears in July. *Crysomela nemorum* (Turnip beetle), Skippers, preys on young turnip plants. *Curculio granarius* (Weevil), this long-snouted insect devours corn in granaries. *Coccinella bipunctata* (Lady cow or Lady bird), very numerous in the summer of 1828. *Forficula auricularia* (Earwig), common. *Scarabaeus melolontha* (Cockchaffer or May bug), seldom abundant, as they live in the larval state four years underground on the roots of trees and plants. Whole woods of oak are stripped bare by them. They are eaten by the turkey, the rook, the jay, and the hedgesparrow, and appear in May. *Scarabaeus solstitialis* (Fernchaffer), appear about the latter end of June, and are supposed to eat off the roots of wheat and clover. They are about half the size of the May-chaffer. Hemiptera, Order II.—*Scarabaeus stercorarius* (common Dor or Clock). Diptera, Order VI.—*Lytta vesicatoria* (Spanish fly), is of a venomous nature and breeds on the tops of ash and other trees. Vermes.—*Lampyris noctiluca* (Glowworm), numerous about Matlock Bath. They are said to put out their lamps between 11 and 12, and shine no more for the rest of the night.—B. Tomlin, B.A., F.E.S., Matlock.

Notes on some Coleoptera of the London district, 1900.—After a long residence in the north-west of England, it has been my good fortune to have been afforded the opportunity of devoting some little attention during last season to the coleoptera of the Metropolitan district. Possibly a record of some of the species noticed may not be without interest. To the specialist in any branch of the study of nature the investigation of geographical distinctions in the same general fauna reveals points of very great interest, and apart from the pleasure of recognising species new to one, and exclusively southern, the dissimilarity between the general coleopterous faunas of Cheshire and Middlesex is most marked. Of course certain species are equally abundant in both localities, being in fact ubiquitous; but otherwise the decrease in the groups *Geodephaga*, *Hydrodephaga* and *Brachelytra*, and increase in *Rhyncophora* and *Phytophaga*, in the south, are very obvious. In many genera, too, where members are perhaps equally common in both localities, one species predominant in the north seems to be replaced by another equally predominant in the south. Reverting, however, to species actually encountered :—The valley of the Brent between Hendon and Hanwell seems to be a locality not specially well worked by coleopterists, and here a few species have occurred which may be worth notice. By the margin of the stream itself, among shingle and on the exposed mud, were taken *Bembidium obliquum*, *B. articulatum*, *Tachyusa flavitarsis*, and by the edge of the Hendon Lake *B. velox* and *Tachyusa concolor*. In tufts of grass and reeds in a small marsh near the brook occurred *Stenolophus vespertinus*, *Myllaena intermedia*, *Lestera punctata*, *Stenus melanopus*, *Bryaxis impressa*, *Tychus niger*, *Mantura obtusata*, &c., and, in pools of the same marsh, *Copelatus agilis* was most abundant in May. Here also were taken *Hydaticus seminiger*, *Rhantus grapii*, *Hydroporus angustatus*, and *H. lituratus*, *Hydrochus elongatus* and *H. angustatus*, while sweeping in this marsh and vicinity resulted in *Axinotarsus ruficollis* (abundant in long grass, July), *Anthocomus fasciatus*, *Corymbites tessellatus*, *Pseudostyphlus pilumnus* (off *Matricaria*), *Ceuthorrhynchus melanostictus*, *C. alliariae* (*inornatus*), *Phyllotreta ochripes*, &c. From under bark and in fungus I was fortunate in taking *Euthia plicata* with commoner species such as *Atomaria fimitaria*, *Litargus bifasciatus*, *Mycetoporus atomarius*, *Rhizophagus cribratus*, *Xylophilus populneus* and *Hypophloeus bicolor* (under elm bark only), and in flood refuse, *Ocypus fuscatus*. Of Richmond Park and Wimbledon Common I had from various notes and published lists of localities formed high expectations. The former, however, seemed at first sight to my inexperience a difficult and even unpromising tract, while the latter far exceeded in apparent promise my anticipations. From Wimbledon, however, I have been able to extract but little worth record, although the yield of species was large. The only beetle new to my experience being *Hydroporus granularis*, which was abundant in shallow pools in August. In Richmond Park, on the contrary, I was able to take several species I had never previously met. Under bark occurred *Laemophloeus bimaculatus* (one), *Paramulus flavicornis*, *Cerylon histeroides*, *Homalota cuspidata*, *Phloeopora corticalis*, *Leptusa fumida*, and *Ischnoglossa rufopicea*. In park refuse *Philonthus quisquiliarius* var. *dimidiatus* was not uncommon, with one specimen of *Philonthus umbratilis*, and, in dead leaves, *Notiophilus rufipes*. Farnham Royal Bucks, near Burnham Beeches, a region of woods of beech, oak, and hazel, appears to me a most excellent entomological district, and one from which few records have been published. Here I was pleased to take *Hydroporus neglectus* (swept from reeds) with *Helophorus nubilus* and, in powdery fungus on a beech stump, *Sphindus dubius*. By sweeping and beating I took *Clytus mysticus*, *Corymbites holosericeus* (in whitethorn flowers), *Cassida vittata*, *Sybinia potentillae*, *S. minuta*, *Gymnetron noctis*, *Miarus campanulae* (in harebells), *Rhinonchus castor*, *Lochmaea crataegi*, *Rhynchites aeneovirens* and *R. ophthalmicus*, with many other species. A visit paid to the classical locality of Headley Lane, Mickleham, in June last, was rewarded by the capture of a fine specimen of the scarce *Myrmedonia haworthi*, and among other more abundant, but to the northern collector quite as unfamiliar, species, I took *Thanasimus formicarius*, *Meligethes palmatus* and *solidus*, *Oedemera lurida* in abundance, *Mantura matthewsi*, *Chrysomela hyperici*, *Longitarsus pulex*, *Aphthona herbigrada*, *Mordellistena humeralis*, *Anthicus antherinus*, *Orchestes pratensis*, *Ceuthorrhynchus chrysanthemi*, *Tychius meliloti*, *Apion hookeri* and *A. confluens*. During a few hours spent in Windsor great park I discovered *Heledona agaricola* in profusion, in a dry spongy *Boletus* in a beech stem, and *Ditoma crenata*, *Cis villosulus*, *C. festivus* and *Ennearthron affine* commonly under bark of a felled beech tree stump. Not more than one or perhaps two of the above mentioned species can be considered as "rare" insects generally, and no doubt the bulk of them are within the common experience of the Metropolitan coleopterist. Yet of the whole number not more than about fifteen could the most assiduous collecting have discovered within the counties of Lancashire or Cheshire—so partial is faunistic distribution over such a relatively small area as that of Great Britain.—W. E. Sharp, F.E.S., "Ledsham," Drayton Park, Ealing, W.

PRACTICAL HINTS.

Field Work for March and April.

By J. W. TUTT, F.E.S.

1.—Towards the end of March and throughout April the almost full-fed larvæ of *Gnophos obscurata* are to be found feeding by night on *Geranium lucidum*, preferably on the flowers, but the larvæ are also to be obtained in January and February (Mathew).

2.—About March 16th is the date for *Nyssia hispidaria* in Richmond Park. In some parts of the park in some seasons they are abundant whilst in other parts not a specimen is to be seen.

3.—The larvæ of *Ellopia fasciaria* must be beaten in April (with those of *Thera variata* and *T. firmata*) from pines; this species does not pass the winter as a pupa as Newman says.

4.—The first warm days at the end of March and early April bring out imagines of *Tephrosia bistortata*, which should be searched for in woods on tree-trunks. *T. crepuscularia* does not usually appear until May and early June, when it occupies somewhat similar situations.

5.—By dusking along mixed hedges containing blackthorn, in April, a few *Aleucis pictaria* may be obtained, but by searching low blackthorn hedges about an hour after dusk, large numbers may be obtained (Raynor).

6.—Larvæ of *Dasychira fascelina* are to be searched for on moorlands, commons and heaths, in April and early May.

7.—From April 10th-21st is the best time to search for *Lophopteryx carmelita*. It is generally found upon the trunk of a birch or oak about midday, about four or six feet up the stem (Mawson).

8.—Larvæ of *Leucania littoralis* are to be obtained in April on the coast sandhills by raking the sand. I have generally obtained the larvæ of *Leucania lithargyria* by cutting open old stems of thistles and umbelliferous plants to which they resort for concealment during the day (Eales).

9.—On the Cheshire sandhills in early April the larvæ of *Epunda lichenea* may be found at night on *Sedum acre*.

10.—In the first week of April search birches for *Asphalia flavicornis*, they are often found resting on pieces of twigs on the ground.

11.—The imagines of *Cymatophora ridens* are best found about April 15th upon the trunks of oak, generally from one to four feet up the tree; they are difficult to see being of the same colour as the bark (Mawson).

12.—About the last week in March the larvæ, pupæ and imagines of *Solenobia inconspicuella* occur abundantly on palings and old elm trunks on Clapham Common (Coverdale) and elsewhere.

13.—In April the thistle stems should be worked for the pupæ of *Ephippiphora pflugiana*.

14.—In April the roots of mugwort should be collected for *Ephippiphora foeneana*, and those of yarrow for *Dicrorhampha petiverella*.

15.—In April the larvæ of *Psychoides verhuella* are to be found under fronds of ferns in lanes near Alkham; also the larvæ of *Stigmonota leplastriana* in stems of wild cabbage, and the larvæ of *Douglasia ocnerostomella* in dried stems of *Echium* at St. Margaret's Bay (Elisha).

16.—In April the plants of *Stellaria holostea* give plenty of almost full-fed larvæ of *Coleophora solitariella* (Machin).

17.—If the birch bushes were systematically worked in April many rare species of the sun-loving genus *Eriocrania* would doubtless be found to have a more general distribution than is at present supposed. They fly gently above the bushes in the sun and are very easily captured.

18.—*Adela cuprella* usually appears about the end of April flying vigorously round the sallow catkins during sunshine.

19.—At the end of March the stems of *Luzula campestris* bearing brown leaves should be pulled up for larvæ of *Glyphipteryx fuscoviridella*.

20.—Plum blossom should be worked (as well as sallows) for the early emerging moths at dusk in April.

21.—I find that, as a rule, evenings following fine or showery days with a west or south wind, and some sort of moisture on the grass, either rain or dew, and no, or at least a very young, moon, are good for moths if the wind be not too strong; whereas a dry night, or when the wind is north or east is usually bad (Keyworth).

22.—To rear larvæ use wide-mouthed glass bottles (such as those in which the anchovies of the Compagnie de la Mediterranée are sold) about 6½in. high, and 3¼in. diameter; at the bottom place baked sand—damp enough for larvæ but not so as to cause mould; on this spread baked moss and plant the food in the damp sand; lids should be constructed of wire rings (ordinary fencing-wire) covered with muslin, &c., and made so as to fit easily over the mouth of the jar (Wilson).

N.B.—Some hundreds of similar hints have been published in the preceding volumes.

NOTES ON COLLECTING, Etc.

Lepidoptera in the Frensham district.—On the whole, 1900 proved to be a late and bad season, scarcely anything at sugar, and light a failure; in the case of *Euchelia jacobaeae*, this was most surprising, for though the insect was very common, not a single individual came through my "moth trap" windows, whereas last year they were a perfect pest. The same applies to *Spilosoma menthastri*, the latter, however, I think was scarce, as I could not detect imagines outside. I fancy the periodical failure of this species, as with many others, is due entirely to the ravages of ichneumons, a few cocoons picked up last year all produced ichneumons. During September I noted the larvæ of *S. menthastri* swarming over the roads near Loch Erne, Perthshire, suggesting that the moth in those parts must have been abundant. Rhopalocera:—*Gonepteryx rhamni*, from January 26th; *Aglais urticae*; *Pyrameis cardui*; *Vanessa io*, a few; *Eugonia polychloros*, in fair numbers; *Cyaniris argiolus*, plentiful; *Euchloë cardamines* from May 1st to June 16th; *Chrysophanus phlaeas*, *Polyommatus icarus*, swarming; *Syrichthus malvae* and *Nisoniades tages*, locally common; also *Pamphila sylvanus* and *Thymelicus thaumas*; *Brenthis euphrosyne*, common in woods: *Dryas paphia*, locally abundant; *Argynnis adippe*, scarce; *Pararge megaera*, scarce; *P. egeria*, non-existent so far as my observations go (two seasons); *Satyrus semele*, extremely common, as also *Epinephele ianira*; *E. tithonus* and *Enodia hyperanthus*, locally common; *Coenonympha pamphilus*, common among heather; *Limenitis sibylla*, picked up dead in conservatory. *Zephyrus quercûs*, common round the tops of oaks. At Llanstephan, south Wales, I took a single specimen of *Zephyrus betulae*, September 3rd, and during October noted *Colias edusa*, securing a dozen examples, 8 ♂ s, 4 ♀ s, all more or less "chipped." From one of the females (October 11th) I extracted an egg of a deep orange colour, there was also a mass of undeveloped ova. Is it possible that some of these ♀ s hybernate*? The last date of capture was on October 18th, when I took five. These butterflies frequented ordinary grass meadows, clover in this district is not particularly in evidence. *Plusia gamma* swarmed up to October 20th, *Pyrameis atalanta* was in great profusion, *P. cardui* and *Aglais urticae* were also noted. *Epinephele ianira*, seen October 15th; the "whites" have appeared in their usual proportions, though *Pieris brassicae*, in south Wales, has again been in excess, the larvæ completely destroying the cabbage crops. Of larvæ captured I notice: *Eutricha quercifolia*, a full-fed larva was taken at Much Hadham, Herts, June 24th, pupated June 30th, emerged July 20th; Wishanger, Hants, *Zephyrus quercûs*, a larva was taken off a nesting-box for "tits," nailed against a shed, this had evidently been carried by the old birds (*Parus caeruleus*) to their young and had either escaped or been rejected by them, it was uninjured and fed up on oak, pupated in a few days, and emerged July 16th. *Cyaniris argiolus*, plentiful on holly, but a large proportion ichneumoned. *Gonepteryx rhamni*, on buckthorn, full-fed June 25th. *Eugonia polychloros*, a web containing many cast off skins discovered on sallow, June 26th, no trace of pupæ to be found on or in the vicinity of tree. *Anthrocera trifolii*, noted June 8th; *Sesia tipuliformis*, pupated May 9th; *Diloba caeruleocephala*, on pear, May 1st; *Dicranura vinula*, many taken; *Malacosoma neustria*, common. *Lachneis lanestris*, a web found on whitethorn hedge, June 27th, began to spin up from July 25th. Cocoons appear small for size of larva, there are too small round apertures on opposite sides of the case which, though piercing the outer shell, appear to be gummed over on the inner side, possibly this surface is porous and admits the air? I should be glad to learn if anything is known with respect to this very remarkable and unusual arrangement? *Cucullia verbasci* and *C.*

---

* Is there any reliable evidence that the ♀ s do or can hybernate? All the evidence surely is against it, see *Ent. Record*, vii., p. 250; ix., p. 280.—Ed.

lychnitis, common on mulleins. *Macroglossa fuciformis*, on honeysuckle, pupated August 23rd, turning at once, on a former occasion a larva of this species remained under its web for a month before changing. *Choerocampa elpenor*, a full-fed larva taken on willowherb, August 24th (though plentiful at rhododendrons last year, the imagines were not observed this season). *Smerinthus populi* and *Sphinx ligustri* were also taken; of *Anarta myrtilli*, throughout the summer there appears to be a succession of broods; *Pygaera* (*Clostera*) *curtula*, several on aspen; *Notodonta carmelita*, on birch, full-fed July 8th; *Platypteryx falcataria*, and *P. lacertula*, July 9th; *Cymatophora flavicornis*, common; *Acronicta leporina*, took a larva from sallow, September, at Comrie, Perthshire, of an unusual colour, *viz*., the long hairs and body of a bright canary yellow*, unfortunately this caterpillar perished.—C. Bingham Newland, Wishanger, Farnham. *November 8th*, 1900.

Eggs of Lycænids.—Erratum.—In the illustrations of Lycænid eggs (*Ent. Record*, vol. xii., pl. xi., figures 4 and 6), the names *Polyommatus icarus* and *Nomiades semiargus* should be reversed. As references to these may be made in future it would be well, to make the correction on the plate as well as in the "explanation of plate" at end of my short paper.—F. N. Clark, Harrow Road, W.

Colias hyale and C. edusa near Croydon in 1900.—It will not be exactly news to readers of the *Record* to be informed that both these species were moderately abundant in this district throughout August last. I have, however, noticed one or two points in connection with the species which may be of some general interest. I may mention in passing that my son, who had holidays from school, and myself, by fairly hard work managed to net, between us, 65 *Colias hyale*, the majority of which fell to the "junior net," he having more time at his disposal than I could spare. They were distributed in suitable spots all over the district—Boxhill, Riddlesdown, Oxted, and Addington all producing their quota of specimens. The flowery down-sides were much more prolific than the clover or lucerne fields, but even these did not produce abundantly, and it was curious to note how soon all the specimens in a locality were caught; one would perhaps net six or eight in the first hour, whereas by staying on the spot afterwards all day, not more than another would be caught, whilst by going on to a spot, perhaps a mile away, another half dozen specimens would be the result. I had never in my quarter of a century of collecting seen *C. hyale* until this year, and could not understand why it should, on the occasion of its visits to our shores, limit itself almost entirely to our south-eastern counties, whilst its congener, *C. edusa*, distributed itself more or less over the three kingdoms. I think I know now! Most men who have chased a *C. edusa* have a pretty fair idea what that means; I remember well my first *C. edusa* chase. It was in June, 1877, I was walking meditatively across a large field with a net in my hand. Suddenly there floated across my vision a splendid yellow butterfly; I was in my teens then, and a bit of a sprinter, and I thought I could run that butterfly down; we started fairly even, and finished with the butterfly about 250 yards ahead. I have always fancied since that *C. hyale* flew at about this rate, but now know there is no 30 miles an

* For details of the various forms of the larvæ of this species see *Entom. Record*, iii., pp. 25 *et seq.*

hour rate of progress with this species, in fact I never saw one that flew faster than an ordinary *Pieris*, say, *P. rapae*, and can thus easily understand why they are not able to distribute themselves far in one year*. From one of the females I obtained about a dozen ova, these hatched in due course, and after the second moult commenced to hibernate. I have kept them in a cool conservatory, and they are at present (Dec. 24th) all right. *C. edusa* has been much the rarer of the two species, and I have only heard of one var. *helice*; this was taken at Riddlesdown by a schoolfellow of my son's and is now the pride of his cabinet, thanks to a successful barter. I fed up a brood of larvæ from a female captured in August, the imagines emerged in October and November, several of the males are of a very striking form with a bright canary-coloured costal streak; I have seen this form occasionally amongst captured specimens, but not nearly so intense. The females had much smaller spots than usual, and one was almost spotless. I have previously noticed that females with absolutely spotless margins are not uncommon in this third brood, probably the result of the low temperature at which the pupæ are developed, of course all the late autumnal bred specimens are very small. Has anyone ever bred *C.* var. *helice*? I do not remember having seen it recorded.† I have myself at different times bred over one hundred *C. edusa* without even obtaining an approximation to this form.—W. G. SHELDON, Croydon.

NOTODONTA DROMEDARIUS FEEDING UPON CORYLUS AVELLANA.—I was considerably surprised last autumn to find a larva of this species on a half-eaten leaf of hazel, far away from what I had considered its only food-plants, birch and alder; I fed it in confinement on hazel leaves, which it ate freely, and became in due course a full-sized chrysalis. This may not be new, but it was new to me.—IBID.

ACIDALIA IMITARIA AT READING.—On July 28th, 1900, I netted a ♀ *Acidalia imitaria*, ova were deposited the same night, larvæ hatched August 12th. I sleeved them on common broom expecting them to feed up soon, but they are still alive, I will not say feeding, as there is very little for them to eat, but they look very healthy perched on the stalks, Merrin's *Lepidopterist's Calendar* gives: "Larvæ, v and vi months."—W. E. BUTLER, Reading. *January*, 1901.

HELOTROPHA LEUCOSTIGMA AT READING.—On August 8th I netted a specimen of *Helotropha leucostigma*, the first I have taken here; it was on one of our chalk hills. Is not this rather a strange place to take it?—IBID.

PORTHESIA SIMILIS DOUBLE-BROODED.—On November 3rd I took a *Porthesia similis* (*auriflua*) at light (on a street lamp), the first time I have taken an example of a second brood.—IBID.

LARENTIA VIRIDARIA DOUBLE-BROODED.—On September 12th I took

---

* How susceptible of cold, too, this insect is. Up to the end of the first week in September the specimens were in full numbers and good condition, just then occurred one or two cool nights, followed by hot days; these nights seem to have killed nearly every *C. hyale* in the district, as, although well looked for, we afterwards only saw one half-torpid specimen, and this, notwithstanding the fact that *C. edusa* and the usual autumn butterflies were observed in full numbers during the whole of the month.—W.S.

† Frohawk records (*Ent.*, xxxiv., p. 3) breeding 302 ♂s, 125 normal ♀s, and 110 *helice* = 537 altogether, from some 850 eggs laid Aug. 19th, 1900, *et seq.*, the imagines emerging Oct. 5th, 1900, *et seq.*—ED.

three *Larentia viridaria* (*pectinataria*) at sugar, I suppose a second brood, they are very small and light in colour.—Ibid.

Anticlea sinuata at Reading.—On July 14th I took two specimens of *Anticlea sinuata* here, the first I have seen, but I believe two or three have been taken previously in this district.—Ibid.

Macroglossa stellatarum feeding at flowers of fuchsia.—During a visit, last November, to friends at Uckfield, in Sussex, I was greatly interested in watching, on the morning of the 6th, a specimen of *Macroglossa stellatarum* extracting nectar from the blossoms on a fuchsia-hedge in their grounds. As the manner in which this moth secures its food from fuchsia flowers was unknown to me, there may be a few others who also are ignorant of it, so a brief account is given. The flowers of fuchsia being pendulous it would be difficult, if not impossible, for the moth to insert its proboscis into the nectary in the same way that it does when feeding at those of geranium, verbena, &c., so it very cleverly thrusts it in through the small spaces formed by the tapering of the petals at their bases. November 6th appears to be an unusually late date not only for *stellatarum* to be seen on the wing, but for fuchsias to be in full bloom in the open air.—B. A. Bower, F.E.S., Lee.

Plusia moneta at Wandsworth.—It may be worth recording that a fine *P. moneta* flew into the study window here to the lights, in mid-July last. It was evidently from the park, where monkshood is grown fairly abundantly.—(Mrs.) M. E. Cowl, Aberceri, Spencer Park, Wandsworth Common. *February* 22*nd*, 1901.

List of Warwickshire insects.—As I am engaged with friends in preparing a list of the insects of Warwickshire, it would be a great assistance if any entomologists who have worked in the county would let me have a list of their captures, which would be gratefully acknowledged.—Colbran J. Wainwright, F.E.S., 2, Handsworth Wood, Birmingham. *February* 14*th*, 1901.

CURRENT NOTES.

The Fifth International Congress of Zoology will be held at Berlin, opening on the morning of Monday, August 12th, and closing Friday August 16th. An excursion to Hamburg will take place on the latter date, and one to Heligoland on the 18th. To those who remember the success of the Fourth Congress, held at Cambridge, in 1897, there is scarcely need to enter into detail. We, however, append the official programme:

Sunday, August 11*th*—8 p.m.: Reception. *Monday, August* 12*th*—10 a.m.: General Meeting in the Lecture Hall of the I. Chemical Institute, 1, Hessische Str., opening of the Congress. Election of Vice-Presidents and Secretaries. Arrangement of the Sections. Scientific Lectures. 12.30-2 p.m.: Luncheon. 2-4 p.m.: Meetings of the Sections. From 4 p.m.: Visits to the following Museums and Institutes which will be open to the Members and Associates of the Congress each day: the Zoological Museum, the Zoological Institute, the Geologic-Paleontological Museum, the Mineralogic-Petrographical Museum, the Museum for Mining and Metallurgy, the Zoological Museum of the Agricultural High School, the two Anatomical Institutes, the Pathological Museum, the Botanical Museum, the Ethnographical Museum, the Observatory, the old and new Botanical Gardens, the Aquarium, the Zoological Gardens, the Urania, and the Treptow Observatory. *Tuesday, August* 13*th*—9 a.m.: General Meeting in the Lecture Hall of the I. Chemical Institute, Scientific Lectures. 12.30-2 p.m.: Luncheon. 2-4 p.m. Meetings of the Sections. From 4 o'clock p.m.: Visits to the above named Collections and Institutes. At night: Reception of the Members of the Congress by the Berlin Municipality at the City Hall, König Strasse, C. *Wednesday, August*

14*th*—9 a.m.: General Meeting in the Lecture Hall of the I. Chemical Institute. Scientific Lectures. 12.30-2 p.m.: Luncheon. 2-4 p.m.: Meetings of the Sections. From 4 p.m.: Visits to the above named Collections and Institutes. At night: Dinner in the Hall of the Zoological Gardens. *Thursday, August* 15*th*—9 a.m.: Meeting of the Section for General Zoology in the Lecture Hall of the I. Chemical Institute, 1, Hessische Str.; in the other Auditories: Meetings of the Sections. At 12.30 p.m.: Trip to Potsdam. Excursion by steamer across the Havel lakes to Wannsee. Return by railway to Berlin. *Friday, August* 16*th*—9 a.m.: General Meeting in the Lecture Hall of the I. Chemical Institute. Scientific Lectures. Conclusion of the Congress. 1 p.m.: Departure from the Lehrter Bahnhof to Hamburg. Arrival in Hamburg about 5 o'clock. At night: Reception by the High Senate in the Hamburg City Hall. *Saturday, August* 17*th*—9-10 a.m.: The Natural History Museum will be open. 11 a.m.: By steamer round the Harbour. In the afternoon: Visit to the Zoological Gardens. *Sunday, August* 18*th*—Excursion to Heligoland. Visit to the Biological Station.

The following gentlemen have undertaken to give lectures at the General Meetings on the following subjects: Geh. Bergrath Prof. Dr. W. Branco (Berlin): "Fossile Menschenreste." Geh. Rath Prof. Dr. O. Bütschli (Heidelberg): "Vitalismus und Mechanismus." Prof. Dr. Yves Delage (Paris): "Les théories de la fécondation." Prof. Dr. A. Forel (Morges): "Die psychischen Eigenschaften der Ameisen." Prof. Dr. G. B. Grassi (Rome): "Das Malariaproblem vom zoologischen Standpunkte." Prof. Dr. E. B. Poulton (Oxford): "Mimicry and Natural Selection." A committee of ladies will place themselves at the disposal of the ladies of the Members of the Congress. Every zoologist and every friend of zoology may become a Member of the Congress by paying twenty marks to the Treasurers of the Congress, either before or during the Session. A Report of the Session will be supplied, on application, to every Member of the Congress. Ladies attending the Congress in the Company of a Member may become Associates on the payment of ten marks. This payment entitles them to attend all the Meetings and Receptions. Application for tickets must be made on or before the 11th of August at the Congress' Office, 1, Hessische Strasse, Berlin, N.

Information of actual dates of appearance (in nature or in confinement) of *Endromis versicolora*, for a single year or spread over a series of years, is badly wanted; also exact details and dates of the autumnal emergence of any Sphingids from pupæ of the same year; also any information relating to the mode of egg-laying in nature of any Sphingids (either British or foreign). Will correspondents please reply direct to the Editor?

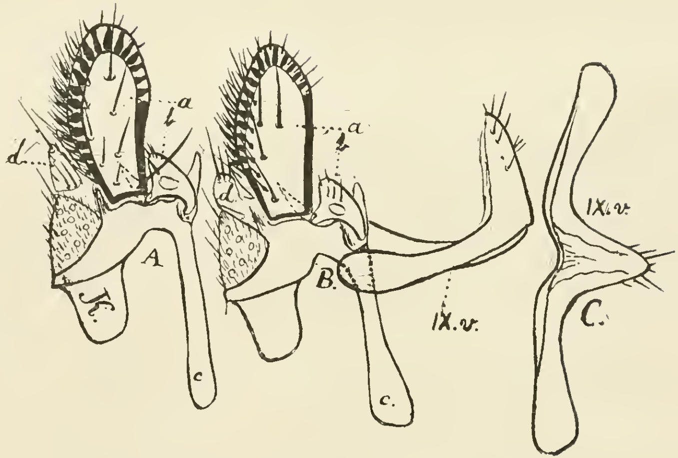
Herr H. Gauckler of Carlsruhe, already well known for his interesting notes on the life-histories of some Geometrids, as well as for his list of Carlsruhe lepidoptera, has published (*Ent. Nachr.*, xxvi., pp. 371-2) notes on the following new aberrations:

Cidaria picata, Hb., ab. *albofasciata*, Gckler.—With an almost pure white submarginal band on the forewings, 3½mm. to 4mm. in width, separated from the outer margin by an olive-green band of about 1½mm. width. Three freshly emerged specimens at Carlsruhe in May, 1900.

Boarmia crepuscularia, Hb., ab. *alba*, Gckler.—Ground colour clear whitish-grey, no dark central shade, and even the blackish dentated line only weakly indicated; very little brown dusting, the brown dots on the margin only very small. One ♀ taken at Carlsruhe in the spring of 1900.

Ortholitha plumbaria, Fb., ab.—A not less noteworthy aberration, but not named. Has a conspicuous dark dentated line in the marginal area, just inside the pale subterminal line. One ♀ at Carlsruhe some years ago. (I have seen specimens in British collections decidedly tending in this direction.—L.B.P.).

ERRATA.—p. 72, line 40, for "1894" read "1849." p. 81, lines 34-5, for "*Acrolepia*" read "*Argyrolepia*." p. 84, line 39, for "*cassipes*" read "*crassipes*."



Pulex canis, Curtis, and Pulex felis, Bouché.

Lasiocampa quercus var. meridionalis, n. var.

By J. W. TUTT, F.E.S.

In the *Entomologist's Record*, vii., pp. 298-305, I gave a critical review of *Lasiocampa quercûs* and *L.* var. *callunae*, and concluded with Staudinger's summary of the various forms of *L. quercûs* and their distribution. Recently, in view of volume iii of *British Lepidoptera*, Mr. Bacot and myself have been dealing with these forms, which Staudinger seems to have jumbled up somewhat unsatisfactorily in one or two instances, and I would provisionally substitute the following in place of the table there given :

Quercûs, Linn., "Sys. Nat.," xth ed., p. 498 (1758).
- var. (et ab.) *callunae*, Palmer, "Zool.," 1847, p. 1656. Mountains and moorlands of central and northern Europe.
- var. *viburni*, Gn., "Ann. Soc. Ent. Fr.," 1868, p. 405. South France and Northern Italy.
- ab. *spartii*, Hb., "Eur. Schmett.," fig. 173 ♂. Germany, Britain, &c.
- var. *meridionalis*, n. var. (generally known as south of France *quercûs*). Wings deep chocolate-brown, transverse bands very narrow; larvæ with pure white dorsal urticating fur (that of *viburni*, Gn., red-brown).
- ab. *roboris*, [F.J.A.D.], "Bork. Rhein. Mag.," i., p. 362 (1793), Schrank, "Fauna Boica," p. 275 (1802). Germany, England, &c.
- var. *sicula*, Staud., "Cat.," 1861, p. 30. Sicily.
- ab. *catalaunica*, Staud., "Cat.," p. 69 (1871). Catalonia.

The other varieties and aberrations—*alpina*, Frey, &c.—need not be dealt with here. It is, however, necessary to give *meridionalis* (the south of France *quercûs* with white-haired larva) a name to distinguish it from *viburni* (the south of France *quercûs* with red-brown-haired larva). It is also necessary to discriminate between Hübner's ordinary narrow-banded German aberration of *quercûs*, which he named *spartii*, and the south of France *viburni* which Staudinger confused with it. My main reasons, however, for this note are to legalise *meridionalis*, which I am using in my vol. iii., and my wish to bring Mr. Bacot's nomenclature into line with that which I am using. The following comparative descriptions are made from the series in Messrs. Bacot and Warburg's collections :

α. *L.* var. *meridionalis*, n. var.—♂. Deep chocolate-brown with a comparatively narrow and very definite yellow transverse band to both fore- and hindwings, that on forewing dropping from costa in a short curve (convex to base of wing on its inner margin) before turning slightly outwards, and then running to the inner margin, where there is another very slight curve towards base; on the hindwings the band forms a regular curve almost parallel to hind margin from the costa direct to the anal angle; the outer margins of both fore- and hindwings almost as dark chocolate-brown as basal areas; the white median spot of forewings very bright, moderately large; fringes of the forewings concolorous with the outer area, fringes of hindwings varying from concolorous with outer margin to bright yellow; tendency for nervures on outer marginal area of hindwings to be yellowish; antennal shaft paler than pectinations. ♀. Forewings yellow-ochreous, transverse band narrow, definite, same direction as in male, and slightly dark-tinted on inner margin, median white spot surrounded with a dark ring. Nervures rather paler in outer marginal area than the ground colour. Hindwings of a redder ochreous tint; a definite transverse band, the outer area rather paler, the nervures therein still rather paler than the ground colour.

β. *L.* var. *viburni*, Gn.—♂. Rather smaller than var. *meridionalis*; considerable variation in direction of transverse band on forewing, which sometimes has a small outward angulation below the costa, at others runs obliquely directly from costa outwards towards anal angle; the band of the hindwing also definite, well-marked; the outer margin conspicuously dark. There is a tendency to an enlargement of the band, both on fore and hindwings medially towards the outer margin; the white median spot intensely white, small; the fringes of forewings concolorous with the outer margin of forewings; those of hindwings from nearly concolorous to bright yellow. ♀. Rather smaller than that of *meridionalis* (one wild one much larger), the forewings a little deeper ochreous, the hindwings distinctly more reddish; the band rather more distinct, but still very definite and narrow; with a similar tendency to pallid nervures on the outer margin of hindwings, and slightly so on forewings.

γ. *L. quercûs*, L.—The British examples tend much to local races. The males from Potton are not unlike the ab. *spartii*. figured by Hübner, from Germany, but have a rather wider band and a faint yellow shade that spreads as it were from the middle portion of the transverse bands on fore- and hindwings, suffusing and narrowing the outer marginal areas, and destroying the striking contrast so observable in var. *meridionalis*, in this respect rather approaching *viburni*. The females are distinctly different inasmuch as the fore- and hindwings are of the same reddish-ochreous tint that characterises only the hindwings of the French races, and the band on the hindwings tends to obsolescence and to blend with the ground colour of the marginal area. The white median spot of the forewings is distinctly larger, whiter, and not ringed so darkly. The tendency to the spread of the yellow of the bands on both fore- and hindwings, in the males from Cambridge and other British localities, is strikingly characteristic, narrowing much the chestnut outer marginal area of the forewings and reducing it on the hindwings to a narrow marginal chestnut band. In the female the tendency is for the outer marginal area to take on the colour of the band entirely in both fore- and hindwings (a characteristic seen most strongly in var. *sicula*, but only in the hindwings).

Larvæ of Lasiocampa quercus and its vars. callunae, Palm., viburni, Gn., meridionalis, Tutt, and sicula, Staud., and of cross-pairings between these races.

By ARTHUR W. BACOT.

Towards the end of 1896 I received from Mr. J. C. Warburg young larvæ of *Lasiocampa* var. *viburni* and *L.* var. *meridionalis*, reared from parents of Cannes stock. These I was to rear with a view to noting their divergence from each other in their several instars, and also from some *L. quercus* larvæ of English (Dorsetshire) parentage, given me by Mr. Goymour. In January, 1897, Mr. Warburg gave me a few larvæ resulting from a cross between *L.* var. *viburni* and *L.* var. *meridionalis* from southern France. The larvæ of the Continental races were fed on ivy; those of the English race preferred privet, but would eat ivy in default. They were all kept in a warm room and fed throughout the winter, spinning up about March, and commencing to emerge in July. Mr. Warburg, who had to leave England on account of his health, passed on to my care all his pupæ of the various races, or crosses between the races, with a request to obtain certain cross-pairings for him and any others I might think desirable. Thus the stock of pupæ under my care was largely increased both in numbers and variety, and a far better chance of success obtained than would otherwise have been the case.

List of pupæ experimented upon.—(1) *L.* var. *meridionalis* (Cannes), mixed families. (2) *L.* var. *meridionalis* (Cannes), a single family. (3) *L.* var. *viburni* (Cannes), a single family. (4) *L.* var. *viburni* (Cannes), from collected larvæ. (5) *L. quercûs* (Dorsetshire). (6) *L.* var. *viburni* × *L.* var. *meridionalis* (white-haired larvæ). (7) *L.* var. *viburni* × *L.* var. *meridionalis* (brown-haired larvæ). (8) *L.* var. *callunae* (Aberdeen). (9) *L.* var. *sicula*, a single family of Sicilian parentage.

Mr. Warburg's brother had already crossed a ♂ *meridionalis* with a ♀ *callunae* when he handed the pupæ to me, and the ♀ laid a large number of eggs. My own pairings were as follows :—

(1) July (1st week), ♂ *meridionalis* × ♀ *viburni*. (2) July 10th, ♂ *viburni*

× ♀ *quercûs* (Dorsetshire). (3) July 10th, ♂ (*viburni* × *meridionalis*, white-haired larvæ, No. 6 above) × ♀ *quercûs* (Dorsetshire). (4) July 18th (*A*), ♂ *meridionalis*, × ♀ of same stock (2.2). (5) July 19th (*B*), ♂ (*viburni* × *meridionalis*, brown-haired larvæ, No. 7 above) × ♀ *meridionalis* (7·2). (6) July 19th, ♂ *viburni* × ♀ *callunae* (3·8). (7) July 19th (*C*), ♂ (*viburni* × *meridionalis*, white-haired larvæ, No. 6 above) × ♀ *viburni* (6·3). (8) July 19th (*D*), ♂ (*viburni* × *meridionalis*, white-haired larvæ) × ♀ *meridionalis* (6·2). (9) July 25th (*G*), ♂ (*viburni* × *meridionalis*, brown-haired larvæ) × ♀ *viburni* (7·4). (10) July 28th (*I*), ♂ and ♀ (*viburni* × *meridionalis*, white-haired larvæ), (6·6). (11) July 28th (*J*), ♂ *quercûs* (Dorsetshire) × ♀ *meridionalis* (5·2). (12) July 31st (*K*), ♂ × ♀ *viburni* (3·3). (13) Aug. 3rd (*L*), ♂ × ♀ (*viburni* × *meridionalis*, white-haired larvæ) (6·6). (14) Aug. 3rd (*M*), ♂ (*viburni* × *meridionalis*, brown-haired larvæ) × ♀ (*viburni* × *meridionalis*, white-haired larvæ), (7·6). (15) Aug. 7th (*N*), ♂ (*viburni* × *meridionalis*) × ♀ *meridionalis* (7·2). (16) Aug. 9th (*P*), ♂ and ♀ (*viburni* × *meridionalis*) (7·7). (17) Aug. 12th (*R*), ♂ *meridionalis* × ♀ *viburni* (2·3). (18) Aug. 12th (*S*), ♂ (*viburni* × *meridionalis*, brown-haired larvæ) × ♀ *viburni* (7·3). (19) Aug. 24th (*U*), ♂ *sicula* × ♀ *meridionalis* (9·2). (20) Aug. 20th (?), (*V*), ♂ *sicula* × ♀ (*viburni* × *meridionalis*, brown-haired larvæ) (9·7).

An attempt to cross a ♂ *Pachygastria trifolii* with a ♀ *L.* var. *meridionalis* was made; it is not certain that copulation took place, although a large number of eggs were at once laid (usually a sign of impregnation), but all proved infertile. In all, 23 pairings were obtained, seventeen being distinct pairings and six duplicates. Of the seventeen, four were pairings between moths of the same races, thirteen being crosses between different races. The whole 23 pairings produced fertile eggs. Unfortunately, the difficulties of attending to so many different broods, most of them large, and all of which required to be reared apart in an artificial temperature, and, when they grew larger, of obtaining a sufficient supply of fresh food, proved too much for my limited leisure. Disease resembling diarrhœa carried off, not only large numbers of each brood, but in some instances entire broods, so that my success as regards obtaining full-fed larvæ and imagines was very indifferent.

During 1898 I only obtained one pairing, this was between a ♂ of the 1897 pairing between ♂ and ♀ (*viburni* × *meridionalis*, white-haired larvæ) (L) and a ♀ *sicula*. Of this cross I reared a large number of larvæ (upwards of 100) until they reached their penultimate skins, when to my great disappointment the above-mentioned disease broke out and nearly decimated the brood. I only succeeded in getting nineteen out of 100 to spin up, while Mr. Prout succeeded in getting fifteen pupæ from twenty larvæ that I gave him, and as regards emergences he has had a greater number than I. Many of my pupæ lay over in 1899, two males emerging at Whitsun, 1900, while a few are still living (autumn of 1900), and are apparently going to attempt to pass another winter before emerging. My failure I attribute almost entirely to want of attention and the keeping of too large a number in a confined space, especially during their younger stages. I believe that it is in the earlier stages that the disease is contracted, although its effect may not become apparent until just before the last moult and a considerable time after the larvæ have been removed to ampler quarters. There did not seem to be any weakness resulting from the intercrossing, as is the case with hybrid *Smerinthus ocellatus* × *populi* larvæ, my want of success applying equally to true-bred larvæ; but the tendency to lie over (largely, if not entirely, due to intercrossing) was responsible for much of the mortality among the pupæ, arising, if not primarily, at least secondarily, from a want of knowledge as to proper treatment due to doubt as to which of the parental habits would be followed.

The chief distinguishing feature of the adult larvæ of the different races consists in the colour of the hairs, especially that of the urticating hairs which form the dorsal fur. It is the colour of these hairs that gives the larva its general tint. The colour of the head is another point of difference, and also, to a more limited extent, the shape and size of the clypeal marking, but these features only serve to differentiate the southern from the northern races, or, rather, the British from the continental forms; as first stated, the rule is very likely to hold good, but I have not had sufficient material through my hands to say if this be always so. In the British races the head is of a deep indigo-blue, occasionally tinged with orange on the cheeks; in the continental forms the head is usually orange-red, the clypeal marks being whitish, the latter usually faint, if not absent in larvæ of British race. Adult continental larvæ are, I think, more densely haired than the British. In the early instars, however, there is a vast difference between them, the continental larvæ assuming the adult coat in the 2nd or 3rd stadia, while those of British parentage do not attain to a full development of hairs until they are much larger, at least one moult, and probably two moults, later. I found larvæ of vars. *meridionalis* and *riburni* indistinguishable before the growth of the urticating fur, the divergence of coloration becoming gradually more apparent until the adult colours were attained about 4th and 5th stadia.

The British larvæ vary considerably, while the French forms are much more constant, the variation in their case being chiefly with regard to the development of the blue shading on the lateral area, while with British larvæ the colour of the dorsal fur varies between dull white and pale brown, and there is much difference as to the stage to which the chain of white medio-dorsal tufts persists. The blue shading on the lateral area of the British larvæ is usually stronger than with the French, and it sometimes developed into interrupted lateral bands. The larva of *L.* var. *riburni* is, in my experience, more constant than that of *L.* var. *meridionalis*. Roughly speaking, the chief points in adult larvæ are as follows:—

L. quercûs (English): *Dorsal (urticating) fur*, dull white to pale dusky brown. *Head*, dull indigo.

L. var. *meridionalis* (Cannes): *Dorsal fur*, pure white. *Head*, orange-red.

L. var. *callunae* (Scotland): *Dorsal fur*, dull brown. *Head*, dull indigo.

L. var. *riburni* (Cannes): *Dorsal fur*, red-brown. *Head*, orange-red.

L. var. *sicula*: *Dorsal fur*, red-brown. *Head*, orange-red.

I speak with some hesitation as to the imagines, as my series are not very long. The differences are most apparent in the males. *L.* var. *sicula* differs more markedly from any of the others than they do among themselves, and, so far as my experience goes, is very constant. The ground colour of the males is russet-brown, the band on the hindwings is orange-yellow, and extends to the margin, while that on the forewings is narrow, the former feature being characteristic of the females as well. *L.* var. *riburni* and *L.* var. *meridionalis* I am unable to distinguish. The males have a ground colour of a soft, but rich deep red-brown, and the yellow band on the forewings is much straighter than is usual with the British races. Some variation exists in regard to the width of the band, but I have never seen a trace of the epaulette markings that are tolerably frequent in *L.* var. *callunae* and not infrequent in English *L. quercûs*, nor have I ever seen a forewing band of the Cannes races so waved as they usually are in the English specimens, or with a hindwing band extended to the margin of the wing as in *L.* var. *sicula*. Males of *L.* var. *callunae* are often, if not usually, of a deeper ground colour than English *L. quercûs* or *L.* var. *meridionalis*. The forewing band is waved and the hindwing band is sharp, not fading into the ground colour towards the margin as is frequently, but not invariably, the case with *L.* var. *riburni*, and *L.* var. *meridionalis*. English *L. quercûs* are the most variable in the imaginal as in the larval state. It seems useless to lay down even the loosest rule. My own short series of nine males shows a wide variation. One taken during July at Lyme Regis would easily pass unnoticed in a series of *L.* var. *callunae*. Several have the epaulette marking, while others have no trace, most of the specimens have the forewing band waved, but two have it much straighter than the others and with one of these it is quite as straight as in the Cannes varieties. Two, in the width of the hindwing band and its tendency to suffuse the ground colour as far as the margins, approach *L.* var. *sicula* as does another specimen in regard to the ground colour, which is of a russet-brown. I am rather inclined to consider that our English race is the nearest to the ancestral stock, and that the variation is largely due to climatic causes, although it is possible that some of the variation towards the southern races may be caused by inroads of fresh blood on our southern and eastern coasts.

A fourth season among Swiss butterflies.

By G. WHEELER, M.A.

The season of 1900 opened hopefully with bright sunny weather at the end of February, and on the 24th of that month and the following days *Gonepteryx rhamni* was out in numbers and in excellent condition. (By the way, is it certain that these early specimens are hibernated ?* My own observations and experience are against this theory). This early promise, however, was doomed to speedy disappointment, for cold, wet weather set in, and an extremely late season was the result. Unfortunately I was prevented by illness from doing much in the way of butterfly-hunting before May; but from all accounts I lost but little thereby, except a projected spring expedition to Lugano, which I hope is only postponed till next (or another) year. The early part of May produced at Veytaux nothing but the usual spring insects, *Nomiades cyllarus* being the best find, and, alas! my favourite hunting-ground in the Veraye gorge (a list of whose species I gave last year) spent the spring and summer in being turned into a cemetery. I do not think that such part of it as is left will be less productive another year, but almost half of it is now unavailable. On May 16th we went for a fortnight to Aigle, but met with bitterly cold weather, and nothing of

* In Britain, there can be no doubt, we think; the evidence of winter specimens is definite and indubitable, and as *Rhamnus* would only allow autumnal-feeding larvæ to get so early an emergence, and as a consequence winter pupæ, and both are unknown, an impossible thing in Britain with such a common species were they actually in existence, we suspect that the generally accepted view is absolutely correct. Surely parallel conditions hold in Switzerland.—ED.

note was done until the 21st, when we made an expedition to Martigny, and across the valley to Branson, where, just below the first houses in the village, *Polyommatus orion* was to be found in some numbers. The next day we went to our old hunting-ground at Lavey, and found both *Cupido sebrus* and *Nomiades cyllarus* in abundance. Towards the end of the week it became wet and cold again, and we had to wait till Monday 28th for another expedition to Lavey. Here *C. sebrus* and *N. cyllarus* were again abundant, and I took one very small ♀ blue which I hoped might be *Nomiades melanops*, but which turned out to be the tiny var. *blachieri* of *N. cyllarus*. This I am informed by Ch. Favre is found abundantly on the plateau immediately above Saillon. An expedition on the following day to Les Plans and thence up to the foot of the Petit Mœuveran was quite unproductive, except for a couple of *Syrichthus malvae* at a point somewhat unusually high for this species. From this point onwards I took nothing unusual, and we returned to Veytaux on June 5th. On the 9th an expedition to the top of the Rochers de Naye, going by train, and walking down from the Col de Jaman, though most enjoyable produced but little. This is a locality for *Pararge hiera*, but I did not see a single specimen ; one specimen of *Pieris napi* var. *bryoniae* was the only mountain insect observed. The whole distance, however, down the slopes of the Dent de Merdasson was covered with large white anemones and pheasant-eyed narcissus, so thickly that it was impossible in many places to move without treading upon them, and on this there were numbers of the commoner insects, and especially of a somewhat large form of *Melitaea parthenie* var. *varia*, which has literally swarmed everywhere this year, though I have never seen a precisely similar form before. During the following week a day on the Rhone banks at Bouveret produced amongst other things—*Brenthis selene*, *Melitaea dictynna* (very fine), *Plebeius aegon* (very large), and *P. argus*. On June 16th we returned to Aigle and there remained, except for three weeks at Mürren, throughout the summer. On the 20th Mr. and Mrs. Lowe arrived, and the following day we walked to Charpigny, on the chance of seeing Mr. Fison's collection, but were not fortunate enough to find him at home. The 22nd was too wet for anything, but on the 23rd we went to Martigny, and thence over the Rhone bridge at Branson turning down to the left in search of *Lycaena iolas* ; on arriving at the *Colutea* patch we were soon at work, and in about an hour and a half we succeeded in capturing eighteen excellent specimens with four nets (Mr. and Mrs. Lowe, my wife and myself) ; besides these there were a good many others, which not being so good were released again. The next day Mr. Lowe went alone to Martigny, where he took *Lycaena amanda* and *Argynnis daphne*. Wet weather prevented our following this example till the 27th, when we went to Vernayaz, walking thence under the cliffs to Martigny. A great part of the way lies between marsh on the left and cliffs with scrub and wood on the right ; in the former *L. amanda* was very abundant, and in the latter a few *A. daphne* occurred. Intending hunters should note that it is useless to look for *L. amanda* except in, or on the edge of, the marsh-land. I also found two or three worn specimens of *Erebia stygne* (*pirene*), the lowland form of which differs greatly from the mountain form which I found later at Mürren. On Thursday Mr. and Mrs. Lowe left, and the next day we repeated our Vernayaz-Martigny expedition, and found *L. amanda*, but no *A. daphne* or *E. stygne*. Towards the end of June *Pararge achine* and *Limenitis camilla* had become abundant at Aigle, and *L. sibylla* was beginning to emerge; by the beginning of July the latter was also very plentiful, and the specimens this year were unusually large. *Dryas paphia* was as abundant as usual, lasting well into September, and I took early in July one specimen of var. *valesina*. The first *Apatura iris* I saw this year at Aigle was on July 2nd, and the first I captured on July 11th; they were common this year, but as usual not easy to catch. The Sépey road is their special haunt. *Thecla ilicis* with both its vars., *T. spini*, and *T. w-album* were to be found on this road also, but I saw no *T. pruni*, except one splendid specimen in Mr. Fison's cabinet, which he took near his house at Charpigny, close to S. Triphon station. He has also taken several specimens of *T. acaciae* in his grounds, one of which he kindly presented to me. Our last expedition to Vernayaz was on July 9th, on which occasion we crossed the valley from Vernayaz station, and, turning to the right after crossing the Rhone, searched the slopes for *A. daphne*, only one specimen of which, however, we found, the day becoming cloudy soon after our arrival. Only one other expedition from Aigle took place, namely, a search for *Lampides boetica* on last year's ground on July 19th. This proved entirely unsuccessful, so far as *L. boetica* was concerned, but produced a fair number of *Everes argiades* var. *coretas*, which are to be found immediately after crossing the Rhone bridge at Branson, on the marshy ground to the right of the path leading down the Rhone bank towards the *Collutea*. *Apatura ilia* was flying about the poplars in the valley, but only one allowed itself to be caught, and even that one I clumsily let escape while bottling it. On Monday the 23rd we went to Mürren, and setting to work the next morning found a considerable number of insects. *Lycaena arion* resembles the form of the lowlands, being very bright and clearly marked, with no inclination towards var. *obscura*. This fact moreover does not stand alone. The normal form of *Chrysophanus chryseis* is universal here, even as high up as the Blumenthal, and no sign of the mountain form *eurybia* is to be seen. So also *Erebia ligea*, which is usually found lower, is abundant at Mürren, which is the same height as Zermatt. The first day's captures included *Polyommatus pheretes* and *Erebia oeme* (some of which are without spots above and below), as well as those above mentioned; indeed *P. pheretes* is very common here, especially in the Blumenthal, and I subsequently took several ♀s. On the following days I took *Erebia manto* in some numbers, and also the var. *caecilia*, as well as the mountain form of *E. stygne* (*pirene*), in which the spots are greatly reduced in size, producing a somewhat close resemblance to *E. oeme*, the underside, however, being identical with that of the lowland form. But Friday, the 27th, was my red-letter day, as I was fortunate enough to discover what I believe to be a new form of *Chrysophanus dorilis*, of which I afterwards took a number of specimens, especially in the Blumenthal. Both ♂ and ♀ are entirely brown on the upper side; the size is very large, the smallest specimens being larger than the largest I have seen of the type, and the largest ♀ I took being as large as the ♀ of *C. chryseis*, in fact one of the largest "coppers" I possess, except large specimens of *C. gordius*, the ♀ has occasionally a few small orange spots at the edges of the wings and always two black discoidal spots on the upper wings, thus closely resembling the upper-side of *C. chryseis* var. *eurybia* ♀; the underside, however, entirely separates it from this, having all the characteristics (as well as the shape) of *C. dorilis*. The ground colour of the underside of both sexes is yellow; the ♂ not being so yellow as var. *bleusei* and the ♀ not so yellow as the typical ♀. There is scarcely a trace of the orange spots on the underside, except faintly at the anal angle of the lower wing. In this characteristic it approaches var. *subalpina*, from which it differs however in size, and in the entire absence of violet reflections. It is unknown both to the English and native entomologists to whom I have shown it, and I have provisionally named it var. *brunnea*, which will not of course hold good if it has been previously discovered and named. I have one specimen of the ♀ with a good deal of dull copper on the upper wings, thus approaching the type except in size. August 1st was spent in a long expedition through Gimmelwald to the Schmadribach Hotel and back by Stechelberg and Lauterbrunnen. On the way down to Gimmelwald the numbers of *Polyommatus corydon* were almost incredible, and *P. dorylas* and *P. bellargus* were also in great abundance. Just below Gimmelwald I saw two specimens of the deeply coloured *Papilio machaon* ab. *aurantiaca*, but was unable to secure them, and, on arriving at the banks of the Weiss-Lutschine, *Polyommatus eros* and a small form of *P. damon* were to be seen among the hosts of *P. corydon*. This appears to be an excellent locality, and I should have liked to have had much more time at my disposal. On the 2nd a visit to the Blumenthal produced amongst other things several specimens of the new copper, and a few of the small var. *montana* of *Nomiades acis*; *Cupido minima* var. *alsoides* is also abundant and very large. On the 3rd a walk on the heights above the Blumenthal produced *Melitaea cynthia* ♀ and a good many specimens of *Erebia tyndarus* var. *dromus*, a variety which is generally supposed not to be Swiss, but which is the only form in the Mürren district; Ch. Favre informs me that it is also common at Trient, and his specimens of the ♀ from that locality are even more strongly marked than those from Mürren; a day or two later I took several more specimens of this variety. It cannot properly be regarded as an aberration. My only other noteworthy captures were one specimen of *Polyommatus optilete* on the first day of my visit, and one of the small form *cyparissus* on the last. On August 13th we returned to Aigle, and on the 16th went to Charpigny to search for *Epinephele tithonus*, a great rarity in Switzerland, and were fortunate enough to hit on the exact spot where it was to be found in numbers, but the ♂ s somewhat worn; a few days later I took one specimen at Aigle. At Charpigny I also saw several *Zephyrus quercus* one of which I took, and a splendid specimen of *Z. betulae* ♀ evidently just emerged. On the following day I made another expedition to Martigny in search of *L. boetica*, and not only found none, but also discovered that the whole of the *Colutea* bushes with one exception were completely withered; I shall look with much interest and no little fear in the spring to see whether, or how far, they have recovered. Close to the Rhone bridge I took a very fine *Colias edusa* ab. *helice*, and around the same spot *Plebeius argus* var. *argyrognomon* was as abundant as it had been throughout the summer. This form (unless it be, as has been suggested, a separate species) is by far the commoner from Martigny to Sierre. I looked the same day to see if any second brood of *Polyommatus orion* was to be found, but in vain.

Satyrus statilinus had appeared but not in numbers as yet. On the 21st and subsequent days I found *Leucophasia sinapis* vars. *erysimi* and *diniensis*, common, and *Satyrus phaedra* very abundant at Aigle, and on this date saw and very narrowly missed *Papilio machaon* var. *aurantiaca*, which Mr. Fison has taken in this neighbourhood more than once; and at the same spot on the 23rd I took another *C.* var. *helice*, which, however, having one wing rather badly torn I allowed to escape. Within the next ten days I took three expeditions to Martigny in search of *S. statilinus* for Mr. Lowe, and also of *Melitaea berisalensis* of which I took two or three specimens each time. *S. statilinus* was abundant, but ♀s very scarce. On one of these occasions Ch. Favre invited me to come and hunt among his duplicates ("chasser parmi mes doublettes" were his words) and I thus obtained a couple of *Pararge hiera* and one specimen of *Erebia christi*, as well as other things of which I was short. On September 6th we returned to Veytaux, and on the following day went up the Rochers de Naye where I took several *Erebia pronoe* var. *pitho*, which differed somewhat from the Simplon specimens, having generally no spots on the deep mahogany blotch on the forewings of the underside. This was, properly speaking, the end of my entomological season; but one day in October Chanoine Favre and I met at Mr. Fison's for a long day to examine his collection minutely, and came across many specimens of interest, including several unusual aberrations. I append a list of my new captures this year, as I did for my three former seasons, but naturally such lists must become "smaller by degrees and beautifully less." *Leucophasia sinapis* ab. *diniensis*, *Chrysophanus dorilis* var. *brunnea*, *Nomiades cyllarus* var. *blachieri*, *N. semiargus* var. *montana*, *Cupido alsus* var. *alsoides*, *Polyommatus optilete* var. *cyparissus*, *Argynnis daphne*, *Erebia tyndarus* var. *dromus*, *E. manto* and var. *caecilia*, *E. stygne (pirene)*, and *Epinephele tithonus*, besides several species presented to me. This year was also the first time that I had personally met with *Polyommatus orion* and *Lycaena amanda*. Two other points I must just mention. I have spoken in a previous paper of the numbers of *Erebia aethiops* at Aigle. I find on comparison with specimens taken this year at Mürren that almost all the Aigle specimens are of the form *leucotaenia*. The other and much more important point is that *Coenonympha satyrion*, which in my last year's papers I called a variety of *C. arcania* (a form of nomenclature altered presumably by the Editor), was very abundant this year at Mürren, and from the number of specimens I was able to examine there, I am pretty well convinced that it is not a distinct species, almost every characteristic of the type being more or less reproduced, some in one example some in another, so that it approximates more closely to the type than the var. *darwiniana*, which has, I believe, never been considered a separate species.

I have been asked several times this year to prepare a small handbook of the Swiss butterflies, there being nothing later than 1880; I shall be most happy to make the attempt, but my power of doing so must depend very largely on the extent to which collectors are willing to put their experience at my disposal. May I be allowed to take this opportunity of begging for the exact localities and dates of the capture of butterflies in Switzerland, especially the rarer and more local species, addressed to me at the Pension Masson, Veytaux, Switzerland?

Sesiidae or Ægeriidae.

By LOUIS B. PROUT, F.E.S.

My friend Mr. E. W. Lane, who is doing such excellent work at the "Clearwings," and other entomologists, have more than once asked me concerning the complications of their generic nomenclature. The Nomenclature Revision Committee of the North London Natural History Society a few years ago accepted Mr. Kirby's nomenclature (*vide*, *Entom.*, xxxvi., p. 61) but neither he nor they have published any exhaustive explanation of the processes by which the result was arrived at. The question is one of quite exceptional difficulty to deal with, without bringing in that most dreaded personal element suggested in the statement "I therefore choose"—this or that—in other words, procedure in the past has been so unmethodical that it seems almost impossible to apply rigidly and unswervingly the "historical method."

Sesia was erected by Fabricius in 1775 for a heterogenous assemblage of bee-hawks and clear-wings which I need not enumerate; but it is important to note his diagnosis: "Palpi reflexi. Lingua exserta, truncata. Antennæ cylindricæ, extrorsum crassiores." "Lingua truncata" seems to preclude the Sphingid section from being typical, although I am aware that—bearing in mind the very vague and loose generic diagnoses of the period—it is generally dangerous to over-press arguments based thereon.

Macroglossum was erected by Scopoli two years later with type *stellatarum*, and *Trochilium* with no type specified; we know from the whole plan of Scopoli's work at the Heterocera, that these were meant to cover sections E and F of the "Vienna Catalogue," *i.e.*, that *Macroglossum* included *stellatarum* and *oenotherae* (*proserpina*, Pall.), and *Trochilium* the clear-winged species, including *fuciformis* and *bombyliformis*. The two new genera therefore covered, for all practical purposes, the *Sesia* of Fabricius, with which Scopoli appears to have been unacquainted; to argue that Scopoli's action constituted some non-European species the type of *Sesia* seems to be, as Sir George Hampson has justly remarked, a *reductio ad absurdum*.

Of course Scopoli's action did not really influence Fabricius' genus in any possible way; it is most important that work at generic nomenclature should not be disfigured with arbitrary assumptions that two authors working quite independently are restricting one another's genera; the only *conceivable* case in which this could happen (automatically) is where two new genera absolutely and explicitly cover the same ground as one old one, and it is necessary (upon present-day ideas) to conserve the old name for the later of the two new genera, in order to give "priority" in the *earlier* of the two, its due weight. Even here, however, it is hard to see how we can sit in judgment on our predecessors, where they have failed to comply with this present-day requirement, and permit ourselves to rule them "out of order;" surely the most we can say is that they *ought* to have done otherwise, *but they did not.*

The above is a slight digression, in order to ventilate a very important question; let us now return to our historic sketch.

In 1797 Cuvier cited *stellatarum* as an example of *Sesia:* this would make it the type, but for its disagreement with the generic diagnosis

—and, as many writers would add, the fact that it had meanwhile been constituted the type of *Macroglossum*.

In 1801 Lamarck in like manner made *fuciformis*, Fb. (*i.e.*, apparently the broad-bordered species) the type; but this again appears to be *ultra vires*. I do not know whether Laspeyres in the same year (*Sesiae Europaeae*) published before or after Lamarck.

In 1805 Latreille removed *stellatarum*, *bombyliformis* and *fuciformis* back to *Sphinx*, and cited four examples of *Sesia—apiformis*, *tipuliformis*, *culiciformis*, and *chrysidiformis*.

In 1806 Hübner (*Tentamen*) cited *culiciformis* as type. This has been accepted by Grote and probably others, and unless Cuvier or Lamarck can be shown to have interfered, it seems quite sound.

In 1807 Fabricius himself removed "*apiformis*, *ichneumoniformis*, *respiformis*, &c.," into his new genus *Ægeria*, and cited "*oenotherae*, *stellatarum*, *fuciformis*, &c.," as examples of *Sesia*; had he expressed himself thus explicitly *before* Latreille and Hübner had accepted his *published* intentions and worked upon them, his decision would have been of great importance; as it is, it comes too late, and can affect nothing, although it was accepted by Leach in 1815, and through him introduced to our English writers.

In 1808 Ochsenheimer followed Latreille, and later (1816) he removed *stellatarum* and the bee-hawks to *Macroglossa* (*Macroglossum*, Scop.); hence the general continental usage.

In 1810 Latreille specified *apiformis*, Fb., as type of *Sesia*: this will have to be accepted by those who reject the *Tentamen*.

In 1815 Oken resuscitated *Trochilium*, Scop., which had lain dormant in the synonymy of *Sesia*, &c., using it (as a subgenus of *Ægeria*) for *apiformis* and *bembeciformis* (*crabroniformis*, Lewin); in other respects he followed Fabricius' latest (1807) work. As he only describes *apiformis*, that becomes the obvious type of *Trochilium*, of which Hübner's later *Sphaecia* is a synonym.

It thus appears, with (as I hope) all the important literature before us, that the types of the early generic names in this group are the following:

Sesia, Fb., 1775; type *culiciformis* sec. Hb., 1806 (or type *apiformis* sec. Latr., 1810).

Macroglossum, Scop., 1777; type *stellatarum* sec. Scop., 1777.

Trochilium, Scop., 1777; type *apiformis* sec. Oken, 1815. (Curtis, 1831, supports).

Ægeria, Fb., 1807; type apparently *respiformis*, L. (=*asiliformis*, Schiff.), which seems to be the only species cited by all the early authors who legitimately use the name—Fabricius, Oken, Leach, Stephens.

Curtis' selection of *culiciformis* (in 1825) as the type of *Ægeria* is debarred by the fact that this was not cited at the foundation of the genus. Westwood's choice of *apiformis*, followed by Mr. Kirby, is probably due to his accepting Oken's abridged *Naturg. Schulen* (1821) instead of his earlier and much fuller *Lehrbuch* (1815). It is to be regretted that the "historical method" employed does not allow of our finding the *same* type for all the three names *Sesia*, *Trochilium* and *Ægeria*, and so sinking the two latter as irrevocable synonyms; for there can be no doubt that this would simplify the synonymy, and allow of the use of the work of those later writers who attempted more subdivision (Hübner, Newman, &c.). As it is, however, I am afraid the best we can do is to restore "*Sesia*" and "*Sesiidae*" to their rightful place for the true clear-wings, *Trochilium* for the "hornet clear-wings," and apparently—though unfortunately—apply *Ægeria* to *vespiformis* (*tabaniformis*).

I may add that Westwood, who (in Humphrey and Westwood's *British Moths*) first made the revision which has been followed by Mr. Kirby, does not seem to have experienced any difficulty in accepting the bee-hawks as the typical section of *Sesia*, and considers Fabricius' action on erecting *Ægeria* to be conclusive. His argument for the restriction of *Trochilium*, Scop., to the small clear-wings is very good from a literary point of view, but hardly forcible enough to override the action of his predecessors; he argues that the allusion to a humming-bird, contained in the name *Trochilium*, shows clearly that Scopoli was thinking of the swift-winged and tufted-tail group, and not of the comparatively sluggish and comparatively smooth-tailed "hornet clearwings."

Migration and Dispersal of Insects: Lepidoptera.

By J. W. TUTT, F.E.S.

Piepers has specially dealt with the migration of the East Indian butterflies in his "Observations sur des vols de lépidoptères aux Indes-Orientales Neerlandaises et considérations sur la nature probable de ce phénomène*," Batavia, 1890, and added some few facts, many of which, however, are too general to be of much service. He mentions some 30 different observations of the phenomenon collected mostly, it must be confessed, from non-entomological correspondents, and in many instances the species observed on flight is unknown. From these observations he concludes that the flights noticed consist usually of individuals belonging to the two sexes of *Catopsilia* (*Callidryas*) *crocale*, but sometimes of three species of the genus *Euploea*, but only those referring to the *Catopsilia* are sufficiently numerous to draw any general conclusions therefrom. Thus, of the thirty cases mentioned, that observed in 1885 by Ottolander, in the province of Besouki, in Java, consisted of *Euploea eunice*, another flight observed in the same year by Schouten, in Sumatra, was composed principally of *Euploea buxtoni*, accompanied by *E. rhadamantus*, whilst in 1883, in Java, Piepers himself observed a vast flight of the two sexes of *Catopsilia crocale*, accompanied by a few specimens of *Atella phalanta* and of a species of *Terias*, and in 1885 Shouten observed a flight of the same species of *Catopsilia* in Sumatra, and De Graaf, in 1886, refers another flight observed at Bagalén, in Java, to the same species. The records of most of the other flights refer to the butterflies composing them as being white and yellow, which suggests strongly that *C. crocale* was the insect under observation. Of the flight that Piepers himself observed in November and the first half of December, 1883, he says: "Among many millions of *C. crocale*, I counted three examples of *Atella phalanta* and two of a *Terias*†." He suspected that these specimens were travelling with the *Catopsilia* in spite of themselves, blindly following the migrants and possibly not accompanying them very far. Most of the flights observed took place in the months of November, December, January and

* *Overgedrukt uit het Natuurkundig Tijdschrift voor Nederlandsch-Indië*, Deel L., Aflevering 2, pp. 199-257 (Ernst and Co., Batavia en Noordwijk, 1890).

† The species might be *T. hecabe*, *T. blanda*, or *T. sari*, three closely allied species which cannot be discriminated on the wing.

February, *i.e.*, in the early months of the westerly monsoon, 25 of the 30 cases enumerated thus occurred, and the others, made from memory, must not be taken too literally. Moore, he says, also observes that in Ceylon the migration flights usually commence in November. Piepers suspects that the flights are annual, but that they are not specially noticed except in those years in which the species are especially abundant, and that this condition arises when there has been an early and a very dry easterly monsoon, the flights being more general in the very early part of the rainy season accompanying the westerly monsoons. During these migrations the butterflies fly rapidly, going straight ahead, not turning aside, but surmounting all obstacles that may be opposed to their progress, continuing their movement in a direct line, never stopping at flowers for food. It is this manner of flight that is abnormal, the continued onward movement, as if for a definite purpose, being very different from that in which the insects ordinarily indulge; they cease flying, however, when there is rain or no sun, just as they would were they not making these definite journeys. The insects, Piepers states, follow no definite direction, they usually fly with the wind, but occasionally, if the wind be weak, they have been observed to fly against it. Thus Zeper and other observers note the flights in 1877 and 1879 as being with the wind; Backer notes in 1882 swarms coming with the wind from the marshy districts in the interior of Sumatra, but changing their direction and following the shore when the coast was reached. Piepers states that the 1883 migration that he himself observed in Java, and which extended over six to seven weeks, was easterly in direction and with the wind. On the other hand Zeper states that one flight observed in 1877, in Java, was towards the south-east whilst the wind blew from that quarter. In different times of the same season the direction varies. Thus Kerkhoven observed, in January, 1889, that the insects flew from west to east, but on February 2nd or 3rd, when they were again noticed, they flew from south-east towards the north-west. So also Ottolander observed in 1885 that *Euploea eunice* at first travelled towards the east, but a dozen days later towards the west. Concerning the fact that butterflies do fly against the the wind, Piepers notes that Marott states (*Feuille des jeunes naturalistes*) that in the month of September, 1872, he met out at sea, a column of *Pyrameis cardui* struggling boldly against the wind, but that, in spite of their efforts, many were continuously beaten back into the water, where they perished in such numbers as to give the sea the appearance of a pond covered with leaves. Piepers observes that Zeper had written that he had often seen isolated butterflies as well as swarms of them flying from the land out to sea at a considerable distance from the shore, but he added that if the wind fell, they at once changed their direction and attempted to regain the shore. He also observes that on the shores of Holland large swarms of lepidoptera have been noticed arriving from a sea journey, and so fatigued by the journey, that immediately on arrival they have settled on the shore and the dunes to rest in such numbers that the road has been covered with them. A somewhat parallel instance is noted by Piepers as occurring at Siak, in Sumatra, in September, 1880, but, in spite of the well known fact that migrating butterflies in Ceylon, nearly always head against the wind when on their periodical flights, Piepers insists that the butterflies observed migrating in the East Indies fly with the wind, and that they cannot fly against it, except it be very weak.

Notes on Pulex canis Curtis[1], and Pulex felis Bouché[2] (*with plate*).

By the Hon. N. C. ROTHSCHILD, B.A., F.L.S., F.E.S.

Dr. Charles J. Patten, of Dublin, kindly forwarded me in November last a fine series of fleas from the domestic cat. On further examination of this material, and after comparison with the specimens I already had at hand, both from the domestic cat and dog, I felt convinced that the fleas found on these animals were distinct species. Kolenati[3] has already advanced this view; his various distinctions, however, are, without exception, erroneous, as Dr. Taschenberg[4] has already pointed out. Dr. Taschenberg, however, considering the fleas from these two animals to be the same species, united them under the new name of *serraticeps*.

The accompanying figures, drawn by my friend Dr. K. Jordan, represent the 9th and 10th abdominal segments of the males of these two fleas.

The chief distinguishing characters lie in the structure of the so-called "movable-finger" of the ninth tergite, (*a*) in the figures, and the shapes of the respective manubria, (*c*) in the figures. The "movable-finger" of each species is drawn in optical section. In *Pulex felis* there are a few more hairs on the surface of this organ than in *P. canis*. The structure of its dorsal edge, moreover, is altogether more rounded, and is produced further along the ventral edge than in *P. canis*. In *P. canis* the ventral edge of the "movable-finger" is much straighter than in *P. felis*.

The manubrium of *P. felis* is almost of the same breadth along its entire length, while in *P. canis* the anterior portion is considerably broader than the posterior. These segments of *Pulex canis* have already been figured by Landois[5].

In the females a constant distinctive character appears to be absent.

Explanation of Plate III.

A. Pulex felis. Ninth tergite, ♂. *B. Pulex canis.* Ninth segment, ♂. *C. Pulex canis.* Ninth sternite, ♂ (flattened out).

---

[1] Curtis, *Brit. Ent.*, iii., No. 114, Fig. A-E., Fig. 8 (1826).
[2] Bouché, *Nov. Act. Acad. Leop. Carol.*, xvii., 1, p. 505 (1835).
[3] Kolenati, *Fauna des Altvaters*, p. 65 (1859), and *Hor. Soc. Ent. Ross.*, ii. p. L (1863).
[4] Taschenberg, *Die Flöhe*, p. 77 (1880).
[5] Landois, *Anatomie des Hundeflohes*, Taf. vi. (1866).

SCIENTIFIC NOTES AND OBSERVATIONS.

Inquiline Cynipidæ—Shape of galls.—With reference to the paragraph (*anteà*, p. 19) relative to the *Cynipidae*, the writer, I presume, wishes to convey to your readers that the inquilines or guest-flies are not parasites, this, however, is not my experience, for I only know of two which are not—these are *Synergus melanopus* and *S. reinhardi*, and these two are true inquilines, infesting galls of *Cynips kollari*—the remainder of the British species, are certainly parasites. I will give one instance out of many I could mention. In 1895 I tried to obtain *Neuroterus vesicatrix*, and, in that year, I obtained 50 galls and only bred inquilines and parasites. Last year I tried again and obtained over 100 galls with the same result, occasionally getting two inquilines out of one of these small galls. It has been suggested that the cause may be the want of vegetable matter ; that is the case in many instances, for the food is not enough for the maker and inquiline, but then we often find two inquilines infesting one small gall. This past week I have examined a large polythalamous gall of *Andricus radicis* containing sufficient vegetable matter to support many inquilines, if they would live on it, but instead of feeding on the vegetable matter they had consumed many of the gall makers, two, three, and in some cases four inquilines had existed on a single gall larva. The common inquiline of *A. radicis* is *Synergus incrassatus*, and we find individuals of the species very variable in size, and no wonder when the food (the larva of *A. radicis*) is only enough to bring to maturity one full-sized inquiline, two, three, or four manage to exist on it.

On page 20 (*anteà*) the writer of the paragraph says : "How the mere oviposition in the leaf or bud should cause such a different growth when pierced by different species is a great mystery." The mere oviposition in the leaf or bud does not make any difference to the leaf or bud. If the egg is not hatched no distortion of the leaf or bud takes place ; the larva is the prime mover of the growth and as long as the larva is active the usual gall growth continues. Should the larva die or get injured from any cause before the growth of the gall is completed, the growth activity ceases, and sometimes, but very rarely, while the larva is active. P. Cameron, in *Ray Soc. Vol.*, iv., p. 10, says : "As a rule they (the inquilines) kill the larva of the gall maker." On p. 21 he says : "In *Cynipidae* the birth of the larva is synchronous with the formation of the gall—until the larva is born and commences feeding there is no gall-formation."—G. C. Bignell, F.E.S., The Ferns, Home Park Road, Saltash, Cornwall. *January 26th*, 1901.

The cry of Acherontia atropos.—Material being available this year, I thought it well to investigate this subject for myself, one reason being that I had quite forgotten all about Moseley's paper in *Nature*, though I must have read it, *Nature*, at the date of its appearance, being part of my regular reading. This had, however, the advantage of leaving me quite unbiassed, and led me to a rather extended examination of the anatomy of *A. atropos*. My specimens all had to come by post, and so did not cry so freely as might be desired, and gave an undue importance to anatomy over experiment. It was plain that the noise appeared to come from, or from near, the head ; the friction of proboscis and palpi had nothing to do with it, as they could be held apart without affecting it. The only movement associated with the noise was one of the under surface of the base of the abdomen ; a similar movement as an ordinary respiratory one occurred, without any noise being produced. I made search, however, amongst the air-sacs and dilated tracheæ of the thorax and abdomen without finding anything to produce a sound. I then examined the spiracles. These have a very beautiful double valve of lace-like structure as an outward protection, but all seemed to be nearly alike, and I could find nothing to suggest the pro-thoracic spiracle as a squeaking organ. Nor could I find anywhere any stridulating surface. The corrugations of the proboscis and palpi are rounded, and do not touch each other, confirming the experimental proof that there is no stridulation here. A strained extension of the proboscis did not stop the sound, but distinctly altered the note, rendering it certain that the source of the sound was affected by this altered position. The opposed edges of the two halves of the proboscis are firmly held together, and no friction here causes the sound. In the interior of the head, facing the lumen of the proboscis, is an opening, capable of varying its form from nearly circular to a narrow slit; this opens behind into a cavity of a diameter of about 2mm. lying immediately behind the clypeal region. This cavity has walls of fairly fixed position below and laterally, being conditioned by the surrounding chitinous structures of the head; but above it is not in contact with the walls of the frons and vertex. The space here between the frons and this special sac cavity is occupied by a *rete mirabile* of tracheal tubes, and over this area the roof of the sac is soft and flaccid, and capable of considerable movement, so much as to amount probably to complete collapse of the cavity when it is depressed. This cavity appeared to be a dilated upper end of the œsophagus, its structure appearing to be continuous with the œsophagus, but I did not succeed in passing a bristle from the cavity into the œsophagus. The primary function of this cavity seemed probably to be to produce a sucking vacuum at the base of the proboscis to draw up honey or other fluids, its method of action being the alternate turgescence and exhaustion of the tracheal spaces above and also around it, produced probably by the abdominal movements, and utilised by the valvular action of its openings. It seemed to me that air either drawn into or expelled from this sac, through the valvular opening at the base of the proboscis, was the cause of the cry. I entirely failed, however, to obtain a view of this opening or chink during vocalisation, and so am unable to feel absolutely sure that this is really a vocal organ. That my conclusion, however, is the same as Mr. Moseley's, and was reached without the prompting of previous information, gives his view strong support.—T. A. Chapman, M.D., F.Z.S., F.E.S., Betula, Reigate. *February 12th*, 1901.

PRACTICAL HINTS.

Field Work for April and May.

By J. W. TUTT, F.E.S.

1.—The eggs of *Gonepteryx rhamni* may be found in April and May on the leaves and petioles of *Rhamnus frangula*.

2.—In May, 1901, examine the ends of the birch stumps cut down in the winter of 1899-1900. The frass of the larva of *Sesia culiciformis* between the bark and wood will tell where to look for the caterpillar itself.

3.—*Nola cristulalis* sits head downwards on the stems of privet, beech, hornbeam, birch and oak in early May; rather conspicuous on beech and hornbeam.

4.—Beating in May for "hooktips" is often profitable. *Drepana cultraria*, *lacertinaria*, *falcataria* and *binaria* are abundant in most southern woods with the right growth. The males of *D. cultraria* fly about freely in the sunshine, and sometimes those of *D. binaria* are to be seen flitting in the glades of the woods of our south-eastern counties. The Fairmead district of Epping Forest is a good locality for *D. binaria*.

5.—The larva of *Geometra papilionaria* is to be found in April and May sticking out from the tips of birch twigs, and closely resembling the birch catkins.

6.—The larvæ of *Eupithecia sobrinata* are to be beaten from juniper in May.

7.—The larvæ of *Cidaria silaceata* from the May brood feed up well and rapidly on *Circaea lutetiana* and *Epilobium montanum* in June and July, many emerging in August, but some pupæ going over until the following May.

8.—The larvæ of *Apamea unanimis* are to be found among grass in April when pupa-digging at the roots of willow, later the pupæ may be found spun up under the loose bark of willows. The moths emerge in late May and June (Machin).

9.—In April and May when young the larvæ of *Plusia moneta* feed two or three together in a web on *Delphinium* and *Aconitum*, but later feed independently, and may easily be shaken out of their food-plant (Hall).

10.—In May the larvæ of *Noctua ditrapezium* occur on a variety of plants—birch, apple, whitethorn, sallow, bramble, bracken, stinging-nettle—on Hampstead Heath, Wimbledon Common, &c. Best obtained late at night.

11.—In the middle of May the full-fed larvæ of *Leucania littoralis* are to be found under the sand at the roots of *Ammophila arundinacea*.

12.—At the end of May the heather must be swept (preferably by night) for the larvæ of *Agrotis agathina*.

13.—The larvæ of *Polia nigrocincta* are to be found by day around the roots of *Statice armeria* or on the blossoms by night (Newman).

14.—Imagines of *Calocampa vetusta* and *C. exoleta* come to sugar in April and May; May 14th for *Calocampa vetusta*, and *C. exoleta* on May 27th, are my latest records (Kane).

15.—In early May search ribbon-grass for the internal-feeding larva of *Apamea ophiogramma*: the affected shoots are easily recognised.

16.—*Nephopteryx angustella* appears in the beginning of May and continues on the wing till nearly the end of June; in hot seasons a partial second brood appears in September and October. The egg is deposited on the fruit of the spindle-tree, generally on the underside, and frequently between two berries; the newly-hatched larva at once bores into the berry, closing the entrance with silk, and is then difficult to find; as it gets larger it passes to another berry, and its presence may then be detected by the frass protruding from the hole through which the larva has eaten into the fruit. By putting a supply of rotten wood into the breeding-cages for the larvæ to spin up in, almost every larva will produce a moth (Machin).

17.—The larvæ of *Aciptilia galactodactyla* are to be found on the underside of the central leaves of burdock in May; the riddled state of the leaves indicates the plants affected.

18.—A form of *Platyptilia pallidactyla* (*bertrami*), or a distinct species feeds on the leaves of *Senecio* in May and June, and emerges in the latter month; recorded as yet from Carlisle, Glasgow dist., Aberdeen dist., and various other northern localities.

19.—The larva of *Mimaeseoptilus plagiodactylus* eats down into the heart of *Scabiosa columbaria* in April and May, before the flowering stem is thrown up.

20.—*Retinia posticana* is reported to fly in May by day round the tops of Scotch firs in Rannoch; probably it has a much wider distribution.

21.—In May the imagines of *Coccyx splendidulana* dance round the extremities of the branches of oak-trees in the morning and afternoon sun, often in large numbers.

22.—In April and May when the buds of various pines start growing, the larva of *Retinia buoliana* bores actively, mounting upwards with the shoot and pupating near the top (Tuely).

23.—The larvæ of *Hypercallia christiernana* were found on *Polygala vulgaris* between April 27th, and May 22nd, 1868, near Shoreham (Walsingham).

24.—In the beginning and middle of May larvæ of *Depressaria enicella* are to be found on *Eryngium*, the dirty brown appearance on the crown of the plant often making their whereabouts known, but they are also often found in rolled-up leaves. Stout gloves and a good knife are wanted.

25.—In May (at Southend) a fine plant of *Conium maculatum* gave larvæ of *Depressaria alstroemeriella*, which resulted in a fine series of imagines in July (Elisha).

26.—The imagines of *Butalis incongruella* are abundant in April and early May on most of the chalk-hills of Kent and Surrey, fly freely in sunshine.

27.—In early May the mines of *Bucculatrix maritima* should be collected in leaves of sea-aster.

28.—*Endromis versicolora* is a very uncertain species in its appearance, in some years being quite abundant in its favourite haunts, the male flies swiftly in the morning sun, the females hanging from bare birch twigs or resting on the heather in April.

29.—The females of *E. versicolora* are rarely to be found in any abundance until the males have been well out for a week or more (Andrews).

30.—The larvæ of *Cirrhoedia xerampelina* are best obtained during April and May, when climbing up the trunks of ash-trees just at dusk. This is not only a less cumbersome method than beating, but a much more successful one, and three dozen is not at all an unusual number for a favourable evening's search ; they appear to be most plentiful when the trees are in full bloom, and prefer the flowers to the buds for food. The larvæ that were collected gave 400 imagines and not a single ichneumon (Porter).

N.B.—Hundreds of similar hints have been published in the preceding volumes.

NOTES ON COLLECTING, Etc.

Lepidopterological notes of the year 1900.—As I was abroad all through 1899, I commenced the season of 1900 with no stock of pupæ or larvæ. I was also too busy during the early part of the year to do any entomological work, and the first entry worth noticing from my diary was the appearance at light of *Amphidasys strataria* ♂ on March 22nd. On April 3rd I got (one) *Taeniocampa stabilis* at sugar, and on April 8th several *T. stabilis*, *T. instabilis*, *T. cruda* and *Pachnobia rubricosa* at sallow bloom. A visit to Richmond Park on April 9th yielded only one *Larentia multistrigaria*, and subsequent visits for the same insect were fruitless. On April 19th I secured several *Anticlea badiata* and *Aleucis pictaria* along the blackthorn hedges, although they were not yet in blossom. April 22nd saw me at St. Anne's-on-Sea, where I got a number of larvæ of *Dasychira fascelina*, *Arctia caia* and *Phragmatobia fuliginosa*. Halting at Liverpool on my return journey, I went to Wallasey for *Nyssia zonaria*, and in a couple of hours had secured all I wanted (♂ and ♀) from the dwarf sallows. At one spot, I found 14♂ s in a bunch, round 2 or 3 ♀ s, evidently a case of assembly. The males are easy to find, but the females want looking for, until you get into the habit of spotting them. The larvæ of *A. caia* proved disappointing, as there was not a single "variety" among those bred. I found no difficulty in rearing the *D. fascelina*. I sleeved them on sallow, and beyond shifting them when the food was finished I gave them no attention, yet some 90% emerged. A few specimens of *Anticlea badiata*, *Aleucis pictaria*, *Cidaria miata* (1) and *Hypena rostralis* brought me into May. The first three days of that month I spent in the New Forest, and secured a quantity of *Boarmia cinctaria*, *Tephrosia crepuscularia*, *T. consonaria*, *Eupithecia nanata*, *E. pumilata*, *Xylocampa areola*, besides larvæ of *Bozrmia roboraria*, *Phorodesma bajularia*, *Triphaena fimbria*, *Boarmia repandata*, *Noctua brunnea*, &c. On May 4th I was home again, and tried beating ash for larvæ of *Cirrhoedia xerampelina*. A bag of 15 was the result, nearly all of which emerged in due course. The plan I adopted for beating the larvæ, our ash-trees here being all high and well-grown, was to make my two sons hold a large bed-sheet under the tree, while I beat with a 20 foot ash-pole, at about 9 p.m. During the next fortnight I got a fair number of larvæ of *Triphaena interjecta* and *T. ianthina* by searching the hedgerows here, and of *Geometra vernaria* by beating clematis. My first *D. fascelina* larva pupated on May 14th. On May 17th I began to look for, and find, larvæ of *Scotosia rhamnata* and *S. vetulata* on buckthorn bushes, but found none of *S. dubitata*, which apparently does not occur here. On May 20th I found numbers of larvæ of *Leucania straminea* on *Arundo phragmites*, at night. On May 21st I ran down to Folkestone. Larvæ of *Porthesia chrysorrhoea* were on one or two bushes only in the Warren, but there were quantities of them on the shingle near Hythe. I got some half-score larvæ of *Tapinostola morrisii* (*bondii*) after much trouble, but all died. They are apparently so sluggish that they will not move to fresh food, and as, naturally, the stem of grass in which they were feeding, died soon after being cut, the larvæ starved, although I brought home a large root of the grass and placed them on it. A visit to Saltwood for larvæ of *Eupithecia subciliata* was fruitless—maple being very scarce there, so far as I could judge. I wonder where Dr. Knaggs' secured his larvæ! I was home again on May 25th, and that night a fine ♂ *Clostera curtula* came to light in my smoking-room. On May 29th I beat larvæ of *Eutricha quercifolia* (1) and *Trichiura crataegi* (2) from hawthorn. A run down to Deal on May 30th was fruitless, except for larvæ of *P. chrysorrhoea*. These were in countless thousands on the sea buckthorn, so much so that hundreds and hundreds must have died solely of starvation. It was simply merciful to take the larvæ and rear them for the more rapid death of the ammonia bottle. On June 3rd I found *Heliodes arbuti* common in one field here, and soon had all I wanted, while *Zonosoma omicronaria* was also plentiful. From June 5th to 10th I was in the New Forest, *Macroglossa bombyliformis* was scarce, and I only took one poor specimen, but *M. fuciformis* (broad-bordered), was common at *Azalea* blossom, in Rhinefield. I also bagged several *Scodiona belgiaria*, *Eupithecia pusillata*, *Eupisteria heparata*, *Hypsipetes* *impluviata*, *Lobophora sexalisata*, *Zonosoma orbicularia*, *Macaria alternata*, the majority, of course, in Matley bog. Larvæ were common : *Taeniocampa miniosa* (which have apparently pupated well on oak, and without change of food), *Asphalia ridens*, *Catocala sponsa*, *C. promissa*, *Scotosia dubitata*, *Cleora glabraria*, *C. lichenaria* (these two much scarcer than usual) : *Lithosia helveola* (I cannot succeed in breeding this), *Aventia flexula*, *Pericallia syringaria* and *Pseudoterpna cytisaria*. I also found one larva of *Pachygastria trifolii*, but have failed to rear it. Searching at night yielded a number of larvæ of *Selidosema plumaria* and *Noctua neglecta*, but neither have emerged well. Considering their local surroundings, I doubt if I have kept the pupæ damp enough. *P. fuliginosa* emerged on June 11th, and I took one *Hemerophila abruptaria* the next evening. On June 20th I went to Rannoch for ten days. The weather was all against me—dull and cloudy with rain on most days. *Hadena adusta*, *Euplexia lucipara*, *Hadena pisi*, *H. contigua*, *H. dentina*, *Hyppa rectilinea*, *Lycophotia porphyrea*, *Noctua plecta*, *N. festiva*, *Rusina tenebrosa*, *Cymatophora duplaris*, *C. or*, and *Xylophasia rurea* (ab. *combusta*), were common at sugar. I also got a few *Thyatira batis*, *Aplecta tincta*, and *A. occulta*. *Emmelesia blandiata* and *Acidalia fumata* were fairly common, and one day on Mount Schehallion filled my rows of *Larentia salicata* and *Psodos trepidaria*. *Fidonia brunneata* was not out, but I got 2 *Melanippe tristata* and 2 *Amphidasys betularia*. I was also kindly presented by a local resident with freshly emerged specimens of *Pachnobia hyperborea* and *Sesia scoliiformis*. Individuals of *Pericallia syringaria* and *D. fascelina* emerged on June 28th. Before leaving on June 30th I was kindly given a dozen larvæ of *Petasia nubeculosa* which later on fed up and pupated well. *Eupithecia rectangulata*, *Aplecta nebulosa*, *Boarmia repandata*, *Metrocampa margaritaria*, *Phorodesma bajularia*, *Noctua brunnea*, *Scotosia vetulata* and *S. rhamnata* all began to emerge about the end of June, and *Cossus ligniperda* on July 4th, followed a day or two later by *Arctia caia*, *Aventia flexula* and *Nola strigula*. On July 9th I beat several nearly full-fed larvæ of *Notodonta chaonia* : while in that week *Apamea ophiogramma*, *Cleora glabraria*, *Triphaena fimbria*, *Geometra vernaria* and *Leucania straminea* appeared in the breeding-cages. A day at Tuddenham on July 14th produced plenty of the larvæ of *Dianthoecia irregularis*, of which only a very small percentage failed to pupate. On July 19th I paid a visit to St. Margaret's Bay in search of larvæ of *Dianthoecia albimacula*, but I was altogether unsuccessful in finding the food-plant, *Silene nutans*. Imagines of *Macroglossa stellatarum*, however, were in plenty, hovering over the flowers of viper's bugloss by day, and of *Choerocampa porcellus* over the same flowers at dusk. A few *Hecatera serena* and *Dianthoecia conspersa*, together with one *Xylophasia sublustris* were also bagged ; and one larva of *Leiocampa dictaea* secured on a poplar. On my return home, *Porthesia chrysorrhoea*, *Psilura monacha* and *Ennomos erosaria* were emerging. My *Dianthoecia irregularis* larvæ being short of food I tried feeding them on *Lychnis floscuculi* and on a garden variety of *Lychnis* and found they took kindly to both. Within the next week I found larvæ of *Chariclea marginatus* common on *Ononis arvensis* along the roadsides here ; and of *Hecatera dysodea* on lettuce in the garden. *Selidosema plumaria* began to emerge on July 28th. While walking up to Goodwood race-course on August 2nd, I spotted some larvæ of *Cucullia lychnitis* on *Verbascum nigrum*, and was able to bring away a good number. As already mentioned (*Ent. Rec.*, xii., September 15th) these fed freely on *Verbascum thapsus* and *S. aquatica*. Between August 10th and 20th several full-fed larvæ of *Acherontia atropos* and *Saturnia carpini* were brought me. On August 12th I collected a lot of pupæ of *Nonagria geminipuncta*, which is common here—but *N. typhae* was still in the larval state. On August 14th *Crocallis elinguaria* emerged from a pupa, the larva beaten from buckthorn, though I cannot find this mentioned anywhere as a food-plant. I had long been anxious to get specimens of *Cucullia gnaphalii*, so on August 16th I paid a visit to Kent in search of the larvæ. Three of us working hard for some six or eight hours only secured, however, seven specimens, and of these only four pupated successfully. I hardly, however, think it so scarce as is believed, and now that I have had an opportunity of studying the habits of the larva I hope to be able to make a good bag on some future occasion. Larvæ of *C. asteris* were plentiful on the golden-rod, as well as a number of Geometrid and Noctuid larvæ. Imagines of *Noctua neglecta* appeared in my cages on August 18th, and of *Cirrhoedia xerampelina* on August 24th. A visit to Sanderstead on August 25th yielded 35 larvæ of *Thera juniperata*, and the next day I beat 2 *Cerura furcula* from sallow near here. On September 6th a specimen of *Citria cerago* emerged from a larva beaten off and fed on ash. September with its shooting was an entomological "blank," except that from the 17th onwards I took a number of *Acidalia virgularia*, evidently a second brood, although I cannot find mention of this second brood having previously been noticed*—and on September 24th a visit to Chippenham Fen gave me 40 or 50 larvæ of *Plusia chryson*. The first fortnight of October I spent in Scotland deer-stalking, but had no opportunity of doing any entomological work. I saw daily, however, on my way up the hills, numbers of the larvæ of *Macrothylacia rubi*, but did not collect any, as I had a brood at home, reared from the egg on raspberry. Returning home on October 15th I found a few *Hybernia aurantiaria* and *Oporabia dilutata* had emerged, and a quantity of the usual common things were to be seen on ivy-blossom including 2 *Orthosia macilenta* (which I have never before taken here). During the next week *Thera juniperata* emerged freely, to be followed in November by *Cheimatobia brumata* and a few *C. boreata*, and 3 *Acherontia atropos*, these latter of course "forced." A very late *Hybernia defoliaria* emerged on December 19th, and thus brought the year's work to a close.—Percy C. Reid, F.E.S., Feering Bury, Kelvedon. *January 19th*, 1901.

Lepidoptera from south-west Scotland.—Not within the memory of anyone living can they recall a season in which so much rain has fallen in the west of Scotland as the summer of 1900. It has rained almost incessantly, and it was often with very much discomfort that any collecting could be accomplished. *Phigalia pedaria* and *Larentia multistrigaria* were taken at Lennoxtown, from tree-trunks, on March 17th, and a few days later at Cathcart a fine lot of *Hybernia marginaria* was netted. On April 19th *Pieris rapae* was captured in Pollokshields, an exceptionally early date for this district. *Pharetra menyanthidis* and *Lobophora carpinata* were boxed from birches at Garelochhead on the 26th. *P. napi* was out but scarce, at Bishopton, on May 3rd. The

* Partially double-brooded almost every season in the south-east Londen district.—Ed.

sallows were very late coming into bloom, but at one small bush in Giffnock quarries, on the 7th, I obtained several specimens of *Taeniocampa incerta*, *T. cerasi* (*stabilis*) and *T. gothica*, and a few each of *Anticlea badiata* and *Cidaria suffumata*. On May 19th, accompanied by Mr. Thos. Wilson and Mr. Fergusson, of Ayr, I was taken to a railway embankment a few miles south of that town where I had the pleasure of taking for the first time *Nisoniades tages*, *Euclidia glyphica* and *Strenia clathrata*. Previously I possessed only southern specimens, from which they do not differ appreciably, with perhaps the exception of *N. tages* which is slightly darker. *Chrysophanus phlaeas* and *Coremia ferrugata* (*unidentaria*) were also taken. On June 3rd I spent a week-end at Luss, Loch Lomond. *Callophrys rubi* and *Coenonympha pamphilus* were out in fair numbers, and the following among others were netted in the evening:—*Noctua plecta*, *Hadena thalassina*, *Panagra petraria*, *Coremia spadicearia*, *Eupithecia satyrata*, *E. nanata*, *Cidaria corylata* and *C. silaceata*. On the 5th *Hepialus lupulinus*, *Emmelesia albulata*, *Scoparia ambigualis* and *S. dubitalis* were out at Crookston, and a single specimen of *Eupithecia plumbeolata* was taken there a few evenings later. *Brenthis selene* was obtained on the Mearns moors on the 16th, *Crambus hortuellus*, *Platyptilia bertrami* and *Mimaeseoptilus bipunctidactyla*, at Crookston, on the 29th. On July 14th, at Shewalton Moss, in Ayrshire, *Argynnis aglaia* and *Hipparchia hyperanthus* were abundant; some nice aberrations with regard to the number and size of the ocellated spots were obtained of the latter. In one male these are entirely absent = ab. *obsoleta*, Tutt, another male has no trace of the spots on the upper side, though well developed beneath. *Anthrocera filipendulae* was also common. *Anarta myrtilli* and *Lycophotia strigula* were dashing about over the heather. A couple of ♀ s of *B. selene* and a few *Acidalia fumata* were captured. In the evening, at Dundonald, a nice lot of *Scoparia murana*, *S. frequentella*, and *S. crataegella* were captured alongside an old wall on the Barassie Road, as also a few *Nudaria mundana* and a single *Acidalia dimidiata*. On the 16th, at Irvine Moor, *Satyrus semele*, large and bright specimens, entirely different from Arran examples, were out in some numbers. *Polyommatus icarus* was common and variable. In one ♀ the lower basal spot and the last spot in the central series are united, forming a band. *Epinephele janira* was also abundant. A single *Anaitis plagiata* was taken off a wall, and a poor specimen of *Scodiona belgiaria* from the ground, the favourite resting-place of this species, but the most interesting capture was *Eurrhypara urticata*, which I caught at Dundonald Castle; this species has not been taken in Clydesdale, as far as I am aware, for nearly 30 years. Here, also, I took in the evening *Plusia festucae*, *P. iota*, *P. pulchrina*, and *P. chrysitis*, a single *Habrostola tripartita* and *Apamea gemina*. My holidays were spent in Arran, at King's Cross, from August 4th till 20th. Little of special interest was taken during my stay in the lepidoptera. The three species of *Pieris* were seen, *Pyrameis atalanta* singly, and *Aglais urticae* in abundance, on the 4th. *Polyommatus icarus* and *Chrysophanus phlaeas* were both very common. *Satyrus semele* abundant, but worn, on Holy Isle; and at ragwort the usual common order of things occurred, such as *Luperina testacea*, *Miana literosa* and *M. bicoloria*, *Triphaena comes* and *T. pronuba*, *Noctua xanthographa*, and a single specimen of *Noctua dahlii* and *Hydroecia micacea*. A solitary specimen of *Stilbia anomala* was taken near the shore. *Cidaria truncata* was abundant and exceedingly variable on the hills, along with *C. testata*, *Hypsipetes furcata*, and *Larentia didymata*. *Melanthia bicolorata* and *Larentia olivata* were both about past, only a few being taken. *Crambus geniculeus* was abundant on the shore, along with commoner members of the same genus. My brother brought a specimen of *Neuronia popularis* from Stranraer, taken about the middle of August, with a few other things. On September 8th *Hydroecia nictitans* var. *lucens* was abundant on thistles on the Kilsyth Hills, with *Plusia gamma*, equally abundant; *Tapinostola fulva* was also common, and a few each of *Celaena haworthii* and *Polia chi* were obtained, but not a vestige of *Phibalapteryx lapidata*. *Pyrameis atalanta* has again been very prolific this year, I saw it in abundance at Kilkerran on September 15th, and a few at Gourock on the 23rd, *Orgyia antiqua* being also taken at both these places, and a few specimens of *Chrysophanus phlaeas* at the latter. *Colias edusa* has been reported from Lendalfoot, Ayrshire, there, also, Mr. Thos. Wilson took larva and pupa of *Acherontia atropos*, and an imago of this species, which was taken in York Street, Glasgow, on September 20th, was handed to me alive, and in fine condition, (*Ann. Scot. Nat. His.*, p. 250). A fair specimen of *Choerocampa nerii* was captured at Barrhead about the end of September, and is now in the collection of Mr. Thos. Grant, of Glasgow.—And. Adie Dalglish, *December* 16*th*, 1900.

Lepidoptera in the Western Highlands.—The following notes refer to the lepidoptera observed on a visit to Argyleshire, Inverness-shire, and the island of Skye during the last week in June and the first two weeks in July last. No systematic collecting was done, and my efforts in this direction were limited almost entirely to taking apparatus with me during each day's excursion and netting any insects that were observed. *Anthrocera minos* had apparently been common in the locality near Oban, where I took it two years previously, but the weather was not sunny when I could visit the spot, and thus a very short series only was collected. Probably one of the best localities in this district is Glen Nant, near Taynuilt, which is well wooded, and appears to contain an extensive insect fauna. *Melitaea aurinia* was here very common; the specimens were all much worn, but had a greater resemblance to southern types than to the Scotch form. Larvæ of *Taeniocampa gracilis* were extremely common in the spun-up shoots of *Myrica gale*, and I may here mention that this larva was to be found in every district in which I examined this plant, in the Highlands, and also in Skye. Geometrids were very common flying in the sun, or beaten out, amongst others being—*Cidaria silaceata*, *Melanippe hastata*, *M. tristata*, *M. sociata*, *Asthena luteata*, *Coremia designata*, and *Acidalia fumata*. *Plusia r-aureum* was also netted by my son. A climb up Ben Cruachan resulted in a fine series of *Melampias epiphron* being taken, with numerous *Larentia salicata*, this species seems to occur from sea-level to the tops of the highest mountains, several specimens were seen well over 3,500ft. My son netted on this mountain, at about 3,000ft., a specimen of *Nemeophila plantaginis*, with the superior wings ab. *hospita*, and the inferior wings typical. On the extreme peak a series of *Crambus furcatellus* was netted. A week's stay at Fort William did not greatly add to the number of species observed, but on Ben Nevis I made my first acquaintance with *Coremia munitata*, and on the same mountain, *Eupithecia constrictata*, *Emmelesia ericetata* and *Melanthia ocellata* were common, the locality, however, seems an unfavourable one, and with the exception of some nice *Boarmia repandata*, closely approaching var. *sodorensium*, I did not see anything worthy of notice. The island of Skye being practically untouched ground, I made one or two excursions especially for insects; in the neighbourhood of Portree, the bogs were full of *Coenonympha typhon*, of the usual Scotch type. Upon the rocks numerous specimens of a rather dark and very handsome form of *Cidaria russata* were sitting, with *Eupithecia constrictata* and *Melanthia ocellata*; the *Camptogramma bilineata* were dark brown and resembled the Shetland specimens, the *Melanippe montanata* were pale, and one or two specimens had the band broken up transversely; *Polyommatus icarus* was frequent and *Cabera exanthemaria* and *Noctua festiva* occurred. *Boarmia repandata* was not uncommon on the rocks, the specimens I captured, however, were all males, but they were almost identical with the Lewis form, var. *sodorensium*. My son beat one larva of *Cleoceris viminalis* from sallow, this afterwards produced a very pretty form, being much variegated; he also found a specimen of *Cucullia umbratica* at rest. I was rather surprised to pick up about a dozen larvæ of *Clostera reclusa* from a sallow bush, these fed up and have not yet emerged, showing that the species in Skye is single-brooded only. In Glen Sligachan, *Dasydia obfuscaria*, *Eupithecia satyrata* var. *callunaria*, and *Acidalia fumata* were all common, and *Nemeophila plantaginis* and a larva of *Saturnia carpini* were taken. The most prominent lepidopteron in any stage in the island was undoubtedly *Lasiocampa quercûs* var. *callunae*, the larvæ of which must have been literally in millions; in all parts that I visited each patch of heather had its contingent of from two or three to a dozen specimens, and this obtained not only on the lower hills and in the glens, but on the tops of the Cuchullin mountains, around Loch Coruisk.—W. G. Sheldon, Croydon.

On a probable new locality for Anthrocera exulans.—In Mr. Tutt's *British Lepidoptera*, vol. i., p. 453, is a note against this species: "? Argyllshire: Mountains in Glencoe district (on July 8th, 1898), flying in sun at 3 p.m., about 1000 ft. above sea-level, a single very worn specimen of this species, or of one not hitherto recorded as British (Sheldon)." Whilst in Scotland last summer I again visited the locality from which I obtained the specimen which was the subject of the above note, but the day being sunless whilst I was on the ground, the species, whatever it was, was not again seen. As it is not probable I shall ever have an opportunity of solving the mystery myself, I am giving all particulars of the capture, in case, as is probable, anyone visits the spot, so that he may be able to set the matter at rest. To a visitor to the charming tourist centre of Oban, no excursion is more popular, and justly so, than that by steamer up the lovely Loch Etive. The train takes you from Oban to a small station, "Ach na Cloich," at which you go aboard the steamer "Ossian," which during the summer months daily plies to the head of the Loch at Glen Etive and back. The mountains rise sheer from the water on both shores of the Loch for 3000ft. or more. Exactly at the landing-place, where the coach takes those passengers who care to go on to Glencoe, a distance of some twelve or eighteen miles, there is, up the side of the mountain, at about 1000ft. from the bottom, a small birch-wood, and it was immediately under this birch-wood I found my mysterious *Anthrocera.* The basal and central pair of spots of the specimen were very distinct, small, round, with paler circumferences, typical of *A. exulans*: there was, however, the question of the outer spot, or spots, for the tips of the wings were so transparent and devoid of scales that I could not be certain whether my burnet was a five spot or a six spot species. Thorax and abdomen were shaggy and hairy, exactly after the style of *A. exulans*; unfortunately, during my journeying about, the moth got lost, and there was thus no opportunity of comparing it with Braemar *A. exulans.* I have not much doubt, however, but that it was that species unless indeed it was a "six spot," in which case it was something new to Britain, for it certainly was not a form of *L. filipendulae.* I may add that the growth over which it was flying included, heaths (two or three species), *Myrica gale*, and grasses, amongst which *Coenonympha davus* was common. The steamer stays at the landing stage about five hours, there would thus be no difficulty, on a suitable day, in thoroughly exhausting the locality; and if any collector does so I should be very interested to know the result, if he will kindly communicate with me.—Ibid.

Hybernia rupicapraria embedded in ice.—On February 17th I found *Hybernia rupicapraria* on a pond covered with ice nearly an inch thick. I broke the ice and put the piece containing the moth in a box; it must have been there about two days, and there was quite a quarter of an inch of ice over it. I dissolved the latter when I got home; the moth was quite perfect, and I was surprised when I looked at it two hours later to find it alive.—T. L. Howe, Beaufort House, Penarth. *February 18th*, 1901.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Eggs of Lepidoptera.—*Psodos trepidaria.*—Bright yellow, shiny surface, the vertical diameter almost equal to the width; (height: width: length: about 3 : 4 : 6), oval in outline, rather full and plump, (*i.e.*, not particularly flattened), laid with the long axis horizontal; the upper surface very slightly depressed; the surface covered with a very distinct polygonal (hexagonal) reticulation, fourteen or fifteen cells to length of egg, the edges of the reticulation very rounded and smooth (Described under a hand lens, August 12th, 1899, from eggs laid previous day by ♀ obtained by Dr. Chapman on slopes above Villa, near Evolena).—J. W. Tutt.

Pupation of Sphinx ligustri larvæ.—It has often been a puzzle to me, as I daresay it has been to other entomologists also, how it is that when one comes across a privet, sallow, or other bush, almost entirely denuded of leaves as the result of recent feeding by larvæ, it is seldom possible to find the pupæ in the earth beneath the bush. The soil is apparently suitable for the pupation of the larvæ, and there otherwise appears no adequate reason for adjoining ground being preferred. The following observation tends to show that in many instances the larvæ will travel a very considerable distance before deciding finally where to go down. Last autumn I had a couple of *Sphinx ligustri* larvæ feeding under gauze on a small privet bush in the garden. One Sunday afternoon I noticed that one of the larvæ had changed colour preparatory to pupation. I undid the gauze covering, and allowed the larva to escape, with a view of gaining some knowledge of the habit of the larva at this stage of existence. After reaching the ground the larva crawled 4ft. in a north-easterly direction, and arrived at what appeared to be a suitable spot to go down to earth, *viz.*, in loose soil adjoining a wooden fence, the only objection to it being that the fence faced south-west. This, however, did not seem a favourable location to the larva, which retraced its steps in a westerly direction for about 4ft. Then it travelled 9 ft. in a north-westerly direction, 15ft. due west along a gravel path, and finally crawled another 27ft. in a north-westerly direction before arriving at the favoured spot for going down, which was under a rose bush. It met with some slight difficulty in going under, but persevered, and disappeared. It will be noticed that the larva had travelled a distance of 59ft. altogether, and the time occupied by it in doing so was 50 minutes.—A. Russell, Southend, near Catford.

CURRENT NOTES.

The dictum of Mr. Verrall, as set forth in the *Ent. Mo. Mag.*, that the first and second pairs of legs are included in the term "anterior" and the second and third pairs in the term "posterior," is one that must not pass unchallenged, and whatever dipterists may do lepidopterists are not likely to follow their lead in this matter. Uniformity is one of the most necessary elements of natural science, and homologous structures and organs must, sooner or later, bear corresponding names (or at any rate not misleading ones) ; anterior and posterior are comparative terms and the forelegs of insects are anterior, the hindlegs are posterior, and the middle pair of legs are middle, *i.e.*, neither anterior nor posterior. The terms anterior and posterior applied to three pairs of legs (and to include all of them) appears to be a scientific absurdity; the proper names of the legs of insects are prothoracic, mesothoracic, and metathoracic, abbreviated in ordinary work to first, second and third pairs. Any usage of the term anterior and posterior for the middle pair is surely not science, nor has it any meaning as English.

A really good handbook of the butterflies of the Alps of central Europe with full notes on the distribution of local forms, as well as the species, is a great desideratum. Mr. Wheeler, with a personal and perhaps an unequalled knowledge of the Swiss butterflies, proposes to produce such a book on the butterflies of Switzerland. In his article published in the current number of this magazine he asks for help in the matter of localities. No doubt Dr. Steck will be able to suggest native lepidopterists who will supply Mr. Wheeler with lists for districts outside his own hunting-grounds, and probably someone at home could search the back volumes of the *Ent. Mo. Mag.*, the *Ent. Record*, the *Entomologist*, &c., for the many lists of captures published during the last 35 years in these magazines. Would it not be well for a work of this description to take a geographical area rather than a political one?

At the meeting of the Entomological Society of London, March 6th, 1901, Mr. H. J. Elwes moved "that a committee be appointed to consider the question of uniformity in nomenclature for the guidance of specialists contributing to the Victoria County Histories." After discussion, a resolution was carried that the appointment of a committee should be undertaken by the council of the society. All this is very interesting and one will await with some interest the selection of the members of the committee. Those, as a rule, who talk most about nomenclature, know least, as a rule, of its intricacies, and there are, in our opinion only three men now in this country who have sufficient knowledge of the literature and facts to constitute such a committee so far as lepidoptera is concerned. If Messrs. Durrant, Kirby and Prout could be persuaded to act for lepidopterists, the result could not help being satisfactory, but we suspect vested interests and personal considerations would make the selection of such an ideal committee impossible.

At the meeting of the Entomological Society of London held February 6th, Dr. T. A. Chapman exhibited a large series of *Endrosae* collected during the last few years by himself, Mr. A. H. Jones, and especially by Mr. Tutt. These included *E. roscida*, which is a very distinct dwarf form, and from frequenting marshy flats must live on lichens growing in such localities and not growing on stones as the others do ; *E. irrorella*, which should be the rarest species in the Alps judging by the comparatively few specimens met with ; *E. aurita*, in very great variety, including a good many specimens that are called *E. kuhlwenii* var. *alpestris*, none, however, reaching the type of *E. kuhlwenii*, but sufficient to show with something like certainty that *E. kuhlwenii* is simply an extreme form of *E. aurita*. *E. aurita* and *E. irrorella*, Dr. Chapman said, are very near together, no point in their anatomy being absolutely distinctive, while the genitalia are practically identical ; *E. irrorella* always looks much slighter, being lighter scaled and the hairs short and smooth. It always has a yellow patch on the mesothorax. The neuration is also distinctive, yet individuals of each species approach each other completely in each of the distinctive items of the neuration, but never in all of them, so far as examination of a number of specimens goes. The specimens exhibited consisted of 24 *E. roscida* from two localities, 22 *E. irrorella* from eight localities, and 204 *E. aurita* from 23 localities. Except *E. irrorella* from England, Finmark, and the Tyrol, and a few *E. aurita* from the Tyrol, all were from the Western Alps of Switzerland, Italy, and France. Examples from each locality when sufficiently numerous usually have a special facies. Some, as all those from Arolla, are radiate ; those from Bourg St. Maurice are without radiate forms, and so on. Some are more yellow ; others deeper orange ; some more mixed. Elevation tends to produce radiation, but no other general conclusion as to the effect of height, latitude, or longitude, seems fully justified by the specimens.

The *Third Annual Report of the Kendal Entomological Society*, 1900, has come to hand and shows how much can be done by a keen and energetic naturalist in a small provincial town. The Rev. A. M. Moss is the moving spirit of the Society, and the *Report* contains an interesting "Presidential address," and papers entitled "Notes on *Colias edusa* and *Acherontia atropos*," by Mr. Moss, "Rearing of lepidoptera," by Mr. F. Littlewood, and more important still, in spite of the obsolete nomenclature used,* a "List of the Macro-lepidoptera of the Kendal district (a radius of twenty miles)." One wants now, built on this foundation, a county list worked out with localities in detail, and including such Micro-lepidoptera as can be definitely identified. An annual subscription of 6d. per member, a balance in hand of

* We would suggest to all local societies drawing up local lists, the use of the nomenclature adopted by Mr. L. B. Prout, in the "London List," published in the *Trans. City of London Ent. Soc.*, 1898, 1899, 1900.

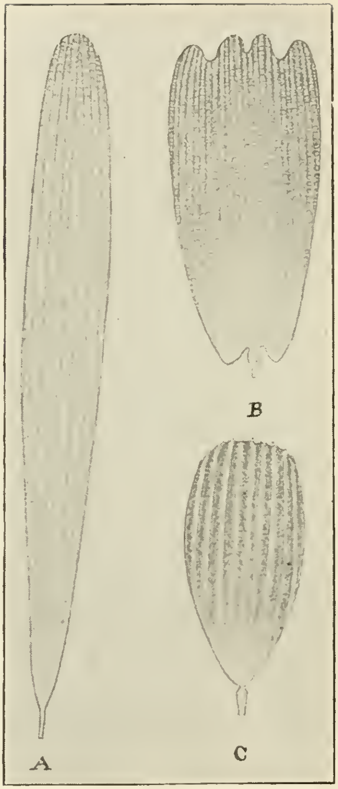
13s. 9d., and an important *Annual Report* of 32 pp. is something, indeed, of which to be proud. Will not the members give us the first instalment of a county list next time?

The City of London Entomological and Natural History Society has published its *Transactions* for 1900 betimes. It appears in this respect to have outstripped the South London Society, and we believe we yet await the last part of the *Transactions of the Ent. Soc. of London* for 1900. The current volume shows a good year's work under the able presidency of Mr. Prout, and there are some good papers therein. The presidential address is, in itself, a most useful paper to the lepidopterist, but *the* paper of the *Transactions* is Mr. Heasler's interesting "Secondary sexual characters in British coleoptera," which is quite out of the ordinary run of papers submitted by coleopterists, especially students of British coleoptera. Mr. Kaye's paper "The re-classification of the lepidoptera," tempts one to criticism, but the author will be sure to eliminate many of the more crude remarks when he has a more detailed knowledge of some of the subjects treated; Dr. Chapman's notes "A few days at Fusio," will have to be read by all students of European Rhopalocera for the interesting facts relating to the Lycænids. Very welcome, too, is the continuation of the *List of the Lepidoptera of the London Fauna*, which has now been completed to the end of the Macro-Lepidoptera. Altogether an important volume of great scientific value, which will have a degree of usefulness in direct proportion to its distribution.

The first part of *Das Tierreich* relating to the lepidoptera has come to hand. It relates to the small family *Libytheidae*, and is by Dr. A. Pagenstecher. As a catalogue it is everything that can be desired; as a summary of what is known of the group, from the natural history standpoint, it is exceedingly meagre. A description that sums up the life-history of *Libythea celtis* as "Larva green on *Celtis australis*. Pupa green," can hardly be treated as serious science in the commencement of the twentieth century. The neuration is named in the old undesirable fashion—the costa ignored, the subcostal called the costal, the radial called the subcostal, the median the radial, the cubital is designated the median, and the anal the submedian. On the generic question the author adopts the safe but unscientific principle of subgenera, which he practically sinks after diagnosing them. For ourselves, if the next evolutionary group above species be a genus, we see no reason for the scientist to pander to the howls of the ignorant, and prefer to call a spade a spade, instead of knowing that it is a spade and calling it something else.

COLEOPTERA.

Bagous cylindrus, Payk., in Bedfordshire.—On December 27th last I was collecting coleoptera near Leighton Buzzard, in Bedfordshire, by cutting and shaking grass tufts in damp places, and turned out three specimens of *Bagous cylindrus* in splendid condition. I worked for an hour or two and took a large number of species, the above being the most noteworthy. I am not aware of its occurrence so far north before. Former localities:—Notting Hill (Power); Hammersmith Marshes (Stevens); Gravesend (Power and Stevens); London district (Stephens); Lee, Sheppey, Whitstable (Champion); Pett Marshes, near Hastings (Ford); Colchester (Harwood).—H. Willoughby Ellis, F.E.S., Westlyn, Knowle, Warwickshire.



Scales from Colias edusa.

Some notes on sexual dimorphism observed in the scaling of Colias edusa (*with plate*).

By R. M. PRIDEAUX.

In his interesting account of *Colias edusa* in the January number of *Science Gossip*, there is one constant distinguishing sexual character which Dr. Lang does not touch upon—which is hardly to be wondered at considering its very fleeting nature in the butterfly at large, I refer to the presence of a peculiar linear pale yellow scale, with which the entire black margin of the ♂ forewings is thickly sprinkled (pl. iv., fig. A); conspicuous enough in bred specimens, but absent, or nearly so, in examples, otherwise perfect, which have flown in nature. The effect is very striking, quite a greenish-black resulting in some instances, the difference in this respect from the hindwings of the same specimen (on the margin of which these scales are absent) being very marked. The presence of these scales in bred specimens only of ♂ *C. edusa*, made a further investigation seem worth while, when it was found that they differed entirely in shape and structure from the other yellow scales—those of the ground colour and of the wing rays on the black border—being unusually long and narrow, and possessing a peculiarly minute and linear stalk of attachment. It is doubtless this latter feature which causes the premature removal of these scales by the insect's earliest activities, which may be quite insufficient to dislodge scales of the ordinary types, which are less than half as long as these strap-shaped ones, and possess the usually seen peg-like stalk, thickening from the base upwards. These facts recall what has been noticed in some of the "clear-wing" moths, the transparent patches having been found in bred examples to be powdered with ill-attached scales, which the first flight of the insect was sufficient to remove. The black portions of the wings of the ♀ *C. edusa* are entirely without these linear yellow scales.

Some interesting features of comparison were here further in evidence. On looking over a number of specimens of both sexes it is soon recognised that the peculiar depth of velvety black, seen on the borders of the ♀, is never approached in intensity even by the hindwing borders of the ♂. It is found microscopically that two very distinct forms of scale are responsible for this sexual difference, those of the ♀ (and also those of the ♂ discoidal spot) being of a familiar type, flat, with numerous fine longitudinal striations, and with a crenated apical margin, possessing from three to five rounded teeth, and, at the narrowed base, two projecting lobes with the stalk lying between (pl. iv., fig. B). The ♂ black borders, on the other hand, are composed almost entirely of much smaller scales, bent convexly towards the observer, and having a few (usually nine) very prominent ridges, these ridges slightly projecting beyond the apex, which, however, is always entire (pl. iv., fig. C). The general shape is that of a "battledore," the base ending in a point from which projects the stalk. These scales seem to be entirely confined to the ♂ sex, and I have not succeeded in finding any truly intermediate forms between them and the other black scales. It seems reasonable to suppose that their convexity and the prominent ridges would cause a dispersal of light resulting in a general effect of the somewhat rusty black referred to above. As mentioned, the black discoidal spot of the ♂ consists of the flat type first discussed, and a few of the same are also found on the inner edge of the ♂ black border, where they give somewhat the effect of a black lead-pencil surface, touched up with pen and ink.

It would be interesting to know whether the other members of the genus *Colias* exhibit scale-characters analogous to those discussed above.

EXPLANATION OF PLATE IV.

SCALES FROM COLIAS EDUSA (uniform enlargement).

A. Fugitive yellow scales from the black border of the forewing of ♂ *Colias edusa*.

B. Black scale from black border of ♀ *Colias edusa*.

C. Black scale from black border of ♂ *Colias edusa*.

Larvæ of Lasiocampa quercûs and its vars.—callunae, Palm., viburni, Gn., meridionalis, Tutt, sicula, Staud., and of cross-pairings between these races.

By ARTHUR W. BACOT.

(*Concluded from p.* 117.)

Many interesting facts were observed in the larval stage of the various crosses. Among others, the larvæ of the cross between ♂ *L.* var. *meridionalis* and ♀ *L.* var. *callunae* (Warburg's cross, see *anteà*, p. 114) fed up at an unprecedented rate. The pairing took place in July, and the eggs hatched about one month later (about the normal period), and the larvæ, having outstripped all the other larvæ either from crosses or of pure stocks, including those of *L.* var. *callunae*, which hatched nearly a month earlier, commenced to spin up during the first week of November, giving a larval period of only three to four months. I kept the pupæ indoors, being uncertain whether the constitution of the southern or northern race would be followed, but no moths emerged during 1898, and it was not until midsummer of the following year that I had the first and only emergence, a crippled male. The pupæ were kept out of doors during the greater part of the winter of 1899-1900, and were still living in the spring of 1900, but all died during the summer, after some 30 months in the pupal stage.

The great influence of the English strain in the four crosses of which one parent was of this stock is very marked in the early larval stages, and in all probability points to the English race being more generalised than the Continental ones. Larvæ of three crosses—♂ *L.* var. *meridionalis* × ♀ *L.* var. *callunae*, ♂ *viburni* × ♀ *quercûs* (English), and ♂ (*viburni* × *meridionalis*, white-haired larva) × ♀ *quercûs* (English)—in their first and second instars resembled the larvæ of the female parent stock, while in the case of the cross between a ♂ *quercûs* (English) and ♀ *meridionalis* (Cannes), the young larvæ resembled those of English race.

I. LARVÆ OF L. VAR. VIBURNI × L. VAR. MERIDIONALIS.—The larvæ of the cross between *L.* var. *viburni* and *L.* var. *meridionalis* (the first 1896 cross, see *anteà*, p. 114) divided into two moieties, one following each parent, so that one part had red-brown and the other part white urticating fur; there were no intermediates. Of the second generation, only a few unfortunately reached adult age; they resulted as follows :—

L*. *Pairing between moths from larvae of white-haired variety.*—Four larvæ lived to adult age, all of which were white-haired.

P. *Pairing between moths from larvae of brown-haired variety.*—These all unfortunately died before reaching adult plumage.

M. *Pairing between moths from larvae of the two varieties, viz.,* ♂ *brown-haired* (7)† × ♀ *white-haired* (6).—All the larvæ, when half-grown, tended to follow the larval form of ♀ and be white-haired; only two became adult, and these had the urticating fur almost white, yet not pure white, being faintly tinged with a dusky hue.

C. *Pairing between a* ♂ *from white-haired larva* × ♀ *L. var. viburni.*—This cross produced larvæ with red-brown urticating fur.

B. *Pairing between* ♂ *from larva of brown-haired variety and a* ♀ *L. var. meridionalis.*—This brood split up into two moieties, one half with white and the other with brown urticating fur; six became adult, of which three had white and three brown fur.

II. Larvæ of (1) L. var. sicula × L. var. meridionalis; (2) L. var. sicula × L. (var. viburni × var. meridionalis).—The larvæ of the crosses obtained between *L.* var. *sicula* and the French forms worked out as follows:—

U. *Pairing between* ♂ *L. var. sicula and* ♀ *L. var. meridionalis.*—All the larvæ were of the *L.* var. *sicula* or *L.* var. *viburni* form, *i.e.*, with red-brown urticating fur.

V. *Pairing between* ♂ *L. var. sicula and* ♀ *L.* (*viburni* × *meridionalis, from brown-haired larva*).—All the larvæ of this brood were of the *L.* var. *viburni* or *L.* var. *sicula* form, *i.e.*, with red-brown urticating fur.

No. 1 ('98)‡. *Pairing between* ♂ L *brood* (*2nd gen. L. viburni* × *meridionalis, from white-haired larva*) *and* ♀ *L. var. sicula.*—The larvæ were of the *L.* var. *viburni* or *L.* var. *sicula* form, except that the fur was, judging from memory, slightly paler than that normal for the larvæ of these in their normal forms.

III. Larvæ of English races crossed with French races.—These worked out at much greater length as follows:—

J. *Pairing between* ♂ *L. quercûs* (*English*) *and* ♀ *L. var. meridionalis* (*Cannes*).—In the early instars the larvæ followed the ♂ stock, but at the 4th instar the majority closely approached the French form as regards the colour of the urticating fur, although in a few it was slightly dusky. The sub-dorsal band, however, was more strongly marked than was usual with the Cannes larvæ at this stage. When full-grown they followed the English stock in having dusky white urticating fur, but their heads, as was also the case in their 4th instar, show strongly the influence of the French race, being shaded, in some larvæ strongly, with orange-red.

2·8. *Pairing between* ♂ *L. var. meridionalis* (*Cannes*) *and* ♀ *L. var. callunae* (*Aberdeen*).—When young, the larvæ chiefly resembled young larvæ of *L.* var. *callunae*, but at 3rd and 4th instars the influence of ♂ parent became predominant, and when in penultimate skin both urticating fur, as well as the longer hairs, were pure white. In their last skins, however, the *L.* var. *callunae* strain again became apparent, the urticating fur being of a pale pinkish-brown, while the lateral hairs were pale reddish-brown, and a few of the long dorsal hairs remained pure white. The heads of these larvæ when full-grown were of various shades, from a bright brick-red, slightly mottled with deep indigo, to a form in which the indigo formed the ground colour, and only a slight mottling of the red was present. The face marking agreed with that of the French race.

3·5. *Pairing between* ♂ *L. var. viburni and* ♀ *L. quercûs* (*English*).—Only one larva of this pairing lived to assume its final skin. It then had pale brown urticating fur, evidently a blending of the parental characters.

3·8. *Pairing between* ♂ *L. var. viburni and* ♀ *L. var. callunae.*—The young larvæ closely resembled those of *L.* var. *callunae* in their early instars; in the penultimate skin they were much nearer to *L.* var. *viburni*, differing only in a few points. Thus the long dorsal hairs were either fewer in number or less brilliantly white than in *L.*

---

* These letters refer to the broods noted already (*anteà* p. 115), and are marked here with the same letters.

† For these broods, see *anteà* p. 114.

‡ For origin of this brood, see *anteà* p. 115.

var. *viburni*, and faint traces of the chain of white medio-dorsal tufts were still present. In their last skin all the long hairs became dusky. Their heads varied, but all showed mottling of red and indigo in varied proportions.

Imagines of crosses.—Of the imagines I can say but little, chiefly owing to my failure to rear more than a very few, and also on account of the slight and inconstant differences between the different races. (1) Of the moths of the *viburni* × *meridionalis* groups, I can detect nothing different from either of the parent races. (2) I reared three ♂ s and four ♀ s of the cross between ♂ *quercûs* (English) and *meridionalis* (Cannes), and, beyond that they are rather undersized, I think they would be taken for English moths, the bands on forewings being waved. Here, as with the larvæ, the English strain appears predominant. (3) I have moths of three different crosses, one parent being *sicula*. In these, the *L.* var. *sicula* strain is generally apparent, even if faint. In the males the russet tint is present, although modified, and the narrowness of the stripe or band on the forewings at once strikes one as being in contrast with that of *L.* var. *meridionalis* or *L.* var. *viburni*. The orange border to the hindwings is deepened by a brownish tint, and in all the specimens save one there is a narrow yellow stripe at the junction of the border and the central area. This does not occur in any *L.* var. *sicula* I have seen, and is evidently due to the Cannes strain.

Perhaps the most remarkable feature of these cross-pairings, as regards the larvæ, is the different result obtained from the crossing of two races occurring in the same geographical area, and of crossing two races occurring in widely separated areas. In the latter case we get a blending of colours, as with *L.* var. *meridionalis* and *L.* var. *callunae*, on the other hand, we get not a blending, but a division of the offspring into two moieties, one following each form without the production of intermediate forms. Somewhat similar facts have, I believe, been noted as regards crossing in the human race in regard to the colour of hair and eyes. It seems possible that the opportunity and probable frequency of intercrossing has led, through the action of natural selection, possibly, in the case of these larvæ, owing to the intermediate forms being less effectively protected than the types, to some mechanism in the germ plasm of the races living in near proximity that brings about the division instead of the blending, which occurs from crosses between forms inhabiting separated areas. It is, however, difficult to see, in view of this explanation, why the moths breed true instead of becoming merged into one race, having white- or red-haired larvæ indifferently, even on the supposition that both forms are equally well-protected.

I have no wish to get entangled in a discussion as to what constitutes a species, but the perfect fertility of the pairings between the different races, and crosses of the races, that I have had, is in marked contrast with the results obtained by crossing *Tephrosia bistortata* and *T. crepuscularia*, as is also the fact that hybridising these species and *Smerinthus ocellatus* and *S. populi* results in shortening the pupal period, whereas cross-pairing the various races of *L. quercûs* tends to lengthen it.*

---

* It will be noticed in Mr. Warburg's paper (which is to follow this) that his later experiments and more extensive material tend to modify this statement.

Migration and Dispersal of Insects: Lepidoptera.

By J. W. TUTT, F.E.S.

Piepers further states that when swarms of butterflies have been observed at sea they must have been carried out, and that their flight is, in such cases, entirely involuntary, and beyond the control of the individuals comprising the swarm. To emphasise his point that insects cannot fly against the wind he notes that in 1899 a migration of dragonflies in Holland was witnessed, and that all the observers stated that the dragonflies came in against the east wind, but that on further enquiry he learned that although the wind was blowing from the east at the levels of the tops of the houses (as judged by the direction of the smoke, &c.), at a height of three or four mètres from the ground, where the dragonflies were, there was no wind, owing to the obstacles, near the earth's surface, and he expresses the opinion that this was the case, at the time that Zeper observed, in the East Indies, a swarm of *Catopsilia crocale* flying against a wind of considerable force, a manner of flight which Piepers asserts is impossible for butterflies. Our previous records suggest that Piepers is entirely wrong, and that his assumptions, based on such erroneous premises, are entirely unwarranted. Piepers concludes that, in the East Indies, these migrations are not the result of a sudden resolution taken by a number of individuals to leave the place of their birth for another, but that there is at most, only a coincidence of individual action. Each newly-emerged butterfly feels the need of putting himself *en voyage* and fulfils this individual need, probably up to that moment when he meets the individual of the other sex, who attracts him, and with whom he leaves the swarm for the purpose of copulation, and that, having paired, these particular butterflies no longer follow the swarm, but commence to lead the life normal to the ordinary mode of flight. He concludes, therefore, that it is only because the number of butterflies which make simultaneously the same choice is large, that their flight seems to be due to common action. The facts on which he bases this conclusion are not very weighty from the scientific standpoint. He observes that no one has ever seen these migrating species leave one country and arrive in another, and that the flights, as usually observed in the East Indies, are not made up of a mass of collected insects moving in common, but rather that, although they continue to move for a long time in the same direction and in the same manner and many are seen at the same time, they never form a band or crowd, and that only in the districts between plantations of trees do they accumulate in any numbers, using these as highways where they can more readily pursue with advantage their onward flight. He further suggests that all those observers who speak of "compact masses" or "nuées de papillons," are misled by an intensity of expression to an overstatement of the facts, and yet he is forced to the conclusion that a statement made by Schonten, that he saw "nuées de ces papillons" in the island of Salaiara in 1885, so many in fact that the butterflies (*Catopsilia crocale*) in passage slightly intercepted the light of the sun as if a light cloud was passing, cannot be passed over in this fashion, but he attempts to explain the crowding as due to the butterflies being huddled in a sharp angle, on the assumption that, having arrived from the interior and reached the coast, they turned to follow the shore, a premise not even mentioned in the original account of the swarm. In fact, one is forced to the conclusion that Piepers came to the consideration of this part of the subject with preconceived notions, and, instead of attempting to explain the facts, is inclined to make the facts fit his assumptions, and the value of this contribution to an interesting subject is thus largely rendered nugatory. The "proof" he offers that the flights are the result of individual action is that, in 1883, whilst the great flight of *Catopsilia crocale* in Java was in progress (it lasted some weeks, and the larvæ and pupæ, as well as imagines, of *C. crocale* were in great numbers) he observed that the newly-emerged insects did not remain for a time where they were born, but, as soon as their wings were perfected, they flew off *en voyage* with the others. He states that he then collected some larvæ, reared them, and, one morning, when a dozen imagines emerged from the pupæ, took the glass case in which they were to some distance from the house, and placed the case on the grass, in the sun, and where the inmates might see the flight of their *confrères* throughout the day; after a short time he opened the case, the butterflies came out and he watched some of them fly away like the others that were passing, directly in a straight line and in the same direction, flying over the house (which was in the line of flight) without passing it on one side, whilst others, also apparently well developed, flew feebly into the trees, their flight showing that they were too weak to undertake a long flight, the well developed ones flying off, the weaker ones staying behind, and on this experiment he bases the conclusion already formulated, and which he states thus: "C'était donc bien comme je l'avais présumé; tout papillon nouvellement éclos ressentait aussitôt le besoin d'aller voler de la manière décrite. C'est donc ainsi que se constituent ces vols, qui par la multitude des insectes, qui en font partie, nous semblent être des rassemblements, un acte produit par entente commune, mais qui ne sont en effet qui le résultat d'une quantité d'actes tout individuels sans cohérence, auxquels chaque insecte est poussé par son instinct sans se soucier des autres" (p. 225). There is, he adds, no general assembly from the commencement, nor a common point of departure, each butterfly commences its flight where it finds itself the moment it becomes an imago, and it is to be presumed that the finish will be the same, that each butterfly will assume at a given moment the ordinary manner of life for the species. A comprehensive conclusion one feels on such a small array of experiment. As to when the individuals will leave the flight and renew the ordinary conditions of life, Piepers suggests that it is determined by sexual conditions. He notes that the butterflies fly straight on without being attracted by the flowers that are in their course; he observes, however, that a small group occasionally detaches itself from the flight, making for the large trees, and that he believes each group to consist of a female with some males in attendance, and that this was the prelude to copulation. M. Westpalm van Hoorn had already stated that he believed that butterflies ceased to take part in the flight after copulation; Hepp also remarked that small groups quitted the flight, and rested some moments in the trees. Piepers concludes that such cases represent a pairing, the paired couple being left behind unnoticed, the unsuccessful males in a short time pursuing their flight. He assumes, as we have already noted, that after copulation the paired imagines remain in the vicinity where pairing has taken place, and that the ♀ there lays her eggs. Thus he accounts for the fact that, in spite of the large numbers that fly off, the whole district through which the flight passes is kept populated, although one is inclined to dissent from an explanation of a phenomenon, that leaves the greater part of the district whence the flight originates to be populated by the remaining remnant of nature's failures.

Notes on the distribution of the British Coleoptera.

By W. E. SHARP, F.E.S.

"If we take the organic productions of a small island, or of any very limited tract of country, such as a moderate sized country parish, we have in their relations and affinities—in the fact that they are there and others are not there—a problem which involves all the migrations of these species and their ancestral forms, all the vicissitudes of climate and all the changes of sea and land, which have affected those migrations, the whole series of actions and reactions which have determined the preservation of some forms and the extinction of others, in fact, the whole history of the earth, inorganic and organic throughout a large portion of geological time."

In these words does so eminent an authority as Dr. Wallace in a recent work, define the problem of the present distribution of the flora and fauna of the earth, and show how, among the many questions submitted to the biologist, few in interest and in complexity exceed it. In fact, faunistic distribution is a department by itself in biology, volumes may be written and the research of a life-time devoted to its elucidation, and yet students who have considered the subject most deeply, are most aware how dimly and partially can its phenomena be understood, and how tentatively and provisionally can any theories be formed on the subject. So vast a problem, however, admits of attack in detail, and I propose in these papers briefly to consider what material a study of the present distribution of one order of insects in Britain can afford, towards some comprehension of their derivation and the order of their arrival here. Insects from their antiquity, their specific and individual abundance and omnipresence, offer, perhaps, better and more cogent evidence, in an enquiry of this kind, than does any other part of our terrestrial fauna; their antiquity as a distinct class is indeed immeasurably great; as far back at least as the carboniferous series, forms referable to existing orders appear, while fossil coleoptera generically allied to existing species, have been found in English oolitic and cretaceous deposits. Indeed, it appears a safe conjecture that in tertiary times—when the mammalian fauna must have been very unlike what it is to-day—the phylogenetic development of the Insecta had arrived at a stage from which but little deviation has been made since. But in any consideration of the distribution of our British insects we need not follow the stream of evolution to such remote springs as these. Our entire insect fauna is, with a few doubtful exceptions, merely an extension of that of north-western Europe, and the geologically recent severance of the connection between these islands and the continent, prevents it having acquired any very distinct insular characteristics.

The order we propose especially to consider in these notes, is that of the coleoptera, which, from its universal distribution and specific abundance, and also from the fact that of all winged insects its members perhaps use their wings the least, make it peculiarly suitable for such an enquiry, and the problem we set ourselves is not of course the phylogenetic origin of the coleoptera, for which, indeed, we should have not only far to transcend the limits of these islands, but attempt as hopeless an enterprise as any that biology can offer, for the geological record, as regards insect evolution, is extensively fragmentary and discontinuous, and we have really not the slightest evidence as to when, where, or how the differentiation of existing specific forms among the coleoptera, or, indeed, among any order of insects, took place. Our simple, but far from easy task, will be to attempt to discover what light our knowledge of the present distribution of the British coleoptera can throw on their proximate derivation and arrival here, and we need not go very deeply into the subject to be made aware how small our knowledge of this really is, and how very provisional all our theories on the subject must necessarily be. And, firstly, we must recognise that no theory as to derivation drawn from any one group of the fauna of any area can be considered even plausible, unless it be supported or at any rate not refuted, by evidence adduced from any other group either of fauna or flora in the same area. Whether any of the conclusions to which we may be led from a survey of our coleoptera are borne out by similar phenomena in the distribution of the flora or other groups of fauna is for students of such groups to say, but I am at any rate not aware that they are likely to be in violent opposition to them.

I have stated already that our British coleoptera exhibit hardly any specific distinction from those of north-western Europe, although I am quite aware that over sixty have been enumerated as endemic to these islands, but I think, on examination, this claim can hardly be substantiated, as most of them are merely varietal forms and, for the rest, no sufficient evidence exists that they are actually absent from the continent, many of them having occurred as unique specimens only in Britain. Since, therefore, our British coleopterous fauna is practically European, it follows that, at no very remote date, Britain must have formed part of some continental extension to the north-west. That such a connection existed we have abundance of evidence to show, but a very little study of this part of the subject will convince the enquirer that the greatest importance attaches to the view we may be disposed to take of that great climatic disturbance known as the glacial age. That is to say whether, at the close of the tertiary period, a change in climatic conditions occurred sufficient to extirpate all previously existing forms of animal life throughout these islands, so that, at the amelioration of so rigorous a condition of things, a perfectly clear field was left for immigration from the south, or whether glacial severity has been overestimated, the extermination of pleiocene life a myth or exaggeration, and the possibility admitted that our present fauna is merely a continuation, perhaps slightly interrupted, of the late tertiary one.

The first of these theories was that generally held until almost quite recently, and we find such authorities as Professor I. Geikie, Dr. Wallace and other eminent geologists committed to the "Greenland" view of British glacial age conditions and to the virtual extinction of all pre-existing life. If to this climatic severity we add the effect of such a general submergence during or after the glacial epoch as the shell beds of Mœl Tryfœn and Macclesfield were at one time held as indicating, there is little doubt but that we might consider the repeopling of these islands after the passing away of glacial conditions and their re-emergence above the waters as *de novo*. But I believe such views as these have been to some extent modified of late years, the great or at any rate total submergence seems not beyond a doubt, and some biologists maintain that the severity of the glacial age has been greatly overstated and that the bulk of our flora and fauna might easily have survived its influence. Possibly such opinions are less frequently advanced by those who have approached the subject from the geological side. It is impossible for any biologist to quite explain away the glacial age in Britain. The climatic conditions of which we have the most indisputable evidence did obtain at some period, must have very greatly modified our flora and fauna if they did not destroy them. Even in a climate as mild as northern Norway is now, the majority of our present insects could not have existed, and, consequently, if they existed here previously, must have been destroyed and subsequently reintroduced on the passing away of such conditions.

It is not my purpose, however, here, to reason from geological data to insect derivation, but rather to examine what data we have of insect or rather coleopterous distribution, and attempt from them the construction of any theories of derivation, which of course will involve geological considerations also, and we shall, I think, see from such an examination, that while the little evidence it affords lends no support to the idea of a complete glacial extinction and subsequent continental diffusion of all present forms, still less does it admit of explanation by any theory of continuity of all of them here since pleiocene days.

(*To be continued.*)

Notes on Luffias—with incidental remarks on the phenomenon of parthenogenesis.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

(*Continued from p.* 95.)

A most interesting point in this genus is the parthenogenetic character of *Luffia ferchaultella*. Parthenogenesis occurs in various orders of insects, and presents several forms. In Aphides it is associated with an alternation of generations, and has been the subject of extensive observations by eminent biologists. It would appear that it does not occur in any other insects in precisely the form in which we find it in Aphides. In these there is a long succession of generations parthenogenetically, ending in an ordinary sexual form ; the parthenogenetic individuals are not, however, ordinary females, *i.e.*, they have not only no relation to any actual males, but they have no possible relations with any imaginable males, that being so, it is not irrational to assert, as has been done, that these are not, in fact, females. The cycle is generally an annual one, the sexual forms being produced in view of the necessity of migration either to other food-plants or to make provision for hybernation. The parthenogentic forms are always wingless. In the origin of these two now correlated characters, *viz.*, apterousness and parthenogenesis, I think we may assume apterousness to have come first, as a result of a habit and habitat in which life could be continued for a number of generations without migration of any sort. This would place some difficulties in the way of pairing and especially of crossing, and so any accidental parthenogenesis would have an excellent chance of establishing itself as a habit.

Another form of parthenogenesis with alternation of generations occurs in the *Cynipidae*, and here also the parthenogenetic brood is sometimes apterous, and in some species the race has lost the alternative sexual form and is entirely parthenogenetic. In all these, however, the parthenogenetic individuals are essentially females, and, though no males are known to exist, there is no reason in the structure of the females or in their method of developing and producing their eggs, why they might not be related to very possible males.

In the hymenoptera there is another very curious form of parthenogenesis, confined to bees and probably wasps. This has been most closely studied in *Apis mellifica*, and I consider that it is proved that unfertilised eggs always produce drones, *i.e.*, unfertilised eggs never prove unable to develop; on the contrary, they always develop, and always into drones. A fertilised queen can lay female eggs also, and so lays both kinds of eggs at will. Dr. Sharp is inclined to doubt this view, and says "there can be no doubt that the queen honey-bee frequently produces males parthenogenetically." He thus begins the argument by begging the question, begging it by a misrepresentation of the facts, saying that the queen bee "frequently" lays such eggs; the fact being that the queen bee invariably lays drone eggs if her fertilisation be prevented, and does so as prolifically as she would lay those of workers (♀s) were she fertilised. It is an experiment I have made myself, and is often made by bee-keepers, not always voluntarily. He goes on "the error of the views we are alluding to consists in taking the parthenogenesis to be the cause of the sex of the individual." This is curiously unintelligible. An unfertilised female always lays eggs freely; those eggs always develop; they always develop into males. There is no question of cause at all, except in the true sense of that word—constant association. If an unfertilised egg of an unfertilised female always produces a male, then we must conclude, according to all correct methods of reasoning, that the male egg of a fertilised female is unfertilised, since any other conclusion demands, in philosophy, a complicated, instead of a simple, solution; and in natural history the same principle applies, since natural selection would eliminate so wasteful a process, when the more economical one is as efficient. He next says, "It must be recollected that the laying of an unfertilised egg by a fertilised female may be different physiologically from the laying of an egg by an unfertilised female, for, though both have as result an unfertilised egg, it is possible that the fertilisation of the female may initiate processes that modify the sex of the eggs produced by the ovaries, so that though these may produce previous to fertilisation only male eggs, yet after fertilisation they may produce eggs of the opposite sex, or of both sexes. In other words, the act of fertilisation may initiate a different condition of nutrition of the ovaries, and this may determine the sex of the eggs produced." Dr. Sharp says all this *may* be so, this must no doubt be admitted, but when there is really no evidence of the slightest character in support of such a series of suppositions, whilst the other theory has many facts that point conclusively to it, I would, if I might be permitted to do so without disrespect, give my comment on the passage in the form of a common Scotch saying, to suggest improbability, "It might happen a cat might kittle a piet."

The sawflies are another family of hymenoptera that give us another phase of parthenogenesis, and one that seems to be nearest to that we meet with in lepidoptera. There are a good number of sawflies that are parthenogenetic, and of which yet males occur with greater or less rarity, whilst there are at least a few in which it seems probable that not only are males not met with because they are very few and rare, but really because there are none.

In the lepidoptera parthenogenesis occurs in what we may call a sporadic manner, *i.e.*, occasionally, unfertilised eggs, which would usually undergo no development whatever, do develop, more or less, and, as a very rare occurrence indeed, proceed so far as to hatch and produce veritable larvæ. It is very probable that sporadic parthenogenesis of this character would be found to be equally common in other orders, were rearing them from the egg as frequently practised as in lepidoptera. It is this sporadic parthenogenesis that no doubt affords the initial material from which the forms we have already noticed are developed by natural selection under suitable conditions. This sporadic parthenogenesis gives rise to progeny of both sexes, but in a good many instances, I think, very decidedly in the majority of cases, the strong tendency is to produce males, and instances are recorded where experiments in continuing, or attempting to continue, a sporadic parthenogenetic variety came to an end because only males were produced.

Taking these cases in connection with those in hymenoptera, we may surmise that the male influence is to produce female offspring and the female to produce male offspring. If this be so, we may hide our ignorance of how it came about, by attributing it to innate conditions, arising along with the distinction into two sexes. But, I think, we may get a little nearer a comprehensible explanation, if we assume that naturally both sexes are produced equally, but that variation may, and, frequently did, produce races that abound more in one sex than the other. If this went too far, so as to injure the prospects of the race, a remedy would be beneficial, this would accrue if variation arose by which each sex tended to produce the other, and so an excess of females would tend to produce more males and of males to produce females. It arises here to ask how could this effect any result without parthenogenesis, not only in females but also in males. There seems, however, little difficulty in the matter; the fact that parthenogenesis occurs, shows that very varying proportions of the male and female elements in an egg, may equally conduce to its proving fertile, even to the extent of its possessing no male element at all. The process of fertilisation of the eggs, in most insects, shows that such variations may very easily occur. In lepidoptera both sexes frequently pair more than once. If males were scarce, each male would pair with several females and would supply the spermathecæ with but a scanty content, and each ovum would receive the minimum supply of the male element, at any rate, in all but the first mating of the male. On the other hand, a paucity of females would supply every female with a distended spermatheca, and a maximum of the male element would be supplied to each egg. If, in a race tending to an excess of either males or females, variation occurred, as undoubtedly it would sooner or later in some degree, making each sex more potent to produce the opposite sex than its own, it would benefit the race by remedying the disparity of the sexes. In the course of the enormous number of generations through which our present insects have descended, it is probable that some such process as this has been gone through by many species, more or less frequently, and that apart from special selection in an opposite direction, there exists in not a few insects a prepotency of each sex to produce the opposite one.

In the Luffias we have *Luffia ferchaultella* that is parthenogenetic in the manner of certain Cynipids, *i.e.*, producing females continuously without any males. In *L. ferchaultella*, however, there is, perhaps, a closer resemblance to the Aphides, though, to prevent misapprehension, I must repeat that in *Aphis* the parthenogenetic female is further modified as to be not, perhaps, strictly a female at all. There is nothing of this sort in *Luffia*, nor, so far as we know, is there in *Luffia* any trace of alternation of generations, nevertheless, many entomologists, perhaps from the analogy of *Aphis*, believe that it is very possible, or even probable, that, in these continuously parthenogenetic forms, as in Cynipids and Tenthredinids, at some long intervals, under some unknown stimulus, a generation may occur with normal males and females. The evidence on which such a belief rests can hardly be said to exist. The resemblance of the case of *Aphis* to that of *L. ferchaultella* is strong in two particulars, which are important ones in so far that they seem to be related to the origin of the parthenogenetic condition. One of these particulars is that both are apterous, the other that both have a restricted habitat. In both cases we may imagine that the restricted habitat led to the loss of wings, and in the second, that the combination of apterousness and a restricted habitat facilitated, if they did not actually determine, the appearance of the parthenogenetic habit. It was a disadvantage to the Aphis to leave its succulent leaf or twig whilst it was succulent, and therefore it became apterous. *Luffia ferchaultella* equally had a lichen-covered tree or rock, which it was well to remain upon. In this respect we must not, however, regard *L. ferchaultella* alone, but rather the whole of the Micro-Psychids, or, rather, the Solenobiids, Taleporiids, and Luffiids, all of which are lichen-feeders. There are parthenogenetic forms in the Solenobiids also, and the operative causes are doubtless the same in them as in *L. ferchaultella*. Why apterousness should in some cases proceed to parthenogenesis in these families, and sometimes not, is one of those questions impossible to solve; it amounts to this—why is a difficulty overcome sometimes in one way and sometimes in another? I think we may, perhaps, guess so far as to say that the benefit of cross-fertilisation in *L. lapidella* is about as great on the one hand as that derived from parthenogenesis in *L. ferchaultella* is on the other. What is the latter? It is difficult to say, but if apterousness were an advantage, in allowing successive broods to remain in their restricted habitat, an advantage, first, in not taking them from it to be lost, and, secondly, in not requiring the waste of developing useless or injurious appendages, it must have had a disadvantage in checking cross-fertilisation. The chances of a male safely arriving from a distant locality was small, and involved great losses to the species, whilst local males would involve inbreeding, therefore any very isolated colony would be advantaged by doing without males. That this advantage was not one obtainable under all circumstances, but only under some, such as, especially, isolation of a colony, is proved by the fact of forms with males being still rather more numerous. That the parthenogenesis of *Aphides* should have gone to such a fuller development than in *Luffia*, results, doubtless, from its greater duration, hemiptera being so much older than lepidoptera. Aphides also having many generations in a season, are really 20 or 50 times older than their greater antiquity involves. In *Cynips*, parthenogenesis has resulted from different forces, or from forces that have acted in a different way. Apterousness is a small, or evanescent, element in association with it; it affects some of the parthenogenetic alternative generations, but I do not recollect a case of it occurring in any continuously parthenogenetic species.

There is one other point in connection with these parthenogenetic Luffias and Solenobias that goes a long way to show that they are a comparatively modern development, and have much interest from several other points of view to the biologist and field naturalist, that is, the fact that each parthenogenetic race or species appears to be closely related to an ordinary form, so closely that the question is, or always can be, raised, as to whether it is truly a distinct species. Now in the case of our *Luffia ferchaultella*, an adult case, or an imago, can always be distinguished from one of *L. lapidella* simply and in itself, without any history of the specimens or outside circumstances. I say can be, because I should not like to say that I could do so, say, next year, without again examining a number of specimens and refreshing my knowledge of them. Nevertheless, I have suggested already some grounds, such as the existence of *L. maggiella*, and occasionally "calling" ♀s of *L. ferchaultella*, that show that, perchance, *L. ferchaultella* is not yet fully distinct as a species from *L. lapidella*. When we come to *Solenobia lichenella* we come to a species that, so far as we know, has no intermediate forms towards *S. inconspicuella*, but also one that is, in its case, larva, imago, &c., quite indistinguishable from that species. *Solenobia triquetrella* is regarded by those who have studied it in the field as being a species like *S. inconspicuella* with male and female, but in some localities getting on with a very trifling allowance of males, and in others never having any. The parthenogenetic form of *S. triquetrella* has not received a separate name, and if the facts be as I have outlined them, ought not to have one. I found a parthenogenetic *Solenobia* last year at Luino that is, I think, related to *S. clathrella*, but I am not familiar with either *S. clathrella* or *S. triquetrella* sufficiently to care to decide whether it is so or not.

(To be concluded.)

ORTHOPTERA.

A LIST OF SCOTTISH ORTHOPTERA.—In the *Annals of Scottish Natural History*, January, 1901, Mr. W. Evans contributes a few notes on Scottish orthoptera. A considerable number of localities are given which are almost entirely the result of Mr. Evans' own collecting; though, of course, neither the species nor the localities are numerous, it is an excellent beginning, for our knowledge of the distribution of orthoptera in Scotland is extremely poor, and we warmly welcome the author as a recruit to the slender ranks of British orthopterists. There are no species of any striking interest. *Labia minor*, L., is noticed from three localities in the Edinburgh district; it seems to appear later in the year than in the south of England. We are more familiar with the lesser earwig in June and the early summer, but all Mr. Evans' specimens are dated from August to the end of September. *Tettix bipunctatus*, L., appears to be widely distributed in Scotland, but *T. subulatus*, L., a more southerly form, is not recorded; strangely enough, no *Locustodea* are included, though our three commonest species are almost certain to occur, even if sparingly. Mr. Evans calls attention to three very old and interesting lists. (1) The first is by Sibbald (1684) where we find reference to "*Blatta*, the mothfly." If this does refer to the cockroach, "mothfly" is a curious name, which is entirely unfamiliar to me. If any readers of the *Entomologist's Record* have ever heard of it before, I should be very glad to hear from them. (2) A list by C. Stewart, published in the *Memoirs of the Wernerian Society*, in 1811, includes *Gryllus varius*, which Mr. Evans considers to be *Meconema varium*, Fabr., if so, this is our first record of this locustid in Scotland. "*Gryllus quadratus*" is doubtful, it may be *Gomphocerus maculatus*, Thunb. (3) A third list by G. Don (1813) includes *Gryllotalpa gryllotalpa*, L., and *Gryllus campestris*, L.; both forms are unknown in Scotland at the present day, though Mr. Evans quotes a few old references, which point to their occurrence; it seems unlikely that such peculiar and remarkable insects could be mistaken, and the species may have disappeared. Mr. Evans suggests that *Mecostethus grossus*, L., may be found in Scottish marshes, and that *Locusta viridissima* and *Meconema varium* have disappeared from Scotland. The former of these two is numerous in Scandinavia, and should be rediscovered in Scotland, at least in the lowland counties. The Scotch orthoptera fauna is poorer even than that of England, but there are certain northern forms which may yet be discovered. *Tettix fuliginosus* is the largest European species of the genus, and might occur in the Highlands—it is noted from Sweden, Lapland, and Norway. *Podisma frigidum*, Boh., is an apterous form not rare in Norway, and should be carefully sought in the Scottish mountains; *Decticus verrucivorus*, L., which is so rare in the south of England, but quite common in Sweden, may also occur.—Malcolm Burr, Dormans Park, East Grinstead.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Egg-laying of Cymatophora octogesima.—A ♀ *Cymatophora octogesima* was captured at Hazeleigh Rectory on June 29th, 1900. She was kept alive for ten days in a cardboard box with living sprays of black, white, and balsam poplars and weeping willow. An analysis of eggs laid on each leaf results as follows:—On weeping willow, 8, 2, 5, all on uppersides of leaves; on black poplar, 7, 7, 3, 1, of which 8 (including a batch of 7) were on undersides of leaves; on white poplar, 16, 10, 5, 1, 1, all on upperside except one; on balsam poplar, 2, 2, all on upper side except one.—Total 70. The eggs sometimes touch one another (as in one batch of six), but are sometimes laid singly. Five eggs were laid on one tiny white poplar leaf.—G. H. Raynor, M.A., F.E.S., Hazeleigh Rectory, Maldon, Essex.

Notes on the emergence of Acherontia atropos in 1900.—On October 15th I placed fourteen *Acherontia atropos* pupæ in two ware pans half filled with moss padded down firmly, previously dipped in boiling water, and covered the pupæ with lightly strewn moss, also wet, and three sticks over, and put them in the fender, with bell glass over, covering at night with an old blanket. On November 1st one fine insect emerged at 10.30 p.m., a ♀ over five inches. On November 3rd a medium-sized ♂, which was two hours expanding its wings. On November 7th, one emerged in the night, and a cripple was found in the moss, with a dent in the head where the skull should have been. November 11th another during the night. On November 12th a fine ♂ at 10.30 p.m., we watched it leave its pupa-case and rapidly crawl up the sticks and feel about to get higher (as did the first). We put it in a bell glass with leno stretched over; it immediately clung to the leno, and began to expand its wings at 10.35 p.m. They seemed fully grown at 11.5 p.m., but it did not put its wings down till 11.35 p.m. On November 13th a very fine ♀ came out at 5.55 p.m., at 6 p.m. it was settled on the leno over another bell glass placed in the fender (open side up) so that the temperature should be more like the one it came out in, as we thought the other which took two hours was hindered by change of temperature. At 6.5 p.m. it put out its proboscis, raised the palpi, and then put its lower two legs off the leno, at rest, crossed. It was one hour before its wings were put down. November 14th, another fine ♀ at 9.30 p.m.; at 10.20 p.m. it suddenly put its wings down, trembling violently for a few seconds first. November 15th another at 11.25 p.m. On November 16th one emerged at 7 a.m. and could not find a good resting-place, so it was rather crippled, but otherwise a fair specimen. The rest all died, they were evidently injured in being dug out of the soil or in the post. The moss was changed and re-dipped in boiling water every other day. Each imago we watched rested the two lower legs, after the first few minutes, till it closed its wings, when it used the six. One was very sick when the chloroform was given it, emitting a pinkish fluid.—(Mrs.) M. E. Cowl, 5, Spencer Park, S.W.

Notes on Acherontia atropos.—So far as my personal experience goes the following have been the years in which I have obtained this species: 1887, Brentwood (a good many larvæ and pupæ); 1893, Rainham (a good many larvæ and pupæ); 1894, Rainham (10 larvæ); 1895, Rainham (6 larvæ); 1896, Rainham (about 120 larvæ and pupæ); 1899, Mucking (6 larvæ and pupæ); 1900, Mucking (60-70 larvæ and pupæ). Larvæ.—Earliest date of capture July 15th (1893), latest date of capture October 12th (1901). This last was the smallest I have seen. I thought it must belong to a second brood, and be the offspring of the earlier emergence, but Mr. Bacot, to whom I sent it, reported that though so small it was already in its last skin. In August, 1894, I took at Rainham two of the dark form of larva, a description of which appears (*Ent. Record*, vol. v., p. 220, September, 1894, see Stainton, *Man.*, vol. i., p. 89). (N.B.—This form is quite distinct from that assumed by the normal larva when ready for pupation, when it becomes semi-transparent, golden-yellow, and looks as though it had been soaked in oil). The larva makes, when irritated, a slight "clicking" noise, such as one can make with one's finger nails. Pupation.—I do not think the larva generally goes down to a great depth, probably about six inches. It is readily turned up by the potato plough, and appears about midway in the furrow. In captivity it pupates without hesitation upon the surface of the earth. I have never been able to secure a perfect specimen of the cell formed by the larva for pupation. There appears to be no sign of silk or gum used in its preparation. The cavity is formed horizontally, and appears to provide plenty of room for the pupa to bend and turn, though there is little to spare in the length. The inner surface of this cocoon bears marks of the feet and of the face of the larva, notably of one or both of the jaws. Pupæ.—Earliest date September 2nd, 1894, Rainham; latest October 20th, 1900, Mucking (really coincident with the potato digging). I once dug a pupa in the spring—dead. The pupæ when in health are remarkably active. On receiving their morning and evening bath they wriggle, and appear to make a bubbling sound as though they were drinking. Some 24 hours before emergence the shell having become detached from the imago, the latter squeaks loudly. Forcing (see *Transactions of City of London Entomological Society*, 1897, pp. 2-3).—*Damp is essential.*—The higher the temperature the more moisture is required. The following is my experience. Forcing in October, November and December: 60°F. produce the imago in four weeks; 70°-80°F. produce the imago in two weeks; 90°-100°F. produce the imago in 1 week. Carelessness in damping results in loss of the whole stock. Imagines (wild).—I have only once taken the imago wild—on September 23rd, 1893—found sitting in daytime upon some straw, I have come across notes of a few such captures in early autumn*, but never in the spring. Mr. Anderson (*Entom. Record*, vol. vii., p. 86) states that he kept the pupæ through the winter, and the imagines emerged in June or July of the following year. I have never succeeded, and suppose that all depends upon how and where they be kept. Personally I do not believe that the insect can survive even the mildest English winter out-of-doors. Imagines (in confinement).—Earliest date September 15th, 1893 (bred); latest date January 6th, 1901 (bred). In 1900 the forcing was conducted at not more than 70°F. The first imago was bred October 12th, and it was followed by others regularly until November 20th, when about twelve remained, and as these began to die off the heat was raised to about 80°F. and four more appeared, the last as above on January 6th, probably the first *A. atropos* born in the new century. The time of emergence has proved somewhat irregular. Mr. Anderson in his note quoted above says between 7 p.m.-9 p.m., after watering. Of 30 specimens bred in 1900-1, the emergences were as follows:—15 appeared after midnight, *i.e.*, between that and 6.0 a.m.; 1 appeared between 6.0 a.m.-7.0 a.m.; 1 appeared at 8.0 a.m.; 1 appeared at noon; 1 appeared at 3.0 p.m.; 1 appeared at 4.30 p.m.; 2 appeared at 5.30 p.m.; 4 appeared at 9.30 p.m.; 2 appeared at 10.40 p.m.; 2 not noted—total 30.——(Rev.) C. R. N. Burrows, Mucking Vicarage, Essex.

Acherontia atropos in the Wisbech district in 1900.—The

* *See* S. Walker, *Ent. Rec.*, viii., p. 244; Hall, *Entom.*. xxix., p. 316 (on wing); A. S. Helps, *loc. cit.*, p. 316 (on furze); Frohawk, *Entom.*, xxviii., p. 280 (washed ashore), p. 310 (at lighthouse); Chope, *loc. cit.*, p. 309 (at light); Woolston, *loc. cit.*, p. 310 (at light), &c.

past season, 1900, has been a record one in this district for pupæ of *Acherontia atropos*; on October 18th, 1900, I recorded that some 150 had been obtained by me, after that date my supply was further increased by 34, making a total of 184; I also know of a friend who procured 82. I have been, I think, very successful in rearing 62 perfect imagines and 15 cripples, considering the following facts:—The pupæ were invariably brought to me by boys at work in the potato-fields, who adopted the crude means of conveying them to me in their hands, paper-bags, &c.; often after two or three had been handed to me in this manner a boy would suddenly thrust his hands into his pockets and produce one or two more, whilst many of the pupæ were injured by the potato-diggers, or in some other way, and consequently had to be thrown away as useless. The boys evidently noticed that I did not reward them for damaged ones and would draw my attention to the lively individuals with the remark that "This wriggles well," at the same time administering a good pinch to make it move; of course I tried to reduce this roughness by telling them to be very careful with the next they obtained, but, as a gang of pickers would number 60 or 80, my admonitions were lost, as the same one seldom came the next time. One farmer told me that the fact of my rewarding the pickers for "Those brown things" was detrimental to the expeditious picking of his crop, for they paid more attention to them than to his potatoes and sometimes doubled their wage through them, so plentiful were they. Considering the above facts, my result must, I think, be looked upon as very satisfactory. My method of forcing was simplicity itself, the mere lying of the pupæ on slightly damped moss and placing them on the kitchen mantelpiece. After having tried various methods of forcing the pupæ in a moist heat (all more or less very unsatisfactory), I have quite decided that very slight moisture is necessary to force them successfully. In fact, I almost think they would force in any temperature of 60°F. to 70°F., practically dry, if it were commenced early enough, say September or October, or as soon as the pupæ are disturbed from the ground. The above views I know are contrary to all recognised methods, but the fact of my rearing 77 imagines from 184 pupæ, after taking into account the manner in which they were obtained, is, indeed, justification for my belief. I know of two collectors here who have tried year after year various moist heat treatments, but cannot boast of a series of six specimens between them yet, although they have experimented upon dozens of pupæ. In the case of my friend who had 82 this season, so disgusted had he become by his previous forcing efforts that he decided to keep them in a cool situation, trying as much as possible to imitate their natural surroundings, the result of this has been a total loss of the entire 82 by this date, February 20th, thus having no single chance left for a natural emergence later. I am by no means alone in my success with a tolerably dry treatment, Messrs. Mousley and Hipwell both having reared a good number by this method. It is quite easy to distinguish during the day the ones that will emerge at night, the wings dry away from the wing-cases and the yellow and blue-black marking of the body is quite easily discernible through the pupal skin. In no case did a single specimen emerge before evening, the usual time being between 10 p.m. and 12 p.m. Immediately on emergence the imago emits the excrement from its body, and in several cases it was noticeable where a specimen could not free itself from the case quickly, and at once discharge this excrement, that the specimen was invariably crippled through the apparent lack of power to expand the wings. I witnessed one night six emergences and found that the imagines never attempted flight the same night but remained at rest when dry until dusk the next day, when, if not previously killed, they quickly spoil themselves by their bird-like flight. The sound so much spoken of from this insect is most frequently uttered immediately after emergence or when disturbed, and I think the reference Barrett makes to the sound issuing from the pupa must have occurred quite close to emergence, when the imago was formed, as I have never heard it from the large quantity of fresh pupæ I have handled. The small proportion of males is very striking only ten having been reared as against 52 females, and of variation there is practically none in the wing markings, while the colour of the skull varies in a slight degree between light and dark.—Fredk. Glenny, F.E.S., The Orchard, Walsoken, Wisbech. *February 20th*, 1901.

Lasiocampa quercûs larva hybernating.—On November 29th, 1900, at Littlehampton, I took a larva of *Lasiocampa quercûs*, nearly $1\frac{1}{8}''$ long, under a coping, evidently hybernating. Is this not rather large? Those I have usually taken in spring are about $\frac{3}{4}''$ long, and with fawn-coloured coats, whereas this one had a dark coat, which I believe occurs at a later stage in its growth. Is it likely to be *L.* var. *callunae*? Its hybernating place struck me as being strange, whilst the only possible food-plants for some distance were the ordinary garden euonymus (laurel) and chrysanthemum, it being in the centre of the town.—C. W. Colthrup.

Finding cocoons of Hybocampa milhauseri and Cerura bicuspis.—*Hybocampa milhauseri*, the larva of which feeds on oak, forms its cocoon in a depression of the trunk in very much the same manner as do the smaller *Cerura* species. The larva itself feeds at the top of the tree and is seldom taken in this stage; for pupation, however, it descends the trunk and spins up from about six feet from the ground down to the very foot of the tree, where the trunk enters the ground. This species was formerly supposed only to occur in the Thiergarten at Berlin, but since entomologists have become better acquainted with its habits, it has been found all over the district, and, in fact, as far as I could ascertain, it is found anywhere where there are sufficiently large oaks. It always selects the largest and tallest trees, and, as the cocoon is so well hidden, it is extremely hard to find until one has had practice. After having been shown how to work for it I spent a great deal of time during the past winter doing so, but only found two, although I frequently found old cocoons, from which the imagines had emerged last summer. I see no reason why this species should not occur in England and think it is highly probable that it has been overlooked. It is seldom taken in any other stage than the pupal, in fact, never as imago, almost all specimens in collections being bred from found pupæ. The larva is occasionally found, but only accidentally, on account of its predilection for the tops of the highest oaks. Another interesting species is *Cerura bicuspis*, which feeds on alder. The cocoons of this species are spun up in the same manner on the trunks of alders, and, if anything, are more difficult to discover than those of *H. milhauseri*. It has the reputation of being a rare species, but this again is probably due to its being overlooked, as it seems to occur wherever there are alders, the only difficulty being its detection. The larvæ, however, are more easily obtained and can easily be beaten from alders during September and October. Both *H. milhauseri* and *C. bicuspis* are occasionally found in double and even triple cocoons.—E. M. Dadd, 3, Colina Villas, Green Lanes, Wood Green, N.

Winter habitat of Senta maritima, with some notes on the larval habits.—I was very much struck during my recent visit to Berlin, by the numbers of bred specimens of this species which were exhibited at the meetings, and, therefore, enquired of the local entomologists as to its larval habits. The larva is about half-grown during the winter, and is obtained in the following manner: First of all the reeds fringing lakes or rivers are searched until a patch is found that has been formerly attacked by the larvæ of *Nonagria geminipuncta*. As is well known this latter species feeds up inside the culms of reeds, sometimes as many as five larvæ being in one reed, and, for the purposes of exit, it gnaws just before pupation a small hole in the side of the reed. Of course at this time the only remains of *N. geminipuncta* are the empty pupa-cases, and the old galleries which are filled with decayed frass. The larva of *Senta maritima*, which does not itself feed on the reeds, takes advantage of these galleries and openings in the reeds to hide itself, and it is to be obtained by opening the reed stems which have been attacked by *N. geminipuncta*. In such situations they are extremely common and almost every old gallery has its occupant. Of course the reeds are best worked when the lakes and rivers are frozen over, as otherwise it is very difficult to reach them. The galleries of *N. geminipuncta* are not only inhabited by the *S. maritima* larvæ, but also by a number of other small insects such as spiders, dipterous larvæ, beetles, &c. During the cold weather the majority of these creatures are perfectly dormant, which is also the case with the larvæ of *S. maritima* when it is extremely cold, in fact they are then sometimes frozen hard and can easily be snapped like sticks, but if the weather be only moderately cold the *S. maritima* larvæ are perfectly lively. It has been found that *S. maritima* is one of the most carnivorous among lepidopterous larvæ, feeding solely and wholly upon other insects and larvæ, as well as its own brothers and sisters if other food be not at hand. After having obtained the larvæ they are very easily reared; all that is necessary is to bring home with the larvæ a sufficient number of reeds and to keep them moderately moist. The larvæ can be fed on almost anything, those which I had in Berlin were fed on raw beefsteak, cooked apples and rice pudding, and these are only a few items of their *ménu*. It is, however, very essential that they should be well watered every day, as water seems to be necessary to life, indeed so partial are they to water that one entomologist in Berlin told me that he had an idea that the larvæ of *S. maritima* fed on water. The larva is full-fed about the middle of May when it pupates in the old galleries of *N. geminipuncta*. I do not know whether the larva of *S. maritima* seeks the galleries of *N. geminipuncta* as a hiding-place, or for the sake of other insects which are found there, or whether it also feeds on the frass which is to be found therein; it seems such a general feeder that I do not see why it should not. Around Berlin this species, besides the typical form, produces four well-marked varieties: (1) The common well-known ab. *bipunctata*. (2) Ab. *wismariensis*, a form with the wings largely suffused with black. (3) Ab. *nigrostriata* with the interstices between the nervures darkened in colour, the nervures remaining paler. (4) Ab. *nigrocostata* with a black costa, the rest of the wings being normal. The ab. *nigrostriata*, however, seems to merge very much into the type, in my opinion, it is doubtful whether this is really a variation or only a well-marked extension of the typical form. The abs. *nigrostriata* and *nigrocostata* are, however, extremely rare. The larvæ of *S. maritima* have also been found in the galleries of *Nonagria sparganii* and *N. cannae* which attack *Typha latifolia*. It seems to me most probable that they inhabit these galleries simply for the sake of devouring the insects which use them as a hiding-place.—Ibid.

Eggs of Lepidoptera.—*Agrotis agathina*.—Of the usual Noctuid form, *i.e.*, flat base, micropyle at top, vertical ribbing, and general form probably derived from a sphere, the sides are flattened, however, in such a way as to make the egg conical, rounded off into the flat base and with a flat top ; a vertical section would be almost an equilateral triangle, with two lower angles rounded and the upper one cut off rather more squarely ; height and width about ·60mm.; about 30-35 very pronounced ribs, diminishing in number upwards, more usually by stopping short than by union, the flat micropylar top netted ; secondary ribs cross directly from rib to rib, usually alternately with those of next sulcus, but often in line with them ; colour dark leaden (hatched next day) [Described September 18th, 1898].—T. A. Chapman.

PRACTICAL HINTS.

Field Work for May.

By J. W. TUTT, F.E.S.

1.—The pupæ of *Thecla pruni* can be found by careful searching in May, on blackthorn, but the larvæ are more readily beaten ; the latter appear to hide during the day very successfully, assimilating to the colour of the leaf and feeding and moving during the night. The pupæ are generally attached to the front of a sloe leaf, distinctly visible, forming, however, an excellent imitation of a bird's-dropping.

2.—The ova of *Callophrys rubi* are laid in nature freely on the upper side of a leaf of *Helianthemum vulgare* in May, sometimes a stalk or flower-bud is selected. Eggs are also laid on *Genista*, *Spartium*, *Cytisus*, *Onobrychis*, *Vaccinium*.

3.—In late May and early June the eggs of *Melitaea aurinia* are always laid on the underside of a scabious leaf near the ground ; they are laid in close batches, often a second upper layer on a lower one and as many as 400 eggs in a batch. The larvæ feed but little after hatching, but hybernate small, leaving their hybernacula in February and March, and sunning themselves and feeding as soon as the weather is suitable.

4.—The newly-hatched larva of *Pyrameis atalanta* feeds at first on the upperside of the nettle leaf on which the egg has been laid, but if this has got a little hard it leaves it for a younger one higher up ; it retreats into the hollow just over the stem, and spins a flat roof of whitish web over its head, and under this it feeds, probably lacking the strength that the older larva exerts to bend the leaves into a tent to cover it.

5.—The imagines of *Gnophria rubricollis* are to be found in their known haunts drying their wings between 7 a.m. and 8 a.m., from middle May until the middle of June. Tree-trunks, fences, palings, &c., are the most likely places.

6.—At the beginning of May young larvæ of *Plusia moneta* are to be obtained on monkshood or larkspur, the cocoon being spun up among the food-plant towards the end of May, the pupæ producing imagines in June. When the larvæ first hatch they are miners, after hybernating they feed in the flowering-shoots, partly arresting the growth by nibbling nearly through the shoot, and then attach several leaves together after the fashion of a Tortricid larva (Webb).

7.—The larvæ of *Plusia chryson* (*orichalcea*) are of a good size, and fairly easy to find about the last week in May and first in June. They eat pieces out of the centre of each side of a leaf of *Eupatorium cannabinum* (hemp agrimony) to the midrib, and the end of the leaf, losing its support, hangs down and fades, many leaves on a stem served in this way looking very conspicuous. Carefully (as the larvæ drop off) bend the stem down, and a larva will probably be found resting on the underside of a leaf if young, or if full-fed, with its hind-claspers grasping the main stem, and its front legs holding on to the underside of one of the *bent* leaves. If it is not on the stem first noticed, look on all near, its presence will soon be evident by *fresh* feeding.

8.—Roots of *Eupatorium cannabinum* should be dug up and planted in the garden for larvæ of *Plusia chryson* (*orichalcea*); larvæ are fairly abundant at the end of May or the first week in June, in Chippenham Fen and the Swansea district and possibly elsewhere; they can be left with safety on the garden plants, covered with a large box and will emerge well about the second week in July.

9.—The larvæ of *Dyschorista suspecta* feed freely in May on *Populus balsamifera* as well as on birch and sallow.

10.—At the end of May and beginning of June, the larvæ of *Apamea ophiogramma* pupate in the dead stems of the last year's grass (*i.e.*, reed = *Phragmites*), about two or three inches above ground (Thornhill).

11.—The full-fed larva of *Hoporina croceago* goes down for pupation in late May and early June, spins its cocoon at once, but does not change to a pupa for some weeks; during this time disturbance is almost certain to be fatal.

12.—The eggs of *Lophopteryx carmelita* hatch from the commencement to the middle of May, feed up on birch rapidly, are full-fed in five weeks, and spin their tough cocoons on the surface of the earth, mixing the silk with moss, small particles of earth, &c.

13.—Imagines of *Stauropus fagi* are found in May and June, at all hours of the day, from early morning till night, on all sides of the trees on which they rest and at all heights from the ground; they generally rest comfortably, too, within reach, although at times they are high up, and, occasionally, quite at the foot of the tree. The imagines appear decidedly to make a selection of the smaller trees and saplings to rest upon, the males in particular being rarely found on anything larger than a scaffold-pole, the favourite trees run from the size of a hop-pole to that of a walking-stick. They do not always rest on beech—a young ash, thorn, nut-bush, in fact, anything standing vertically in a beech wood will do for *S. fagi*. The ♀ s are not so frequently found on young trees, but when they have flown they seem also to prefer them. In many beech woods small trees are not readily available and for this reason at Cuxton, Epping, &c., large trees are perhaps the more frequently chosen.

14.—Wherever one specimen of *Stauropus fagi* is found, others are usually near; the lethargic female appears to keep the males near her. Holland notes five from one small tree and ten from a single clump of young trees.

15.—When eggs of *Stauropus fagi* are wanted in confinement; place a ♀ in a good-sized cardboard box, in which, as soon as it is dark, she will fly about and deposit eggs here and there, several nights are needed to complete the egg-laying, and the ♀ s do not always commence egg-laying at once.

16.—Larvæ of *Porthesia chrysorrhoea* should be obtained in late May and June. They have been extremely abundant on our south-eastern coasts of late years—Deal, Folkestone, Hythe, Sheerness, &c.

17.—In May *Drepana cultraria* occurs commonly in the Monks-wood section of Epping Forest, the males flitting about freely in the sunshine, whilst at the end of May and early in June the imagines of *D. binaria* sometimes fly very freely in the glades near Fairmead, although the species is well distributed throughout the whole of the Forest.

18.—The eggs of *Drepana harpagula* are laid in May on the edges of the lime leaves (*Tilia parvifolia*) just at the bottom points of the serrations. The larvæ appear in about eleven days, refuse the leaves of *Tilia europaea*, and seem to prefer somewhat dry leaves, being often found at large on stunted hard leaves; they feed quite exposed, and when full-fed roll up a leaf funnel-shaped and pupate therein; the pupa is covered with a thick resinous powder, possibly to protect it from damp during the winter when it is lying in its cocoon among the dead leaves at the foot of the lime trees.

19.—In searching for the catkin-like larvæ of *Geometra papilionaria* in May, remember that the small bushes that have only been cut two or three years are generally the most productive, and that the larvæ usually stand out rather near, if not quite at, the end of a twig.

20.—The larvæ of *Eupithecia subciliata* feed on maple bloom in May; they are best beaten, feed up rapidly, pupate in, or near, the surface of the soil, or among the food-plant, and are very easy to rear.

21.—Female *Numeria pulveraria* are sometimes to be taken in May flying during the daytime in bright, sunny weather along the hedgerows, apparently seeking for sallow on which to lay, as such ♀ s lay almost immediately if enclosed in a chip box covered with muslin. If missed at the first stroke of the net they dive down into the herbage, but are easily disturbed by the stick or captured by searching. This insect is usually supposed to fly only at dusk.

22.—Eggs of *Cidaria suffumata* are readily obtained in May, the larvæ feed up rapidly on *Galium mollugo*, and pupate about July.

23.—The small birch-trees in the localities for *Dimorpha versicolora* should be searched in May for the larvæ of this species; although smaller, they are more readily found when young, owing to their gregarious habits. When they are older they spread, and bear a close resemblance to the leaves of alder and birch, and hence are more readily overlooked.

24.—At the end of May and beginning of June the larvæ of *Pachygastria trifolii* are to be obtained by searching at Lyndhurst on the heaths, on the Lancashire and Cheshire coast sandhills, and on the coast near Rye.

25.—In May and June the larvæ of *Eutricha quercifolia* should be searched for, resting low down on the main stems of hawthorn, sallow, buckthorn and blackthorn by day, but on the upper twigs and branches feeding by night. It is a common practice in the Fens, when the larvæ are sometimes very abundant, to feel down the stems with the hand, the pale, mottled larvæ being difficult to see on sallow and whitethorn, and the dark ones on blackthorn and buckthorn.

26.—Virgin females of *Macrothylacia rubi* placed in a box covered with gauze, taken to the moors in late May and the first or second week of June, will attract a large number of males—80 in a single evening captured between 6.15 p.m. and 7.45 p.m., near Morpeth.

27.—The cases of *Coleophora conspicuella* are to be obtained on *Centaurea nigra* in May; they are sometimes common at Cuxton, Benfleet, &c.

28.—The ♀ *Lampronia capitella* lays its eggs on red currants rather more than half grown in May, two eggs being apparently laid at each penetration; at the end of June the larva leaves the currant and hybernates in a simple, firm, white cocoon placed among the dead scales at the bases of the buds; it mines the shoots in spring, and, like *L. muscalella*, does not make a case.

29.—Larvæ of *Bucculatrix maritima* should be collected in early May, their mines being readily detected in leaves of sea-aster at Benfleet, Shoeburyness, and other coast districts.

N.B.—We are commencing an entirely new set of "Practical Hints" in this number. None of the large number just published in our new work, *Practical Hints for the Field Lepidopterist*, will knowingly be repeated.

VARIATION.

Striking aberration of Smerinthus ocellatus.—A most striking ♂ aberration of *Smerinthus ocellatus* was bred by Mr. L. W. Newman, of Bexley, Kent, on June 2nd, 1900, the larva having been obtained from sallow in Bexley Woods. The forewings are of a delicate grey with the normal transverse lines fairly well marked, a brown margin to the median ring, a brown patch directly below, and another centrally on the inner margin (and continued towards the base); the outer margin is also filled up with a brown patch roughly triangular, the base formed by the curve directly below the apex of the wing, and the apex on the submarginal line. The two forewings, however, are not quite symmetrical either in the arrangement of the transverse lines or in the darker patches of colour. The hindwings are also grey slightly tinged with yellowish the nervures alone grey, the ocellated spot is well-marked, the pupil, a pale ring, and black outer rings being well-defined. The most striking features are, of course, the absence of the rosy-red tints in the hindwings and the metallic blue ring that surrounds the pupil of the ocellated spot, but the absence of the rosy tinge of the forewing is also very noticeable.—J. W. Tutt.

NOTES ON COLLECTING, Etc.

Stridulation of Smerinthus populi.—On the evening of November 1st, at 10.30 p.m., a fine specimen of *Acherontia atropos* emerged in our incubator. I had never seen a living specimen before, and the peculiar squeak which we heard several times reminded me of another scene. One evening after dusk, a few years ago, I was walking with a friend up a lane when I heard the sound of some strong-winged insect humming through the air. I put up my hand and it flew right into the curved palm held to receive it. I closed my fingers over it, the third finger very firmly holding the wriggling body, and it repeatedly uttered the very same sound as *A. atropos* only weaker. I carried it 200 yards, and I found it to be a very fine specimen of *Smerinthus populi*.—(Mrs.) E. M. Cowl.

Hybernating stage of Acidalia imitaria.—This species appears to hybernate as a larva in nature. A larva, about two-thirds grown, was beaten from honeysuckle near Haslemere, April 16th, 1900, and produced a moth on the 24th of the following June.—R. M. Prideaux, Reigate. *March 22nd*, 1901.

Lepidoptera from the Penarth district.—The following are a few of the more interesting captures made last autumn, sugaring from the end of September until the first week of November being exceedingly productive. *Peridroma ypsilon* (*suffusa*) and *P. saucia*, very common, *Miselia oxyacanthae*, plentiful (I took two almost black), *Agriopis aprilina*, common, one *Xylina rhizolitha*, four *Calocampa vetusta*, one *C. exoleta*, *Orthosia lota*, *Citria cerago* (*fulvago*), common, *Tiliacea aurago*, common, one *Cirrhoedia xerampelina*, *Polia flavocincta*, *Hadena proteus*, and *Tapinostola fulva*.—T. L. Howe, Beaufort House, Penarth.

Leucanias at Rye.—Among the Noctuids captured last August in the neighbourhood of Rye were two *Leucania straminea*, two *L. albipuncta*, and a few other good species.—J. Henderson, 7, Pinfold Road, Streatham.

Lepidoptera at sugar in Warwickshire in 1900.—During the past season I took upwards of twenty species of Noctuids at sugar in my garden at Hampton-in-Arden. I obtained better results than in previous seasons, and I attributed my success mainly to the comparative absence of honeydew, which happy state of things prevailed throughout the summer. Among those taken were *Noctua c-nigrum*, *Tethea subtusa*, *Triphaena ianthina*, *T. interjecta*, *Xylophasia hepatica*, *X. sublustris*, *Mellinia gilvago*, *Hadena pisi*, *Leucania conigera*, *Agrotis corticea*, *A. nigricans*, *A. tritici*, *Peridroma suffusa*, *Cerigo matura* (*cytherea*), *Calymnia affinis*, and *Catocala nupta*. Of these *Agrotis tritici* appears to be new to this district, and I was also pleased to get *Agrotis corticea*, *Triphaena interjecta*, *Calymnia affinis*, and *Catocala nupta*, all of which may be considered rare in Warwickshire.—G. W. Wynn, Lyndhurst, Hampton-in-Arden.

Insects in the Brighton district.—Among the more interesting captures that I made in this district in 1900 were the following:—Homoptera: *Ledra aurita*.—Taken August 3rd on trunk of Spanish chestnut, Cowdray Park, Midhurst, Sussex, the day was cold and showery, the insects being in consequence very sluggish. Lepidoptera: *Colias hyale* and *Colias edusa*.—Taken in September on the downs, about two miles directly north of Brighton; in one spot of about a quarter mile radius both species were decidedly plentiful although in other parts I found none. *Pyrameis cardui*.—Taken on the same date and in the same locality as the Coliads. *Gonepteryx rhamni*.—Two specimens near Pulborough on July 29th. *Eugonia polychloros*.—Captured at Wardley, Sussex (near Liphook, Hants) on August 2nd. *Macroglossa stellatarum*.—In Brighton during October. *Choerocampa porcellus*.—Two specimens at Brighton in September, one in the north, the other in the south part of the town.—Ralph C. Hinkins, 77, Stanford Road, Prestonville, Brighton.

Cosmotriche potatoria at sugar?—One evening last July Mr. Arnold and myself were sugaring in the fens, and were surprised to see a ♀ *C. potatoria* on one of the posts close to the sugar patch; four nights later we noticed another, but not on the same post. Has anyone any further information on this subject? Does the species affect sugar as do the Lithosiids and other unexpected visitors?—John F. Musham, Blenheim House, South Park, Lincoln. *March 6th*, 1901.

Early appearance of Zonosoma porata in confinement.—I was surprised this morning in glancing into one of the cages in which I keep my pupæ during the winter to see a fine specimen of *Zonosoma porata* sitting on the side of the cage, having emerged from a pupa received from Bexley, Kent, last October. The room in which I keep my pupæ is an ordinary bath-room without fire-place or any artificial means of heating, and the window is invariably kept open all the year round.—H. Ainslie Hill, F.Z.S., F.E.S., 9, Addison Mansions, Kensington. *March 14th*, 1901.

On the pupal condition of Hemerophila abruptaria during winter.—On November 29th last, at Littlehampton, while searching on walls for ichneumoned *Bryophila muralis* pupæ, I came across a cocoon similar to that made by *B. muralis*, and in removing it I accidentally broke the pupa-case, and revealed a moth quite ready to come out, in fact while it lay in my hand it crawled out of the case and was very lively. I pill-boxed it, but the imago did not expand, and it died two or three days after. I have examined the unexpanded wings, and the markings look very like those of *Hemerophila abruptaria*. I do not know whether it is usual for the moth to be ready to come out so long before its proper time of emergence, and it is to obtain information on this point that I have written this note.—C. W. Colthrup, 127, Barry Road, East Dulwich, S.E. *January 28th*, 1901.

Early emergences in the Isle of Man.—It may perhaps interest some of the readers of the *Record* to know that worn specimens of *Dianthoecia capsophila* were captured on the Douglas coast on the evening of April 28th, and *Eupithecia venosata* the following day. It seems somewhat strange that these insects should be out so early in the season considering the exceedingly cold winds experienced here during March and beginning of April. In favourable seasons the earliest record I have of *D. capsophila* being on the wing is May 7th. I am indebted to Mr. Garrett, of Douglas, for the above note.—H. Shortridge Clarke, F.E.S., Sulby Parsonage, Isle of Man. *April 30th*, 1901.

Pachythelia villosella in April.—I had an imago of *Pachythelia villosella* emerge on April 14th from a pupa, the larva of which was collected in May, 1899.—(Mrs.) M. E. Cowl, Aberceri, Spencer Park, Wandsworth Common. *April* 15*th*, 1901.

Macroglossa stellatarum in March.—This afternoon I saw in my garden a fine specimen of *Macroglossa stellatarum* flying at *Arabis*.—(Rev.) C. R. N. Burrows, Mucking, Stanford-le-Hope. *April* 18*th*, 1901.

CURRENT NOTES.

The scientific works belonging to the library of the late Mr. P. Crowley were sold at Stevens' sale room on April 15th. The larger number of the more valuable books were ornithological, and nearly all lots brought very good prices. Some of the more conspicuous entomological works were the following:—Moore's *Lepidoptera Indica*, 4 vols., £7 7s.; *Rhopalocera Exotica*, 2 vols., Smith and Kirby, £5 10s.; Wilson's *Larvae*, £1 15s.; *Rhopalocera Exotica*, A. G. Butler, 1 vol., £3; Felder's *Lepidoptera*, 3 vols. in 1, £3 3s.; Romanoff's *Mémoires*, 7 vols., £13; Eaton's *Ephemeridae*, 29s.; Leech's *Butterflies of China*, &c., 3 vols., £9; *Exotische Tagfalter*, Staudinger and Langhan, 2 vols., £4 12s. 6d.; *Biologia Centrali-Americana*, £90; Donovan's *British Insects*, 16 vols. in 8, £4 12s. 6d.; Trimen's *South African Butterflies*, 3 vols., £1 12s. 6d.; Marshall and Nicéville's *Butterflies of India*, 3 vols., £3 5s.; *Transactions Entomological Society to 1899*, 46 vols., £38; Lubbock's *Collembola*, £1; Buckton's *Aphides*, 4 vols., £2 2s.; Stephens' *Entomology*, 11 vols. in 6, £3 10s.; Westwood's *Introduction*, 2 vols., 16s.; *Aid to Identification of Insects*, 2 vols., Waterhouse, £4 10s.; Buckler's *Larvae*, 8 vols., £6; Cameron's *Phytophagous Hymenoptera*, 4 vols., £2 10s.; Lang's *Butterflies*, 2 vols., £2 15s.; *Iris*, 10 vols., £5; Scudder's *Butterflies of Eastern United States*, &c., 3 vols., £1 10s.; Hewitson's *Exotic Butterflies*, £15 15s.; Distant's *Butterflies of Malay Peninsula*, £3. Private buyers seemed to be absent or silent—Quaritch, Wheldon, Sotheran, Wesley, Janson, and a few other well-known firms securing nearly everything.

At the meeting of the Entomological Society of London, held March 20th, 1901, Mr. G. T. Porritt exhibited specimens of an almost black form of *Cuspidia menyanthidis* from Skipwith Common, near Selby, and stated that the same form was also common on Strensall Common, near York. For comparison he also showed specimens from the moors near Huddersfield. The chief interest in the exhibit consisted in the fact that in both the districts where the melanic *C. menyanthidis* occurred, melanism was not a common feature; whereas in the Huddersfield district, where only the pale form of *C. menyanthidis* was taken, melanism was a conspicuous feature in many species, even in, and close to, the grounds where only pale *C. menyanthidis* could be found.

In the *Horae Societatis Entomologicae Rossicae*, vol. xxxv., March, 1901, André de Semenov contributes a short paper on the species of *Anechura* and *Forficula* which occur in Russia. It is written in Russian, with descriptions in Latin. *Anechura orientalis* (Krauss), sp.n., is described, being the sub-species of that name of de Bormans in his recent great work; a second novelty of the same genus is *Anechura zuborskii*, from the Western Himalayas. In *Forficula*, *F.*

smyrnensis, Serv., is added to the Russian fauna, being found by M. Semenov on the south coast of the Crimea.

Owing to the absence of published material on the local variation, possible within the limits of the same brood, of the larvæ of *Saturnia pavonia* (*carpini*), we should be exceedingly glad if those lepidopterists who are rearing the species during the next few months will make detailed observations of the different forms in each stage, the number of each form in the brood, and the chief changes that the larvæ undergo, both in colour and in details of tubercles at each moult. Will those who are likely to be breeding the species please communicate? It is hoped that at least one Irish and one Scotch brood of larvæ will be under observation.

At the meeting of the Entomological Society of London, on May 18th, Professor Poulton exhibited an ingenious apparatus by means of which it is hoped that the strength of the formic acid secreted by *Formica rufa* may be ascertained. Seven of these instruments have been entrusted to Mr. Donisthorpe, who will endeavour to carry out the necessary experiments in the field.

At the same meeting Mr. Horace Donisthorpe exhibited living specimens of *Ripersia tomlini*, Newst., a myrmecophilous coccid, being a species new to Britain. He had discovered them in the roots of *Lasius nigra* at Portland, in April last.

All our readers will, we are sure, be pleased to learn that Professor T. Hudson Beare has been appointed by His Majesty King Edward VII., to the Chair of Engineering at the University of Edinburgh. Our colleague, therefore, becomes a Regius Professor, and we heartily congratulate him on his well-deserved promotion to so important a post.

In the *Ent. Mo. Mag.* for April, Mr. Ernest Green in an interesting account on "Moth-catching by electric light at the Boer Camp, in Ceylon," states: "Some of the Boer prisoners have occupied their leisure in catching the moths that settle within their bounds and have in this way amassed quite considerable collections." He then goes on to complain that they have no proper apparatus for collecting and preserving their specimens. Does Mr. Green suggest that the British Government, should supply them with killing-bottles, &c.? The unfortunate "Tommy Atkins" who is obliged to spend his time in guarding these people (instead of moth-catching!), is spoken of as "the heavy-footed British soldier." At the meeting of the Entomological Society of London on May 1st., Mr. Distant, who has lived in the Transvaal Colony among the Boers, and knows their habits well, said that when he saw a Boer collecting on his own initiative he would believe it! He accounted for these collections by the fact that a German official, who is an entomologist and a Fellow of the Entomological Society of London, is a prisoner of war at Ceylon. If all reports be true, the insects best known to the combatants in the late war, are certainly not lepidopterous.

The position of Lemonia (Crateronyx) dumi.

By J. W. TUTT, F.E.S.

Some time since Mr. Bacot was good enough to show me some ova that had been sent to him by Herr Voelschow as those of *Crateronyx dumi*. It was so distinctly evident to us from these that the species not only did not belong to the *Lachneides*, with which it has been previously associated, but that it did not even belong to the Sphingo-Micropterygid stirps (*vide*, *British Lepidoptera*, i., p. 109). It was also quite clear that it belonged to the Noctuo-Hepialid stirps, its affinities being distinctly with the *Notodontides* or *Lymantriides*. Further exploration discovered that Herrich-Schäffer, Rambur, and the Scandinavian authorities had already dissociated, on imaginal characters, the group to which *L. dumi* belonged from the Lachneids, *sensu stricto**. Wallengren placed it (*Vet. Akad. Handl.*, (5), 4, pp. 28 and 33), in 1865, in the family *Phialidae* of the *Striphnopteryges*, whilst in 1869 he placed it in the family *Striphnopterygidae*, a family maintained by Aurivillius (*Iris*, vii., p. 185) although, in 1879, he had placed (*Ofvers. Vet. Akad. Förhandl.*, xxxvi., 7, p. 52) it in the *Phialidae*, and, in 1893, had removed it to *Sanidae* (*Ent. Tids.*, xiv., p. 206). Hampson curiously enough places it in the *Eupterotidae* (*Fauna Brit. Ind. Moths*, i., p. 41). Aurivillius also sinks *Crateronyx* in favour of *Lemonia*, Hb. (*Verz.*, p. 187) and places in the latter genus—*Lemonia taraxaci*, Esp., *ballioni*, Christ., *vaillantini*, Oberth., *balcanica*, H.-Sch., *dumi*, L., *sardanapalus*, Staud., *philopalus*, Donz.

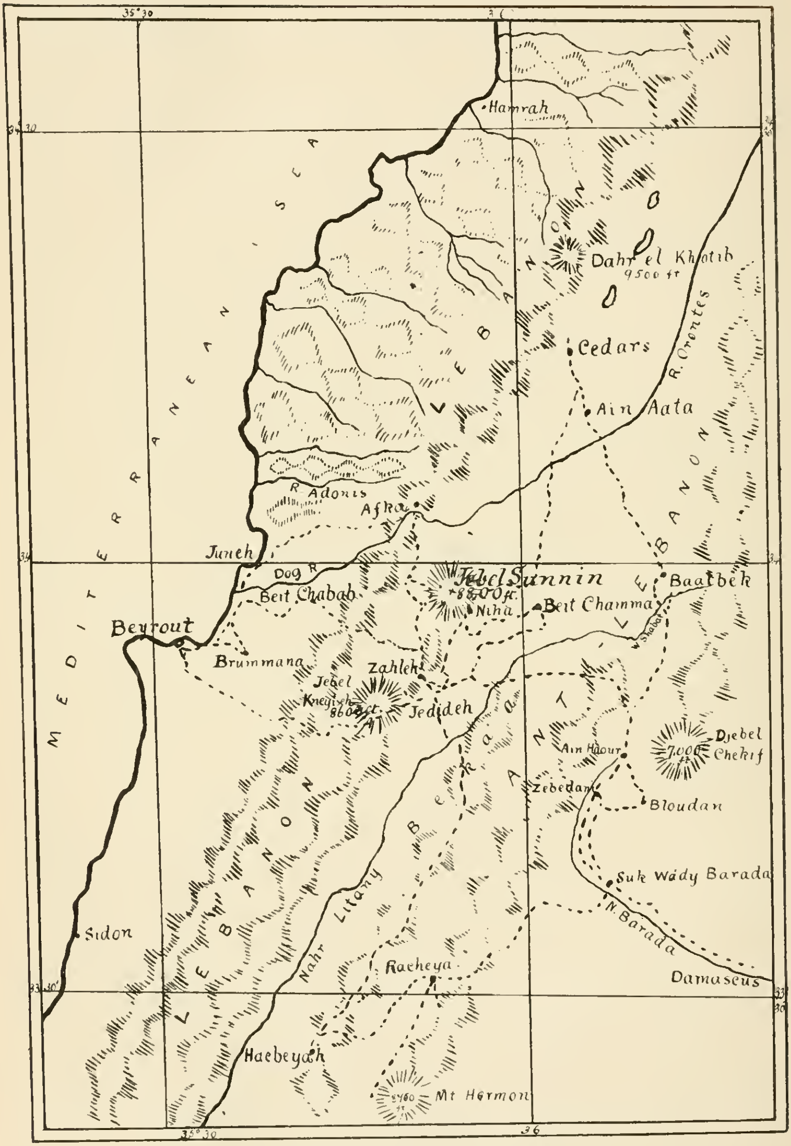
Bacot describes the eggs of *Lemonia dumi* as follows:

Attached to each other in small groups of two to five, probably they have been laid at a loose ring or clump on a twig or other surface, and have been broken off. Upright, having the micropyle at the summit of the vertical axis; in shape a little over half a rough sphere, the sides curving outwards and upwards from flattened base before curving inwards and upwards in a rough dome; size 1·3mm. to 1·4mm. in diameter by ·9mm. in height; coloration white, slightly mottled and speckled with brown. A black spot at the micropyle and a broad ring of the brown mottling condensed into a dark brown band surrounding the dark spot at a sufficient distance to leave a band of the ground colour between it and the micropylar spot; beneath the brown ring is a band of the ground colour, and below this again a second brown band rather paler than the first; the second band is situated about the equator of egg. The shell looks strong and is opaque with a shiny and varnished surface, slightly unequal or faceted on upper slopes and with traces of cell reticulation round the micropyle; the micropyle itself being represented by a minute dimple. The attachment of the eggs to one another is apparently due to a transparent glue or varnish, which, when hard, forms a gelatinous-like membrane. The ova contain a fluid, no development or gastrula having as yet, October 23rd, taken place (A. Bacot, October 23rd, 1901).

From this description it will be seen that the egg shows *Lemonia* (*Crateronyx*) to belong to the upright-egged stirps. As the imagines have been separated by the neuration from the Lachneids, and the egg suggests distinctly affinities with the Notodontids or Lymantriids, we trust that someone with leisure will now work out the life-histories and affinities of the species included in the genus *Lemonia* in detail, and clear up the difficulties attending the position of the genus. That the views of Herrich-Schäffer, and those later authors, who have given the group family rank, on imaginal characters were well-founded is evident, and one suspects that the larvæ and pupæ will support the view that *Lemonia dumi* is the type of a distinct family. It may be advisable to suggest *Lemoniidae* as a suitable family name should none of those already used be available (*e.g.*, *Striphnopterygidae*), but what is more important at present is a knowledge of the relationship of the *Lemoniidae* to the superfamilies of the Noctuo-Hepialid stirps, there being a consensus of opinion as to the necessity of separating it from its old associates.

---

* Herrich-Schäffer (*Samml. Aussereur. Schmett.*, p. 3) erected for it the family *Lasiocampina* (due to his erroneous employment of the generic name *Lasiocampa*), while the Lachneids form his family *Bombycoidea*.



Butterflies in the Lebanon.
(*Journey marked with dotted line.*)

Butterflies in the Lebanon (*with Map*).

By (Mrs.) MARY de la B. NICHOLL, F.E.S.

Very little is known of the butterflies of Syria. A catalogue exists of the lepidoptera taken by the German consul around Jerusalem; and another, printed by Lederer, professes to enumerate the butterflies and moths of the Lebanon; but Lederer himself never collected in that district. He only sent a collector to Beyrout, and this man does not appear to have penetrated into the mountains at all, but confined his researches to the coast, and neighbourhood of Beyrout. Mr. Elwes and I therefore resolved to make an excursion to the Lebanon and Antilebanon in May and June last, in hopes of finding out something about the butterflies. A map copied from my guide book, with my route specially traced, gives some idea of the country in which my collection was made; I have also marked the heights of the principal peaks of the two ranges, all of which I ascended, excepting the highest, most northerly, and most interesting of all—Dahr el Khotib, 9500ft. I had fully intended to go there about June 20th, but time failed me.

It will be observed that the ranges of Lebanon and Antilebanon run exactly parallel to each other, in a north and south direction, divided by the high and fertile plain of the Beka'a, which is from ten to fifteen miles in width and forms the watershed of the rivers Litany and Orontes. The Antilebanon rises to its highest point at its southern extremity, in Mount Hermon, about 8750ft., whilst the greatest mountain of Lebanon is Dahr el Khotib, at its northern end. The two ranges resemble each other very much in shape and character, but the Antilebanon is much less fertile than the western face of the Lebanon, which, rising abruptly from the Mediterranean, gets more rain and cloud than any other part of Syria, and is, accordingly, green and well watered. Both ranges were thickly covered with forest, within living memory, but the wood has been entirely destroyed—the Turkish Government having cut down the trees and replanted none—much as the French Communes have done. The whole region is over-populated, over-cultivated, and over-grazed; but as the cultivation is of a slovenly character, the butterflies contrive to exist; and a young cornfield generally affords a good opening to the collector, especially as nobody ever objects to a chase in the corn!

I arrived at Beyrout on April 28th, at daybreak; and that same day went to see a local collection of butterflies, made by Professor Day, of the American College. This was extremely interesting, though by no means representative of the mountain insects, as Professor Day is detained at Beyrout by his college work till July is well advanced. The most notable feature of the collection was a remarkable variety of *Pieris callidice*, taken on the highest summit of Dahr el Khotib (this species I never saw). I found that it was already too late for *Doritis apollina*, *Euchloë damone*, and *E. belemia*, all of which are to be had along the coast in March and April, I never met with either of these insects on the higher levels.

As I had to wait six days for Mr. Elwes' arrival, I resolved to pay a visit to Brummana, about ten miles east of Beyrout, where there is a good mountain hotel. The place is magnificently situated, about 2500ft. above the sea, from which it is not more than four miles distant, and is a remarkably windy place. Mrs. Day kindly accompanied me, and gave me the benefit of her local experience, and excellent Arabic. I give our bag for April 30th, May 1st and May 2nd. The weather was fine, but very windy: *Papilio podalirius* and *P. machaon* (much damaged by wind), *Thais cerisyi*, *Pieris brassicae*, *P. rapae*, *P. daplidice*, *Anthocharis belia*, *Euchloë cardamines* ♀, *Gonepteryx cleopatra* var. *antonia* (or *taurica*), *Leucophasia sinapis*, *Pyrameis cardui*, *P. atalanta*, *Polygonia egea*, *Melitaea phoebe* pale var., *M. didyma*, *M. trivia*, *Epinephele janira* var. *telmessia*, *Pararge maera*, *P. megaera*, *Thecla spini*, *Chrysophanus thersamon*, *C. phlaeas*, *Lampides boetica*, *Lycaena cyllarus* var. *eruginosa*, *L. icarus*, *Ypsima asterope*, *Spilothyrus alceae*, *Syrichthus alveus*, *S. orbifer*, *S. melotis* and *S. nomas*. Butterflies were few and far between, no number flying in any one spot. May 3rd we descended from Brummana and drove along the rich and narrow belt of irrigated land along the coast, northward to the mouth of the glen through which Dog River rushes to the sea—between steep limestone mountains. These protect the narrow valley more or less from the prevailing winds, so that it is a good place for butterflies, and I found them in greater numbers than at Brummana. *Danais chrysippus* was just out in the irrigated belt. This insect remains a long time on the wing, as I saw several on this occasion—then again on May 5th, on May 14th, and on June 22nd, when I passed along the coast road for the last time. In a cornfield at the mouth of Dog river, facing the sea, a fine *Melanargia*, *M. titea*, was just out of chrysalis, and I caught several. In the shelter, about half a mile up the glen, *Lycaena trochilus* was flying in numbers; I took nearly all the butterflies we had found at Brummana, besides one specimen of *Parnara mathias*, and two of *Hesperia actaeon*. At the entrance of another valley nearer Beyrout we took several specimens of *Lycaena gamra*, mostly much worn. Returning to Beyrout, I found that quarantine had just been declared from Port Said, Alexandria, and most of the Levantine ports, so that the whole steamer traffic was disorganised, and Mr. Elwes would be unable to join me. This was most unfortunate as I had relied entirely upon his knowledge of the Asiatic insects (with which I am unacquainted), to name my captures. In fact, I was quite at a loss what to do, but finally concluded to start without him, and trust to luck not to miss any valuable insects. So I engaged a dragoman and went to Damascus on May 6th, in very cold wet weather which lasted till May 10th. Then the sun shone and I spent the day at a little place called Jedideh, a station nine miles up the Beyrout and Damascus railway in the beautiful, well-wooded glen of the Farada. It was an interesting day, and a good place for insects. On the barren hills which sloped down to the woods by the river I got *Melanargia titea* var. *titania*, a Lycænid I could not name, as all the specimens were worn out, *Lycaena astrarche*, *Melitaea didyma* var. *neera*, *Syrichthus melotis*, *S. poggei*, and *S. orbifer*. Among some rocks higher up *Satyrus telephassa* was just out. In the valley, among the bushes, *Thais cerisyi*, *Gonepteryx* var. *antonia*, *Pararge egeria* and *Syrichthus nomas* were plentiful. I saw one *Aporia crataegi*, but failed to catch it. *P. daplidice* was very common, but no *Anthocharis belia* was to be seen, nor did I ever see any in Syria, excepting near the sea-coast, and at Bloudan. May 11th I went to Bloudan, where there is a good mountain hotel in the village, splendidly situated at an elevation of 4850ft., immediately below Djebel Chekif, the highest point of the northern Antilebanon. It is the summer resort of Europeans resident in Damascus, and is a good place for collecting, though the mountains are dreadfully bare from over-grazing. Zebedani is the station for Bloudan (or Bludein), and here I started with the net soon after 10 a.m., and hunted the railway banks near the station before beginning the ascent. I found *Aporia crataegi* common, also *Argynnis niobe* var. *eris*, *A. lathonia* and *Syrichthus melotis*. I also took a bad specimen of *Pieris napi*—the only one I saw in Syria. In the cornfields on the way up to Bloudan, were a good many *Anthocharis belia* var. *simplonia*, and, in the deep bushy lanes near the village, *Cyaniris argiolus* was plentiful. I caught *Argynnis pandora* coming fast round a corner, and then, ascending the mountain above Bloudan, found plenty of *Satyrus telephassa*, and also a small pale *Melitaea* of which I took two or three, and now regret that I did not take more as they were a nice form of *M. cinxia*, many of them without the row of antemarginal spots on hindwings. At a height of at least 5000ft. *Leucophasia duponcheli* was flying; and close to Bloudan, at 4.30 p.m., I was lucky enough to get two specimens of *Anthocharis charlonia*. This pretty butterfly is taken all over the Lebanon and Antilebanon, but never, I think, in any abundance. Professor Day had captured a few in various places, and I caught two more specimens in places far apart from each other; several more escaped me but I never saw more than one in a day on any subsequent occasion. Next day I took three specimens of *Nisoniades marloyi* on the way down to Zebedani. Returning to Beyrout in the vain hope of getting news from Mr. Elwes, I finally gave him up and went, May 14th, to Beit Chabab, a flourishing village in the Lebanon, about 3000ft. high, completely embosomed in mulberry gardens. Here my dragoman has a very nice house, where I stayed very comfortably for two days, whilst he arranged everything for our tour. His two sons showed me all the country round, which looked promising for butterflies, but, though the weather was lovely, I saw very few insects of any sort, those I got were much the same as around Brummana, excepting that I took one indifferent female specimen of *Lycaena semiargus* var. *antiochena*, and one of *L. anteros* var. *crassipuncta*. I tried my best to get more but never even saw a second specimen of either in this district. I also took one specimen of *Satyrus hermione*, very dark, among the mulberry trees. May 17th we started with the tents and rode round the lower slopes of Djebel Sunnin, across the pass leading eastwards over the range to Zahleh, and encamped about 5000ft. above the sea in a beautiful spot, red sandstone formation, and grass and water abundant, with rhododendrons and *Osmunda regalis* fern growing along the watercourses, whilst butterflies were more abundant than they had been lower down. Here I took *Lycaena anteros* var. *crassipuncta* in some numbers, and two female specimens of the lovely *L. semiargus* var. *antiochena*, besides *Aporia crataegi*, *Chrysophanus dorilis*, and other common things. Next day it blew a hurricane and we rode only a short way down the east side of the pass, and encamped in the most sheltered place we could find, as I wished to ascend Djebel Kneysseh, a great limestone mountain 8600ft. high, which rose due south of our pass. Here, on the eastern side of the ridge I had two good days notwithstanding constant and very cold gales. I took *Parnassius mnemosyne*, *Aporia crataegi*, *Chrysophanus thersamon* var. *persica*, *C. asabinus*, *L. anteros* var. *crassi-*

puncta, *L. semiargus* var. *helena* (but no more of *antiochena*), *Melitaea cinxia*, *Spilothyrus althaeae*, &c. We then went down to the Beka'a, below Zahleh, and rode northwards to a village called Beit Chamma, on the Baalbek road, where we encamped. Next day we went into the mountains to Niha, a Phœnician ruin beautifully situated at the mouth of a narrow glen which runs up into the eastern flank of Djebel Sunnin. This was a good place for insects. The lower ranges of hills were chalk, the higher mountains limestone, and very bare and rocky, and overgrazed. The chalk-hills were almost entirely covered with green corn, thin crops and plenty of weeds, with dry watercourses hollowed out in the bottoms. These watercourses swarmed with insects—*Chrysophanus asabinus*, *C. ochimus*, *C. thersamon* var. *persica*, *Argynnis pandora*, *A. lathonia*, *Melitaea didyma*, *M. trivia*, *M. phoebe*, *Lycaena anteros* var. *crassipuncta*, *Syrichthus* var. *nomas*, *S. melotis*, and many common things. In the little glen by the temple I took *Thecla myrtale* for the first time, also one *Anthocharis charlonia*, several *L. isaurica*, one or two specimens of *L. panagaea*, and *Thecla acaciae* var. *abdominalis*. High up the glen I took two *Satyrus anthe* and saw my first bear. *Satyrus telephassa* was everywhere abundant, it is one of the commonest Lebanon butterflies. Here also I caught for the first time a *Lycaena*, which puzzled me exceedingly, and which I afterwards took in many places, all over both ranges, and which I have hitherto failed to name. It is supposed to be possibly a var. of *L. zephyrus*, which, however, it does not much resemble. I walked a good many miles over the higher limestone ranges without meeting with anything new, they are excessively bare and waterless, and produced few insects besides *Satyrus anthe*, *S. telephassa*, and *Pararge megaera*, but lower down, where there are bushes or cornfields, *Lycaena amanda* swarms, the "coppers" haunt the cornfields, and on rocky ground *Melanargia titea* var. *titania* abounded. Riding northwards to Ain Aata, on the pass from Baalbek to the Cedars, we stopped there several days, delayed by bad weather, and I tried the higher part of the Lebanon, but found it still too early, much snow and no butterflies above 5000ft. However, I rode across to the Cedars and took *L. isaurica*, *L. argus*, *Callophrys rubi*, *Leucophasia duponcheli*, and other common insects. At Ain Aata I got a good many *Thecla myrtale*, which I found in plenty around wild rose bushes. I also took *Aglais urticae* var. *turcica*, *Lycaena astrarche*, *L. amanda*, *L. isaurica*, *L. candalus*, and the doubtful *Lycaena*, which at first I supposed to be a form of *icarinus*, but now believe to be a distinct species. May 28th we crossed the plain of the Beka'a to Baalbek. The foot-hills of Lebanon are here thinly clothed with scrub, oak copses, growing out of bare stones, every green herb within reach of the goats being devoured. I saw scarcely any butterflies, but observed that *Gonepteryx rhamni* was tolerably common, and appeared to replace *G.* var. *antonia* on this side of the range. Nothing was to be seen on the Beka'a but *Pieris daplidice* and *Colias edusa*. We stayed a day at Baalbek, and did not find butterflies in any plenty, but in some cornfields on the chalk, southwards from the town, I took several beautiful Lycænas of the *icarinus* type, but with very distinct and brilliant orange spots on the upperside of the hindwings. This corresponded exactly with the insect I had previously taken for a form of *icarinus*, excepting that here I first found the upperwing heavily marked with orange. Whether this insect is a new species, or a new var. of *zephyrus* is undecided. The brown female had both sides of all the wings heavily marked with orange. Here I also took two specimens of *L. loewii*? the only ones I met.

(*To be concluded.*)

Notes on Bankesia conspurcatella, &c.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

On March 28th I took in the Val Varanno, near Pegli, a specimen of a *Bankesia* at rest. Close by on the same rock, I found a case, closely corresponding with those of *Bankesia staintoni*. After killing and setting the male specimen I was very vexed to breed from the case a female. I have no doubt the male had been attracted by the about to be disclosed female, since one other empty case was the only further trace of the species I could find by a careful, but not very prolonged, search. I was vexed, because I thus just missed by a trifle obtaining a pairing and the means of raising a number of the species. I afterwards found another case, but bred no moth, in the valley behind Volti. This might possibly not belong to the same species, having a more *Diplodoma*-like appearance. These specimens are interesting, as their habitat is almost exactly half-way between that of *B. vernella* at Cannes and of *B. conspurcatella* at Pratolino (near Florence), and further because the ♀ and case do not appear to be known of any of the forms except our *B. staintoni* and that from the Paris district which is also probably *B. staintoni*.

My specimen (♂) differs from *B. staintoni* in being very distinctly and crisply marked, and in having the inner fringe alternately dark and pale, and the outer pale. It is, indeed, extremely close, except in size to *B. alpestrella*. That it is not *B. alpestrella* I conclude from its size, date and habitat, and from the absence of any cases of *B. alpestrella* in the neighbourhood, new or old, which are always so conspicuous. The cases and ♀ are certainly of the *conspurcatella* group, and the presumption that the ♂ belongs to them is so strong as almost to amount to demonstration.

I may say that I myself regard all these species of the *conspurcatella* group (*vernella*, *staintoni*, *montanella*) as being local forms of one species rather than fully differentiated species, but whatever view we may take on this point does not diminish the interest of elucidating their differences.

The female specimen is very close indeed to *B. staintoni*. *Antennæ*: *B. staintoni* has 11 joints to the antennæ, of which, however, several are so fused that they may be described as 8 or 9. Unfortunately I have mounted my specimen so that the antennæ are not well exhibited, but it appears to have a joint or two less (*B. alpestrella* has a number more). *Legs*: The legs are slightly more slender than those of *B. staintoni*, but otherwise are identical, they have 3 joints to all tarsi (*B. alpestrella* has 5). *Scaling*: This is fairly well distributed, the scales are slightly longer and narrower than those of *B. staintoni*. *Rods of ovipositor*: These seem to be of the same length as those of *B. staintoni*, *viz.*, of last joint 1·6mm., of penultimate joint 1·05mm. It has an equally abundant supply of wool for distribution amongst the eggs.

Having weather at Cannes that admitted of little other work, I devoted a good deal of time to searching for cases of *B. vernella* during February and March. I utterly failed to find any trace of it, no sign of cases, young or old, full or empty. Those of *Luffia ferchaultella* and of *Meesia vinculella* occurred everywhere, and were often abundant. My experience thus differs much from that of Lord Walsingham, who says (*Ent. Record*, vol. xi., p. 258) that "the cases are very abundant in the foothills of the Esterels from Agay to La Napoule," *i.e.*, their whole coast line; I searched many points within these limits absolutely without success. Of course they are there somewhere, but their abundance did not come under my notice.

[Dr. Chapman has generously presented the specimens described above to Mus. Wlsm. [♂ (71979); ♀, pupa and case (71980); case (71981)], and has asked me to add a note on the species involved. It would be mere presumption on my part to attempt to criticise Dr. Chapman's note on the ♀, and I shall therefore confine my remarks to the ♂. I should regard this as nearer *vernella*, Cnst., than *staintoni*, Wlsm., or any other species known to me. It agrees with *vernella* in the impressed costa and spotted cilia, our specimens of *vernella* are not in good condition, but I should refer this specimen to *vernella* rather than to *staintoni*. Zeller's type of *conspurcatella* is worn, but a better specimen received from Schulz, and placed with it by Zeller, appears to belong to the same species. In the Hofmann collection is a specimen from Herrich-Schäffer's Coll. labelled 6/4 H.-S. and identified as *conspurcatella*—it does not appear to have been the original of Herrich-Schäffer's figure and the date shows that it was not one of Mann's original specimens—I should regard this as *staintoni*. *L. conspurcatella* is a larger species than *staintoni*, *vernella*, *constanti*, Wlsm., MS. (the narrow-winged Cannes form) or *montanella*; in the greater length of the ciliations of the antennæ it resembles *staintoni*, &c., but it appears to be intermediate between these species and *alpestrella*. The acquisition of good specimens of *conspurcatella* from the original locality will I think prove this to be a distinct species, certainly we have seen no specimens that we could put in the same series as Zeller's type of *conspurcatella*.—John Hartley Durrant.]

Reported Hybridity among the Sesiides.

By J. W. TUTT, F.E.S.

The Abbé de Joannis has (*Bull. Soc. Ent. Fr.*, 1901, p. 40) an interesting note entitled "Observations sur quelques espèces du genre *Sesia*." It is a summary of a paper by M. Delahaye published in the *Mémoires de la Société d'Agriculture, Sciences et Arts d'Angers*, and relates to certain observations on the habits of *Sesia ichneumoniformis*, *megillaeformis* and *chrysidiformis*, made in June and July last. The facts are related as follows: (1) Near Angers, in a locality where *Rumex acetosa* and *Genista tinctoria* grow, Delahaye has found *Sesia chrysidiformis* and *S. ichneumoniformis* in great numbers, the first appearance of the latter species being a little later than that of the former. (2) On July 11th a freshly-emerged ♀ was found, referable to *S. megillaeformis*. (This species was first described as distinct, then as a variety of *S. ichneumoniformis*, whilst quite lately there has been a reversion to the view that it is distinct.) (3) Other *S. megillaeformis* were later observed, all ♀ s, and ♂ s of *S. chrysidiformis* and of *S. ichneumoniformis* were attracted by them, and followed them eagerly, even with more insistence than they pursued their own females. Swarms of the males of both species flew around the freshly disclosed

♀ *S. megillaeformis*, and the ♂ s of *S. chrysidiformis* even followed a ♀ after it was pinned in a box, as well as being attracted by the net in which one had been. (4) The ♂ s of *S. ichneumoniformis* copulated regularly with ♀ *S. megillaeformis* (the fact was observed more than twenty times), whilst ♂ *S. chrysidiformis* was noticed to pair with the ♀ *S. megillaeformis* only twice. (5) *S. ichneumoniformis* ♂ and *S. chrysidiformis* ♀ were observed to attempt to pair on one occasion. These facts, coupled with the close resemblance in wing-colour and -shape to *S. ichneumoniformis*, and to *S. chrysidiformis* in its abdomen, have led Delahaye to suggest that *S. megillaeformis* is a natural hybrid between the two species. Certain points arise out of this for consideration: (1) Why did not Delahaye observe the pairing between ♂ *S. ichneumoniformis* and ♀ *S. chrysidiformis*, or the reverse, more than the single attempt (*S. chrysidiformis* ♀ and *S. ichneumoniformis* ♂), that he records (*loc. cit.*)? It appears that at least these crossings should have been noted as frequently as those of ♂ *S. chrysidiformis* or ♂ *S. ichneumoniformis* with ♀ *S. megillaeformis*. (2) Why did not the ♂ s of *S. chrysidiformis* pair with ♀ *S. megillaeformis* as frequently as did the ♂ s of *S. ichneumoniformis*? (3) Why is *S. megillaeformis* always ♀? Still more puzzling to deal with are the facts of distribution. *S. ichneumoniformis* covers Europe, Algeria, Asia Minor, Syria, Northern Asia. *S. chrysidiformis* is confined to western Europe. If *S. megillaeformis* be really a hybrid it can only exist on the ground common to both parent species; but *S. megillaeformis* is reported to occur in southern France, Bavaria, Saxony, Greece, the Urals, Altai, &c., in districts quite outside the range of at least one of the stated parent species. Another suggestion of course arises. Is the *megillaeformis* of Delahaye something entirely different from the *megillaeformis* of the Altai, Urals, Greece, &c.? It is, of course, quite beside the question, but we should like to know whether *Genista tinctoria* has hitherto been recorded as a food-plant of *S. ichneumoniformis*.

Notes on the distribution of the British Coleoptera.

By W. E. SHARP.

(*Continued from p.* 149).

In any consideration of the present distribution of our British coleoptera, one of the first points to arrest the attention of the enquirer will be that a careful distinction must be drawn between species whose presence here is strictly natural and those which owe their introduction either directly or indirectly to the agency of man; for it is obvious that any evidence of derivation which the latter can afford is quite useless to the present enquiry. Among our British beetles there are many such, but again we must distinguish. A species may be introduced in a non-natural way, *i.e.*, through human agency, whose general economy and environment are strictly natural, that is absolutely independent of human modification of natural conditions, or a species may have so altered its economy and relations to environment as to be quite dependent on such conditions, and, in fact, incapable even of continued existence apart from them. I believe that there are really very few instances of the first kind among the Insecta. I doubt whether there is a single well-authenticated case in coleoptera. No doubt there are many such *immigrants:* when we consider the enormous facilities which for several years past have existed for the transmission and diffusion of insect life in all its stages, the vast quantities of timber, corn, fruit, hay, dye-woods, esparto grass, and various other commodities which daily reach these shores from all the ends of the earth, as well as from just across the narrow seas, and the modern rapidity of their transit, it seems absolutely certain that the opportunity must be afforded to hundreds of species of establishing themselves here if they were capable of it. It seems, however, probable that the land connection between Britain and the continent existed sufficiently long to allow of every species which could do so, and whose range was sufficiently north-western, to extend themselves here, that the area was in fact peopled to the full extent of its capabilities before severance, and that there is now no room, especially since that area has been so greatly modified by human agencies, no possible interstice into which a newcomer can successfully thrust itself. No doubt, just as when the whole area was continental, a favourable season or succession of seasons might have enabled species to temporarily extend their range northward, so now such conditions may allow a species to gain a provisional foothold in these islands, but the average climatic conditions being adverse, such species are always doomed sooner or later to extirpation, and the result is that, although we continually meet with stray immigrants and even the descendants of such immigrants, still we are pretty safe in assuming that, with the doubtful exception of a few Longicornia or *Scolytidae* we have no coleoptera which, introduced by other than natural means, that is immigration long before the epoch of human civilisation, have permanently established themselves here. Thus I hold that when a new species of *Tachys*, *Trogophloeus*, or *Acupalpus*, is discovered, we have no right, simply because the species has not been recorded as British previously, or because its range seems remarkably restricted, to immediately assume it to be an "introduction," on the contrary, I believe that, however limited or discontinuous in range an insect may be, the fact that it is *established* at all is evidence that its presence is *not* due to human introduction, but that it is genuinely indigenous, and probably by reason of its limited range or small size previously overloooked. But, on the other hand, the case is quite different when we consider those numerous beetles whose economy has been entirely modified by their contact with *Homo sapiens*, which are quasi-domesticated, and follow mankind in all its wanderings as faithfully as the inquiline bee does its host. I refer to such species as those of the genera *Carpophilus*, *Nausibius*, *Tribolium*, *Blaps*, *Trigenogenius*, *Mezium*, and many others will readily occur to the coleopterist. Possibly the ancestors of such species may have lived at some time under strictly natural conditions, but it is also probable that some *Calandra* played havoc with the stores of millet of the Swiss lake dwellers, and that in the cave dwellings of the lost Dordogne some species of *Blaps* was the obscure companion of palæolithic man. However, as we may, I think, neglect accidental introductions in our list of established coleoptera living under natural conditions, so we must eliminate from our enquiry all those species which, although undoubtedly well-established, live under more or less non-natural conditions and depend for their continued existence on an environment caused by human agency.

There remains, of course, the great bulk of our fauna, these we must now consider a little more critically; and a very brief study of the physiological characteristics of these species will make clear to us that in this, as in all the other orders of Insecta, its members naturally fall into two more or less definitely separated groups, which we may call the adaptables and the non-adaptables, or if we prefer, the progressives and conservatives, that is species which are common everywhere, and species which are either generally rare or abundant only very locally; in other words, that there are a certain number of forms which have successfully solved the problem of the continual adjustment of themselves to an ever-changing environment, and those which, failing to do so, perish when their own particular environment ceases to be. Now, it must further be noted that this cleavage follows no distinct lines of phylogenetic affinity. In nearly every large genus we find a minority of adaptables, a majority of non-adaptables, a majority attached to the sandy wastes of the shore, to marshes, forests, heaths, and mosses, and when we replace our sandhills by docks and golf-links, drain our fens and mosses, cut down our forests, and cultivate our desert wildernesses, then the non-adaptables, the conservatives of the feral population of such places, pass to return no more; they are, in fact, incapable of the necessary adaptations. Hence it is that inasmuch as the physical characteristics of this country are continually changing, and that in an increasing ratio, the extinction of many of our rarer species is merely a matter of time. This process may not perhaps be very obvious among the coleoptera, but it is certainly noticeable among such a group as the diurnal lepidoptera, is in full progress among the birds, and has nearly completed itself among the mammals. The further problem of *why* one species of a genus—why for instance in *Nebria*, *N. brevicollis* should be everywhere one of our most abundant beetles, and the other three members of the genus strictly limited in distribution, or in *Cis*, why we should find *C. boleti* almost everywhere where grows sufficient *Boletus* to support it, and all the other species which apparently subsist on the same food and are nurtured under the same environment only rarely and sporadically—this is a problem which eludes our solution. Probably the causes of a disparity so striking depend on factors too complex or too subtle for our apprehension, for to say the fittest survive is only to restate the fact in other words, and not to explain it. However this may be, the point germane to the present enquiry is that these conservative species are the only ones which can be of any service in our endeavour to trace the derivation of any of them. The others, the species which have become *fit*, and are, therefore, common everywhere, are not the slightest guide to us in our search for the causes and methods of original distribution, their facility for adaptation being so great that whether they may have arrived early or late, from the north, south, east, or west, it comes to quite the same thing, that is, their present ubiquity and the complete obliteration of all their past proceedings. Having thus eliminated from our survey all such coleoptera as are not found apart from the habitations or operations of mankind, and all such indiscriminately abundant species as *Harpalus aeneus*, *Tachyporus hypnorum*, or *Agabus bipustulatus*, we still find we have abundant material for consideration. A further scrutiny, however, reveals the evidence of some of these witnesses as not absolutely admissible, for there are certain parasitic and semi-parasitic species attached to various hymenopterous hosts, as *Meloë*, *Metoecus*, and many species of *Staphylinidae*, and there are a few such as *Microglossa nidicola*, or *Leptinus testaceus* which hold similar relations with birds and mammals. The distribution of these, as well as of the still greater number of phytophagous species which are dependent on particular plants, can only be studied in relation to such special hosts and plants, and it is obvious that, to explain the presence of the beetles, we must first explain the presence of the hymenoptera, birds, mammals, and plants on which they depend, and whose travels they have doubtless accompanied.

(*To be continued.*)

Notes on Luffias—with incidental remarks on the phenomenon of parthenogenesis.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

(*Concluded from p.* 153.)

The Luffias have many other features to rouse our curiosity with regard to them ; perhaps the most important of those I have not yet touched on is their systematic position. This may be described by calling them the keystone uniting the Micro- and Macro-Psychids. We are indebted to Tutt for first fully appreciating this valuable conclusion as to their position. The Psychides have long suffered at the hands of systematists a violent separation of their higher and lower families. Hübner, Guénée, Bruand, and others in the past fully grasped the absurdity of this, but the separatists still go on their way unaffected. Nevertheless, it amuses one to note that they have rarely agreed as to where the line between them should be drawn. Heylaerts, for instance, placed the Fumeas and Epichnopteryges with the Macro-Psychids ; Meyrick puts them with the Micro-Psychids. Of course, it may be admitted that in a fairly continuous line it is a matter of taste where you make a division. Still, there is no doubt that Heylaerts' division is much the more agreeable to the position at which the most important evolutionary changes are found. Meyrick's superfamily *Psychina* is a most indefensible one, associating the higher Macro-Psychids with Cochlidids and Zeuzerids. If there is one thing that one cannot resist concluding from a study of the Psychids, it is that, from their lowest forms, somewhere about or perhaps below *Narycia*, the whole of them are one branch of the lepidoptera wholly unconnected with any other.

The lowest Neo-lepidopteron I am acquainted with is *Incurvaria*, though I believe *Crinopteryx* is a lower form. I have taken the larva of this, but never reared it. However this may be, we begin the Neo-lepidoptera with larvæ at first miners, and then, as they get older, casebearers. The tendency in the *Adelidae* was various, but in one direction, including the Adelas themselves, the tendency was to shorten the early mining life and lengthen that of casebearing. We may recognise, when this tendency became accomplished fact, that some forms stayed behind so far as this method of advance went, such as the Heliozelas and others that have a very Adelid habit, but are probably outside that group. Those that became purely and simply casebearers present two branches, which may be parallel, or one a derivation of the other. I think the latter more probable, the Tineid section seems to be the lowest; these formed cases that still consisted of an upper and lower valve like that of the Adelids; they tended to get away from ordinary green vegetable food, as we find in the large group of *Tineae*, that are clothes' moths, and live in dry or rotten material, dead wood, fungi, &c. The *Meessia* (*vinculella*) group of these, took to a method of life very like that of the lowest Psychids, *viz.*, lichens on rocks, &c., the cases of these have a lower small flat valve, and an upper one overlapping at the ends, and bulging out laterally and upwards. Such a form as *Narycia* cannot be very far from this and was probably derived from some similar form. As imagines they now present considerable differences, but both still retain the metallic scaling that so frequently occurs in the lowest families. As case-bearers, the Micro-Psychids have a three-sided case, not difficult perhaps to derive from a two-sided one, like *Meesia vinculella* where the upper valve is expanding. In some of them the three sides are in form only, but, in many, it is constructional, in that the case easily splits up into the three sections, and it would seem that the larva so splits it when it enlarges it, adding a strip to each valve separately, just as must be done by *M. vinculella* to the two valves of which its case consists. Whether *Narycia* and *Diplodoma* are entitled to be called Psychids, may be a matter of taste, but it is certain that they mark the beginning of the line of evolution that included all the Psychids and nothing else.

The branch of Psychids I have called the main line, first included the Solenobias and Taleporias already with apterous females, and with some characters still in common with *Tinea*. They followed *Narycia* in being lichen-feeders, or with a taste for animal *débris* like *Diplodoma*. I am myself inclined to confine *Taleporia* to *tubulosa* and its allies, having carnivorous propensities and a long hard case, nearly cylindrical except at its open end, placing Tutt's *Bankesia* with its lichen-feeding habit and short markedly triangular case with the Solenobiids. These genera are marked by the larvæ having trapezoidal tubercles normally placed, the pupæ have two dorsally placed terminal spines, and the imagines have simple antennæ and an areolar cell at the apex of the discoidal; these are clearly Micro-Psychids. The unquestionable Macro-Psychids have inverse trapezoidal larval tubercles; the pupæ have the terminal spines ventral, and the imagines have pectinated antennæ and no areolar cell.

The Luffiids (including *Bacotia sepium*) do not agree with either of these characterisations. They have the areolar cell like micros but pectinated antennæ like macros. They first show the macro character of the inverse trapezoidal tubercles of the larva, the ♂ pupa is a Micro-Psychid, the female a Macro-Psychid. The larvæ are lichen-feeders, like the Micros, but have round cases like the Macros. The cases are carried vertically to the surface on which the larvæ walk, and so the larvæ, if seen without their cases, carry their abdominal segments in the air, or at least away from the surface they are on. This is a character that affects the young larvæ of very many, if not all Macro-Psychids, but only here is it persistent through the whole larval life. The Macro-Psychid pupa-case of Luffiids is associated with the Macro-Psychid habit of leaving the pupa-case of the ♀ within the sac on emergence, and the eggs are laid in the pupa-case. Whilst calling, the female does not retain the ovipositor in the pupal shell, but there is a certain beginning of the process which we find in the Fumeas, of retaining the abdominal extremity in the mouth of the sac, doubtless as protection against the intrusion of enemies, but which leads on to the habit that has been acquired by the higher Psychids of the female never leaving the sac, though she leaves the pupa-case.

The whole matter comes to this, that without the Luffiids the macros could be divided from the micros by several characters, but with them it is really impossible. Taking various characters as correct grounds of division, the results would be very different, thus :—

	Female pupa-case. Trapezoidal tubercles. Pectinate antennæ. Round cases.	Male pupa-case. Areolar cell. Lichen-feeding habit.	? emergence from sac.	Loss of posterior tibial spurs.	Scaling of pectinations. Anterior tibial spurs.
Micro-Psychids.	Solenobiids	Solenobiids Luffiids	Solenobiids Luffiids Fumeids	Solenobiids Luffiids Fumeids Epichnopterygids	Solenobiids Luffiids Proutias* Epichnopterygids
Macro-Psychids.	Luffiids Fumeids Epichnopterygids Psychids	Fumeids Epichnopterygids Psychids	Epichnopterygids Psychids	Psychids	Fumeas* Psychids

This unity of the *Psychides* as one superfamily is by no means a new discovery, it was appreciated by Hübner, and fully understood by Guénée and Bruand half a century ago, but when we see a contrary view held by two such ambitious authors as Barrett and Meyrick, who hold front places as systematists of British insects, it is necessary to reiterate sound views, even if somewhat *ad nauseam*.

A consideration of the Lypusids, however, even the little I know of them, shows that the phylesis of the Psychids is not altogether so simple and direct, as we have been representing it. The Lypusids are, like the Luffias, Micro-Psychids in some respects, Macro-Psychids in others. This is outside our present subject, which I will thus conclude.

Since writing the above, I find that Weismann has published the result of certain researches†, proving clearly that the drone egg laid by the fertilised hive bee contains no ♂ element, *i.e.*, is parthenogenetic, and showing the natural deductions from field observations to be correct.

---

* The Proutias (*Proutiinae*) and Fumeas (*Fumeinae*) are united by Tutt (*Brit. Lep.*, ii., pp. 276 *et seq.*) to make up the family *Fumeidae*.

† A. Weismann, "Ueber die Parthenogenese der Bienen." *Anat. Anz.*, December 5th, 1900.

The Orthoptera of Iberia.*

By MALCOLM BURR, F.Z.S, F.L.S., F.E.S.

Bolivar's work has been appearing at intervals since July 1897,† in the *Annaes de Sciencias Naturaes de Porto.* As its title implies, it is a complete synoptical catalogue of the Orthoptera of the Iberian fauna ; full diagnostic tables are given, but not detailed descriptions of the species, except in the case of novelties, of which several are described. The author divides Orthoptera into three main groups, *Dermaptera*, *Dictyoptera*, and *Euorthoptera*. Probably everybody will agree with the separation of the earwigs, which form certainly a separate order, and are only classed with the Orthoptera at the present day for convenience sake, but the separation of the *Mantodea* and *Phasmatodea* will cause criticism. Bolivar unites the *Mantodea* with the *Blattodea* in the *Dictyoptera*. The points upon which he considers them to be so intimately related are the depressed cordiform head, the insertion of the front legs, the fact that in repose the elytra are superimposed in the greater part of the discoidal as well as the anal area, the pluriarticulate cerci, and the production of oothecæ. In his *Euorthoptera* the head is large and ovoid, the front legs are differently inserted, the elytra in repose only cover each other in the anal area, the cerci are non-articulate and true oothecæ are not deposited. There is a great deal of weight in these arguments, but the superficial resemblance of the *Mantodea* and *Phasmatodea* will disincline orthopterists to readily follow Bolivar's original arrangement. He further places the *Gryllodea* next to the *Acridiodea*, beginning with *Gryllotalpa*, which, as de Saussure and Zehnter have shown, possesses many analogies with the *Acridiodea*. Finally, *Locustodea* comes at the end of his system. There is another point upon which many authors will disagree with the writer, that is his adoption of subgenera‡ ; this is, however, a point of personal opinion. Dermaptera.—*Labidura riparia*, Pall. var. *affinis*, Guèr., is *L. riparia* subs. *virida*,§ Borm., var. *mixta*, Bol., is probably *L. riparia-riparia*, or *L. riparia-japonica*, (Haan), being two of the six subspecies into which de Bormans divides *Labidura riparia*, Pall. It is interesting to note *Forficula lesnei*, Fin., recorded from Madrid and Galicia. Bolivar considers that in Spain it is often confused with *F. pubescens*. The name *Apterygida*, Westw., is adopted at the expense of *Sphingolabis*, Borm. Blattodea.—*Ectobia panzeri*, Steph. var. *haeckeli*, Bol., is apparently the form *nigripes*, Steph., with which we are familiar in England. A

* *Catálogo Sinóptico de los Ortópteros de la Fauna Iberica*, par I, Bolivar, Coimbra, 1900.

† The last instalment was published in 1899, but the complete work is dated 1900.

‡ One must of course recognise that this is merely a matter of terms. As our knowledge of the affinities of the insects we study becomes greater, so the necessity for a terminology to express these affinities becomes urgent. For ourselves, and believing as we do that the genus should be the next highest grouping above species, we should call Bolivar's subgenera, genera, whilst his genera are really tribes, according to the more complicated terminology now of necessity used by the leading lepidopterists.

§ The use of the term subspecies is a much more serious matter, and it would seem that Bolivar is using this term identically with the term variety—a local race, whilst his term variety is synonymous with an aberration = a chance sport or form of variation occurring with other forms or with the type.

new variety of *Aphlebia sardea*, Serv., called *adpsersa*, is described. Mantodea.—It is this group which particularly indicates the peculiarity of the Spanish fauna. *Discothera tunetana*, Fin. and Bon., originally discovered in Tunis, has occurred in two localities in Spain, and the strange *Geomantis larroides*, Pantel, is peculiar. *Ameles* is divided into three subgenera, *Ameles*, *Parameles*, Sauss., and *Yersinia*, Sauss.; *Ameles abjecta*, Cyr., is restored against *A. spallanzania* of authors and *A. assoi* is restored to specific rank. Phasmatodea.—*Leptynia hispanica*, Bol. and *L. attenuata*, Pantel, are peculiar. Acridiodea.—No less than 103 species are included. *Acrida* (*Truxalis*, auctt.) is divided into *Acrida* properly so called, and *Acridella*, for *unguiculata*, Ramb. The large genus *Stenobothrus*, with its thirty Spanish species, is subdivided into *Stenobothrus*, *sensu stricto* (*lineatus*, Panz. *et affinia*), *Omocestus*, Bol. (*petraeus*, Bris, and *viridulus*, L. *et affinia*, and *antigai*, sp. n.), *Stauroderus*, Bol. (*morio*, Fabr., and *bicolor*, Charp. *et affinia*, and *cazurroi*, sp. n.), and *Chorthippus*, Fieb. (*parallelus*, Zett. *et affinia*). Instead of *Stethophyma*, we have *Arcyptera* Serv. restored (*fusca*, Pall., *tornosi*, Bol., and *flavicosta*, Fisch.), and *Ramburia*, Bol. (*hispanica*, Ramb.). Gryllodea.—A new subgenus *Pronemobius*, for *N. sylvestris* is erected. Surely, however, *N. sylvestris*, should be the type of the subgenus *Nemobius*, *sensu stricto*, and *heydeni*, Fisch., and *lineolatus*, Brulle, be placed in the new subgenus. *Liogryllus*, Sauss., is restored for *campestris*, L. and *bimaculatus*, de Geer. Of the difficult genus *Gryllodes*, Sauss., there are seven species, including *G. boscai* nov. *Gryllomorpha*, Fieb., is divided into Pantel's three subgenera, *Petaloptila*, *Discoptila and Gryllomorpha*, *sensu stricto*. Locustodea.—We are surprised to see the *Stenopelmatidae* and *Sagidae* represented by one species each only, namely *Dolichopoda palpata*, Duf., and *Saga serrata*, Fabr. The large and difficult genus *Ephippigera* is subdivided into four subgenera; these are *Ephippigera*, Latr. (*vitium*, Serv. *et affinia*, 11 sp.), *Uromenus*, Bol., for *durieui*, Bol., *Steropleurus*, Bol. (14 sp.), for *stali*, Bol., *andalusia*, Ramb., with their allies, including *catalaunica*, *asturiensis*, *nobrei*, spp. n., and finally *Callicrania*, subg. nov., for *ramburi*, Bol. and allies (4 sp.). In the *Phaneropteridae*, we have *Odontura* divided into *Odontura*, Ramb., and *Odonturella*, Bol. In the *Decticidae*, *Pterolepis cordubensis*, sp. n., *Scirtobaenus lusitanicus*, sp. n., and *Antaxius florezi*, sp. n., are described; *Olynthoscelis*, Fisch.-W., is restored for the familiar *Thamnotrizon*, Fisch., and finally, there are fourteen species of *Platycleis*. This closes a most useful and important synoptical catalogue of that subregion which, of all Europe, is the wealthiest in Orthoptera. Two hundred and eighty three species are included, with several varieties, and are distributed as follows: *Dermaptera* 17, *Blattodea* 15, *Mantodea* 12, *Phasmatodea* 4, *Acridiodea* 103, *Locustodea* 99 and *Gryllodea* 33.

COLEOPTERA.

Trimium brevicorne, Reich., from Chiddingfold.—On March 15th last I captured a specimen of this very local little beetle in moss from Chiddingfold. The only other British locality where it has been taken since the time of Stephens is Scarborough. It was taken in some numbers there some years ago by Messrs. Lawson and Wilkinson, and all the specimens in collections come from that source.—Horace Donisthorpe.

SCIENTIFIC NOTES AND OBSERVATIONS.

Names for Saturnian hybrids.—As I find, in dealing with the material relating to Saturniid hybrids, that many of the forms that I am summarising at length have no names, it becomes advisable, in order that the new names I am using may not be forestalled, to publish a list of those names that I have adopted. To these I add those already legitimised :

1. *Platysamia* hibr. *griffithsi* (=*Platysamia cecropia* ♂ × *gloveri* ♀).
2. *Platysamia* hibr. *watsoni* (=*Platysamia cecropia* ♂ × *ceanothi* ♀).
3. *Platysamia* hibr. *heyeri* (=*Platysamia ceanothi* ♂ × *cecropia* ♀).
4. *Platysamia* hibr. *americana* (=*Platysamia columbia* ♂ × *cecropia* ♀).
5. *Actias* hibr. *mortoni* (=*Actias luna* ♂ × *selene* ♀).
6. *Antheraea* hibr. *pernyyama*, Wailly (=*Antheraea pernyi* ♂ × *yamamai* ♀).
7. *Antheraea* hibr. *kirbyi* (=*Antheraea pernyi* ♂ × *roylei* ♀).
8. *Antheraea* hibr. *moorei* (=*Antheraea roylei* ♂ × *pernyi* ♀).
9. *Saturnia* hibr. *bornemanni*, Stdfss. (=*Saturnia pavonia* ♂ × *spini* ♀).
10. *Saturnia* hibr. *hybrida*, Ochs. (=*Saturnia spini* ♂ × *pavonia* ♀).
11. *Saturnia* hibr. *emiliae*, Stdfss. (=*Saturnia pavonia* ♂ × *pyri* ♀).
12. *Saturnia* hibr. *hybrida-media*, Staud. (=*Saturnia pyri* ♂ × *pavonia* ♀).
13. *Saturnia* hibr. *hybrida-major*, Ochs. (=*Saturnia spini* ♂ × *pyri* ♀).
14. *Saturnia* hibr. *schaufussi*, Stdfss. (=*Saturnia bornemanni* ♂ × *pavonia* ♀).
15. *Saturnia* hibr. *standfussi*, Wiskott (=*Saturnia emiliae* ♂ × *pavonia* ♀).
16. *Saturnia* hibr. *risii*, Stdfss. (=*Saturnia emiliae* ♂ × *pyri* ♀).
17. *Saturnia* hibr. *schlumbergeri*, Stdfss. (=*Saturnia bornemanni* ♂ × *pyri* ♀).
18. *Saturnia* hibr. *dixeyi* (=*Saturnia bornemanni* ♂ × *spini* ♀).
19. *Saturnia* hibr. *complexa* (=*Saturnia standfussi* ♂ × *pavonia* ♀).

If any other Saturnian hybrids have been reared to the imaginal stage, full references will be very acceptable, whether the form has been named or not.—J. W. Tutt.

Corrections in generic nomenclature.—A few errors or inconsistencies have crept into my work in the *Transactions of the City of London Entomological and Natural History Society*, Parts viii to x, and should, in the interests of accuracy, be corrected. The following names from Hübner's *Tentamen* must of course be accepted provisionally, until it has been definitely decided by lepidopterists to cast aside that "bone of contention." (1) Heteromorpha, type *caeruleocephala*, L. (2) Pseudoips, type *bicolorana*, Fuess. (3) Nycteola, type *undulanus*, Hb. (=*revayana*, Tr.). (4) Andria, type *rinula*, L. (5) Meigen's name Acrosema should supplant *Phalera* (for *bucephala*, L.), this latter being pre-occupied ; a few other changes, proposed by Professor Grote in *Ill. Wochensch. Ent.*, ii., pp. 388-90, can stand over, pending further investigation. (6) Hama, Barr., *nec* Stph., unfortunately cannot stand for *abjecta* and *sordida*, as they were not in the genus as first proposed in 1829 ; Westwood, in 1840, selected *basilinea*, Fb., as type of *Hama*, and he must be followed. Unfortunately also, I find none of the Hübnerian names are available for Mr. Barrett's genus, and I am afraid it will have to be re-named. I therefore propose *Eleemosia*, n.nom., with type *abjecta*, Hb. ; and I leave it to those of my classical friends who possess sufficient of the quality indicated, to favour me with an "emendation" in due course. (7) Orthosia, Ochs., as I have pointed out in a footnote (*Tr. City Lond. Ent. Soc.*, ix., p. 73), was restricted by Curtis to the Taeniocampid section through the citation of *instabilis* (*incerta*, Hfn.), as type. For Guénée's *Orthosia*, purified by the elimination of *Dyschorista*, Led., I therefore propose *Leptologia* n.nom., type *lota*, Cl. ; those who take an interest in etymology may please themselves as to whether they refer the origin of this name to the cavilling which has given rise to this article, or to that of the entomologists who oppose work of this kind. (8) ZENOBIA, Oken (*Lehr. Zool.*, p. 681, 1815), was a mixed genus, being proposed for *oo*, *delphinii*, and *retusa*; the two former having been made the types of good monotypical genera, it seems best to declare *retusa* to be the type of *Zenobia*. The generic synonymy of the last-named species is already in a state of confusion, and it will be little or no loss to have to resuscitate *Zenobia* for it. Not only has *Tethea*, Ochs., been variously applied by various authors, but Boisduval in 1829 (*Eur. Lep. Ind. Meth.*, p. 58) rejects it as pre-occupied by *Tethya* (Oken) "genus Polyporum." Should Boisduval's opinion not be maintained, I may point out that Samouelle in 1819 cites *retusa*, *subtusa* and *ridens* as types of *Tethea*, and that this restriction was certainly prior to Hübner's (to *duplaris* and *fluctuosa*); Stephens, following Samouelle, rightly rejected *ridens*, and retained *retusa* and *subtusa*. (9) *Amphipyra*, Ochs., should be used for *tragopogonis*, L., which Duponchel specified as its type; it can hardly be considered congeneric with *Pyrophila pyramidea*. (10). *C. cruciata*, Knoch, in my list, was of course a *lapsus* for *Heterogenea cruciata*: I did not for a moment mean to imply that I thought it congeneric with *Cochlidion limacodes*.—L. B. PROUT. *March* 11*th*, 1901.

RAPIDITY OF WING-GROWTH IN CYCLOPHORA (ZONOSOMA) PENDULARIA, CL.—On looking into a box containing some pupæ of the above-named species, at exactly 3.20 p.m. to-day (May 13th), I noticed a male in the very act of emerging from the pupa-case. I removed it into a glass-bottom box, and, on looking again at 3.28 p.m., I noticed that the wings were already nearing full growth; I then watched them closely and found that they attained their full size at 3.30 p.m., the tips, however, still very slightly curled outwards; at 3.32 p.m. these had completely straightened, and the wings were beginning to assume their final rigidity. I do not suppose this betokens abnormal rapidity of development for this species, and it certainly does not equal that of some Psychids (*cf.* Tutt, *Brit. Lep.*, ii., p. 331); but as there seem to be too few exact observations recorded on the subject, I think it desirable to publish this note.—IBID.

SHAPE OF GALLS, ETC.—Referring to Mr. Bignell's note (*anteà*, pp. 126-127), I may say that when writing on the formation of the gall (*anteà*, p. 20) I was thinking both of those of the *Tenthredinidae* and the *Cynipidae*. Of the galls formed by them, Cameron says: "In the *Tenthredinidae* the gall is already formed before the larva leaves the egg, while in the *Cynipidae* the birth of the larva is synchronous with the formation of the gall." I ought, therefore, to have written "How the mere oviposition in the leaf or bud *or the presence of the larva* should cause such a different growth in the different species is a great mystery"—not less I think in one case than in the other. I have put in italic the additional words.—(REV.) E. N. BLOOMFIELD, M.A., F.E.S., Guestling. *April* 26*th*, 1901.

THE ANTERIOR AND POSTERIOR LEGS OF INSECTS.—The writer of "Current Notes" in the *Entomologist's Record* for April, 1901, objects to my definition of the terms "anterior" and "posterior," in reference to the legs of insects. Does he not know that the comparative degree applies to the comparison of one thing against one other thing only, but that the superlative degree is a comparison against all others?

To speak of the anterior or fore-legs of a horse is quite correct, but to speak of the anterior or fore-legs of a millepede (or an insect? Ed.) is most vague. Does the writer contend that fore or anterior (Latin *anterior*) is the same as front (Latin *anticus*), and that posterior (Latin *posterior*) is the same as hind (Latin *posticus*)? The writer in his remarks causes confusion by speaking of fore-legs. What does he mean by that word? If he means front legs, why does he not say so? To me, fore-legs (*pedes anteriores*) and front legs (*pedes antici*) convey quite distinct meanings. Fore,* anterior, and posterior are grammatically comparative terms, which can compare with only one other thing, and not with more than one other thing. I most emphatically object to the statement that "Any usage of the terms anterior and posterior for the middle pair (of legs) is surely not science, nor has it any meaning as English." Those words convey a most distinct meaning to me as an Englishman, and they mean something quite distinct from "front" and "hind" when more than two of anything are being distinguished. Because careless writers have used the term "anterior" or "fore" when they meant "front," and "posterior" when they meant "hind" is no excuse for subsequent writers. I am not enunciating any new dogma, because Linné in 1758 was usually accurate, but as he dealt with all animated nature he sometimes incorrectly used in *Insecta* the terms which he had correctly employed in *Mammalia*. Nearly seventy years ago, in other orders than diptera, the accurate Haliday always differentiated these terms, while the inaccurate Walker muddled them. Lepidopterists may grammatically write about the anterior and posterior wings, because they are comparative terms, but if they and others choose to be more slovenly in their definitions of the legs than dipterists, so much the more credit to the dipterists!—G. H. Verrall, F.E.S., Sussex Lodge, Newmarket. [The front legs (*antici*) become more front (*anteriores*), by adding to them that which is behind them. The second pair of legs are also both anterior legs and posterior legs. Several similarly logical and lucid results follow from Mr. Verrall's definitions. Nevertheless, however absurd, logically and grammatically, any phraseology may be, it must be accepted, if it has that amount of authority behind it, which is involved in early, continuous, and general usage. Mr. Verrall definitely shows that no such authority exists. We have no space to go into detail of argument, but we may point out that *anticus* ("front") is itself a comparative term, whilst *anterior* means more in front than any other, unless you have just specified some other for comparison. "Anterior" as an English word is synonymous with "fore," and both with "front" as we now use it as an adjective. "Front" is a noun and of very doubtful authority as an adjective. As adjectives implying being in front we have only fore (or forward) and anterior, both having the meaning of Latin *anticus*. We have no English word derived from *anticus* to which anterior can be the comparative. Westwood calls the first legs, fore-legs, Sharp calls them indifferently, front and anterior. Stainton says anterior, middle and posterior. Scudder says fore-legs, &c. Various instances may be cited where *anticus* and *posticus* are used in Latin descriptions, translated into anterior and posterior in English. The English word anterior has not the meaning of the Latin *anterior*, but of the Latin

* Fore is not comparative, any more than hind is.—Ed.

anticus. *Pedes antici* = anterior legs, *Pedes anteriores* = anterior legs, an immediate source of endless confusion if *Pedes anteriores* means two pairs of legs. The English word "posterior" is in a precisely similar position.—Ed.]

VARIATION.

Hoporina croceago ab. latericolor, n.ab.—At the sale of Mr. Abbott's collection on March 26th last, I purchased lot 153, which, according to the catalogue, contained "two brown vars. of *H. croceago*." As a matter of fact, the lot contained three dark specimens, the darkest of which is a very striking insect, the whole of the forewings being suffused with a dull brick-red colour, the markings, however, being as in typical *H. croceago*, although the orbicular and reniform are practically obsolete; the hindwings are pale smoke-coloured. This is evidently the aberration mentioned in these words towards the end of Mr. Tutt's description of the species in his *British Noctuae and their Varieties*, vol. iii., p. 9: "The following note from Mr. W. E. Nicholson refers probably to this variety (*i.e.*, var. *fulvago*, Hb.): 'I have a single specimen of this species from north Wales, which is of a dull brick-red colour. It seems to be a constant form in north Wales (*in litt.*).' I have heard of such dark aberrations, but have no specimen in my collection." As my darkest specimen evidently corresponds with Mr. Nicholson's, but does not tally with Hübner's description of var. *fulvago*, I would propose for it the varietal name of *latericolor*. The other two dark specimens I bought at Mr. Abbott's sale are intermediate between ab. *latericolor* and the type, the ground colour of the forewings in both being of a dull dead orange, slightly suffused with fuscous—one much more so than the other. They are all three labelled "Wyre Forest, September, 1899." To make sure of the colour being original, I wrote to Mr. Abbott on the subject. He was good enough to reply as follows: "I bred about six of that dull copper-coloured form from a Wyre Forest brood. The insects were killed in cyanide, as they came out in a straggling manner, and I only kill in ammonia when I have large quantities. I was surprised at the form myself. I fancy I gave the others to Mr. Hodges." In conclusion, may I express a hope that entomologists possessing aberrations and varieties (of Noctuids) not included in Mr. Tutt's very interesting work will from time to time publish descriptions of them in your pages?"—(Rev.) Gilbert H. Raynor, M.A., Hazeleigh Rectory, Maldon, Essex. *April 13th*, 1901.

PRACTICAL HINTS.*

Field Work for June.

By J. W. TUTT, F.E.S.

1.—The larvæ of *Pyrameis cardui* are, in years when an immigration has taken place in May or early June, most abundant in their little globular homes of spun-together thistle leaves in late June and early July.

* Practical Hints for the Field Lepidopterist, recently published, contains 1,250 similar hints to these, distributed over every month in the year. Interleaved (for collector's own notes).—Ed.

2.—*Cupido minima* may often be found in hundreds in June sitting in rows of half-a-dozen or more on the grass stems on the outskirts of a wood (especially if on chalk) in the afternoon, they are also to be found sitting in the hot sun in great numbers at puddles if there be any in their immediate neighbourhood.

3.—A ♀ *Colias edusa* placed under a bell glass with a sod of white clover will lay plenty of eggs on the upper surface of the leaves; the eggs of a batch often hatch irregularly even when the whole is deposited within a few hours.

4.—The larvæ of *Zephyrus betulae* always sit on the underside of a leaf of sloe along the midrib, and are most difficult to see. I have never seen one move in the daytime in nature (Turner).

5.—The larvæ of *Gonepteryx rhamni* are sometimes very abundant from the beginning to the end of June on *Rhamnus frangula*. They should be searched for early as most of the larvæ appear to wander away to pupate.

6.—The larvæ of *Apamea ophiogramma* in confinement feed up readily in short stalks or pieces of the stem of their food-plant, and will pupate therein, emerging well at the end of June, if the pieces be not allowed to get too dry. We have kept them on a damp piece of blotting-paper in a tin box with satisfactory results.

7.—The imagines of *Moma orion* come to sugar during the first fortnight of June from about 9 p.m.-9.20 p.m., and settle with wings closed at the top of a sugar patch, looking remarkably like a piece of the green lichen that covers the tree.

8.—In June in some years the larvæ of *Asphalia ridens* are in great numbers on oaks all over the New Forest. Sleeving is perhaps the best way of rearing them, and if moss be placed in the sleeve they will spin up in it without the slightest trouble. The pupæ should never be removed from the cocoons, and it must not be forgotten that a large number of pupæ usually go over two or three winters.

9.—The first week in June is the time for *Clountha perspicillaris*, one of our rarest Noctuid moths (see *Ent. Rec.*, iii., pp. 159-160).

10.—The larvæ of *Taeniocampa miniosa* prefer the large juicy oak-galls to oak leaves. They grow to a large size when fed upon this food, and as the galls keep juicy longer than the leaves I find them very useful in satisfying the voracious appetites of the larvæ (Broughton).

11.—The first week in June is the best time to beat the larvæ of *Cosmia paleacea* (*fulvago*); they are in great abundance on oak and birch in some seasons in Sherwood Forest.

12.—The imagines of *Hecatera serena* are to be searched for in June on palings, tree-trunks, &c.; they also come to sugar and flowers at dusk, and are occasionally abundant at light.

13.—In June the oak-trees in the Monkswood section of Epping Forest should be beaten for larvæ of *Hylophila bicolorana*, they may often be found crawling over the oak-trunks when nearly full-fed. Also common in some years in the New Forest.

14.—The full-fed larvæ of *Leucoma salicis* always spin up in the leaves of the trees on which they have fed up, not on the trunk or on the ground except in very exceptional cases.

15.—The best way to obtain *Sesia sphegiformis* is to get on the ground between 7 a.m. and 8 a.m. and search the alder stems carefully, when you will find the pupæ protruding ready for emergence or the insects actually emerged. Care should be taken to keep a virgin ♀ for assembling, the virgin ♀ s do not call till nearly mid-day, and pairs *in cop.*, are almost always taken in the afternoon, sometimes as late as 5 p.m. (Hamm).

16.—The brown ova of *Trochilium bembeciforme* are laid on the underside of willow or sallow leaves in early June, generally near the mid-rib, one to five eggs on a leaf.

17.—The males of *Adscita geryon* fly in swarms among the long grass in the morning sun, the females are usually difficult to obtain, hiding low down on or near the ground; later in the day they affect the flowers of their district, resting helplessly thereon, and are easily boxed without the need of using a net.

18.—The true *Anthrocera trifolii* is well out in early June, in a variety of situations—meadows, chalkhills, &c. ; the imagines are rather small and frequently subject to modification in that the normal red spots of the forewings and the hindwings, are of a yellow colour. The cocoons are usually spun low down near the ground.

19.—During the first week of June the imagines of *Anthrocera hippocrepidis* (*stephensi*), intermediate in superficial appearance between *Anthrocera trifolii* and *A. filipendulae*, may be found in meadows and similar situations.

20.—The ♀ s of *Brephos parthenias* and *B. notha* lay freely in confinement, and eggs are readily obtained ; the larvæ feed up without trouble, but unless some rotten wood, cork, or similar substance be provided into which they can enter for pupation, the full-fed larvæ will perish miserably.

21.—The larvæ of *Amphidasys strataria* from the same brood will feed up at very different rates under identical conditions, some being quite full-fed by the beginning of June, others not till quite the end of the month or even later.

22.—The eggs of *Geometra vernaria* are laid in late June and early July, one on the other in little steeples of about ten or a dozen, on the stems of *Clematis*, each little batch looking like a leaf-petiole or tendril shortly broken off. The larva hatches in late July, stretches straight out from a leaf-stalk, and is easily beaten.

23.—The larvæ of *Boarmia cinctaria* will feed freely on sallow in June as well as on the usually accredited food-plants—*Erica tetralix* and *E. cinerea*.

24.—Whitethorn, blackthorn, and oak should be beaten in early June for larvæ of *Hemithea thymiaria* which spin up among the dried twigs of the food-plant, and produce such deeply-coloured imagines as are rarely taken wild in the imaginal state.

25.—The ♀ s of *Boarmia consortaria* will lay their eggs in June in a chip box, hiding them under the films of wood ; one can easily overlook the eggs, unless one looks carefully, when the green tint of the eggs often shows plainly through the thin layer of wood above them.

26.—On Midsummer day, 1892, I was able to secure some thirty examples of *Nemoria viridata*, which were knocked out from the furze in Guernsey, all in the finest possible condition (Hodges).

27.—At the end of June and in early July, stand in the wider rides of the southern woods to net the quickly flying zigzagging males of *Angerona prunaria:* they commence to fly at sunset and continue flying till after dusk. The ♀ s are to be beaten from the trees.

28.—In June the larvæ of *Cidaria silaceata* (second brood) feed up well and rapidly on *Circaea lutetiana* and *Epilobium montanum*; only part of the pupæ emerges in August, the remaining pupæ going over until the following May.

29.—The imagines of *Nascia cilialis* come freely to light in Wicken Fen from the third week of June onwards when they are usually to be taken on the front of the lamp glass, although some are to be boxed off the sheet.

30.—Honeycomb affected by larvæ of *Achroea grisella* should be isolated in early June, pupation taking place by the middle of the month among the destroyed cells, the imagines emerging by early July.

31.—The larvæ of *Peronea hastiana* occur in Wicken Fen almost continuously from June until September in rolled leaves of sallow, without any suggestion of a break to divide the appearances into separate broods.

NOTES ON COLLECTING, Etc.

Help wanted and offered.—Correspondence with a naturalist and educationalist desired.—Having been for many years interested in the study of lepidoptera, and having amassed a considerable collection, principally for educational purposes, I should be very glad to correspond with some British lepidopterists with a view to exchanging the butterflies and moths of the northern United States (especially of New England) for those of Britain. I am making this appeal not only in my own interests, but at the request of those of my pupils, who are also much interested in the study. We are particularly anxious that a teacher, or a natural history student interested in education, should co-operate with us; and as I have had considerable experience in this direction, I should be pleased to explain in detail the best mode of collecting, preserving, and forwarding specimens. I sincerely trust some educationalist, who is also a naturalist, will interest him- (or her-) self on our behalf.—Wilfred E. L. Todd, Principal, Valley Falls School, Worcester, Mass., U.S.A. *March 12th*, 1901.

Butterflies at Cannes.—This note fails by a very little to rival the oft-referred to chapter on "Snakes in Ireland." This season has been the coldest and most inclement known to the oldest visitor. December was all that could be desired, but since then fine days have been rare, warm ones almost unknown. In the latter half of February snow and ice were everywhere, and great masses of ice and huge icicles were frequent wherever there was a spray or trickle of water, and ice over an inch thick was often noticed in the Esterels. Even now (March 18th) it is milder, but very wet. On February 17th a newly-emerged *Pararge megaera* was seen, on the 24th a single white butterfly was on the wing. February 25th was the first day that was at all mild, but no butterfly was seen. On the 26th two *Pyrameis atalanta* and one other Vanessid were seen. On the 27th there was some sunshine, and one *Pieris daplidice*, one *Pararge megaera*, one *Chrysophanus phlaeas*, *Pieris rapae*, *P. napi*, *Polygonia egea*, and *Pyrameis atalanta* were seen on the wing near Pegomas. A blank again occurred till March 4th, when *Pararge megaera* and several *Pyrameis atalanta* were seen. March 5th was a tolerably fine day, but no butterflies were seen in any numbers, several *P. atalanta* and *P.*

megaera, and one *Colias edusa*, and Mr. Brabant observed a *Gonepteryx cleopatra*. Since then an odd *P. atalanta* or *P. megaera* or two, with an occasional *P. rapae* or *P. napi*, make up the tale. Last year was late, but not so bad as this, whilst four years ago *Anthocharis belia* was almost over at this date, and *Euchloë euphenoides*, *Thais medesicaste*, and *Erebia epistygne* were flying. The *Colias edusa* seen on March 5th interested me very much from its always selecting for settling some yellowish, sickly leaves of myrtle, that happened to be frequent along the roadside where I saw it. It did so at least half a dozen times along some hundred yards of road, and with frequent approach to and rejections of position that were not quite of the right tone. When settled, the underside of the butterfly agreed very closely with the leaves, and made it inconspicuous, so much so, that, on one occasion, when I had noted to within an inch or two where it had settled, I failed to find it, looking all about, and returning to the spot several times before I detected it, just where I had supposed it to be, the wings being at a favourable angle to produce a similar effect to that of the myrtle leaves, with their shadows and interspaces. On February 14th I noted a larva of *P. brassicae* suspended for pupation on a gate-post, and continued to see it until February 26th ; next time I looked for it some enemy had destroyed it, but it seemed quite healthy on the 26th. I felt rather annoyed not to have been able to watch it till it pupated. On the 15th I found a larva of *P. brassicae* wandering with a view to pupation ; kept in the house, this specimen was suspended on the 18th, and changed to pupa on the 27th. It is clear, therefore, that *P. brassicae* is here continuously-brooded, and is able to stand severe cold when suspended for pupation, but before changing, great delay in the process resulting, but without fatal result, except by prolongation of exposure to enemies in a very helpless stage. I met with a specimen of *Clerus formicarius* in the Esterels running over some pine logs. The bizarre markings and colourings of this little beetle suggest that they are of a warning character, and so they prove to be, but indirectly; I felt quite sure the creature was a *Mutilla*, both by its appearance and movements, and when it hid itself in a crevice of the bark I turned it out, with due precautions not to get stung. Not being a coleopterist, this fact was new to me. The larvæ of *Charaxes jasius* are now very scarce, though only half-grown, M. Constant tells me ; and the abundance of their silken carpets shows that in November they were much more common than usual. Besides the usual accidents that befall them, there is no doubt that the hard weather has made birds and other enemies more destructive, but, if several larvæ seen dead and black on their leaves are correctly interpreted by me, not a few have been directly killed by the frost. Nothwithstanding the cold, larvæ of *Luffia ferchaultella* are larger than usual, being already nearly fullgrown, they hide away in a warm, dry time, but come out in the wet, this is especially noticeable on walls with many crevices, especially dry stone walls. The reason of this is not only to avoid desiccation in their own persons, but, no doubt, also because the lichens on which they feed are not negotiable except when moist. This winter, therefore, they have had many more opportunities of feeding than usual.—T. A. Chapman, M.D., Hotel d'Europe, Cannes.

Lepidoptera in 1900 in the Southend district.—The following list of lepidoptera includes the more interesting of those taken or bred during the past season. *Eupithecia vulgata*, a pupa found under sallow bark, April 16th, yielded a moth, May 18th; *Malacosoma castrensis*, May 13th, a brood of larvæ found on carrot near Havengore; *Lithocolletis spinicolella*, May 14th, Southend; *Melanippe hastata*, May 20th-27th, a series bred from ova obtained at Eastwood, June 25th, 1899, showing considerable variation in size and shape of the broken black band which starts from the middle of the costa; *Ephippiphora pflugiana*, May 24th, Southend; *Nemeobius lucina*, May 27th, a solitary specimen at Eastwood; *Eupithecia assimilata*, May 31st-June 20th, a series bred from larva found on hops; *Spilosoma mendica*, emerged June 31st; *Penthina sororculana*, netted at Eastwood, June 9th; *Drepana falcataria*, netted at Eastwood, June 10th; *Sesia cynipiformis*, a series bred between June 11th-25th, a long-tailed parasite has been identified by Mr. Morley as *Macrocentrus marginatus*; *Dasycera oliviella*, June 11th, bred from larva found when searching for *Sesia cynipiformis* in oak stumps; *Nephopteryx rhenella*, June 12th, bred from poplars; *Choerocampa porcellus*, emerged June 13th-14th, larvæ on *Galium verum* at Benfleet, July 17th, 1899; *Teleia proximella* and *Eupithecia scabiosata*, emerged June 14th; *Laverna atrella*, emerged June 15th; *Earias chlorana*, emerged June 17th, larva on osier at Shoeburyness; *Argyrolepia subbaumanniana*, *Crambus sylvellus*, *Cochlidion limacodes*, June 17th, at Eastwood; *Antithesia salicella*, emerged June 21st; *Hypermoecia cruciana*, emerged June 22nd; *Elachista scirpi*, flying over and settling on reeds at Pitsea, June 23rd; *Bactra lanceolana*, a fine large form with broad pale costal streak, flying over reeds at Pitsea; *Grammesia trigrammica*, a variable series bred from ova, June 23rd; *Eupoecilia subroseana*, bred June 28th from goldenrod gathered at Eastwood in September; *Marasmarcha phaeodactyla*, larvæ, pupæ, and imagines among rest-harrow at Benfleet, July 1st; *C. gerronella*, one specimen only among rest-harrow at Benfleet; *Orthotaenia striana*, July 1st-11th, at Benfleet, two taken. I have at various times taken odd specimens of this species, but always ♂s. Wilkinson says (*Brit. Tortrices*, p. 263), "♀ is extremely rare in cabinets." *Hadena trifolii*, a long series bred between July 2nd-August 18th from larvæ found on *Suaeda maritima* at Great Wakering. The last to emerge in this long typical series happens to be an example of the ab. *indistincta* of *British Noctuae*, &c., vol. iii., p. 83. *Spilonota rosaecolana*, Southend, July 3rd; *Coleophora alcyonipennella*, Benfleet, July 3rd; *Catoptria microgrammana*, July 4th, between Leigh and Benfleet; *Butalis fuscocuprea*, swept near Hadleigh; *Elachista atricomella*, *Blabophanes ferruginella*, *Penthina sellana*, July 5th, at Benfleet; *P. inopella*, July 8th, bred from *Inula crithmoides* gathered near Havengore; *Catoptria citrana*, July 9th, rather common on the slopes near here, one specimen taken had not been able to disengage its head from the pupa-case; *Lomaspilis marginata*, bred, variable of course; *Homoeosoma binaevella*, emerged July 10th; *Melanargia galatea*, July 11th, a few ochreous ♀s near Leigh; *Coleophora nigricella*, emerged July 12th; *T. aurana*, July 15th, near Southend; *Eupithecia pumilata*, bred; *Eupoecilia hybridellana*, July 16th, near Shoeburyness; *Spilodes palealis*, a beautiful and variable series of 38 specimens between July 16th-August 16th, only one specimen shows a commencing submarginal blackish band near the apex of hindwings; *Sciaphila chrys-*

antheana, July 18th, bred from larvæ found on houndstongue; *Crambus culmellus*, July 20th, a very yellow specimen near Shoeburyness; *Ephippiphora inopiana*, July 4th, near Shoeburyness; *Lithocolletis corylifoliella*, emerged July 25th; *Conchylis francillonana*, emerged July 26th; *Eupithecia virgaureata*, from larvæ on golden-rod at Eastwood; *Depressaria ocellana*, July 29th, bred from sallow; *Catoptria aemulana*, July 30th, bred from golden-rod gathered at Eastwood; *Coleophora virgaureae*, August 3rd, bred from golden-rod gathered at Eastwood; *Eupithecia absynthiata*, bred from sea-aster; *Smerinthus ocellatus*, August 4th, larva near Shoeburyness; *Miana literosa* and *Œdematophorus lithodactylus*, sugared burdock near Shoeburyness; *Pterostoma palpina*, August 6th, larva on osiers near Shoeburyness; *Noctua rubi* and *N. plecta*, August 11th, on sugared *Eupatorium* near Shoeburyness; *Agrotis tritici* ab. *costacaerulea*, August 18th, on sugared *Eupatorium* near Shoeburyness; *Dianthoecia cucubali*, August 28th, on sugared *Eupatorium* near Shoeburyness: *Pyralis farinalis*, August 30th, on a shed near Shoeburyness. The above list includes the names of several species not previously reported from this district. —F. G. Whittle, 3, Marine Avenue, Southend. *December 6th*, 1900.

Lepidoptera at Sudbury, Suffolk and neighbourhood (Essex) during 1900.—The following notes which I made during last year's collecting may possibly be of some interest. Among the butterflies my first capture worth recording was a specimen of *Cyaniris argiolus* on April 21st. This species was very plentiful here during the early part of the summer, and it was also abundant in the Essex part of this district. The second brood, which was not nearly so numerous as the spring one, was out by July 21st, and they were still to be caught on August 15th, but were then much worn. This species is usually very scarce with us, and they were welcome captures. The abundance of the larvæ of *Vanessa io* is worth noting, as in many seasons they are hardly to be found here at all. In some places they were swarming on the nettles, but the imagines were not to be seen, later on, in any particular numbers. This makes the second consecutive season in which these larvæ have been unusually numerous. The larvæ of *Aglais urticae* were also most plentiful the whole summer, and were to be found in all stages of growth at the same time. In July *Enodia hyperanthus* was on the wing in large numbers in both the Suffolk and Essex parts of the district. I had two specimens of *Limenitis sibylla* brought to me which had been captured in a Suffolk wood a few miles distant. In the same place *Apatura iris* was also to be seen flying round the tops of the oak-trees, but unfortunately they defied all attempts at capture; but it is well to know that they occur here. As elsewhere, *Colias edusa* and *C. hyale* put in an appearance, but they were not very plentiful, and were extremely local, showing a partiality for some particular field or other; *C. hyale* was more in evidence than *C. edusa*. I do not know of any examples having appeared in this part of Essex. The season having been so backward, and the weather very unfavourable, I am unable to chronicle any work done at the sallows. At that time cold, strong winds were unpleasantly prevalent. At the beginning of June *Smerinthus ocellatus* was emerging in my breeding-cage. They made their appearance in the early morning, never later than 9.30. Later on the larvæ of this species were fairly abundant in both counties here feeding on sallow. On September 2nd I was much surprised to find that two well-developed (♂ and ♀) specimens had emerged in my breeding-cage. They were *in cop.* when I found them, and the female produced fertile ova on September 2nd and 3rd. These ova hatched on the 19th of the same month, but owing to the lateness of the season, I was unable to obtain any food on which to keep them alive. I do not recollect to have seen an autumnal emergence of this species previously recorded. *S. populi* was also fairly plentiful in the larval state, chiefly feeding on poplar, and only very rarely on some of the species of willow. I find that these moths emerge in the early morning, in fact, at the same time as *S. ocellatus*. The ova of this species are deposited singly, or in clusters of two and three, upon the underside of the leaves. I constantly found unhatched fertile ova at the same time as nearly full-grown larvæ. Several larvæ of *Acherontia atropos* were found towards the end of July. They were all from the Suffolk district. The larvæ of *Sphinx ligustri*, which are sometimes to be found here in plenty, were somewhat scarce this season. On July 25th I found two ova of this moth deposited singly on the underside of a leaf of privet; these hatched on the 29th of the same month. *Choerocampa elpenor* was rather common in the larval state, but they had to be diligently sought after. One of my larvæ, after pupating, remained a very short time in that state, and produced a fine female on September 15th. I believe that an autumnal emergence of this species is most unusual, and worth recording. The pupa was of a very pale colour, and I had placed it apart from the others, hoping that it might produce an aberration. This moth deposits its ova on the underside of a leaf of its food-plant. *Macroglossa stellatarum* was again this season a welcome visitor; but it did not occur in anything like the numbers it did the previous season. I found in all twenty larvæ, mostly feeding on *Galium verum* but a few on *Galium mollugo*. They commenced pupating on August 19th, and were emerging from October 1st to November 9th. One, however, is still in the pupa. It appears perfectly healthy and I hope that it may successfully hybernate. *Arctia caia* was, as is nearly always the case every season, plentiful, and the larvæ were to be found feeding on almost everything. I have found the ova deposited on willow, sallow and apple. They are placed on the underside of a leaf in large clusters, from 60 to 70 in number. Apple is a most unsatisfactory food-plant. A few seasons ago I reared some larvæ on it. Having found the ova on an apple leaf, I confined them to this diet and watched for results. They hatched on August 9th of that year and hybernated as small larvæ. The following spring they grew very slowly; a few were full-fed in the summer and pupated, but they nearly all produced dwarfed moths, one only measuring 1¾ins., and was of an exceptionally pale colour. A few of the larvæ were only about half-grown when twelve months old, and they hybernated for a second winter. Unfortunately, they died the next spring. *Leucoma salicis* was very scarce; it is, as a rule, somewhat plentiful with us where it occurs, but I know of only one locality in this part of Suffolk and not one in Essex. I was only able to obtain one larva of *Dasychira pudibunda* (Suffolk), a species which never appears to be very common with us. *Poecilocampa populi* occurred at the gas lamps in the autumn in fair numbers. Some larvæ of *Lachneis lanestris* were brought to me, but I was quite unable to ascertain in which county they were found. It does, however, occur sparingly in this part of Suffolk, for I had one larva given me the previous season which had been found here. *Lasiocampa quercûs* and *Cosmotriche potatoria* were to be found in some abundance in their usual habitats in both districts. On July 22nd I found three ova of *C. potatoria* placed quite close together on the stem of a species of dead nettle. They hatched on August 2nd. I observed that the young larvæ devoured about half the empty egg-shell as soon as they were hatched. *Eutricha quercifolia* occurred sparingly in both counties. On June 20th I found a cocoon of this moth. It was spun on a dead stalk of *Verbascum thapsus* about two or three inches above the ground. The plant was growing on a hedge-bank. The moth emerged the first week in July. Later on, when the foliage had fallen from the hedges, I found two more empty cocoons. They were spun on the branches of a short thick whitethorn hedge, and were placed about a foot above the ground and in the centre of the hedge, where it would have been quite impossible to discover them when the hedges were in leaf. After a heavy thunderstorm on July 27th, a specimen of this species came to light, and on August 25th, I found three ova of this insect (Suffolk). They were placed on the underside of a sallow leaf, quite close together. They hatched on August 29th, and fed up until they were about an inch in length, and then hybernated. I considered myself fortunate in obtaining two larvæ of *Saturnia pavonia* (*carpini*), the moth being by no means common with us. Two larvæ were found in Essex on July 31st, feeding respectively on blackthorn and whitethorn, and two in the Suffolk district on August 4th, feeding on blackthorn. These two latter commenced spinning their cocoons on August 14th and 15th. I only took one specimen of *Pericallia syringaria* on July 24th, and one of *Crocallis elinguaria* on August 3rd, both Suffolk captures. *Timandra amataria* was fairly abundant, and was still to be taken as late as September 22nd, but were then much worn. *Oporabia dilutata* was on the wing by November 3rd (Suffolk). I bred one specimen of *Dicranura furcula* from a larva which I took on sallow the previous autumn in the Essex district. It is rare with us. I also found some full-fed larvæ of *Dicranura vinula* August 11th (Suffolk). It is somewhat common with us, but it does not seem to be so plentiful in the Essex district. The larvæ of *Leiocampa dictaea* were fairly abundant on poplar here (Suffolk), and were full-fed by about October 5th. *Hydroecia nictitans* was to be taken at treacle during August (Suffolk). Some ova which were deposited August 28th and 29th, hatched September 9th. The larvæ of *Mamestra persicariae* were to be found feeding on various garden plants in the autumn, bnt not abundantly (Suffolk). A great prize was a fine example of *Triphaena fimbria* at my treacle on August 18th (Suffolk). It is quite a rarity with us. I bred rather a large number of *Hecatera chrysozona* from larvæ which I found here (Suffolk) feeding on the flowers of lettuce the previous season. *Polia flavocincta* was quite a regular visitor to my treacle from September 25th to October 11th, sometimes turning up in the bright moonlight. It is rather common in this part of Suffolk. One of the most plentiful moths with us is *Phlogophora meticulosa* occurring sometimes in great abundance. I took it from August 18th to November 20th, even the later caught examples having the appearance of freshly-emerged ones. The weather had been mild up to that date. There was quite a multitude of the larvæ of *Cucullia verbasci* in June and July, devouring the leaves of *Verbascum thapsus* in one of the Essex lanes here. They also occurred in the Suffolk part of the district on *Scrophularia aquatica*, but much more sparingly. I fear these larvæ are cannibals in confinement as I observed an otherwise unaccountable decrease in those that I took for the purpose of breeding. These larvæ are subject to the attacks of some species of parasite, but I have been unable to ascertain what it is. It oviposits externally, firmly attaching its ova to the skin of the larva; I counted ten which were scattered about the body of one larva. Unless the parasitical ova are detected there is no other indication that the larva is affected by them until full-grown, when it dies after spinning its cocoon and before attaining the pupal state. I took a few larvæ of *Plusia chrysitis* feeding on wild mint. The abundance of *Plusia gamma* is worthy of notice as it was plentiful in both districts here all through the season. A female which I caught deposited some ova on June 18th, which hatched June 23rd. The larvæ were full-fed and pupated July 16th, the moths emerged July 27th. It seems as if there were several broods during the season. Some ova of *Catocala nupta* which I obtained from a female the previous autumn hatched on June 10th. The larvæ were full-fed and pupated on July 23rd, and the imagines emerged August 18th. They emerged in the early morning. Among numerous captures at treacle (Suffolk), I think the following are worth mentioning *Noctua plecta*, *Noctua c-nigrum*, *Amphipyra pyramidea*, *A. tragopogonis*, *Naenia typica*, *Mania maura*, *Orthosia lota*, *Cerastis ligula* (*spadicea*), *Mellinia gilvago*, *M. circellaris*, *Miselia oxyacanthae* and *Catocala nupta*.—Edward Ransom, Sudbury, Suffolk. *March* 1901.

Larvæ of Aciptilia galactodactyla in late June.—I see in your "Practical Hints," *anteà* p. 129, that the larvæ of *Aciptilia galactodactyla* occur in May; last year I took some on June 27th at Bungay, Suffolk, which pupated, and the imagines emerged in due course.—W. G. Clutten, 10, Hallwell Street, Burnley. *April* 16*th*, 1901.

Brephos notha in Worcestershire, with some notes on the habits of the imagines.—Until April 18th I had done absolutely nothing except get two *Amphidasys strataria* on March 12th, whilst on the former date a visit to sallows produced *Taeniocampa gracilis* and *Anticlea badiata* and very little else. A visit to Worcestershire for *Brephos notha* from April 19th-24th was successful, and I obtained a good series, the weather being perfect for the work. Before 11 a.m. there was a large number on the ground, and they were easy to catch; after that hour, however, they got up in the trees, beginning to fly fairly freely at 2 p.m. (when the sun was hot), but very rapidly, and they were hard to catch. On Monday, the only cloudy day, they flew very freely when the sun was hidden, ceasing immediately during the short hot intervals of sunshine. I believe *B. notha* is an insect "scheduled" as one to be very sparingly taken by the "protection committee." I think "Aunty" cannot have had much practical experience in taking *B. notha*, or she would not have put it in the list. I have only seen it in two large woods where aspens were numerous and high; practically none but stragglers would be caught and then only in the rides. One can of course get a good number in a week's work, but certainly not more than 25 per cent. of those seen, and I imagine one does not see 10 per cent. of the total number of the individuals in the wood.—F. C. WOODFORDE, Market Drayton, Salop. *April 25th*, 1901.

CURRENT NOTES.

In the *Bull. Soc. Ent. France*, 1901, p. 79, fig. 4, Gadeau de Kerville publishes an article entitled, "L'Accouplement des Lépidoptères," and gives a figure of the pairing of *Psyche atra**, and writes (p. 78): "Les Psychidés ont un mode d'accouplement particulier. La majorité des femelles des espèces de cette famille ne sortent pas de leur fourreau pour s'accoupler. Après, s'y être retournées, elles en fendent l'extrémité postérieure et présentent à cet orifice le bout de leur abdomen. Le mâle, en battant des ailes, se pose sur le fourreau et, pour le coït, introduit par l'ouverture son abdomen, jusqu'à la base de ses ailes postérieures." The only raison d'être of an article on a detail of habit is surely to present accurate views derived from actual observation. Is M. Gadeau de Kerville prepared to assert that any ♀ Psychid (1) turns itself round before or after breaking open the extremity of the case and (2) presents the end of its abdomen at this opening? The pairing of the true Psychids is very well known, and has been more than once accurately described and figured, so that even as a matter of common knowledge it is quite time that erroneous statements should be eliminated from elementary papers, especially when published in the bulletins of learned societies.

We would call the attention of our readers to the notice, under the head of "Societies," relating to the Sixth Annual Congress of the South Eastern Union of Scientific Societies. For a sum of 2s. 6d. (members) or 3s. 6d. (associates) any lady or gentleman interested in scientific pursuits can spend June 6th, 7th, and 8th with kindred spirits, investigate the charming district of Haslemere and Hindhead, and partake of the hospitality of the scientists and naturalists of the Surrey paradise. We hope to meet many entomologists at the congress this year. With Mr. Merrifield, Vice-President, Messrs. R. Adkin and J. W. Tutt on the Council, and Mr. Oswald Latter reading a paper, entomologists should show up well. Perhaps some who cannot attend on Thursday and Friday can run down on Saturday for the afternoon outing.

After some little delay *Practical Hints for the Field Lepidopterist* has been published. There are some 1,250 "hints," dealing with all the superfamilies of the lepidoptera found in Great Britain. Only about one-half of them have been previously published in the *Entomologist's Record*, the others having been written and collected specially for the book. It will no doubt save lepidopterists an enormous amount of time and trouble.

---

* One cannot tell from the figure whether the species is *Ptilocephala atra*, Linn. (=*plumifera*, Ochs.), or *P. angustella*, H.-Sch. (=*atra*, Esp.).

ERRATA.—We have to apologise for the following careless errors in our last number. Page 151, line 18, for "veritable" read "viable"; page 167, lines 21-22, for "roots of *Lasius nigra*" read "nests of *Lasius niger*"; page 168, line 13, for "*Sanidae*" read "*Ianidae*"; page 168, line 37, for "1901" read "1900."

The food-plants of Phorodesma smaragdaria, Fab.

By (Rev.) C. R. N. BURROWS.

In my paper upon this insect, read at the meeting of the City of London Entomological Society on April 17th, 1900, and published in the *Entomologist's Record*, vol. xii., nos. 5, 6, and 7, I made some remarks and noted some experiments as to the food-plants of the larva, which I acknowledge, with some shame, call for further explanation. I then stated that I did not believe the record of Herr G. Koch that the larva had been found feeding upon *Achillea millefolium* in the town woods of Frankfort-on-the-Main, and further, that when the larvæ had been twice publicly exhibited in London feeding upon the same plant, I fancied this had been done from motives of policy rather than as a demonstration of fact. I then proceeded to state that I had fed the larva upon (besides its English food-plant, *Artemisia maritima*) southernwood and *Artemisia absinthium*, while *A. vulgaris* (mugwort) was rejected. In a later note (*Entomologist's Record*, vol. xii., no. 7) I recorded some further experiments, the result of which went to prove that *Tanacetum vulgare* (tansy) and *Santolina chamoecyparissus* (French lavender) were acceptable foods, while *Achillea millefolium*, and many more somewhat similar plants, were rejected. It is a remarkable thing that the well-fed larvæ, from May 8th under my close observation, actually died rather than finish their growth when confined to *Achillea millefolium*. It has been said that "wise men sometimes make mistakes, fools never." This is a comfort to me. I was resolved to thresh the matter out, so, when ova hatched on July 5th, 1900, I isolated, in bags out of doors, twelve freshly hatched larvæ upon *Achillea millefolium*, twelve upon *Tanacetum vulgare*, and twelve upon *Santolina*. The result was as follows: Of the twelve upon *A. millefolium*, two fed up rapidly, pupated, and produced two males at the beginning of September. The rest hybernated, and, on examining the bag on April 16th, I found nine healthy and active survivors. So much for the food-plant which I found before was not acceptable and incapable of saving the larvæ from death by starvation. Of the twelve upon *Tanacetum vulgare*, I found, on examining the bag, but six survivors, also healthy and active. Of the twelve upon *Santolina*, I found only dead and shrunken bodies. It is evident that the larvæ had fed and lived until hybernation, for they had grown, and, further, spun themselves down for the winter. But they certainly had not thriven, for they were not half the size of the other survivors—probably not past the second skin. So far then as my investigations go, we may safely conclude that *P. smaragdaria* may well be an inland insect, and that it is not confined to *Artemisia maritima* for food, but that it will feed from the egg upon southernwood, wormwood, tansy, and yarrow, and thrive thereupon. Probably many more food-plants will be found.* I am only concerned to make amends for my error of observation. How it is that larvæ will take to a fresh food-plant when

* We should be glad to know whether the larvæ of this species will feed on *Gnaphalium*. If any of our readers have the chance the experiment might be made. We found the species (imagines) high up (above 5,000ft. elevation) in the Dauphiné Alps, near La Grave, among what we suspect was a bushy species of *Gnaphalium*, and very abundant by the roadsides in this district.—Ed.

just hatched, which they obviously reject when middle-aged, I cannot explain, but such really seems to be a fact.

The partial double-broodedness of *P. smaragdaria* seems to be now an established fact. I reared several imagines, sleeved out of doors, on *A. absinthium*, in August, 1899 ; two males on *Achillea millefolium* in early September, 1900 ; and I find a note by Mr. H. J. Turner that a larva taken by himself on August 31st, 1895, produced an imago (a male) on October 10th of the same year (*Entomologist's Record*, vol. vii., p. 82).

Migration and Dispersal of Insects: Lepidoptera.

By J. W. TUTT, F.E.S.

The migration of the Callidryads is not confined to eastern lands. In America they are still the most prominent of the migrating species, and Scudder observes that they show a distinct propensity for congregating together, even when not acting under a migratory influence. Commenting on this Marchwood says that he has seen quite a hundred specimens of Pierid butterflies within the diameter of twelve inches. Lindley saw in Brazil, in March, 1803, an immense flight of white and yellow butterflies which continued to pass for many days successively in a south-easterly direction, whilst Werneburg says that at Venezuela, on one occasion, in June or July, "a throng of different species of *Callidryades* moved in a northerly direction out to sea for many days together, between 11 a.m. and 2 p.m." Spence records the passage "of a vast multitude of butterflies of common white and orange-yellow species flying to the S.S.E. across the Amazon at right angles to the wind," in November, 1849. He further states (*Journal Linn. Soc., Zool.*, ix., pp. 355-357) that, in South America, the direction of the migrating swarms is mainly south, and he considers them to be largely due to the exhaustion of the food-supply in seasons when the insects are, by rain and other favouring circumstances, produced in certain districts in unwonted abundance. Willet states (*Canadian Entomologist*, xii., p. 40) that at Macon, Georgia, he saw "*Callidryas eubule* passing in great numbers during September, October, and November, 1878, from north-west to south-east. About noon, when they were most abundant, there would be half-a-dozen visible all the time crossing a 15-acre square of the city. They pursued an undeviating course, flying over and not around houses and other obstructions. They flew near the ground and stopped occasionally to sip at conspicuous flowers. Papers in southern Georgia noticed the great numbers passing at different points, and a friend in southern Alabama sent specimens of the same, saying that they were subjects of speculation there. About March, 1879, there was a similar migration from S.E. to N.W., but in diminished numbers." He further states that he saw the autumnal migrations again in October and November, 1879, but in smaller numbers than in 1878. He also notes that a lady of S. Georgia informed him that her husband called her attention to the autumnal migration twenty-six years ago, and that she had observed it every year since. Gibber writes from Charleston (*loc. cit.*, xii., p. 60) : "In the course of the last two or three years several accounts have appeared in *Nature* of flights of lepidoptera in large numbers. . . . . In the summer (August) of 1870 I was crossing the harbour of this city by the 3 p.m. trip of the steam-packet boat between the city and Moultrieville, on Sullivan's Island, at the entrance of the harbour, a summer resort of the inhabitants of our city. The distance is between four and five miles, and when about half-way, or perhaps two-thirds, the steamer passed through an immense stream of butterflies crossing the harbour towards the south-west. They were all of the genus *Callidryas*. The wind was light, and from the rapid motion of the vessel it was difficult to say whether the insects were aided or opposed by it in their transit. As the vessel passed obliquely through the stream their rate of motion could not be determined, and the dimensions of the stream only roughly estimated; it seemed to be six or eight yards wide, about as many high, and extended a hundred yards or more on each side of the vessel. Whence they came or whither they went could not be ascertained; they seemed to be crossing the harbour in a direction nearly parallel to the general trend of the coast." Hamilton writes from the New Jersey coast (*loc. cit.*, xvii., p. 204), some distance further south: "Specimens were observed on the wing nearly every day along the margin of the ocean, flying apparently at the height of fifteen or twenty feet, and about the same distance from the shore, so that their capture could not be effected, though I took a crippled one, and thus ascertained the species. All appeared to be southward bound, flying steadily but slowly"; whilst Clark observes (*Rand. Notes Nat. Hist.*, i., p. 8) that, in 1869 or 1870, at Narragansett Pier, the northernmost point at which *C. eubule* has been found, this species "was swarming about the brilliant cardinal flowers, which grew in abundance, and that their numbers were constantly augmented by new arrivals, which all appeared to come from the south. Most of the specimens were considerably mutilated, and appeared to have been on the wing for a considerable time; some two dozen fair specimens, however, were obtained, and some nearly perfect. They were common about the place for several days, and then gradually disappeared." Scudder observes that this butterfly is very abundant in the southern United States, and extends northwards into the more northern states, and goes so far as to say that its occurrence in the latter is probably entirely due to annual migration. The migrating flocks seen in the southern states are autumnal, and are apparently always in a southerly direction. Davis reports (*Insect Life*, iii., pp. 335-6) that, in early September, 1890, *Callidryas eubule* was flying over the Fayette district of Alabama in millions, from a north-westerly direction, and taking a south-easterly course. When they came to trees or houses they rose gradually and flew over them, and they rested but for a short time on leaves and flowers, and then hastened onward. Writing of the Callidryads observed in the neighbourhood of Obydos, on the Lower Amazons, Bates observes (*Naturalist on the Amazons*, p. 131): "These *Callidryades* seem to be migratory insects, and have large powers of dissemination. During the last two days of our voyage the great numbers constantly passing over the river attracted the attention of every one on board. They all crossed in one direction, namely, from north to south, and the processions were uninterrupted from an early hour in the morning until sunset. The migrating hordes, as far as I could ascertain, are composed only of males, and on this account I do not believe their wanderings extend very far."

Records of the migration of African butterflies are very rare, and such as there are, appear to be referable to the movements of the Callidryads. Anderson records that, in south-western Africa, for two consecutive days, such immense myriads of lemon-coloured butterflies were encountered by him that the sound caused by their wings was such as to resemble the distant murmuring of waves on the sea-shore. They always passed in the direction that the wind blew, and as numbers were constantly alighting on the flowers, their appearance at such times was not unlike the "falling of leaves before a gentle autumnal breeze." Kenrick states (*Entom.*, xxxii., p. 288) that he came across a swarm of a species of *Callidryas* on the borders of the Transvaal a few years ago. The insects formed a stream about a mile wide, and were slowly moving on, those in the rear flying forward to the front, this movement being continued. He says that the species of this genus are difficult to collect, owing to their speed ; it was almost impossible to follow them, and the only way to get them was to find the flowers they frequented and wait for them. Trimen notes (*Trans. Ent. Soc. Lond.*, 1870, p. 383) that Colonel Bowker witnessed, in March, 1869, an immense flight of *Callidryas florella*, all steadily moving on eastward across the Maluti mountains in Basutoland ; in this swarm both sexes were represented, the ♀s being easily recognised by being mostly yellow instead of greenish-white. Describing this flight, Bowker says, "During my trip to No-Man's-Land in March, 1869, I crossed the Maluti mountains at two different points going and returning; and throughout the journey, whenever there was a gleam of sunshine between the prevalent showers, the exodus of *Callidryas florella* and *rhadia* continued in one uninterrupted stream. These butterflies were to be seen in countless numbers, from the deepest and darkest valleys through which the Orange River forced its way, up to the highest peaks, 10,000 feet above the sea, and all were steadily moving on eastward. Sometimes one of them would stop and take a sip from a tempting gladiolus, or even turn back a few yards for that purpose ; but it would be only for a minute, and then off it would hurry again as if fearful of being left behind by its comrades." Bowker further mentioned that he had seen similar gatherings both in the Cape Colony and in the Trans-Keian country. As regards these appearances in Trans-Kei (Kaffraria proper), Bowker noted in March, 1883, that *C. florella* suddenly appeared in thousands, but became rare by the end of April. Barber, in 1881, observed an extraordinary abundance of this species in Griqualand West. The larvæ were observed in thousands on *Cassia arachnoïdes*, a very abundant plant there. They stripped it entirely of leaves, and then devoured the young shoots, and even the bark of the stems. In March or April the butterflies appeared in myriads. The case is instructive as indicating how the migration, in force, of species of this genus, is most probably occasioned by their having, as larvæ, exhausted the supply of their proper food-plant in a tract where circumstances had favoured their excessive multiplication. Trimen points out (*loc. cit.*, p. 32) that when "both sexes are represented in the swarms, it cannot be doubted that these multitudinous invasions of fresh territory must considerably widen the area occupied by the species, and it seems probable that the world-wide prevalence of the *Pierinae*, and the immense range of such genera as *Callidryas* and *Colias* have been largely aided by both the ordinary and extraordinary travelling tendencies of these butterflies. It may be added that when (as seems not seldom to be the case) these vast flocks wing their way out to sea, although, as a rule, destruction must sooner or later overtake them all, yet occasional stragglers of such powerful flyers may occasionally reach oceanic islands and possibly succeed in establishing their species there." Trimen further notes that he saw *Pyrameis cardui* fly on board a vessel 90 miles to the west of Teneriffe, and after a short rest start off westward again, and, on another occasion, 195 miles west of Sierra Leone, he captured (among other insects that flew on board the steamer "Norseman") ten species of butterflies belonging to the subfamily *Satyrinae*; this was the more remarkable as the butterflies were slow-flying, shade-frequenting species of *Melanitis* and *Mycalesis*, which haunt dense woods and thickets and avoid the open sunshine altogether. The wind on this occasion, though from the eastward, was not at all strong; the time was noon.

A marvellous flight of *Terias* (*Eurema*) *lisa*, that evidently had its origin in America, is recorded (*Psyche*, 1875, p. 121) as occurring in 1874, when, early on the morning of October 1st, several people living on the northern side of the main island of Bermuda, perceived what they thought to be a cloud coming from the north-west. This proved, however, to be an immense flight of the small yellow butterfly, *Eurema lisa*, which, on reaching the shore, divided into two parts, the insects in which spread over the island, flitting about all the open grassy patches and cultivated grounds in a lazy manner, as if fatigued after their long voyage over the deep, whilst the fishermen who were out very early that morning near the reefs, some few miles to the north of the islands, reported that their boats were literally covered with the butterflies. The nearest point of land is Cape Hatteras, in North Carolina, roughly about 600 miles distant. The insect is not one with especially strong powers of flight, and allowing that the flight came from the nearest land point the shortest possible way, at a rate of 12 miles per hour, it would only cover 288 miles in 24 hours. So that at this rate it would take 50 hours continuous flight to cover the journey.

Scudder records that Mr. W. Hill, of Albany, who spent the month of April, 1894, on the Indian River, Florida, wrote to him concerning the movements of *Pieris* (*Ascia*) *monuste* as follows: "During the last ten days of my stay there, I observed that *Pieris monuste* seemed impelled to move southward. At first there were but few of them to be seen, but their numbers steadily increased until at the end of ten days, when the time came for me to take my departure, many hundreds could be seen at any one time during the day, when not stopping momentarily at some bed of flowers, moving in one direction. If obstruction were encountered these butterflies flew over or around it and then went on in the same southerly direction."

Notes on the distribution of the British Coleoptera.

By W. E. SHARP.

(*Continued from p.* 178).

Having eliminated from our consideration of the British coleoptera the exceptions which we have already discussed—species equally abundant everywhere, those introduced by man, and such as may be treated as quasi-parasitical—there still remains to be dealt with the vast majority of our beetle fauna, and one of the first points which will strike the student of their distribution is its general discontinuity. Many of them no doubt occur wherever a suitable environment exists, as we find *Philopedon geminatus* on all the coast sandhills of the kingdom, and may be always sure of the association of *Strophosomus limbatus* and *Erica* wherever the latter may occur; but the majority we discover in more isolated detachments, the environment may be there and the appropriate beetle absent, and this segregation may occur quite within the limit of range of the species.

Now discontinuity of this kind, but perhaps on a larger scale and over a wider area, has been held by eminent authority as an indication of extreme antiquity of residence. In the cases under consideration, however, I think we shall be justified in rather attributing it to the changes which the environment itself has undergone, and that comparatively recently. The Great Britain of a thousand years ago was a very different land from that which we see to-day; easterly a vast area of fen and marsh land, the midlands continuous forest, the south primæval open downs and heaths, north and west moors and mountains; such was the general aspect of Saxon England. Now consider the advent of a more extended agriculture, an ever-increasing rural population, the arable area round the scattered settlements continually growing as these settlements grew into villages, and villages into towns, the plough invading the pasture lands, and the pasture lands ever encroaching on forest and marsh. The effect of all this would be the gradual isolation of such of the fauna as clung tenaciously to the environment of the wilderness, the, I think, probable extermination of some species which once had a place in our fauna—and the diminution of all of them—so that now we find in such a vestige of the primitive world as Askham bog, lingering remnants of a fen fauna which was once perhaps continuous from Yorkshire to the Wash, and on Cannock Chase and in Delamere forest the last outposts of species such as *Miscodera arctica* and *Hydroporus incognitus*, which once peopled every heathery eminence or mossy hollow between those localities and the mountains of Wales and the moors of Devonshire. Thus it was I believe that lines of communication were cut, not by any natural process but through the agency of man, and what was once an army of occupation is now reduced to isolated and discontinuous garrisons in mutually remote but favourable spots.

But apart from this obvious discontinuity of distribution we cannot fail to discern a larger grouping of species within approximately definite limits of range, and as we study the subject a little more closely, three, possibly four, separate groups begin to emerge which are assignable to distinct areas, and which, although their limits are not always quite clear, at any rate to our present very incomplete knowledge, still seem to represent separate homogeneities and to have possibly distinct histories and derivations.

Taking these groups in the order which we may provisionally consider as representing to some extent that of their appearance, we have: (1) A number of species inhabiting more especially the mountains, moors and highlands of the north and north-west. They form the most distinctive fauna of the north and west of Scotland and Ireland, are well represented in the north of England and the highlands of Wales. Many of them, however, are entirely absent from

England, but a few appear as isolated detachments in suitable localities as far east as Surrey and south as Devonshire. (2) We have a large assemblage comprising, in fact, the bulk of our species, which forms an area of greatest density in the south-east, gradually thins out west and northward, till the species become generally rare, and are in many cases entirely absent from Scotland and Ireland. (3) The third group is, perhaps, more difficult to define, and its members cannot always be disentangled from those of the second division. I should comprise in it all those species whose distribution is *exclusively* southern and south-eastern, and it is often marked even in the limited area of its range by extreme discontinuity and specific rarity. (4) We have a small assemblage of species which either occur only in Ireland, but are not there restricted to the north, or which occur in England, only, or in greatest abundance, in the extreme south-west, and with this group I should feel inclined to associate a few species which inhabit only or principally the shores of the Bristol Channel.

Now, as already stated, we are by no means able from the very slight, incomplete, and sometimes even erroneous data which we possess, to go through the list of our British coleoptera and assign, even with the exceptions previously noted, every species to one or other of these groups. They are at least more or less approximate generalisations, and to enumerate the species which we can so assign would be superfluous to the coleopterist reader, and tedious to any other. We may, however, consider these four groups a little more in detail.

Our first has been called the Arctic, Glacial or Celtic element in our fauna, all terms which to some extent beg the question, perhaps the Celtic is the better name, if we can eliminate any connotation with the Celtic race ethnographically considered. Now the distinctive points about this group are, that its area of maximum density is in the north-west, that none of its members occur in England or Wales which do not occur in Scotland or Ireland, or both, but that several species are found in the latter, which certainly have not yet been discovered in England or Wales, although environments in every respect suitable may exist there. The group outside these islands extends over the whole of northern Europe and the coleopterous fauna of Faroe, Iceland, and Greenland, as far as it is known, is represented in it. The question then arises whence was this element, distinct, homogeneous, and separate as it is in our fauna, derived ?

If we assume the destruction of all life during the glacial period, or a total submergence of these islands since or during that period, this derivation could only have been from the south or east, for if *ex hypothesi* Glacial conditions made life impossible in these latitudes still more would the derivation of any life from still more northerly areas have been impossible, and we have excellent geological reasons against assuming any great western continental extension of land since the close of the tertiary period at least. Therefore this assumption requires that all those species which we now find in the north and west must have travelled there from the south and east. Yet of this journey we can find no trace*. Why was not *Dytiscus lapponicus* left in the

* The occurrence of *Carabus clathratus* in Norfolk, if it rested on absolutely unimpeachable evidence, would undoubtedly be a *trace* of the kind meant, but hardly sufficient to prove that this species reached Donegal and the Hebrides *viâ* East Anglia.

Lynns of Wales or the Meres of Cumberland? Why has such a species as *Cymindis vaporariorum* never been taken on any of the Surrey heaths, whereas, at no higher elevation or differently conditioned locality, it occurs at Heswall in Cheshire? The assumption that these species did once occur all along the line of their march, under suitable conditions, but have been exterminated by younger and more vigorous immigrants, will not I think stand, for extermination implies competition, and competition a similarity of habitat and economy, and between these species and those which have by this supposition supplanted them, the dissimilarity of habitat and economy is absolute. Such a species as *Carabus clathratus* is not a beetle easily overlooked, and would probably have been discovered if it existed in Wales where areas apparently eminently suitable for it are abundant, and I might considerably multiply such examples. The force of such evidence to me appears to be that the members of this north-western group never did cross the lowland plain of eastern England at all, and that consequently the area of their origin must be looked for elsewhere than in continental Europe.

There are, indeed, in other groups of our fauna and flora, indications which point to another possible solution of this problem. A few years ago three species of north American freshwater sponges were discovered in the west of Ireland—species not yet found elsewhere in Europe. The presence of these can only be explained by the supposition of a former land connexion which closed in the Atlantic on the north, and united Ireland and Scotland with Greenland and North America by way of the Faroe Islands and Iceland to the north and Norway to the north-east. Such an area, if it existed in late tertiary times, might well have been peopled by a fauna which we discover now in its remaining fragments. We must also renounce the idea of a vast ice or snow-sheet covering the whole of Great Britain during the Glacial period, we must imagine these species which we are considering driven south by the advent of the cold epoch instead of led up north-westerly at its conclusion, and resident in these islands, but probably with a range much more southerly than at present, during all those ages of lowered temperature when no doubt there were glaciers over all the mountain districts of Ireland, Scotland, the north of England and Wales. As the mean temperature gradually rose century after century such species as had advanced furthest south shrank back, not through stress of any competition, but through a physiological necessity of association with certain climatic and other conditions.

Thus we may explain the presence of two or three species of *Hydropori*, undoubtedly members of this group, in Surrey, and of others in Devonshire, as the vestiges of a range much further south than at present, and which has been maintained in these isolated detachments through the environment having continued to a great extent unchanged, that environment being aquatic, and subject to somewhat other than terrestrial conditions.

No doubt before the conclusion of the Glacial epoch great changes in the distribution of sea and land had taken place. This country may have been reduced to the condition of a more or less connected archipelago, but I doubt if there is any evidence whatever from the biological side to support the hypothesis of a total submergence. Certainly before the complete passing away of Glacial conditions, the suppositious connection between Ireland, Scotland, and Norway must have ceased to exist, otherwise it is probable we should discover in Scotland more Norwegian species than we do at present. Enough, however, remain to suggest their community of origin, and I believe we shall not be wrong if we can rightly call any element in our British fauna as autochthenous, in applying that title to this Celtic or north-western area.

(*To be continued.*)

Butterflies in the Lebanon (*with Map*).

By (Mrs.) MARY DE LA B. NICHOLL, F.E.S.

(*Concluded from p.* 178.)

May 30th was a grey and windy day; as we rode across good butterfly country into the mountains, south-east from Baalbek, I got a few insects in a sheltered glen, but the weather got steadily worse, so my bag was small. As we went on we came into very wild mountains, less grazed and less cultivated than any I had seen, so I resolved to halt in a lonely glen called Wady Shabat, hoping that the next day might bring better weather, and enable me to see what butterflies were to be had. Morning broke bright and sunny, but very windy, and I started out early, attended by four men well armed, as this district is rather unsafe. Butterflies were very plentiful, *Argynnis niobe* var. *eris* swarmed, so did *Lycaena amanda*, always on blue vetches. I also took all the "coppers" I had previously met with, *Thecla myrtale*, *T. spini*, *T. ilicis*, many species of *Syrichthus*, but common in variety, and nothing new, and about midday the gale increased so much that nothing more could be done, which was unfortunate, as it was a good locality. Next day we rode down the valley by the old Roman road till we came to the Damascus railway and a more settled country, but I saw very few butterflies all day. We camped at a village called Ain Haour, close below the southern precipices of Djebel Chekif, on June 2nd. I sent the tents round the mountain to Bloudan, whilst I walked across, ascending to the summit and coming down the other side to Bloudan. The ascent was very steep, up dry watercourses and stone slopes. I got *Thecla myrtale*, *Chrysophanus asabinus*, *Lycaena anteros* var. *crassipuncta*, *L. isaurica*, *Syrichthus nomas*. A high meadow near the top, which looked promising, produced nothing; there was a snowdrift in one corner, and it was probably too early for it. The rocky summit 7,000ft. high, was only enlivened by a few specimens of *Pararge megaera* and *Aglais urticae* var. *turcica*, but on the way down to Bloudan, I again took *Callophrys rubi*, and in a cornfield got several specimens of the beautiful orange marked *Lycaena*. June 3rd was fine, and in the lanes from Bloudan down to Zebedani, I took three fine specimens of *Eugonia polychloros*, two of *Pararge roxelana* (neither of which I ever saw elsewhere), also *Nisoniades marloyi*. Working the railway banks at Zebedani, I took specimens of *Thecla acaciae*, an interesting insect, being a very small form of the species, with underside tinged yellowish. The railway banks further produced one very bad specimen of *Lampides theophrastus* and several good ones of *Syrichthus melotis*, and then the day clouded over and I had a long ride down the beautiful valley of the Farada to Suk Wady Farada (once famous for brigands), where we encamped, and next day turned southwards across rocky hills, towards Hermon. Here I first met with *S. pelopaea* just out of chrysalis.

Melanargia titea var. *titania* was plentiful all over these hills, but not much else. About two hours' ride brought us to the coach-road from Beyrout to Damascus, which here follows a nice green valley with a pretty brook, along the banks of which I took *Lycaena astrarche*, *Syrichthus poggei* in some numbers. *S. orbifer*, &c. Leaving the valley we rode along narrow, rocky, partly cultivated and much grazed valleys, which wound deviously through barren and very rocky hills. I hunted carefully for butterflies, but got nothing new, much the same insects as at Wady Shabat. June 5th, we still travelled southwards, through much the same kind of country, and I found butterflies plentiful in some of the dry watercourses and little stony cornfields. *Thecla myrtale*, *T. ilicis* var. *cerri*, *Chrysophanus thersamon* var. *persica*, *C. ochimus*, *Lycaena amandus*, *L. astrarche*, *Argynnis niobe* var. *eris* (very small), *L. candalus* (?). *Melitaea phoebe*, *M. didyma* var. *neera*, *M. trivia*. *Syrichthus orbifer*, *Hesperia thaumas*, &c. My best catch was *Satyrus actaea* var. *hadjina*, a form quite new to me, of which I took three among the rocks. We camped outside Racheya, a rather interesting Druse town close under the western flank of Hermon, which I intended to ascend next day, but the guide declared it to be too windy (which was not the case). As the day went on, the sirocco dropped considerably and I went out after butterflies, but had to go about four miles from the town before I could find any place not grazed to death. I found a good spur of Hermon, about 5,000ft. high, and took several *Satyrus actaea* var. *hadjina* and *S. pelopea*, saw *Anthocharis charlonia* and missed it, took *Thecla spini* var. *melanctho*, *T. ilicis* var. *cerri* and var. *caudalata*, *M. trivia*, *Epinephele lycaon* just out, *Hesperia lineola* and *H. nostradamus*. Of this I took two or three specimens, but whether I considered them good enough to keep or not, I cannot remember. None, however, have come back from the setter, but I am quite certain that I took the insect on this occasion and saw it in one or two other places. I also got several ♀s of the unknown orange-marked *Lycaena*, the males appear to be over, as I saw none. On June 7th, the heat was excessive from the sirocco, which had been blowing for three days, and I went up Hermon, reaching the top very easily in four hours from Racheya. The day was fine, not very windy, and when we reached an elevation of about 6000ft., we got above the sirocco and breathed again. There was still much snow in all the gullies and the ascent was most interesting, but entomologically it was not a success. The summit, a broad, undulating stony plateau, sparsely covered with prickly shrubs, produced no butterflies except *Pieris daplidice*, *P. napi*, *Colias edusa*, *Pyrameis cardui*, all very scarce. On the way down, I saw a very few *Parnassius mnemosyne* (probably its southern limit), took one *Lycaena panagea*, several *Thecla myrtale* and *T. spini* var. *melanctho*, one *Colias edusa* var. *helice*, and a few doubtful and battered sundries. Next day was hotter than ever and we rode southwards by a little known track to Hasbeyah. Here we came to the red sandstone formation, and a better-watered country, with valleys pink with oleander in full bloom along the water-courses, and here I took several specimens of *Cigaritis acamas* in bad order. I wish I had visited these glens a fortnight earlier, where they would probably have been more productive. June 9th was the hottest day we had, sirocco, grey sky and no butterflies out. On June 10th we started back to the Lebanon, and had two fearfully hot days' march, and I saw scarcely any butterflies, except at our camp on the 9th, by a nice spring in chalk-hills, where I caught *Lycaena bellargus*. On arriving in the Lebanon we found fresh high wind and much cloud, most refreshing. but bad for butterflies; nor did I have another good day till we were encamped at Khan Sunnin, about 6,000ft. above the sea, in a hollow directly below the highest summit of Djebel Sunnin, on its western side. Here is excellent butterfly ground, rough, half-cultivated, terraced fields, deep watercourses and snow-fed streams. Here I stayed for three days and worked the slopes. I found *Thais cerisyi* common at 6,000ft., rather bleached in colour. There were also numbers of *Thais* caterpillars feeding on the *Aristolochia*. They spun themselves up between the leaves in bright sunshine, feeding only in cloudy weather or at night. I took some, which appeared nearly full-fed, in hopes that they might go into chrysalis within a few days, but entirely failed in getting pupæ before I left Syria. On these mountain sides I took *P. mnemosyne* and saw three fine specimens of *Euchloë cardamines*, none of which I could catch. *Thecla myrtale* was common, also *T. spini* var. *melanctho*, *Chrysophanus thersamon* var. *persica*, *Lampides boetica*, *Lycaena cyllarus*, *L. isaurica*, *L. candalus*, *L. semiargus* var. *bellis* (but no var. *antiochena*), *L. anteros* var. *crassipuncta*. *L. bellargus*, *L. argus* or *L. zephyrus*, *L. icarus*, and two or three of the doubtful *Lycaena* ♀s, *Argynnis niobe* var. *eris*, *A. pandora*, *Melitaea didyma*, *M. phoebe*, *M. trivia*, *Melanargia titea* (but no var. *titania*), and most of the species of *Syrichthus* I had previously taken. I went up Djebel Sunnin (about 8800ft.) and got no butterflies on the top, excepting *Aglais urticae* var. *turcica*. June 19th and 20th, we rode for two days northwards across mountains whence every green thing had been stripped by goats as far as Afka, where we encamped on an excellent place for butterflies, about four miles short of the famous grotto of Venus. Here the mountain had been reserved for cows and horses and late grazing, so insects were plentiful. We were on the head waters of Dog River. Here I took *Pieris ergane* and *Lycaena admetus* var. *rippertii* and saw *Gonepteryx rhamni* as well as *G. antonia*, it was the only place where I found the two species flying together. *Thecla ilicis* and *T. spini* were common, also *Melanargia titea* and most of the mountain insects I had previously taken. I spent two days here and was then reluctantly compelled to ride to Beyrout, to catch the steamer for Constantinople on the 23rd, instead of going north to the Cedars and Dahr el Khotib. But there was no other boat for a fortnight, and I could not spare so much time in Syria, and thus ended a rough and most incomplete attempt to investigate the butterflies of the Lebanon. I hope in the course of another year or so, with the assistance of Professor Day, to get a more complete catalogue of the lepidoptera of this district. He and his wife have taken at least twelve species which I never met with, and there are probably many more to be had, especially in the Antilebanon and Hermon country and the extreme northern end of the Lebanon range. To the best of my belief, these regions are unexplored by the collector. I append a list of captures. Many of the names are given on the authority of Mr. Elwes, but he declares himself unable to decide positively as to the species of several of the Lycænas, and we hope to get a more complete series during the ensuing summer.

Papilio podalirius: Not very common on coast. *P. machaon:* Not very common. *Parnassius mnemosyne*: Lebanon and Hermon, not very abundant, about 4000ft. to 6000ft. *Thais cerisyi*: Lebanon and Hermon, common from 2500ft. to 6000ft. *Gonepteryx rhamni* var. *farinosa*: Common on the eastern slope of Lebanon. *G. cleopatra* var. *taurica*: Common on the coast and western slope of Lebanon; I saw both species of *Gonepteryx* at Afka. *Aporia crataegi*: Common everywhere along the eastern slopes of Lebanon and in Antilebanon, 1200ft. to 4000ft. *Colias edusa*: Very common everywhere; var. *helice*, not uncommon. *Pieris brassicae*: Common in gardens, very white underneath. *P. rapae*: Common in gardens and on the mountains; found as high as the top of Hermon. *P. napi*: One specimen only at Zebedani. *P. ergane*: At Afka, western slope of Lebanon, 4000ft., not uncommon, not seen elsewhere. *Anthocharis belia*: Not uncommon along the coast; none seen inland except at Zebedani. *Anthocharis charlonia* var. *penia*: Not common, but widely distributed on eastern slopes of Lebanon and Antilebanon. *Euchloë cardamines*: Coast and western slope of Lebanon, not very common. *Leucophasia sinapis*: Very common. *L. duponcheli*: Not uncommon and widely distributed. *Limenitis camilla*: Common on Lebanon and Antilebanon. *Pyrameis atalanta*: Not uncommon. *P. cardui*: Common on Lebanon and Antilebanon. *Aglais urticae* var. *turcica*: Common above 4000ft.; haunts the summits of the highest mountains. *Eugonia polychloros*: Not common, Zebedani only. *Polygonia egea*: Common along the coast, April. *Melitaea cinxia*: Not very common; above Bloudan, about 5500ft., and on Djebel Kneysseh at 4500ft.; very small and pale var. with antemarginal row of black spots on hindwings, almost or altogether, obliterated, probably var. *amanda*. *M. phoebe*: Common everywhere, always small and very variable. *M. didyma*: Very common, and extremely variable. *M. trivia*: Common, 3000ft. to 4000ft., rather small and resembling the form from Turkestan. *Argynnis lathonia*: Very common. *A. pandora*: Not uncommon, Lebanon and Antilebanon. *A. niobe* var. *eris*: Very common on all high mountains, Lebanon and Antilebanon, not taken below 3500ft., all small specimens and rather greenish. *Danais chrysippus*: Very common in the irrigated strip of fertile land along the coast north of Beyrout; April to July. *Melanargia titea*: Common along the coast and on western slope of Lebanon up to 4000ft., not on eastern slope; var. *titania*, very common, Antilebanon and eastern slope of Lebanon; it much resembles *M. larissa*, and is possibly a distinct species. *Satyrus hermione*: Common, Lebanon and coast. *S. telephassa*: Universally common, May and June. *S. anthe*: Universally common, June. *S. pelopea*: Not quite so common, mid-June, about 3000ft. *S. semele* var. *mersina*: Common on Lebanon, June. *S. actaea* var. *hadjina*: Only on the higher foot-hills of Hermon, June; this resembles most nearly an Armenian form of *S. actaea*. *Ypsima asterope*: Very common along the coast; April to July. *Pararge roxelana*: Rare, two specimens only near Zebedani. *P. egeria*: Widely distributed, Lebanon and Antilebanon. *P. maera*: Lebanon, common. *P. megaera*: Very common, swarms on all the highest summits. *Epinephele janira* var. *telmessia*: Very common everywhere, from April to July; this var. differs from the type, not only in coloration but also in habit; it has a trick of alighting on bare earth, furrows, or stones which match it in colour. *E. lycaon*: Common, Hermon and

Lebanon, 3500ft. to 5000ft. *Coenonympha pamphilus*: Universally common. *Thecla spini*: Common at low elevations, Lebanon and Hermon, the var. *melantho* replaces the type or nearly so, above 4000ft. *T. ilicis*: Not very common, Lebanon and Hermon; var. *caudalata*, occurs with type, not uncommon; var. *cerri*, with type, Hermon. *T. acaciae* var. *abdominalis*: Eastern slope of Lebanon, common. *T. myrtale*: Common on all the higher mountains from 3000ft. and 6000ft., Lebanon and Antilebanon. *Callophrys rubi*: Common above 6000ft., Lebanon, Antilebanon, and Hermon. *Chrysophanus ochimus*: Lebanon and Antilebanon, not uncommon, May. *C. asabinus*: Not uncommon, eastern Lebanon and Antilebanon, May. *C. thersamon*: Common from coast to 5000ft., April to June. *C. phlaeas*: Not very common; but generally distributed. *C. dorilis*: Rare, taken only on Lebanon, 4000ft., May. *Cigaritis acamas*: Hermon, June, common in the mountains of Lebanon later in the season. *Lampides boetica*: Lebanon, common, 2000ft. to 5000ft., April to June. *L. theophrastus*: One specimen only at Zebedani, May. *L. gamra*: Coast, only a few worn specimens, April. *Lycaena trochilus*: Very common, April to June, everywhere. *L. argus*: Common near Afka, June, 4000ft., very small specimens. *L. loewii*: Two specimens only, Antilebanon. *L. astrarche*: Common, 3000ft. to 6000ft., Lebanon and Antilebanon. *L. panagea*: Hermon and eastern face of Lebanon, 4000ft. to 5000ft. *L. anteros* var. *crassipuncta*: Common, 3000ft. to 6000ft., Lebanon and Antilebanon; this form differs widely from *L. anteros*, as taken in Bulgaria and Roumelia, May and June. *L. isaurica*: Not uncommon, 4000ft. to 5000ft., eastern Lebanon and Antilebanon. *L. amanda*: Very common, 4000ft. to 5000ft., Lebanon and Antilebanon; females very dark and brilliant. *L. bellargus*: Lebanon and Antilebanon, 3000ft. to 6000ft., June. *L. candalus*: Not common, eastern Lebanon, 4000ft. to 5000ft., May and June. *L. admetus* var. *rippertii*: Very common, Lebanon, June, 4000ft. *L. semiargus* var. *bellis*: Not uncommon on Lebanon, 4000ft. to 5000ft.; var. *antiochena*, not common, Lebanon and Baalbek, May, 2000ft. to 4000ft. *L. cyllarus* var. *aeruginosa*: Common, Lebanon, 2000ft. to 6000ft. *L. icarus*: Common, Lebanon and Antilebanon. *L. zephyrus* var. *nicholli* (or new species?): Not uncommon, Lebanon and Antilebanon; the form with brightest orange spots on upperside of hindwings was invariably taken on chalk, in fields of green corn, Baalbek and Bloudan produced the best specimens, May and early June. *L. eurypilus*: Not common, Antilebanon and Lebanon. *Cyaniris argiolus*: Common, Lebanon and Antilebanon, May. *Parnara mathias*: Not common, coast, May. *Spilothyrus althaeae*: Common, coast, Lebanon and Antilebanon. *S. alceae*: Common below 4000ft. *Syrichthus alveus*: Very common everywhere up to 5000ft. *S. orbifer*: Common, Lebanon and Antilebanon, 3000ft. to 6000ft. *S. serratulae*: Not very common, Lebanon and Antilebanon, 3000ft. to 4500ft. *S. poggei*: Not common, Damascus and Antilebanon, 3000ft. to 4500ft. *S. nomas*: Common everywhere, from coast to 6000ft. *S. melotis*: Common everywhere, coast to 5000ft., April to June. *Hesperia thaumas*: Common, Lebanon and Antilebanon, 3000ft. to 5000ft. *H. lineola*: Not so common, Hermon and Antilebanon, 3000ft. to 5000ft. *H. actaeon*: Not common, Dog river glen only, coast level. *H. nostradamus*: Saw several specimens but failed to get any good ones, Lebanon. *Nisoniades marloyi*: Not uncommon in the Antilebanon, about 4000ft. to 5000ft.

Observations on some new and little-known Orthoptera with biological notes*.

By J. PORTOCHINSKY (translated by JACOB KOTINSKY).

The subject of the present article comprises two species of orthopterous insects in the family *Acridiodea* to which I have paid special attention during my travels in Transcaucasia. One of these species belongs to the genus *Eremobia*, and, it seems to me, is a new one, while the other belongs to *Nocarodes*, and is one of the very little known orthoptera. Both species are, as we shall see later, of considerable interest.

In the fields surrounding Erivan and Echmiadzin during the month of May we come across an *Eremobia* peculiar for its large size and the shape of its pronotum. Before, however, I proceed with the detailed description of this apparently new species, which I shall name *Eremobia grandis*, I deem it necessary to give a short description of the country in which this insect breeds. The plains of Erivan present a quite level surface nearly surrounded by mountains. These clay fields, covered almost over their entire extent with a thick layer of volcanic sand and other volcanic products, have quite a peculiar appearance. In places, the surface appears of a dark bluish-grey colour, in others grey, passing here and there into pink and reddish. Each of these colours depends upon the hue of the sand and gravel, and predominates either upon small spaces or upon entire plains; so much so, that it is hard to find a patch where pure clay with its natural colour is exposed to view. Thus the prevailing tints of the fields are slaty-grey, grey, and bluish, more rarely clay-yellow. This level is covered with an uniform, stunted growth. Clumps of blooming *Peganum* are found in places, also blooming *Salvia*, *Euphorbia*, creeping *Astragalus*, and the low-growing *Artemisia*, these are the principal representatives of the local flora, which becomes more vigorous and more varied only on the banks of streams; but even these few prevailing vegetable forms rarely occur altogether. There, whole squares are covered with *Peganum*, only so, however, that the distance between two bushes of it is several yards of bare ground; here, you strike a strip entirely covered by *Salvia* and *Euphorbia*, and, finally, a large area covered almost exclusively by *Artemisia*.

The numerous animals found in these fields conform with the soil of the Erivan steppes in colour, presenting in their general appearance a striking resemblance to it. This is true principally with all those that either always remain on the surface, or are wont to sit there occasionally. I have often walked considerable distances without seeing a single animal, but, no sooner did I slacken my pace, and, as far as possible, zigzagged my course, when, now here, now there, some insect or other would either jump or fly out of the way. To those of the latter group belong the large *Eremobia grandis* and others. The conformity of colour between the locusts and the soil has been noticed more than once, nevertheless the phenomenon herein described by me deserves special attention, since, in the description of this new species, all possibilities of imagining even an approximate general colour of the insect, are excluded. Its colour varies to extremes, and I did not

* From *Horæ Societatis Entomologicæ Rossicæ*, vol. xx., pp. 111-127, pl. xii., 1886.

succeed in finding two specimens exactly alike. They are either of a dark dirty or clay colour, or more often of a light bluish or pink, and, to such an extent do all resemble the bluish, pink, &c., stones abundantly scattered about the field, that even at close range the insects could not be distinguished. In connection with this striking resemblance between the colouring of the insect and the objects upon which they rest, there is a perceptible immobility of the described orthoptera. Only when the foot of the pedestrian threatens to crush the insect does it make a leap, then it remains at rest again, when its colour blends with that of its surroundings and again becomes imperceptible to the eye.

Eremobia grandis, n.sp., is from 1·3-1·5 in. long. The males being shorter and thinner than the females. From these dimensions we see that this species belongs to the very large *Eremobiae*. In order to make the specific characters of *E. grandis* more conspicuous I will give a comparative description of the different parts of the body of this species with the similar parts of another very common form, *i.e.*, *E. muricata*. Except in the difference in size the heads of both are almost exactly alike in shape. The essential difference is noticed in the shape of the epicranium, *i.e.*, the distance between the eyes; in *E. grandis* it is slightly truncate, while in *E. muricata* it is broader and marked by many raised lines. The pronotum presents the most important character of the species. As in *E. muricata* it consists of two parts; the anterior, separated from the posterior by a transverse sulcus, is in its turn crossed by three sulci (as in *E. muricata*) dividing it into three parts, each of which terminates above in a tooth (exactly as in *E. muricata*). These three divisions, narrowing dorsally, conjunctively form an elevated sharp ridge or crest which runs along the middle of the anterior half of the pronotum, and is divided into three teeth that are not equally distinct in all specimens. This anterior half of the pronotum of *E. grandis*, as in *E. muricata*, is granulous and thickened, but differs from *E. muricata* in that the teeth of the elevated crest are raised one above the other, in which case the first (the one nearest the head) is lower than the third, while in *E. muricata* the third is lower than the first two which are almost equal in length. More important as a differentiating character is the posterior part of the pronotum. In *E. muricata* this part is sharply separated from the anterior by reason of its being almost flat above with but a slight longitudinal ridge in the middle. Besides, this part of the pronotum in *E. muricata*, even though it becomes narrower posteriorly, terminates in a rounded angle almost entirely flattened, while in *E. grandis* this part of the pronotum is entirely different in structure. Beginning with its end the pronotum gradually curves upwards, and near the middle runs into a raised crest with a sharp edge, which continues to the posterior end of the pronotum that here forms an acute angle. Thus the crest of the anterior half of the pronotum of *E. grandis* gradually passes into the raised crest of the posterior part, in consequence of which, the division between the anterior and posterior parts of its prothorax is not as distinct as in *E. muricata*, and the sharp posterior end of the pronotum increases the difference between the two species. It should also be mentioned that the thorax of *E. grandis* is covered with small tubercles as in *E. muricata*. Of other plastic characters and differences one may be noticed in the structure of the exterior surface of the posterior femora which is generally smoother than in *E. muricata*, and the upper and lower margins of that femur in *E. grandis* are smooth, while in the other they are more or less sinuous or slightly wavy. In the colouring of the body and its parts I did not find sufficient differentiation in character to be worth consideration. It is worth mentioning only that the wings of the male as well as the female are longer than the body though in the male they are comparatively longer. The colour of the wings is ash-blue, lighter near the base ; but, as already stated above, it is almost impossible to describe the colour of the body of this new *Eremobia*, to such an extent does it differ in different specimens. Some of them are of an uniform bluish-grey tint, others are ash-grey, and still others are of a pinkish colour. Besides, some forms are uniformly coloured with one of the above enumerated hues, while their tegmina are covered with a larger or smaller number of dark or blackish irregular spots or lines. Regardless of the fact that the general coloration of *E. grandis* is of the modest class, since it completely resembles the colour of its habitat, we should, nevertheless, recognise it as very brightly coloured were we to examine the various parts of the body which the insect naturally conceals either when at rest or in the presence of danger. It is evident that, were the exposed exterior parts of the body tinted brightly, the presence of the insect would be betrayed and it would become a prey to its enemies. This is why only such parts of the body of the orthoptera are highly coloured as would normally remain concealed. Among these parts in *Acridiodea* the long hindlegs play an important role. The bright hues are here usually displayed either only on the lower and inner faces of the femora, or also upon the tibiæ and tarsi. The colour of the inner surface of the hind femora of *E. grandis* is bright red but the ends of the femora are light blue ; the colour of the inner surface of the tibiæ, like the femora, is also bright red. There is a still more beautiful decoration in *E. grandis*, however, the meaning of which is entirely puzzling to me. If by means of the finger we push the head a little away from the pronotum we shall notice upon the posterior surface of the head, which usually closes quite tightly upon the pronotum, two small round spots of a clear white colour. These spots are surrounded by rings of a beautiful lilac, and this entire design by orange or bright yellow extending almost to the lateral side of the head. Upon examining these beautiful decorations one naturally asks himself, if the bright colours of the *Acridiodea* are generally distributed over the under and inner surface of the hind legs, raising which these are readily exposed, how and under what circumstances *E. grandis* exhibits its curious coloration placed where one would least expect to find it ? During my sojourn in the Caucasus I did not succeed in unravelling this mystery, but it would be most interesting to have it explained in the nearest future.

In order to judge the variation and gaudiness of colours in the hind legs of *Acridiodea* I deem it sufficient out of the numerous instances to notice, besides the already described *E. grandis*, the following. In one variety, apparently, of our common *E. muricata*, the body of which is coloured greyish-yellow-clay, very much like the colour of the clay plains of south-eastern Russia, where it breeds, the colour of the inner side of the basal ends of the hind femora is violet, and the other ends bright red; the inner sides of the hind tibiæ are also violet, while their ends, as well as the inner row of spines upon them, are bright red. In *Stethophyma fuscum*, Pall., the hind femora are bright red below, and, on the inner side, are yellow with a black marking, which consists of a spot located above and nearer the base, and a semicircular transverse stripe; the ends of the femora are also black, the hind tibiæ are black basally, then follows a yellow ring, and the remaining length, including the spines (only the lips of which are black), is red. The general body colour of *Acridium aegyptium*, L., is dirty grey; the inner faces of the hind femora are reddish-grey with reddish veinlets, while below they are bright red; the inner faces of the hind tibiæ and the tarsi are lilac, becoming brighter terminally; besides, the tibial spines are white at the bases sharply passing into reddish-brown and black at the tips.

(*To be concluded.*)

Notes on an unsuccessful attempt to breed Colias edusa.

By J. C. DOLLMAN.

Two female imagines of *Colias edusa* were caught at Ditchling Beacon on September 5th, 1900, and placed on a clover plant in a large flower-pot, and the first egg was deposited on September 8th. Pellets of cotton-wool soaked in treacle and water were dropped in the pot, on which the insects fed until the 15th of the month, when they died. The eggs were shaped like a nine-pin, with a sharply-pointed upper extremity, and were laid on the lower as well as the upper side of the leaves. Their position was at right angles with the surface of the leaf, and they were of a bright yellowish-white colour until the 11th of the month, when they began to change colour, turning to a rich saffron-yellow, gradually deepening to strong sienna red-brown. The tip always remained light yellow. The ova turned dark grey in colour on the 16th and hatched on the 17th. The young larva partly devours the eggshell after emergence, and when seen through the microscope is deep saffron in colour with a black head. The head is larger than the body segments, which gradually taper to the anal end, the last being the smallest of them all. The segments are distinctly marked with a sharp skinfold, and are all strongly wrinkled transversely. The entire larva, including the head, is profusely dotted with white warts arranged in longitudinal rows and which emit white hairy projections thickened and club-shaped at the tips. The length of the young larva upon emergence is rather over $\frac{1}{16}$th of an inch, and it appears, almost invariably, to feed upon the upper side of the leaf. In two or three days the young larva had filled out and grown to be almost $\frac{1}{8}$th of an inch in length. The body was then shiny in appearance, with every segment strongly emphasised by the skinfold, and between the folds the skin on the segments was strongly wrinkled transversely. On the skinfolds determining the segments were white protuberances, and a few black and white ones on the body generally, which was finely reticulated with minute black dotting. The head was still black, with strong hairy club-headed projections of a whitish tint developed freely upon it. On the second segment, immediately beyond the head, was a row of five or six black warts. The habit of the larva was sluggish, as it had been from the first, the creature being extended at full length upon the upper side of the leaf on which it moved only to feed. On September 23rd the first moult took place, the second skin was exhibited, and the larva was about $\frac{3}{16}$th of an inch in length. The head and body now were of the same colour—a light greenish cinnamon—and were both heavily studded with white warts, having a black centre. The entire larva, head and body, covered with short white hairs projecting from these warts. The segments were still strongly marked, and the body wrinkled transversely. These wrinkles, swelling upon each side in the line of the spiracles, formed a projecting longitudinal fold which caught the light, and looked like a white line for the whole length of the larva. In a day or two the head had again darkened in colour, yet not to black, but of a brown colour, and was now inferior in size to the central segments, which again narrowed to the anal end. The young larva has a habit, which had been shown from the first, of lying along the middle of the leaf of the food-plant on that portion of it known as the "mid-rib." It resorts to this position before evening, so that when the clover leaf closes, which it does at night, the larva lies shut within it. This habit may possibly be associated with the larva almost always feeding, when young, upon the upper side of the leaf. A large proportion of those larva which died early were found either on the underside of the leaf or away from the centre of it on the upper surface. This may indicate that, in the first instance, the larva missed the protection afforded by the shelter of the closed leaf at night, and, in the other, that it may have suffered some inconvenience or injury from the tightly closing sides of the leaf when young and delicate. I can conceive no other reason for the large percentage of mortality which occurred at this period, for the larvæ had not been touched or disturbed since being carefully placed upon the leaves of the growing food-plant, it being necessary to remove them after emergence from the plant on which the ova were deposited, as it had failed to grow. There were eighty-four emergences from the ova, and, on the 27th of the month, but twenty-seven larvæ survived. The larva at this period—ten days old—was in the habit of resting with the claspers firmly holding the surface of the leaf and elevating the forepart of the body in a bent posture, like the larvæ of the genus *Sphinx*, to a slight extent, with the head depressed and just resting the tips of the legs upon the leaf. It appears seldom to feed at the edge of the leaf, but to eat small holes in the broad surface, on the upper side, which are gradually enlarged by consumption to the margin in a ragged and broken manner. On the 27th of the month the second moult was accomplished, and the larva was about a quarter of an inch long, or rather less. In the third skin it is pale yellowish-green all over, including the head, but the body is so thickly covered with black warts, having white rings around them, as to present an almost dark grey appearance in colour as a whole. The segments are distinctly marked by an incision or skinfold rather sunken from the surface, and between each of these skinfolds are five others on each segment more raised in character; and, while on each segment these folds are thickly covered with the black warts with white rings, the folds marking the segments are almost bare of warts, except upon each side, where two or three are found at some distance from each other. The warts are arranged on the body in irregular longitudinal rows, a row of large ones, then a row of smaller ones, then another row of large ones, the space between the warts being reticulated very finely with black net-like tracery upon the yellowish-green ground. The head is thickly sprinkled with black warts, without the white rings round them, and from every wart on the larva projects either a white or black hair. Extending the full length of the larva there is a thin black line below the spiracles, edged upon the upper side with a thin white line. Upon the dorsal area are also two lighter brownish lines closely set together. The larva now appears rather more active than hitherto, but is still very sluggish, scarcely leaving the leaf on which it practically lives from day to day. The casting of this skin would seem to have been a difficult matter, for the whole of the stock succumbed to this ordeal, save one example. This remaining one I placed on fresh food by itself, on which it fed well for a few days until October 4th, when it stopped feeding and prepared to cast the third skin. It evidently was not going to be successful in the effort, for on the 5th it lost its foothold upon the food-plant, and, on the evening of the 5th, after three or four violent movements from side to side, presumably an effort to break the skin on the forward segments, it laid still on its side and gave no further evidence of vitality. An examination of the dead larva gave the following results. The ground colour of the entire creature was a pale yellowish-green, the head, legs, claspers, and anal extremity shiny and smooth in surface. The head, legs, claspers, and anal region were sprinkled with small black warts, and the light green ground colour, with the exception of the head, was covered with minute black dotting. The upper and lateral surfaces of the larva were covered with broken longitudinal rows of black warts, set in white rings, and of the two different sizes. The whole of the warts, on head and body, supplied with either a black or white hair. The space between the warts on the green ground was closely covered with minute black reticulation. On the back ran the two closely set pale brown lines. On the spiracular region, for the entire length of the larva, were the thin black and white lines—the black line not now so evident as at first. The spiracles themselves were oval in shape, set on end, and were light shiny olive-green in colour, the edges gradually darkening in a suffused manner to the outside edge, which was sharply determined by a thin black line. The larva was about $\frac{5}{16}$ths of an inch in length at the time of its death.

PRACTICAL HINTS.*

Field Work for July.

By J. W. TUTT, F.E.S.

1.—*Melampias epiphron* swarms in early July all over Ben Cruachan, south of the Cruachan Burn, from 1000ft. to 3000ft. elevation.

2.—Worn females of *Thecla w-album* will oviposit freely if sleeved out in the sun on elm in early July.

3.—From the middle of July into August the imagines of

* Practical Hints for the Field Lepidopterist, recently published, contains 1,250 similar hints to these, distributed over every month in the year. Interleaved (for collector's own notes).—Ed.

Thymelicus actaeon abound on the slopes at Swanage—July 15th is a good normal date.

4.—The large *Anthrocera palustris* is to be found abundantly in marshes throughout July (and early August), the insect is much confused with the early June-flying *A. trifolii*. The cocoons are usually spun well up on grass culms, &c., like those of *A. filipendulae*.

5.—Old currant bushes should be searched during the last week of June and the first fortnight in July for paired examples of *Sesia tipuliformis*; they appear to be most readily found about 4 p.m.-6 p.m.

6.—The imagines of *Trochilium bembeciforme* may be found in July in numbers, just emerged, from about 7 a.m.-8.30 a.m. on poplar-trunks, the empty pupa-cases sticking out of the trunks beside them (Porritt). In the south of England this species usually affects sallows and willows.

7.—In July the young larva of *Apatela aceris* sits curled in a note of interrogation (?) form, beneath a leaf of sycamore or horse-chestnut, and eats only the lower parenchyma between the veins in its first stadium, and in the second it still leaves the veins and upper cuticle, but by the time it gets into the third stadium it eats the whole thickness of the leaf, and traces of its feeding are pretty evident.

8.—The larva of *Craniophora ligustri* always rests underneath a leaf of the food-plant (usually ash), as soon as large enough along the midrib, and when fullgrown along the central petiole; the tapering to either extremity assists it in eluding observation, and it is difficult to see even when full-grown, whilst a half-grown one is very readily overlooked even in captivity.

9.—During the early part of July searching rushes and thistle-heads in a damp wood near Church Stretton, resulted in a good series of *Xylophasia scolopacina* (Newnham).

10.—In July the imagines of *Phothedes captiuncula* are abundant everywhere on the coast of county Galway, flying about in the daytime in hundreds, and much more strongly marked and marbled than English specimens (Harker).

11.—The imagines of *Phothedes captiuncula* are best taken from the middle to the end of July. They fly (near Hartlepool) in short low flights over grassy places near the sea; for five minutes or so many specimens will be seen, then, possibly owing to a slight change in the temperature, none will be seen for perhaps half an hour, then the flight will be repeated, &c. (Maddison).

12.—Near Cambridge, in 1892, *Apamea ophiogramma* was on the wing a long time; the first examples were taken on July 5th, and the species was still in first rate condition from the 15th-26th, and then others up to August 5th. The species is a genuine dusk flyer, about half an hour being the time in which one can take them; three or four were taken by walking about with a light, but dusk is undoubtedly the time. They fly quietly, look very light on the wing, settle on different flowers, and are very quiet and easy to box (Farren).

13.—In July, 1892, some 50 *Agrotis obscura* (*ravida*) were taken in the neighbourhood of Chinnor, only two, however, at sugar, the rest being obtained by searching outhouses, &c. (Spiller).

14.—Capsules of *Silene maritima*, collected in July on the western coast of Scotland (Oban), gave a supply of larvæ of *Dianthoecia conspersa* the resulting imagines proving almost identical with the southern form.

15.—In the Shetland Islands (Unst) the larvæ of *Dianthoecia conspersa* feed on *Silene maritima*, in July and August; in the south of England the larvæ feed on *Silene inflata* (McArthur).

16.—The larvæ of *Dianthoecia irregularis* are to be swept in middle and late July from *Silene otites*, or, when nearly full-grown, they may be found just below the surface of the ground at the roots of their food-plant by day, or obtained by searching with a lantern at night whilst feeding at Tuddenham, &c. They will feed freely on *Lychnis flosculi* in confinement, and also on garden varieties of *Lychnis*.

17.—By the first week in July the larvæ of *Cucullia verbasci* are often quite large enough to show very marked traces of their feeding on the mulleins.

18.—The last fortnight in July is the time to sugar for *Calymnia pyralina*. Swansea appears to be a better locality for it than Reading, fifteen specimens having been taken on one evening at sugar among elms.

19.—During July, beds of *Aconitum* and larkspur should be well watched for *Plusia moneta* hovering over the flowers at dusk; light near such beds is also attractive to the species. They are also attracted by flowers of *Nicotiana affinis*.

20.—Eggs of *Plusia bractea* laid in July will hatch in a week; the larvæ can be kept in a cold frame, and fed on lettuce and groundsel till end of August; then, if one wishes to force them, they must be put into a cucumber-house with temperature from 68°F.-80°F. and fed on dandelion; some thus treated were full-fed from September 13th till end of month, imagines emerged September 24th-October 15th.

21.—The larvæ of *Hecatera serena* are to be swept during the afternoon at dusk in late July or August from various species of *Picris*; they are common on railway banks in Kent, on the *Dianthoecia irregularis* ground at Tuddenham, &c. The larvæ are also sometimes abundant on the blossoms of *Crepis virens* (Norgate).

22.—*Calligenia miniata* flies at dusk in early July, and sometimes occurs in considerable numbers in a limited space, possibly males assembling. May also be beaten by day.

23.—During the first week of July the imagines of *Leioptilus lienigianus* may be disturbed from the mugwort by day, or found on the mugwort plants with a lantern by night.

24.—In the last week of July, larvæ, pupæ and imagines (chiefly the last-named) of *Aciptilia spilodactyla* are to be found on or among *Marrubium vulgare*; the pupæ always on the upper surface of a leaf near the midrib.

25.—*Depressaria ciniflonella* is to be taken on old stone walls at Rannoch, in July and August.

26.—*Sericoris irriguana* is common on all the mountains between Braemar and Glen Shee at a high elevation, frequenting slopes covered with *Vaccinium* and *Alchemilla*, and flying in the sunshine, the ♀s very rarely seen on the wing. A splendid locality for *S. irriguana* is the western slope of the hill at the back of the hotel at Glen Shee, also common on the mountains near Loch Laggan.

27.—The foxglove flowers, collected on the smaller islands of the Inner Hebrides in July, produce larvæ of the fine form of *Eupithecia pulchellata*, known as var. *hebudium*.

28.—Capsules of *Silene maritima*, collected in July on the western coast of Scotland (Oban), gave a supply of larvæ of *Eupithecia venosata* (the resulting imagines but slightly darker than those from the usual inland food-plant, *Silene inflata*).

29.—During the first fortnight of July the imagines of *Acidalia ochrata* are usually actively on the wing by about 3 p.m., and continue on the move till dark, flying about *Ononis*, quite close to the herbage; after dark they may be found with a lantern whilst resting on the plants.

30.—The larvæ of *Acidalia emarginata* thrive on the withered leaves as well as the fresh ones of convolvulus, and have such a great protective resemblance to the withered stems of their food-plant that it is difficult to find them amongst the dried *débris*; the pupal stage is a very short one, the imagines emerging early in July. The eggs are loosely scattered, and hatch within a week or ten days of being laid, given suitable weather.

CURRENT NOTES.

At the meeting of the Entomological Society of London, held on May 1st, 1901, Mr. C. G. Barrett exhibited for Mr. H. W. Vivian a Noctuid said to be referable to *Xylophasia lateritia*, Hufn., a species not hitherto recorded in the British Islands. It was taken in South Wales by Mr. W. E. R. Allen.

At the same meeting Sir George Hampson exhibited two females of an apterous Lachneid from the Transvaal, with cocoon and ova bred by Colonel J. M. Fawcett, 5th Lancers. The larva is very much like that of the British *Macrothylacia rubi*. The female does not emerge from the cocoon, its antennæ being aborted and all the joints coalesced with a flabellate organ with slight striæ indicating the joints; the fore tibiæ short with traces of tibial claws. The male is unknown, and as Colonel Fawcett was on active service at the time of emergence, he was unable to expose the female for the purpose of attracting the male.

At the same time Mr. H. Goss exhibited a gynandromorphous specimen of *Lycaena bellargus* which he had taken at Reigate, in June, 1900. It had the characters of a male in the right wings, and the characters of a female in the left wings, which were, however, not entirely free from the blue scales of the male. No dissection had been made of the genitalia, so it was impossible to say whether the specimen was strictly hermaphrodite.

We are very sorry to learn that Monsieur A. Constant died suddenly on May 13th. Less known to English entomologists perhaps, than some less accomplished workers, he had a most extensive acquaintance with European lepidoptera, and his work on the fauna of Burgundy and the Riviera is well-known. His loss diminishes irreparably the very small band who study the micro-lepidoptera of France.

On June 7th, at the Royal Institute, Professor Meldola, F.R.S., gave a lecture on "Mimicry" before a large and distinguished audience, many of whom were ladies. After referring briefly to the causes of the different kinds of colours in insects, the learned lecturer gave a general account of the phenomena of mimicry in insects in all its branches. The lecture was profusely illustrated with many beautiful lantern slides. We were pleased to see present the veteran Alfred Russell Wallace, the originator of the theory of "warning colours."

Other entomologists present were Professor Poulton, F.R.S.; Mr. Roland Trimen, F.R.S., and Mr. Horace Donisthorpe, F.Z.S.

On June 5th, at a meeting of the Entomological Society of London, Mr. Horace Donisthorpe read a paper on "Mimicry, protective resemblance, &c., in British Coleoptera." After pointing out that it was a subject much neglected by coleopterists, and urging them to work at it more, and also noticing the necessity of many carefully-devised experiments on the edibility or non-edibility of many species, he proceeded to give an abstract of the paper which contains all cases of mimicry, &c., that he had been able to find among Coleoptera belonging to the British fauna. He classified them according to the table introduced by Professor Poulton in his book: "The Colours of Animals," and since extended. After the paper, Professor Poulton spoke at some length on the subject, and Canon Fowler, Mr. Chitty, Sir G. Hampson, Mr. Champion, and others joined in the discussion.

At the same meeting, Mr. G. C. Champion exhibited a male specimen of *Odontaeus mobilicornis*, one of the rarest of British beetles, captured at Woking on May 28th. Mr. Donisthorpe said that the same species had also been taken this year at Bournemouth by Mr. and Mrs. Jackson.

At the same meeting, Dr. A. Jefferies Turner exhibited specimens of Australian wood-boring Lepidoptera belonging to four different families. They included—*Pyralidae: Doddiana xyloryctis*, Turn. *Gelechiidae: Cryptophasa flavolineata*, Walk., *C. hemipsila*, Turn., *Maroga mythica*, Meyr., *M. setiotricha*, Meyr., and *Uzucha borealis*, Turn. *Cossidae: Dudgeona actinias*, Turn., *Xyleutes pulchra*, Roths., *X. macleayei*, *X. nephocosma*, Turn. *Hepialidae: Charagia mirabilis*, Roths., *C. ramsayi*, Scott., and *C. cyanochlora*, Lower.

At the same meeting, Mr. H. St. J. K. Donisthorpe exhibited a glove burnt by discharges of formic acid in the nests of *Formica rufa*. In connection with the apparatus exhibited at the last meeting to determine the strength of this acid, Professor Poulton said that the discharges collected in the tubes fluctuated greatly in strength, the strongest yielding a proportion of 60 to 70 per cent. of anhydrous acid, a drop of which placed by Mr. Holroyd on the back of his hand left a distinct scar some days after the application. The discharge of *Cerura vinula*, he added, shared a strength of about 45 per cent., and Mr. F. Merrifield remarked that in breeding the larvæ the acid liberated by this species left a yellow stain on the leno, making it rotten.

COLEOPTERA.

Cosmopolitan beetles in a London warehouse.—In a package of drugs in corked bottles, originally sent from this country to India, and returned from thence as damaged, the corks were found to be utterly destroyed by the larvæ of beetles. The following cosmopolitan species were found alive on opening the package:—*Cathartus advena*, Waltl., *Tribolium ferrugineum*, F., *Lemophloeus ferrugineus*, Steph., and a single specimen of *Phthora crenata*, Muls. This last is an interesting capture, as there is, I believe, no record of its having been taken in Britain before. It is included in the French catalogue and is likely to occur again here. The insect was possibly parasitic on some of the other species as some of its near allies are certainly parasites. A dipteron, doubtless also parasitic, occurred in large numbers with a single specimen of a spider, which the Rev. O. Pickard-Cambridge, believes to be a new species of the genus *Phoeocedus*, Lin., hitherto consisting of a single British and European species. It is much to be regretted that the *débris* of the package was destroyed before I had an opportunity of examining it. I have since received from the same warehouse a living specimen of *Attagenus megatoma*, F. (=*piceus*, Ol.), an insect which is common in Paris and other continental cities, but has but one British record, *i.e.*, "a single specimen" taken by Mr. Wollaston, in July, 1868, in Finsbury Circus [Fowler, *Brit. Col.*, iii., 360].—E. A. NEWBERY, 12, Churchill Road, N.W. *June 6th*, 1901.

NOTES ON COLLECTING, Etc.

HABITS OF BREPHOS NOTHA.—*Brephos notha* is not only a very easy insect to breed, but is also very prolific, so that there must always be a large number that will escape the collector; it is, moreover, so high a flyer, that a great many must live in peace from year to year. The only apparent reason for its scarcity is that it is local.—J. C. MOBERLY, M.A., F.E.S., Woodlands, Basset, Southampton. *May 1st*, 1901.

LARVÆ OF PLUSIA MONETA.—With the exception of a hunt for *Plusia moneta* larvæ, which appear to be again fairly common this year, I have not been able to give much attention to entomology. It does not follow that because the larvæ are common I shall have a number of imagines in duplicate.—B. A. BOWER, F.E.S., "Langley," Willow Grove, Chislehurst. *May 16th*, 1901.

EXTENDED DURATION OF PUPAL STAGE OF PETASIA NUBECULOSA.—On March 13th a fine ♂ *Petasia nubeculosa* emerged in one of my breeding pots, the larva of which I brought from Rannoch; it pupated in 1898, and has thus been three winters in the pupal stage; a fine ♀ also emerged on March 31st, and there should still be a few pupæ to hatch out.—G. O. DAY, F.E.S., Knutsford. *April 4th*, 1901.

I bred a ♂ *Petasia nubeculosa* on April 3rd from 1898 pupæ, and two ♀ s on the 15th and 17th from last year's pupæ. This is a later date than any I have known before, and I still have pupæ of the 1898 batch going over.—T. MADDISON, F.E.S., South Bailey, Durham. *April 29th*, 1901.

LEPIDOPTERA AT KNUTSFORD.—The mild weather previous to March 14th encouraged emergences. *Phigalia pedaria* has been rather more plentiful than usual, as also has *Hybernia marginaria*; about 20 per cent. of the specimens of the latter species in this neighbourhood are ab. *fuscata*, with a large percentage of others tending in the same direction. It has also been a favourable season for *Anisopteryx aescularia*, but I have taken *Nyssia hispidaria* and *Amphidasys strataria* only sparingly.—G. O. DAY, F.E.S., Knutsford. *April 4th*, 1901.

LEPIDOPTERA AT LYNDHURST.—I stayed at Lyndhurst over Easter, and had fair success, though the weather was very bad. Only a few sallow bushes were out, but these produced *Taeniocampa miniosa*, *T. munda*, *T. pulverulenta*, *T. instabilis*, *Panolis piniperda*, *Xylina socia*, *X. ornithopus*, *Xylocampa areola*, &c. Not a single female Tæniocampid was seen until April 7th, although males were in abundance. Searching posts and trees produced *Xylocampa areola*, *Xylina ornithopus*, *Anticlea badiata*, and *Tephrosia bistortata* (commonly), *Brephos* *parthenias*, and *Asphalia flavicornis* were seen. During my absence *Amphidasys strataria*, *Nyssia hispidaria*, *Eupithecia pumilata*, *Taeniocampa miniosa*, *T. pulverulenta*, and *T. instabilis* had emerged from pupæ.—(Major) R. B. Robertson, Forest View, Southborne Road, Boscombe. *April* 11th, 1901.

Lepidoptera at Castle Moreton.—Very few lepidoptera were moving in this district during March, and the season appears to be a very late one. Last evening (April 16th) was the first night fit for sallow work, and I found *Taeniocampa gothica* and *T. stabilis* common, but no other visitors except a single *T. opima*.—(Rev.) E. C. Dobrée Fox, M.A., Castle Moreton, Tewkesbury. *April* 17*th*, 1901.

Length of the larval life of Pachythelia villosella.—Erratum as to emergence of imago.—I am now quite sure that *Pachythelia villosella* takes three years to complete its transformations, if not four. In May, 1899, we found some larvæ about ¾ inch long, in cases as thick as a Swan fountain pen. I cannot think they had grown so much since the July previous, when they would be hatched. Some I had that came out of the egg on July 27th, 1899, hybernated about ⅓ inch long, and as thick as a hay-stem only. Those I found in May, 1899, are now, after the second hybernation, about 2 inches long, and will certainly spin up soon. On page 166 is a slip due to the meaning of a paragraph I had written not being very clearly expressed. I did not have an imago emerge on April 14th, 1901, as there stated, but one of the larvæ collected in May, 1899, emerged from hybernation on that date. —M. E. Cowl, 5, Spencer Park, S.W. *May* 14*th*, 1901. [We have to apologise to Mrs. Cowl for our share of responsibility in the blunder. In attempting to make clearer the statement Mrs. Cowl made, it appears that we misunderstood her meaning altogether.—Ed.]

Searching for night-feeding larvæ.—Although the evening of May 7th seemed too cold for the field lepidopterist to do any successful work, yet at 8.15 p.m., in company with Mr. H. Field, I set out with lamp and boxes to search for night-feeding larvæ. After half an hour's walk we commenced operations at a ditch running along the outside of a plantation. In this ditch stunted hawthorn bushes were growing, and on them our prey was feeding. We separated, working along the ditch to each other from opposite ends. Meeting at the end of an hour, we found that our united take was sixty-eight larvæ of various species, mainly *Boarmia repandata*, *Triphaena ianthina*, *T. fimbria*, *T. orbona*, *T. interjecta*, *T. pronuba*, *Lasiocampa quercus*, *Noctua festiva*, and *N. triangulum*.—E. Crisp, 31, Union Road, Cambridge.

Drymonia chaonia at Bromley.—On the morning of May 19th last I found a very fine, freshly emerged female of *Drymonia chaonia* at rest on a fence within a mile of my house here. I have made inquiries and find so far that this species has only been taken once before in this district, and on that occasion by Mr. Hope Alderson, some years ago, on the same fence, and within a yard or so of the same spot.—Alfred J. Lawrance, 8, Cross Roads, Bromley Common, Kent. *May* 20*th*, 1901.

Odontopera bidentata ovipositing on Arundo phragmites.—*Odontopera bidentata* is known to be polyphagous, but I own I was surprised last night to box a female when busy ovipositing on the terminal leaves of *Arundo phragmites*.—Percy C. Reid, Feering Bury, Kelvedon. *May* 27*th*, 1901.

Sesia myopæformis on pear. *Sesia myopaeformis* is said by some authors to feed in pear, as well as apple, stems. I have collected many hundreds, but have never found a trace in pear wood, but in Mr. Fitch's garden, at Maldon, the ancient pear-trees are riddled, just as Newman records, in the trunk itself. The trees are not trained, but of full natural size, and very old. I think Newman must have seen these.—(Rev.) C. R. N. Burrows. Mucking Vicarage. *May 16th*, 1901.

Larvæ and cocoons of Plusia moneta at Bidborough.—On June 5th I had an opportunity of spending an afternoon in the beautiful garden of my mother's home at Bidborough, near Tunbridge Wells. While admiring the luxuriance of a particularly fine herbaceous border I was struck by the unusual appearance of one of the leaves on a plant of *Delphinium*, and a closer scrutiny was rewarded by the discovery of a nearly full-fed larva of *Plusia moneta*. Further search revealed three more larvæ and no less than twenty-four cocoons of a rich golden silk, attached to the under surface of the leaves. During the last few years that I have lived at Bidborough I have always searched the same plants indefatigably though in vain, so that it is the more curious that I should have been successful on the occasion of a flying visit like the present.—H. W. Shepheard-Walwyn, M.A., F.E.S., Dalwhinnie, Purley, Surrey. *June 6th*, 1901.

Colias hyale hibernated and bred.—During August last year I obtained several wasted females of this species, and confined them over clover plants in the sun, for the purpose of obtaining ova; these were deposited very sparingly, and the total number obtained was only a dozen. On hatching, the young larvæ were fed upon white clover, planted in a pot, and kept in a cool conservatory; they fed slowly until the end of November, at which period they evidently commenced to hibernate, spinning pads of silk on the upper surface of the clover leaves for that purpose. I counted ten larvæ at this period; these, I presume, had done their best to imitate the natural conditions under which the species hibernates, but these did not strike me as exactly ideal. In the first place, the clover leaves closed up each evening, and opened in the morning, and thus fixture of position was not obtained; and then the leaves themselves usually dried up or decayed during the winter, with the result that a larva hibernating on a decayed leaf would probably have got mouldy. I, therefore, took nine and put them in a large chip box, covered with muslin, and stood it on a ledge in the conservatory, where I could keep it at a temperature of from 32° to 45° during the winter; the tenth larva I left undisturbed on the clover plant. The result proved as I anticipated. On December 25th the larva on the clover had developed a patch of mould, which proved fatal, whereas those in the chip box were quite healthy. Towards the end of February the weather got warmer, and, on the 20th, I noticed the larvæ were moving about, and accordingly placed the chip box containing them on a plant of growing clover, and found that by the 23rd all except one had commenced to feed. This specimen showed no signs of eating, and in a few days was dead. Judging that now they were started from their hibernation it would be advisable to keep them fairly warm, I kept the conservatory at a temperature of from 40° to 55°. They fed slowly each day, chiefly during the sunshine. During March, in changing them from one plant to another, one larva was dropped beneath the staging of the house, reducing my stock to seven. On April 20th one had pupated, and by the 23rd four others. Two at this stage sickened and died, probably owing to the necessarily close atmosphere in which they had been reared. On May 19th two imagines appeared in the breeding-cage, and the three others on the 22nd, one of which was unfortunately a cripple. The four perfect specimens are of fair average size, and all are of the primrose-tinted form.—W. G. Sheldon, Heimath, Friend's Road, Croydon. *May 28th*, 1901.

REVIEWS AND NOTICES OF BOOKS.

"Practical hints for the field lepidopterist," by J. W. Tutt, F.E.S. London: Elliot Stock, 62, Paternoster Row, E.C., Price 5/6 net. (interleaved 6/-).—It is difficult to estimate how much the present generation of entomologists—whether systematists or field-workers—are indebted to Mr. Tutt for his successful efforts to provide us with interesting hand-books, and so to popularise our very fascinating pursuit. His latest work is of the most practical character, being a very large mass of hints, contributed and original, as to the habits and methods of obtaining a considerable proportion of our British lepidoptera. However long and carefully an individual collector may have worked, it is no exaggeration to say that almost every page of this book will reveal to him some fact which had not come within the range of his personal observation. Valuable as are the "Practical Hints" published from time to time in the *Record*, they are unfortunately scattered through different volumes, and are not classified (as is now the case) under the headings of the different families. One great advantage of this system is that the Macro-lepidopterist can easily skip those hints which concern the Micros only, and *vice versa*. At times the Editor launches out into a more general disquisition, as when he enthusiastically recommends his readers to devote some of their time in July to beating larvae. Our own personal experience is that with the exception of oaks, which produce some of the better Notodonts, most trees are singularly unproductive at this sweltering time of year when also flies are so abundant (especially in woods) as to be an almost intolerable plague. A large number of garden flowers have been from time to time recommended as proving attractive to night-flying moths, perhaps the most favourite one being red valerian; but we have found white valerian to be quite as attractive, and it possesses the very great advantage of rendering the dark-coloured insects that settle on it extremely conspicuous, and therefore much more easy of capture, and here we may convey the additional hint (not, we think, contained in the work under review) that not only are the flowers of *Hesperis matronalis* (the garden rocket) very attractive to Noctuids all June, but the seed-pods are a food much beloved by the larvae of *Euchloë cardamines*, which may generally be found resting thereon in goodly numbers from the middle to the end of July. We cannot too strongly recommend entomologists who have the space to spare to grow this plant in quantities in their gardens in addition to such well-known sources of attraction as sallows, rhododendrons, *Lychnis* of various species, and hemp-agrimony. Here and there is to be found a statement that one feels a little inclined to question, such as the recommendation to beat oak for *Trichiura crataegi*. Blackthorn and whitethorn are undoubtedly its favourite food-plants in this country, and (except on the Scotch moors where it partakes of the universal heather) we believe that it very rarely eats anything else in these islands.* On the other side of the account it cannot be too freely conceded that Mr. Tutt's new book abounds in absolutely invaluable hints, of which we may quote an instance (occurring at page 49) to the effect that "*Tethea subtusa* uses a single poplar leaf to hide in, turning over one side and fastening it firmly round the edge with silk, whereas *Taeniocampa populeti* invariably uses two leaves, one fastened above the other." Another instance we may quote from page 84, where we find the very useful information that "during May it pays to search sallow bushes, not to beat them, for larvæ of *Tethea retusa*, which prefer sallows with leaves of thin texture." As very few cabinets seem to contain an enviable series of *T. retusa*, it is to be hoped that the above hint may go some way towards remedying the deficiency. In conclusion we may say that the really keen entomologist who possesses this book already has no doubt carefully read it through and stored away many new facts in his receptive mind, whilst his unfortunate brother, not being an original subscriber, lives on, unconscious of the appetising scientific pabulum awaiting his digestion, and yet this omission on his part can be repaired by the modest expenditure of little more than a crown, after which he will be fully justified in remarking "Finis coronet opus!"—G.H.R.

* The full list of food-plants from *British Lepidoptera*, ii., p. 494, reads as follows:—Apple (Newnham), whitethorn, sloe, willow (Stephens), sallow (Stainton), oak, birch, poplar (Thurnall), crab-apple (Holland), hazel (Christy), ling (Harris), beech (Edmunds), bramble (Montgomery), cherry (Esper), pear (Speyer), *Cotoneaster* (Standfuss), *Escallonia serrata* (Zach *teste* Staudinger), *Salix caprea*, *Populus tremula* (Hering), *Alnus viridis* (Frey), *Populus nigra* (St. John), plum (Barraud).

SCIENTIFIC NOTES AND OBSERVATIONS.

Further notes on the assembling of Macrothylacia rubi.—A larva of *Macrothylacia rubi* pupated on April 25th, and a ♀ emerged on June 1st. It appeared to be calling on the first evening, but on June 2nd and 3rd (cool, dull evenings) when taken out, from 6 p.m.-7 p.m., seemed to exert no direct influence on wild ♂ s, though one or two were seen in her vicinity. On the 5th, however (sunny and warm) ♂ s began (at about 5 p.m.) to be seen in the garden of this cottage (close to their locality), and, on the ♀ being taken out about twenty were seen in the course of an hour, one as late as 9.45 p.m. In my experience, the males of this species have nothing like the acuteness, boldness, or assiduity shown by *Lasiocampa quercus* under similar conditions, seeming to have difficulty in precise location, and being easily frightened off. The ♀ had laid two ova (infertile) previous to the evening of the 5th.—R. M. Prideaux, 103, Reigate Hill. *June 6th*, 1901.

Stridulation of male of Macrothylacia rubi.—Yesterday (8.45 p.m.) a ♀ was first heard and then seen, buzzing over the grass, she was followed up, but soon lost. Ova were found same evening. The snapping sound that accompanies the ♂ s flight can be clearly heard, when one is wheeling round the observer.—Ibid.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Ovum of Lachneis lanestris.—The account of this egg in Tutt's *British Lepidoptera*, vol. ii., p. 507, is not at all points quite as complete as it should be. The point chiefly in need of being more definitely brought out is the flattening of the egg. In the whorls in which it is placed, the micropylar end is outwards, and, as stated, this end of the egg is rather larger than the other; but further, as it is usually placed on the twig, the thickness of the egg parallel with the length of the twig is greater than that transverse to it, *i.e.*, regarded as a flat egg, it has the long micropylar axis, but the other two axes at right angles to this are unequal, a fact that is not mentioned in the description referred to*, and yet most important as showing that this egg has made no serious progress from the flat to the upright type of egg, notwithstanding that its position when laid more suggests an upright than a flat position. The details said to be seen under a $\frac{2}{3}$ lens are for the most part invisible under a half-inch object-glass, nor do I make out a circular depression on the "upper surface" of the egg. (Which is the upper surface?) The long axis of the egg, *i.e.*, from micropyle to nadir, is 1·3mm. Viewed from above, looking straight down on micropyle, the diameters at right angles to each other are the longer 0·86mm., the shorter 0·58mm.; we may, therefore, describe it, as in other flat eggs, as having a top, a side, and ends, though here, as the egg is laid, the "end" (micropylar) is at the top. Or we might, in view of such eggs as this—and to make terms of description the same in flat and upright eggs—describe the egg as having a top or summit (micropylar end) and a nadir, and a side and an edge—the side being that aspect which gives the egg its largest apparent area. The form of the egg is then further to be described as giving the side a diameter at the top (micropylar end) of 0·74mm., at the middle of 0·84mm., and at the base of 0·68mm. The same diameters on the edge view being 0·74mm., 0·68mm., and 0·50mm. One of the sides is generally somewhat irregularly hollow†. As to the colour of the egg, the woolly coating is not difficult to remove sufficiently for the egg to be seen, but it remains more or less covered with gummy matter. Allowance for this suggests that the colour is really a slightly dirty white. The depression in the side, as in most flat eggs, is probably the result of shrinking by evaporation. No other depression can be made out. The micropylar area is slightly thinner than the rest of the eggshell, and shows a trace of different tint not always easy to be sure of. As to markings and sculpture, the micropyle presents a rosette of eight cells, with a diameter of 0·04mm., which is thinner than the rest of the eggshell. The rosette is surrounded with hexagonal cells somewhat elongated in a radial direction, and getting larger outwards till they are about twice the

---

* The typical Lachneid egg is described (*Brit. Lep.*, ii., p. 435) as having "the micropylar axis horizontal, and usually considerably longer than either of the other axes, of which the vertical is the shorter." As the typical characters relating to these three axes are maintained in *L. lanestris*, they have not been repeated on p. 507.—Ed.

† Probably this represents the badly-termed "upper surface," the depression in the particular egg described (*Brit. Lep.*, ii., p. 507) being almost regular instead of irregular.—Ed.

size of those of the rosette; at about the third row their outlines begin to get dim, and by the sixth or seventh it is difficult to say that one can really make them out. Beyond this the shell has no definite markings or sculpturings, and its apparently minutely granular surface is probably its real nature, but may result from the cement which more or less covers it. On examining a newly-laid egg quite free from gum and hairs, the colour is seen to be pale straw-yellow with a whitish porcellanous area, including the whole micropylar end except the micropylar spot. Over the surface of the egg is a number of little dots, apparently raised, and they suggest that these positions are at the meeting-points of the netting (not itself visible), but if so, they are largely wanting, as the dots occur singly or in two and threes, as if at those points of the cells nearest the micropyle, and not of all. Towards the micropylar end a portion of eggshell made transparent shows these dots not round as over the rest of the shell, but elongate or pear-shaped, strongly resembling the mussel-shaped scales of some coccids.—T. A. CHAPMAN, Betula, Reigate.

EGGS OF LEPIDOPTERA.—*Trochilium apiformis.*—Mr. Bacot gave me some eggs of this species sent him from Malta, with the information that they are scattered freely in laying. The eggs bear out this statement by being quite devoid of any surface for attachment, and rolling about loosely just like those of *Hepiali*, and bounding elastically in the same way when dropped, but being flat instead of spherical they do not roll quite so freely as those of *Hepialus.* Lying on one side the egg has an oval outline, the largest diameter being 0·63mm., the shorter 0·54mm. It is not, however, exactly an ellipse, being just appreciably narrowed towards the micropylar end, which is further marked by being flattened, as though a portion, 0·012mm. thick, had been cut off. Viewed edgewise, the egg is 0·37mm. thick, rather thicker at the micropylar end by perhaps 0·012mm., and the flattening of this end is evident. Seen endwise, the diameters are of course 0·54mm. and 0·37mm. The sides are flat, and one inclines to become hollow by desiccation, but only slightly; the edges are very rounded, so that seen edgewise (sideways) the ends are nearly semi-circular, apart from micropylar flattening. The sculpturing is difficult to make out; at one stage the globules lining the shell show through, so as to give the appearance of a surface raised into a number of flat bosses or rounded corners. In certain lights, however, the true sculpturing may be seen, as a very fine network (roughly hexagonal) of raised lines, that stand out colourless above the brown material of the shell. The diameter of each cell of the network is about 0·014mm. The micropyle presents a minute central cell, pentagonal or hexagonal, 0·003mm. in diameter, surrounded by five or six cells, the group being 0·015mm. in diameter; round these are larger cells, probably the same as those of the general surface, but difficult to see in the view obtained of the micropyle. These eggs compare remarkably with those of *T. crabroniformis* (*bembeciformis*), being so much smaller (though proportionally rather thicker), and especially in being scattered loosely instead of being glued to a leaf.—T. A. CHAPMAN. *May*, 1901.

ERRATUM.—Page 173, line 15, for "Volti" read "Voltri."

Peronea cristana, Fab., and its aberrations (*with plate*).

By J. A. CLARK, F.E.S.

There are few genera more interesting than that of *Peronea*, and no species therein more attractive than *P. cristana*. Stephens, Curtis, Desvignes and others have studied the Peroneas somewhat closely and each of these authors has written at length about them. The members of the genus are known popularly as "buttons" owing to the little tuft of scales which is such a prominent feature of the central area of the forewings. These early authors were not at all clear as to which of the forms were entitled to specific, and which simply to varietal, rank, but there can be no doubt that Curtis' and Stephens' excellent summarised descriptions of the various forms (*Brit. Ent.*, 2nd edition, pl. xvi., expl. and *Illus. Haust.*, iv., pp. 148 *et seq.*), and Desvignes' paper in the *Zoologist* (vol. iii., pp. 841 *et seq.*) are much more worthy of the name of science than are the bare diagnoses of Meyrick and Stainton in which the multitude of forms belonging to a single polymorphic species is included in a description that practically gives no real clue to the endless variation exhibited by the species.

Peronea cristana, owing to its great range of variation, has always had a great fascination for me, and, during the last few years, I have, whenever opportunity has offered, collected the most varied series possible of this interesting species. Little, indeed, seems to be known of its life-history. Like myself, many have bred odd examples of the species, the larvæ having been obtained by general beating, and without actual knowledge of the species, until after pupation had taken place and the imagines had emerged. My recollection of the larvæ is that they have been brownish-green in colour, and I believe that they feed on the lichen growing on whitethorn, but the authorities, such as they are, appear to be against me. Wilkinson notes (*British Tortrices*, p. 174): "The larva is unknown, although the insect has in one or two instances been bred promiscuously from whitethorn," an experience very similar to mine. Meyrick states (*Handbook*, &c., p. 521): "The larva on rose and hawthorn, June and July." Merrin says (*Calendar*, p. 115): "Dwarf sallows and hawthorn between united leaves." Sorhagen says (*Die Kleinschmett.*, &c., p. 64): "Die Raupe, 6-7 (June and July) in den Herzblättern von *Prunus spinosa*, *Salix caprea*, *Ulmus*, *Carpinus*; dringt auch in die Stengelspitzen." One is rather astonished at Sorhagen's list of food-plants, and would be inclined to suggest, were it not for the general well-known accuracy of this author, that some of the references were possibly to other species of *Peronea*, of which, however, it must be confessed, there is not the slightest evidence. I have repeatedly tried to obtain ova in the autumn, but have never been successful. I had long supposed that the imagines hybernated, and Mr. Tutt tells me that Frey says (*Lep. Schweiz*, p. 281): "Falter im tiefsten Spätherbste und nach der Ueberwinterung im Frühling." Merrin states that the imagines are found from September to November, but says nothing of their re-occurrence in spring. The imagines may be taken freely during September and October in the New Forest, the Warren at Folkestone, and Epping Forest in secluded spots where there are plenty of old whitethorns covered with lichens. Stephens, Curtis, and Desvignes give other localities, in some of which, *e.g.*, Whittlebury Forest, the species is (or was) very abundant. Studd gives Dawlish Warren, Tutt notes Chattenden, &c.

The great number of imagines that I have captured during the last five years, has given me a very large amount of material. Added to this I have examined many other of our leading collections—my thanks are especially due to Mr. Sydney Webb, Dr. Mason, and various others who have kindly placed their valuable collections at my disposal for examination and research, and also for the notes and observations with which they have helped me, in many instances enabling me to come to a definite conclusion in critical cases. As I consider my own collection to be fairly representative, I have named the new aberrations which I possess (and am also publishing figures of the same with this account of the species), and I trust the descriptions and figures will enable the lepidopterists of to-day to arrange their series of this species under the special names which have been bestowed upon the various forms. In order to make the list as complete as possible, it has been deemed advisable to add the descriptions of the forms named by other authors. This will at least make this article a good basis on which to found even a more detailed grouping of the aberrations should some one give the species continued study and attention.

I have, in the following list, adopted as a basis for grouping, the two characters of colour and markings, and, although, when one becomes accustomed to the general character of the markings, the aberrations are not difficult to group, yet, at first, the grouping is somewhat bewildering, and it is only when an intimate knowledge of the various forms has been obtained and the details mastered that success is at all assured. To my short descriptions of new forms, I have appended notes setting forth the differences between these and the allied forms in their respective groups, which should make reference to any of the aberrations described, a comparatively easy matter. Lepidopterists have usually called the tuft of raised scales in the centre of the forewings the "button," whilst the streak along the inner margin is known as the "vitta," these terms I have retained in my descriptions.

Curtis, in 1824, diagnoses (*Brit. Ent.*, expl. pl. xvi) the genus *Peronea*, and describes several forms, and in the 2nd edition, 1862, gives the following general notes thereon: "The genus *Peronea* (derived from the Greek signifying a "button") is here divided into sections, those with a large elevated tuft of scales in the centre of the upper wings being the typical species. I shall introduce Hübner's sectional names from his fanciful arrangement, but I may here state that, as it is a mere catalogue divided into groups, the markings of the wings being briefly added, without any attempt at scientific definitions, I shall never feel bound to adopt them. The *Peroneae* measure from about nine to ten lines when the wings are expanded, most of them conceal themselves in the lichens that cover the old whitethorns, &c., and they have nearly all been taken at Coomb, Birch and Darenth woods in Kent, and in the neighbourhood of Brockenhurst in the New Forest." He divides them into the following sections in the second edition of *British Entomology* (ten new forms not noticed in the *Illustrations* of Stephens, being described in the second edition):

A. PERONEA. Button large.

a. Very dark—*Bentleyana*, Curt., *semiustana*, Curt. (*profanana*, Haw.), *profanana*, Fab., *striana*, Haw., *substriana*, Curt., *brunnea*, Curt., *lichenana*, Curt. (Bent. MSS.), *vittana*, Curt., *spadiceana*, Haw., *subcristalana*, Curt. (Bent. MSS.).

β. Button ochreous or large—*Cristalana*, Don., *fulvovittana*, Curt., *sequana*, Curt. (Bent. MSS.), *consimilana*, Curt., *sericana*, Hüb. (*desfontainana*, Haw.), *desfontainiana*, Fab. (*fulvocristana*, Stephs.), *albovittana*, Curt.

γ. Button white—*Chantana*, Curt., *cristana*, Fab. (*lefebrriana*, Goda), *insulana*, Curt., *subrittana*, Stephs., *albipunctana*, Curt. (Haw. MSS.).

δ. Button small (*Lopas*, *Acleris*, and *Eclectis*, Hüb.)—*Alboflammana*, Curt., *ruficostana*, Curt., *umbrana*, Hb., *albistriana*, Haw., *ramostriana*, Curt., *radiana*, Hb., *divisana*, Hb. (*strigana*, Curt.), *centrovittana*, Curt. (Haw. MSS.). *combustana*, Hb. (*nec* Godt.), *autumnana*, Hb., *byringerana*, Hb. (? *sponsana*, Fab.), *obsoletana*, Stphs., *coronana*, Thnbg. (*eximiana*, Haw.), *buringerana*, Hb., *subcristana*, Curt., *latifasciana*, Haw., *plumbosana*, Haw. (*plumbana*, Fb., *elevana*, Fb., *scabrana*, Hb.).

B. Palpi shorter. Button vanishing; wings a little scabrous—*Lecheana*, Curt., *marmorana*, Curt. (Bent. MSS.), *reticulana*, Haw., *favillaceana*, Hb., *fagana*, Curt., *logiana*, Linn., *semirhombana*, Curt. (*boscana*, Haw. *nec* Fab.), *trigonana*, Stphs. (*logiana*, Hb.), *schalleriana*, Linn. *nec* Hb., *rufana*, Fab. (*comparana*, Hb.), *cirrana*, Curt. (*borana*, Haw. *nec* Fab.), *variegana*, Fab. (*abildgaardana*, Fab.), *asperana*, Fab. (*nyctemerana*, Hb.). *schalleriana*, Goda, *costimaculana*, Stphs.

C. Wings powdered, not scabrous—*Similana*, Curt., *bistriana*, Haw. (? *apiciana*, Tr.), *albicostana*, Stphs. (*pulverana*, Curt.).

Stephens, in his *Illustrations*, iv., pp. 148 *et seq.*, also diagnoses the genus *Peronea*, and writes : " Like the insects of the preceding genus (*Sarrothripus*), much uncertainty exists as to the limits of the respective species ; the typical ones may be instantly recognised by having a large bundle of elevated scales nearly in the centre of the anterior wings, the costa of which is rounded at the base, emarginated slightly in the middle, and faintly ciliated, with rough scales ; the less typical species want the tuft of scales on the middle of the wing, but have small scattered elevated ones towards the base and hinder margin ; the costa is less prominently rounded, and the prevalent colours are more diversified ; the species are autumnal, making their appearance about August, though a few specimens are occasionally met with earlier." He then subdivides the genus into two main divisions, which he diagnoses as :—

A. Anterior wings, with a large elevated bundle of scales on the disc, a little beyond the middle = *Lopas*, Hübner.—*Profanana*, Fab., *striana*, Haw., *substriana*, Stphs., *brunneana*, Stphs., *vittana*, Stphs., *spadiceana*, Haw., *consimilana*, Stphs., *desfontaniana*, Fab., *fulvocristana*, Stphs., *albovittana*, Stphs., *fulvovittana*, Stphs., *cristalana*, Don., *subrittana*, Stphs., *cristana*, Fab., *albipunctana*, Haw.

B. Anterior wings, without a large elevated tuft of scales in the middle, a few scattered ones only on the disc.

a. Palpi large, with the terminal joint concealed—*Lopas* et *Eclectis*, parte Hübner.—*Ruficostana*, Curt., *umbrana*, Hb., *divisana*, Hb., *radiana*, Hb., *ramostriana*, Stphs., *centrovittana*, Stphs., *combustana*, Stphs. (? Hb.), *albostriana*, Haw., *autumnana*, Hb., *subcristana*, Stphs., *coronana*, Thnb., *byringerana*, Hb., *obsoletana*, Stphs.

β. Palpi, with the terminal joint exposed = *Acleris*, Hb.—*Favillaceana*, Hb., *tristana*, Hb., *reticulana*, Haw., *bistriana*, Haw.. *albicostana*, Stphs., *similana*, Stphs., *latifasciana*, Haw., *plumbosana*, Haw., *boscana* (?) Fab., *trigonana*, Stphs., *schalleriana*, Linn., *rufana*, Fab., *costimaculana*, Stphs., *asperana*, Fab., *variegana*, Fab., *borana*, Fab., *logiana*, Hb.

(*To be continued.*)

Staudinger and Rebel's Catalogue.*

At last the long-awaited "new edition" of this Catalogue has appeared, and the stagnation of the last 30 years (as regards the bulk of the continental European work in matters of classification and nomenclature) is doomed to be rudely disturbed. At the close of his preface Dr. Rebel is modestly content to claim that the new Catalogue, as compared with that of 1871, may be regarded as "ein Schritt nach Vorwärts," and he certainly would be one of the last to wish to have it treated as a "ne plus ultra," although it is to be feared that, when once it has found acceptance in the entomological world, all corrections will be ignored except by the comparative few—just as has been the case with its precursors. Be this as it may, we hail the present edition with profound satisfaction; in how many ways it is an enormous step in advance the following review will, it is hoped, sufficiently show.

In the matter of classification the system laid before us in the present work cannot be regarded as more than a *via media*. Dr. Rebel, in his preface, more than hints at the great difficulties which he and his late colleague encountered in arriving at any understanding at all on the subject—difficulties which at times threatened to wreck the whole undertaking; and, as Dr. Rebel had to make many concessions, and even sacrifices, to the greater conservatism of Dr. Staudinger, it need occasion no surprise that there still remains much room for progress in the classification from a biological standpoint. Let us hope that so long a period as 30 years will not elapse between the appearance of this catalogue and the next, and that Dr. Rebel will be spared himself to participate in a further revision and rearrangement. On p. xxxii there is a convenient "Uebersicht der Familienreihenfolge," which facilitates comparison of the present system both with that of the 1871 edition and also with Dr. Rebel's scheme published two years ago.† The first thing that strikes one is that, notwithstanding the decidedly-expressed opinion of the last-named, the domination of the old and inaccurate conceptions of "Macrolepidoptera" and "Microlepidoptera" is not yet brought to an end; for, although the *terms* are avoided, yet the *contents* of Theil I and Theil II respectively show the influence of those conceptions, and the result is that the sequence of families is less natural than that proposed in vol. xi of the *Iris*. This, however, was the almost inevitable result of the division of the work between the two collaborators, Dr. Staudinger wishing to retain control of all those families which formed his share of the 1871 catalogue—including such primitive forms as the *Hepialidae* (Theil I, Fam. 39). But its most regrettable result, perhaps, is the almost pole-wide severance of the two recognised Psychid families—the *Psychidae*, in Theil I, and the *Taleporiidae*, in Theil II. Dr. Chapman's recently-renewed protests (*anteà*, p. 180) are not uncalled-

---

* "*Catalog der Lepidopteren des palaearetischen Faunengebietes*," von Dr. Phil. O. Staudinger und Dr. Phil. H. Rebel. Dritte Auflage des "Cataloges des europäischen Faunengebietes." Berlin: R. Friedländer und Sohn. Mai, 1901. I. Theil: Fam. *Papilionidae-Hepialidae*, von Dr. O. Staudinger und Dr. H. Rebel; II. Theil: Fam. *Pyralidae-Micropterygidae*, von Dr. H. Rebel. xxxii + 411 + 368 pp. in 8vo.

† "*Ueber die gegenwärtigen Stand der Lepidopteren-Systematik*" (*Iris*, xi., pp. 377-391, February, 1899.)

for, yet it is satisfactory to know that Dr. Rebel himself holds the sounder view. The preface (p. x) also expressly tells us that the retention of *Thyrididae*, and all families from *Heterogynidae*, in Theil 1, was a concession to the special desire of Dr. Staudinger. Another important difference of arrangement between the new *Catalog* and the scheme in *Iris* is that the latter follows the ascending scale, beginning with the *Eriocephalidae* (now correctly called *Micropterygidae*), whereas the former starts with *Papilionidae* and (roughly speaking) works downwards. This difference, too, is obviously due to the wishes of Dr. Staudinger, or to the fact that the present work is regarded as a new edition of the Staudinger-Wocke *Catalog* rather than as an entirely independent publication (see preface, p. xii). The genera of each family among themselves should also surely follow the same plan—to the limited extent, that is, to which it is possible—and this has evidently been Dr. Rebel's ideal, as he shows in his prefatory remarks concerning the *Sphingidae*, which Dr. Staudinger insisted on retaining in an order almost the reverse of that desired by his colleague. As will have been gathered from the foregoing remarks, the general arrangement of the new catalogue is a series of "families," many of which correspond to "superfamilies" in Mr. Tutt's sense. Higher groupings are disregarded, and the illusive terms "Bombyces," "Tineina," &c., are swept away, never again, let us hope, to appear in any work of credit. The division into "Rhopalocera" and "Heterocera" is also abandoned. Theil I (whilom "Macrolepidoptera") consists of 39 families, in the following order:—*Papilionidae*, *Pieridae*, *Nymphalidae*, *Libytheidae*, *Erycinidae*, *Lycaenidae*, *Hesperiidae*, *Sphingidae*, *Notodontidae*, *Thaumetopoeidae*, *Lymantriidae*, *Lasiocampidae*, *Endromididae*, *Lemoniidae*, *Saturniidae*, *Brahmaeidae*, *Bombycidae*, *Drepanidae*, *Callidulidae*, *Thyrididae*, *Noctuidae*, *Agaristidae*, *Cymatophoridae*, *Brephidae*, *Geometridae*, *Uraniidae*, *Epiplemidae* (this is the last family which Staudinger lived to revise), *Nolidae*, *Cymbidae*, *Syntomidae*, *Arctiidae*, *Heterogynidae*, *Zygaenidae*, *Megalopygidae*, *Cochlididae*, *Psychidae*, *Sesiidae*, *Cossidae*, *Hepialidae*; of these, only the *Nymphalidae*, *Noctuidae*, *Geometridae*, *Arctiidae*, and *Zygaenidae* are divided into subfamilies. Theil II consists of 18 families, namely:—*Pyralidae*, *Pterophoridae*, *Tortricidae*, *Glyphipterygidae*, *Yponomeutidae*, *Plutellidae*, *Gelechiidae*, *Tinaegeriidae*, *Elachistidae*, *Gracilariidae*, *Lyonetiidae*, *Nepticulidae*, *Talaeporiidae*, *Tineidae*, *Crinopterygidae*, *Eriocraniidae*, *Micropterygidae*; ten of these are divided into subfamilies. It may be noticed in passing that both Staudinger and Rebel have accepted the classically incorrect terminations *iidae* and *iinae* where necessitated by the root structure; the present writer had already corrected his own copy of the *Nomenclature of Lepidoptera: Correspondence* (Hampson's), on p. 303, "Analysis of Replies," where Staudinger and, apparently, also Kirby and Aurivillius are made to vote *against* "iidae, iinae," contrary to their expressed opinions—the only shadow of evidence of bias which has been noticed in Mr. Durrant's truly admirable analyses. In Rebel's 1899 article the number of families proposed reached 60, as against the 57 enumerated above; the slight discrepancy is due to the sinking of *Blastobasidae* and *Oecophoridae* as subfamilies of *Gelechiidae*; of *Adelidae* as subfamily of *Tineidae*; and of *Lithosiidae* as subfamily of *Arctiidae*: while on the other side the family

Lyonetiidae is here separated. Another little change which does not affect the total number is the acceptance of the recently-erected family *Lemoniidae* (*Ent. Nachr.*, xxvi., p. 49; *Ent. Rec.*, xiii., pp. 167-8; *Trans. Ent. Soc. Lond.*, 1901, p. 187), and the consequent rejection of *Eupterotidae* (with which the genus *Lemonia*, Hb., had been associated) from the Palæarctic fauna. Dr. Rebel (*Ent. Nachr., loc. cit.*, Feb. 1900) forestalled our English entomologists in this change, and will blame our insular ignorance of his work. No doubt our most advanced students of phylogenetic classification will find a good deal to criticise in matters of detail as regards the contents and boundaries of the various families, apart altogether from the less important question of their sequence. Why, for instance, are the Syntomids maintained as a distinct family from *Arctiidae*, while, on the other hand, Fam. xxxviii, *Cossidae*, is allowed to contain such diverse elements as *Cossus* and *Zeuzera* without even subfamily distinction? (In *Iris*, xi., p. 387, two subfamilies, *Cossinae* and *Zeuzerinae*, are recognised, and intimation given that their differences are not unperceived.) But there are few things more difficult than to arrange our material in a series of families of *approximately equal value*, and there is much cause for thankfulness that in the catalogue now before us many of the most absurd combinations are abandoned, and the work is in the hands of an author who is at least thoroughly in sympathy with the modern biological standpoint.

In dealing with the individual families, and, in some cases, individual genera, our authors have made considerable use of the most recent monographic works, and their results are satisfactory or the reverse largely according to the value of the authorities followed. No better method could, however, be desired for a catalogue; even a catalogue of the high position which will be conceded to that of Staudinger and Rebel cannot be expected to undertake first-hand revisional work on any large scale (compare preface, p. ix), although, of course, it was the duty of the authors to check everything so far as possible before accepting it, and evidence is not wanting that this has in nearly all cases been conscientiously done. The amount of literature gone through must have been enormous, and very little of importance published up to the close of the year 1900 seems to have been overlooked. The literature list on pp. xv-xxvi contains 524 entries (sometimes with valuable bibliographical details), as against 360 in the 1871 edition, nowithstanding that a good many pre-Linnean works which were previously quoted are now omitted; nor must it be forgotten that many of the entries are of periodicals which have been running for quarter or half a century (or more), and it is no light work to make oneself conversant with the lepidopterological contents of even one such periodical. Very few of the monographers have been followed without some reservation; perhaps Aurivillius, on the *Lasiocampidae*, is an exception—but in any case he is a recognised specialist on the family. The revisions among the butterflies, such as those of the *Hesperiidae* by Elwes and Edwards, of *Erebia* by the same authors and Dr. Chapman, were of course independently judged by Dr. Staudinger, and in a few details his opinions differ from theirs. The old aversion to the multiplication of genera is still observable; the new genus *Erebomorpha*, Elwes (*Trans. Ent. Soc. Lond.*, 1899, p. 351)—which, by the way, is a preoccupied name, *Erebomorpha*, Wlk., 1860, being a

Geometrid genus*—is not accepted, although it seems to be founded on quite sufficient peculiarities; nor are Scudder's groupings in *Argynnis*, nor (to any adequate extent) in the Blues, followed; on the other hand, the necessary splitting up of *Thecla* into three genera (*Thecla*, *Callophrys*, and *Zephyrus*) has apparently been deemed inevitable, as also has the removal of *hyperantus* from the genus *Epinephele* (into *Aphantopus*, Wllgrn.). Hampson's work, so far as published, has been requisitioned for the Syntomids and Lithosiids, as well as for the *Pyralidae*, and Meyrick's revision has had some influence in the *Geometridae*, &c. Mr. Tutt's *British Lepidoptera*, vol. ii., was no doubt received too late for the close study which it requires, and the treatment of the Psychids is a kind of compromise between the systems of Heylaerts (mentioned as authority in the preface, dated December 31st, 1900) and of Tutt. The latter, based as it is upon the splendid work of Dr. Chapman, may be trusted to win its way in all essentials so soon as it is thoroughly known and digested. Already one is glad to see much of the corrected nomenclature accepted according to Tutt, and some of his most obviously necessary genera—*Luffia*, *Bankesia*, &c., duly recognised.

* For *Erebomorpha*, Elwes, *nec* Walker, the name of *Boeberia*, n. nom., should be substituted, in honour of the discoverer of the type species, which is *parmenio*, Boeb.

(To be continued.)

Migration and Dispersal of Insects: Lepidoptera.

By J. W. TUTT, F.E.S.

The tropical and subtropical forests of Central and South America appear to produce several migrating species of lepidoptera. In the openings of these great forests insects abound. Here giant trees throw up their great crowns and form a canopy of foliage that almost shuts out the light, whilst the twining lianas hang rope-like from the branches, entangling the massive trees like cables or covering the dark leafage with their beautiful flowers; epiphytes may be seen in every fork sending down their long aërial roots, and great broad-leaved heliconias, leathery melastomæ and succulent begonias are abundant, whilst the cecropia trees, with white stems and large palmate leaves form huge candelabra, and the ground is sometimes carpeted with large flowers, yellow, pink, or white, that have fallen from some invisible tree-top above, or the air is filled with a delicious perfume, the source of which one seeks around in vain, for the flowers that cause it are far overhead out of sight, lost in the great overshadowing crown of verdure. It is on the outskirts of such forests as these, so exquisitely described by Belt, that insect life is most prolific, and this powerful writer briefly chronicles (*Naturalist in Nicaragua*, p. 152) the migrating habits of certain species. He writes: "As we rode along, great numbers of a brown-tailed butterfly (*Timetes chiron*) were flying to the south-east; they occurred, as it were, in columns. The air would be comparatively clear of them for a few hundred yards, then we would pass through a band, perhaps 50 yards in width, where hundreds were all in sight, and all travelling one way. I took the direction several times with a pocket-compass and it was always south-east. Amongst them were a few yellow butterflies, but these were not as numerous as in former years. In some seasons these migratory swarms of butterflies continue passing over to the south-east for three to five weeks, and must consist of millions upon millions of individuals, comprising many different species and genera. The beautiful tailed green-and-gilded dayflying moth, *Urania* (*Cydimon*) *leilus*, also joins in this annual movement." Some of the Uranias have been known as migrants for almost a century. Swainson records (*Zoological Illustrations*, 2, vol. iii), under *Leilus surinamensis* (*Urania leilus*), that "the typical species of *Leilus* (= *Urania*) are found in tropical America where they fly with amazing rapidity, and perform, like their prototypes the swallows, annual migrations." Under *Leilus braziliensis* he quotes from his notebook, that great numbers of this insect were observed for three or four days, from June 12th, 1817, flying past Pernambuco, in a direction from north to south, not one deviated from this course, notwithstanding the flowers that were growing around; they flew against the wind, which blew rather strongly, and near the ground, but mounted over every tree or other high object which lay in their course, yet their flight was so rapid that not a single specimen could be captured. They flew singly, and some 50 or 60 must have passed the spot opposite the window before midday; and they continued to pass for three or four days in this manner. It is clear that these insects could not have come from so far north as Surinam, where only the other species (*L. surinamensis*) is found, and they certainly do not migrate to the more southern latitude of Rio de Janeiro." In the *Handelingen der Nederlandsche Entomologische Vereeniging*, 1, p. 75 (1850), it is recorded that Heer Verhuell, when he was a prisoner of war at San Salvador, in All Saints' Bay, on the coast of Brazil, about 1807, witnessed, whilst standing on the high coast at the entrance of the bay, from the opposite island, Itaparica, high above the surface of the water, a dark cloud approaching, which was soon recognised as a swarm of moths. Some, which flew lower than the rest of the army, were captured and proved to be *Urania leilus*" (probably *U. braziliensis* as in the former case). Otto Friedrich, who lived long in Mexico and Texas, is noticed (*loc. cit.*, 1854, pp. 91 *et seq.*) as having observed that every year there is a great migration of lepidoptera from the State of Vera Cruz, in Mexico. It begins in April and lasts for three or four weeks; every day from 9 a.m. to noon, fresh troops follow exactly the same direction, the lepidoptera following the eastern slope of the Cordilleras, from Anahuac, somewhat more to the east than in the direction of Orizaba or Ciltalteptle, towards Coffre de Perote or Naucampatepetle, and away northwards. They always fly at the foot of the Cordilleras, and not higher. These migratory insects consist of *Urania leilus* (probably *U. fulgens*), *U. marius*, Cram. (= *chiron*, Godt., this latter species is a Nymphalid not an Uraniid), and a smaller species, the latter only in small numbers, and, according to Friedrich, of less interest. The two large species commenced their journey somewhere near the foot of Orizaba, or from the region of Cordova, a little further north. When they migrate thence they are quite fresh, and just emerged from the pupa. Friedrich does not say where the smaller species begins its migration. He was not able to ascertain with certainty the goal of this migration, but *U. leilus*, he says, does not appear to travel further than to the neighbourhood of the Rio Grande in Texas, because the *Cidrus* trees on which the larvæ feed stop there, and the species has not been observed farther north than on the Mexican-Texan frontier of the Rio Grande; he had only met with one example of *marius*, very much battered and worn, on the Guadeloupe. Friedrich asserts that the hosts of lepidoptera return along the same route five or six weeks later, but in greatly reduced numbers, the survivors greatly exhausted, and the females without eggs. In the table (*loc. cit.*, p. 103) the direction of flight of those observed by Verhuell is given as from south-east to north-west, and of those observed by Friedrich from north to south. *Urania leilus* is again noticed in *The American Naturalist*, in 1872 (referred to *Entom.*, vi., p. 332) as migrating in immense numbers, flying in swarms across the Isthmus of Panama, and equally abundant at Para, Pernambuco and Rio Janeiro: "From an early hour in the morning until nearly dark these insects passed along the shore in amazing numbers, but most numerously in the evening. It was very seldom that one was seen travelling in the opposite direction." One of the latest records of the migration of one of these beautiful Uraniids comes from Colon, in the Republic of Columbia, where, in March, 1889, *Urania boisduvalii* was observed by Davis, who states (*Insect Life*, ii., p. 22) that when within a few miles of Colon, the insects were seen flying from the mainland in a northerly direction across the bay. This migration continued daily from the date of the observer's arrival (March 18th) for nearly a week. When the flight began could not be ascertained. Its duration daily was from just before sunrise until sunset; it was protracted, however, until late at night on three evenings near and at full of the moon. The point which attracted most attention was the vast number of the insects. "The air was actually full of them. It resembled an unremitting shower of forest leaves in autumn." *Urania fulgens*, however, is perhaps even more remarkable for its migratory habits. It is described by Kirby as migrating in vast flocks, flying at a great height by day, from north to south, or from east to west.

Mann, writing (*Psyche*, v., p. 168) of an observation made in Brazil, in 1871, says that "great numbers of the Vanessid butterfly *Coea* (*Aganisthos*) *acheronta*, followed each other singly at intervals across the meadow in front of the house, apparently migrating, and were difficult to catch. They came with powerful, rapid, direct flight, perhaps from three to five mètres above the level of the meadow, from the direction of a rising ground or small hill near by. After seeing several and noticing the uniformity of their behaviour, I ascended the hill, and thus, so far as I recollect came within reach of them. From how great a distance they came I could not tell, nor can I now say from or to what direction of the compass they flew. The season was early fall (February 17th, 1871)." We have previously recorded the occurrence of *Eugonia j-album* in vast swarms, at the Sankaty Head lighthouse on Nantucket Island, and we have already noticed the migrations of *Pyrameis cardui*, and the fact that *Euranessa antiopa* has been observed at sea, many miles from the nearest land. Another American species, *Eugonia californica*, closely allied to these, is also reported as a migrant. Dr. Behr writes (*Proc. Cal. Acad. Nat. Sci.*, iii., p. 124) of this species: "The first migration I observed was on November 15th, 1856, when numbers of this butterfly flew over San Francisco in a general direction of south-south-east. They flew singly and never crowded into swarms. Most of these butterflies passed over our streets at too great a height to permit close inspection—a few alighting here and there on lamp-posts, signboards, or in the more rural parts on flowers. They nearly all looked worn and shattered, and there were no fresh specimens among them, clearly indicating that they were not raised in the neighbourhood of the city but had come from different parts. On the 18th some of the stragglers were still to be seen, but on the 19th they had all disappeared. The second migration took place last fall (1863) but did not reach San Francisco . . . . By comparing notes received from Mr. Johnson, of Marin County, I have come to the conclusion that the country to the northward crowded with this Vanessid (*Eugonia californica*), must have sent at least one colony south ; and I was told by the above-mentioned gentleman, the statement being confirmed by many intelligent farmers of the same neighbourhood, that large numbers of a brown butterfly had come from San Quentin and occurred over that part of the bay which stretches between San Rafael and Saucelito. About the same time, great numbers of the same insect were observed in Lagunita Valley, at the base of Tamal Pais, where the swarms gathered in a great crowd and disappeared as suddenly as they came."

It has been frequently noticed that when *Pyrameis cardui* is making one of its migratory movements, nothing appears to stop it, and specimens have been seen ascending and crossing the highest Alps, or have been picked up dead on the snow. *Eugonia californica* appears to act in much the same manner. On August 29th, 1889, during an ascent of Mount Shasta, Hopkins records (*Insect Life*, ii., p. 355) the flight of countless myriads of these butterflies at an altitude far above the snow-line. He writes : "In our early morning climb we had left our horses at half past four o'clock at very near the snow-line, where, indeed, there were many small snow-fields close about us. Our progress was very slow and tedious, and some little time after daylight a few signs of insect life were seen in the shape of 'snow-fleas,' two or three large winged grasshoppers and, occasionally at first, a butterfly. The last two were stiffened by the cold as if they were there from the day previous. The butterfly increased greatly in numbers as we ascended, and were, many of them, found among and under the loose stones as well as a few upon them. At perhaps half-past nine, we came to a point on which the sun had long been shining, and here the butterflies were flying in the air, the flight being in a south-easterly direction. From here, they seemed to increase very rapidly in numbers up the remainder of the ascent to well towards the summit. The latter was reached at 12.20 a.m., and the temperature was noted as 42°F. in the open air. We remained here about half an hour, then passed down by way of the Hot Sulphur Springs and thence out on the southerly face of the mountains. We again encountered our beautiful friends, at not further than six or eight hundred feet below the extreme peak, and they were now in countless numbers, filling the air with their flashing wings, and all passing in the same direction as observed during the ascent, *i.e.*, towards the south-east. This strange sight continued until we seemed to pass below them at an altitude of between 11,000ft. and 12,000ft. The fact of its being a continuous flight of these insects across the mountain in one direction during the warm part of the day—a period of nearly five hours—is beyond question. That it was in progress one or more days previous to that upon which I observed it, is an easy deduction from the fact of the numbers of the insects found among the rocks and stones, while yet stiffened by the cold of the night air. How much longer it may have continued I had no means of knowing. Where the butterflies came from in such vast numbers and what brought them to such a high altitude is, of course, a matter of pure speculation."

On some races of Lasiocampa quercûs.

By J. C. WARBURG.

Having spent many winters on the Riviera, I had good opportunities of breeding the two forms of *L. quercûs* which occur at Cannes. The one which Mr. Tutt has named *L.* var. *meridionalis* is the form considered by local entomologists as the type of that part of the world, and referred to locally as *L. quercûs;* the other called *L.* var. *spartii* by these authorities was designated *riburni* by Guénée, who logically refrained from mixing up a casual German aberration with a southern race.

The general colour of the hair is brown in the larva of *L.* var. *riburni*, white in *L.* var. *meridionalis*, and this difference makes it easy to distinguish any larvæ which may be found. With regard to the imagines, as long as I only possessed a few, I found these also easy to distinguish ; but, as my series increased, I found greater and greater difficulty in the matter, until I began to doubt whether the colour of the larvæ was more than accidental. To set at rest my suspicions I obtained pairings from various moths of both varieties which emerged in 1895 (being bred from larvæ found wild). From these I obtained a large number of larvæ. Owing to the difficulty of keeping and feeding them all separately one family of *L.* var. *riburni* larvæ was kept apart (labelled A) the others of both kinds were all bred together in one large cage and sorted out by the colour when fullgrown, the *riburni* being marked B, the *meridionalis* C. From these I obtained the following specimens*:

A—Emerged between 28/7/96 — 10/ 9/96 (?)	.. 22 ♂ ♂	20 ♀ ♀	..	Total 42
B—Emerged between 5/9/96 — 16/10/96	.. 3 ♂ ♂	27 ♀ ♀	..	,, 30
C—Emerged between 9/8/96 — 17/10/96	.. 52 ♂ ♂	97 ♀ ♀	..	,, 149
				221

B and C were treated alike and kept out of doors a great deal. A was very likely kept indoors, which would account for the earlier emergence. The pupæ were brought to London in May, 1896.

From these moths I obtained several pairings, including the crosses between *L.* var. *meridionalis* ♂ and *L.* var. *riburni* ♀. I have no record of the contrary cross. The ova and larvæ obtained from these pairings I shared with Mr. Bacot, who had kindly undertaken to assist me in the matter, as I wished to widen the scope of the experiments and include various other races of *L. quercûs*, namely, *L.* var. *sicula* (of Sicilian descent) and *L.* var. *callunae* (from Aberdeen). Mr. Bacot, on his side, contributed some Dorset *L. quercûs*. With the exception of some Swedish *L. quercus* (*callunae*?) larvæ, all of which died when half grown, and some from Paris, added later, this was the

* The actual number of ♂ s was probably greater as specimens which spoilt their wings by fluttering were discarded.

whole of our living material. I may as well state at once that the original object of the experiments was accomplished, and the constancy of the larval colouring of *L.* var. *meridionalis* and *L.* var. *riburni* established in four consecutive generations of larvæ; the wild larvæ found by me in 1894-1895 being the great grand-parents of Mr. Bacot's batches K (*riburni*) and AO (*meridionalis*) laid in 1897; or, if my mixing the larvæ of my batches B and C be considered to vitiate the results in the first generation, there still remain these consecutive generations to form ample evidence of the fact.

Imagines.—The following is a description of *L.* var. *meridionalis* and *L.* var. *riburni.*—♂. Size varying from 2 to nearly 2½ inches. Body and wings dark chocolate-brown, the basal area up to the band generally darker, var. *riburni* with a slightly more purple tinge than var. *meridionalis*, which is redder. The wings very thickly scaled, more thickly than those of the British and Parisian *L. quercus*. The band ochreous on the forewing, reddish-ochreous on the hindwing (this character is given by Guénée as determining var. *riburni*, it is, however, shared by var. *meridionalis*, but I think will serve to differentiate these two forms from more northern ones). The band is regularly curved on the hindwing. On the forewing it is much straighter inside than in most of the northern *L. quercûs*. It generally begins on the inner margin as a small crescent, with the concave side turned towards the base. It then runs almost straight across two-thirds of the wing, approximately at right angles to the inner margin in *L.* var. *meridionalis*, but sloping inwards in front in *L.* var. *riburni*. It then forms a more or less sharp elbow inwards, but generally finishes on the costa with another outward curve. The spot, elbow and apex of wing are approximately in a straight line, while in the northern forms the elbow is lower than the line between dot and apex, and more in the centre of the wing. On the outside, the band is more evenly curved, it is narrowest on the inner margin, broadest from the elbow to the costa. It is comparatively narrow, being about midway in width between British *L. quercûs* and *L.* var. *sicula*, in which it is very narrow. It is, on the average, narrower and more sharply defined in *L.* var. *meridionalis*, than in *L.* var. *riburni*, and, in this respect, *L.* var. *riburni* is nearer to *L. quercûs* than *L.* var. *meridionalis* is, though, in the matter of ground colour, the reverse is the case. The band is quite sharply defined internally on both wings, and has not so much tendency to form what I may call ripples between the nervures as in the northern *L. quercûs*. Outside it is only slightly suffused, or not at all: nor is the wing beyond the band ever powdered to any great extent with lighter scales. I have only one specimen out of hundreds of the pure Cannes breeds in which the width of the band on the hindwing at all approaches that of *sicula* (this specimen has the hindwing much like that of *L.* var. *guillemotii*, Trimoulet,* from the Gironde). The nervures are inconspicuous, slightly darker than, or concolorous with, the ground colour, except occasionally, when faintly powdered with ochreous outside the band on hindwings. The spot is small or of medium size, round or square, smaller on average in *L.* var. *riburni*: the fringe of forewings concolorous with wings. The fringe

---

* Placed by Staudinger with *L. roboris*, Schrk. The latter is so scantily defined, that I keep the local name.

of the hindwings either concolorous, or coloured like the band. The former more usual in *L.* var. *viburni* the latter in *L.* var. *meridionalis.* Of the 22 ♂ *L.* var. *viburni* in batch A (all of the same brood) 16 had dark, and 6 light fringes. The fringe of hindwings is generally brown on the inner margin, whatever its colour elsewhere. The tuft of the abdomen is lighter, as is also the shaft of the antennæ, especially towards the tips. The following are, in brief, the usual but not constant differences between *L.* var. *viburni* and *L.* var. *meridionalis* ♂. In *L.* var. *meridionalis* ♂ the anal angle of the wings is fuller (squarer), covering the abdomen more when set in the same way; median spot generally larger; band on forewings joining that on hindwings (when set with the inner margins in a straight line), whereas in *L.* var. *viburni* the band on the forewing is generally outside the continuation on the hindwing. The bands on the forewings converging in front in *L.* var. *viburni*, parallel in *L.* var. *meridionalis*, the most constant difference. ♀. Expands from 2¼in. in small specimens to just over 3in. in the largest, generally, however, between 2½in. and 2¾in., averaging, therefore, rather smaller than the northern races. The colour varies from ochreous to fairly dark red-brown, the darker forms being more frequent in *L.* var. *viburni*. In the ochreous specimens the hindwing is always browner, especially inside the band. The colour is a warmer yellow or brown than in the northern races, in which there is a tinge of greenish coloration as a rule. The white spot is smaller and less conspicuous, not being such a pure white. The band, on the contrary, is more distinct and more sharply bordered outside, and generally lined inside fairly markedly with brown, especially on the inner margin. The basal area is often darker than the borders. The whole insect seems squarer and less elongated than the British specimens. The nervures are concolorous or in *L.* var. *viburni* generally lighter than the ground colour. The fringe of the hindwing concolorous in *L.* var. *meridionalis*, lighter in *L.* var. *viburni*, in which the bands are more differentiated from the ground colour, giving a brighter, more contrasted effect.

I should be sorry however to pin my reputation to any of these distinctions or to have to pick out a mixed drawer full of ♀s of the two races. As will be seen the differences of the imagines are slight and inconstant, on the other hand those of the larvæ are quite clear. I have two aberrant imagines of these races, in one of which one of the plumes of the ♂ antenna is bifurcate, another, a ♀, in which the neuration of one hindwing is abnormal.

Larvæ.—The adult larvæ of *L.* var. *meridionalis* differ in the main from those of English (Dorset) *L. quercûs* by the larger number of long white hairs, and the purer white or ashy-grey of the dorsal coat, which is yellowish in the English ones. The spiracular dashes are generally less conspicuous. The French race looks smarter and sleeker than the English, it grows quicker and does not become lethargic in the winter. *L.* var. *viburni*.—The adult larvæ have rusty-brown hairs on both back and sides, with long white hairs sprinkled sparsely but evenly all over, not more on the sides than on the back. The *quercûs* pattern on the back lighter than the ground colour but also brown. Face rusty. Stigmata very white, spiracular streaks not very prominent. I have found the larvæ on various plants, *Viburnum tinus*, *Cytisus hirsutus*, *L. triflorus*, *Erica scoparia*, *Spartium junceum*, and ivy. The latter is a favourite food. I do not remember ever to have found them on any species of oak.

Guénée who worked out these two races from larvæ supplied him from Cannes by M. Millière, gives a careful description of the larvæ in all stages (*Ann. Soc. Ent. Fr.*, 1868, p. 407) which, however, would unduly lengthen this article to quote adequately. He also gives a useful comparative table of *L. quercûs*, *callunae*, and *viburni*. While recognising that *L. quercûs* (*meridionalis*) from southern France differs from Parisian *L. quercûs*, he does not, in my opinion, allow sufficiently for this difference, as many of the landmarks he gives for distinguishing *L.* var. *viburni* from *L. quercûs*, though they differentiate it from the northern forms, do not sever it from *L.* var. *meridionalis*. The following are his chief points :

Viburni ♂.—Coffee- or violet-brown, middle size, wings a little square, band less yellow on forewings, narrow, clearly cut on both sides on the forewings, straight with a bend at each end. On the hindwing, elbow-curved, as narrow as on forewing, clearly detached from marginal space.	*Quercûs* ♂.—Rufous or tan-coloured, small, wings short, hindwings rounded, bands concolorous on all wings variable in width on forewings, irregularly sinuated inside, shading into ground-colour outside. On the hindwings the curve is regular, the band melting more or less into the ground colour, which is always more or less marked with yellow.
Viburni ♀.—Wings broad ochreous-yellow warmed with violet-brown, nervures lighter or concolorous. Fringe of hindwings reddish with the extremity only straw-colour.	*Quercûs* ♀. — Light yellow-ochre (tinted with reddish in var. *B*), nervures darker, bands indistinct, marginal area of all wings always light. Fringe absolutely concolorous.

I do not know that any of these differences hold absolutely except perhaps the one referring to the fringe in the female.

(*To be continued.*)

Observations on some new and little-known Orthoptera with biological notes*.

By J. PORTOCHINSKY (translated by JACOB KOTINSKY).

(*Continued from p.* 213.)

The last species upon which I should like to dwell somewhat at length is interesting, not only because of the colour of its hindlegs, but also on account of many other considerations, since the insect is still little known. I speak of *Nocarodes cyanipes*, F. v. W. Although this Orthopteron was described as long ago as 1846 by the eminent entomologist Fischer von Waldheim, its exact characters have only been determined recently, 1883, by Brunner von Wattenwyl, in his well-known work on European Orthoptera. Until now it was known only that this interesting insect lives with us in the Caucasus (in Karabakh) and in Asia Minor. Fischer von Waldheim gives the plains of Karabakh as its habitat, which is positively wrong. According to my observations, *N. cyanipes* is a purely mountainous form that, beyond doubt, never occurs in the plains, and Fischer's specimens were not from the plains but the mountains of Karabakh. These

* From *Horae Societatis Entomologicae Rossicae*, vol. xx., pp. 111-127, pl. xii., 1886.

large and peculiar insects live in large numbers in the mountainous meadows of Caucasia Minor (Semenooka, Elenooka) at an elevation of 7000-8000ft. above sea-level. During my excursions through the localities surrounding the lake Hokcha I have always captured specimens of *N. cyanipes* either while they were slowly crawling along the grass or quietly sitting on it, not attempting to make the least movement while I approached them or took them in my hands. In life, these insects are very brightly and peculiarly coloured, but, after death, several of their colours disappear entirely. Since the colour of this species described (from dead specimens) by Fischer and Brunner von Wattenwyl is incorrect, I deem it necessary to give an exact description of the female made from living specimens. The prevailing colour of the body is a quite bright cinnamon-grey, over which are scattered numerous dark and yellowish spots; several dark stripes pass along the raised lines of the sternum; the dorsum of the anterior half of each abdominal segment is coloured a beautiful pink, which is quite conspicuously contrasted with the general body-colour; the short hind femora are, on the outside, tinted the same as the rest of the body, and, on the inside, are blue; terminally, however, they are bright red; the tibiæ, too, are blue and are armed with black-pointed, red spines, but their terminal ends and entire tarsi are bright red. This red colour is so prominently contrasted with the blue that it appears as though the legs were sprinkled with red sealing-wax. Considering the vast numbers and bright colours of these strange Orthoptera, and their slow motion, one would think that they have very few enemies, and from these they are probably protected either by being unsavory or by poisonous properties. Their males are peculiar by the very small dimensions of the body, as compared with the size of the females, and with their somewhat more rapid power of movement. In colour, however, they hardly differ from the females, only (as in the young females) their abdominal segments lack the pink stripes. Besides, the venter of the abdomen is bright yellow, and, on each side of each of the posterior segments, there is a narrow, dark stripe that expands towards the last segment, and has the appearance of two dark spots. Finally, each side of the dorsum of the abdomen bears a broad, dark, longitudinal stripe. But the most noticeable character in the colouring of the males is presented in their hind-legs, the inner and ventral sides of the hind femora, as well as the entire tibiæ and tarsi, being of an uniform orange-red. The tibial spines, too, except their tips which are black, are also of the same colour. In some, however, a bluish tinge is still noticeable upon the underside of these femora, in the form of an indistinct narrow stripe. The males Fischer von Waldheim mistook for a distinct species calling them *Nocarodes rubripes.*

Insects with colours so closely resembling their habitat, would have been subject to great danger had their bright hues betrayed their presence. We have seen that, on this account, the bright colours of locusts are distributed over such parts of their hind femora as are normally entirely concealed. On the other hand, however, we have also seen that the tibiæ and tarsi are also brightly coloured, and these could likewise betray the presence of the insect. In view of this the Orthoptera possess several adaptations: thus, it is known that each of the hind femora are provided below and on the inner surface with a long and deep furrow, or rather, with a channel which almost completely receives the tibia and tarsus, and thus their bright decorative colours can be concealed from the eyes of their enemies. In addition to this, even though the tibiæ of these insects are thin, in some of them, for further protection, the bright colours are disposed only along the inner surface; thus, for instance, in *Acridium aegyptium*, only the inner surface of the tibia is lilac-coloured while the outer is of the same grey tint as the rest of its body. In species of *Eremobia* we likewise notice that only the inner surface of the tibia is red or violet, but here, adaptation goes even further and is enhanced in that only the inner row of tibial spines is brightly coloured, while the outer one, as well as the joints of the tarsus, is entirely devoid of bright hues. Thus we see that, in the locust family of Orthoptera, nature gave preference to the long hind-legs for the development of brilliant hues and that even there she arrayed them with great precaution.

But even in this family of Orthoptera species are met with whose bodies are coloured so gaily that *a priori*, without preliminary experimentation, one can conclude that these insects are not fit as food for insectivorous animals.* It is self-evident that insects thus protected, *i.e.*, by unpleasant taste and perhaps poisonous properties, will not answer to those general conditions of the distribution of bright colours spoken of above. As an illustration I will take a South American representative of the family, *Acridiidae*, described under the name of *Acridium tarsatum*. This insect is so brightly coloured that it more resembles a gaudily coloured toy than a living being. Its entire body is bright green, but the upper part of the head is orange-red. The femora and tibiæ of the first two pairs of legs are tinged with red, yellow and black, and all the tarsi are red and black. The hind femora are yellow on the outside having a black spot and ring near the top. The hind tibiæ are red at the base, then follows a black ring, then a broad yellow one, and at the ends are black again. Hence we see that, in this Orthopteron that does not need any protective colouring, all the bright colours are not hidden as in most of those considered above, but, on the contrary, are conspicuously displayed. Those parts of the body that, in other Orthoptera, bear the bright colours, are either coloured equally bright with the other more exposed parts, or even more modest, as, for example, the lower and inner surfaces of the posterior femora in *Acridium tarsatum*. But, beside that, we find here a still more important and interesting phenomenon; the hind tibiæ adorned with their bright hues present no danger to the unsavoury insect, so that there is no necessity whatever for concealing these bright colours in the groove of the inner surface of the femur. In connection with this we also find a somewhat different structure of the femur in *A. tarsatum*. Its hind femora are comparatively much thinner than in other *Acridiidae* with a protective body coloration, and the groovelet on the inner surface is, comparatively, very little developed. And thus we come to the conclusion that the bright

* Similar facts are known also in other cases of insects belonging to the order Orthoptera. Thus, Horn observed that birds and lizards always turned away from one brightly-coloured Indian species when it was offered to them (*Proc. Ent. Soc. London*, 1869, p. xi). Upon piercing the thorax of several Orthoptera, a strong odour is perceived, which is given off by the liquid issuing from the pierced place (Serville, *Hist. Nat. des Orthopt.*, p. 219).

colours with which some parts of various *Acridiidae* are bedecked mean much to them, and that, therefore, wherever these colours could have betrayed the presence of the insect bearing them, changes in structure are noticeable, *i.e.*, the narrowing of the hind femora and the deepening of the groove on their inner side.

(*To be concluded.*)

ORTHOPTERA.

Panchlora viridis in England.—On May 3rd, 1901, whilst purchasing fruit at a shop in this town, the fruiterer's son handed to me, for identification, an Orthopteron found by him when unpacking a bunch of bananas shipped from Costa Rica. The specimen (then very active), being unknown to me, was sketched in water colours and submitted ultimately to Mr. Burr, who writes me thus:—"It is almost certainly *Panchlora viridis* which is about the commonest species of the somewhat large genus . . . . all natives of the tropical parts of America . . . . I have not heard of *Panchlora* (*sensu stricto*) being noted before with us." The fact of its occurrence in England appears to be certainly worthy of record, although explained by the above quoted authority who further says:—"A large number of exotic cockroaches have become cosmopolitan with the expansion of modern shipping, &c."—Arthur J. Jenvey, The Abbey, Romsey. *May 15th*, 1901.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

The development of the Imago in the Pupa of Lachneis lanestris.—At some date last year I met with the statement that the imago of *Lachneis lanestris* develops within the pupa some time during its first year of existence, and so remains as an imago ready to emerge even in the case of those pupæ that fail to produce imagines until the second, third, or even sixth or seventh years. I do not now remember where I saw this opinion stated, or whether I merely heard it expressed verbally at some meeting of an Entomological Society; but I found on consulting various friends of much experience in rearing lepidoptera that several entertained this view, whilst no one either contradicted it or seemed to see anything doubtful about it. In Barrett's *Lepidoptera*, vol. iii., p. 11, it is stated to be the case that the imago remains fully matured and ready to emerge over several years, any doubt as to the definiteness of the language employed being removed by Mr. Barrett's assurance that that was his meaning. I felt as positive that this view was erroneous as one can be without absolute available proof. In the first place, I knew positively that, in such cases as the Acronyctids, *Acronicta leporina*, and *Cuspidia megacephala* especially, *Petasia nubeculosa*, and others, no development took place till the year of emergence, and in the second I felt tolerably sure that I had made the same observation on *Lachneis lanestris* itself, but was naturally doubtful about this in the absence of any written note and the consensus of opinion against me. To determine the point I got a number of cocoons of *L. lanestris* last autumn. This spring these divided themselves into three sets: (1) Those that emerged (some thirty odd); (2) those that are dead (a dozen or so); (3) those remaining over. I appear to have been very unfortunate in my supplies, since out of several dozen cocoons only one selects to remain over. This one, however, is a pupa of pale yellowish colour and transparent texture, *i.e.*, with development of the imago quite in abeyance, and no further advanced than shortly after the pupal state is assumed. I had rather there had been more specimens going over, but as it is, the one specimen, with none *per contra*, is sufficiently conclusive. There must be cocoons of *L. lanestris* going over another year, in the possession of various collectors, by which this point could be further illustrated. I should be glad to examine any specimens that may be sent me.—T. A. Chapman, Betula, Reigate.

Cocoon of Lachneis lanestris.—On the same page (*loc. cit.*) of Barrett's work, he says "a lid is pushed off the cocoon, having been, to all appearance, carefully cut partially through, from the inside, by the pupa for this purpose." This is quite true if we give a very full value to the qualifying phrase "to all appearance." The lid might look very much as it does were it so cut through. As a matter of fact, no such cutting takes place—the lid is formed by accidental fracture, by pressure from end to end of the cocoon, by the inflation of the body of the moth that almost always occurs at emergence, aided by muscular action. That the fracture takes place where it does is no doubt determined by this zone of the cocoon, having more brittle gum and less fibrous silk in its structure than elsewhere. It does not appear that any softening fluid of any sort is employed, but that the fracture is in a dry and brittle structure.—Ibid.

Imaginal development in pupæ of Lachneis lanestris.—The opening of the so-called lid of the cocoon.—With reference to Dr. Chapman's note *re* the non-development of the imago in the pupa of *Lachneis lanestris* until the year of its emergence, I can fully corroborate the evidence offered by his single pupa. Owing to the statement referred to in Barrett's work being contrary to my own recollection, I examined a pupa or two in my possession, and, finding it erroneous, I referred the matter to Mr. A. Russell, who had a large number (some thirty) of non-emerging pupæ in the early summer of 1899, many of which he examined, and in none of which he found any trace of imaginal development, nor could I find anywhere, among all the references I collected (see *British Lepidoptera*, vol. ii., pp. 514-517), any authority for the statement that the imago was fully developed and awaited emergence sometimes for several years. With regard to the opening of the so-called lid of the cocoon, there is an interesting note by Latter (*Trans. Ent. Soc. London*, 1895, pp. 457-8), who states that "the median frontal portion of the head of the imago between the eyes is produced forward into a prominent and sharply-pointed umbo or boss of great strength, and capable of being used as a powerful awl in opening the cocoon . . . . the boss being developed to a less degree and less sharply-pointed on the head of the pupa also." These structures are figured for *Lasiocampa* var. *callunae*, considered by Latter as essentially similar to those of *Lachneis lanestris*, which differ only in being smaller (*loc. cit.*, pl. viii., fig. 8, and pl. ix., fig. 9).—J. W. Tutt.

Oviposition of Coleophora murinipennella.—On May 14th, 1901, between 6.45 and 7.30 p.m., I noticed three females of this species ovipositing on the cymes of *Luzula campestris*, in a meadow here. The moth sits very quietly on the flowers, thrusting the abdomen down between the perianth and the scarious bract at the base of the flower, where the egg is laid. One female made use of an outside flower, and as the bract was forced away from the perianth by the moth's abdomen, I could plainly, by aid of my pocket lens, see the ovipositor which appeared little, but strong, thrust out. When fully extended, however, the tip was hidden in the flower and I failed to see the egg actually deposited. One female, kept in a box, laid no eggs, but the next evening, when placed in a large test tube with a piece of the food-plant, she commenced laying at once. These moths appear to hide in the grass during the day. At the time of flight they run up a grass stem and take wing with a jerk, keeping low down among the herbage. If they collide with a leaf or stem, which they seem habitually to do, they settle for a few minutes, and then repeat the process. The best way to find the ova of *C. murinipennella* is to pull off carefully the perianth of the *Luzula*, leaving the scaly bracts on the plant, the egg will usually be found adhering to the base of the perianth or it may be left in the bract. I should say in nature not more than one egg is laid in the same flower.—Alfred Sich, F.E.S., 65, Barrowgate Road, Chiswick. *May 18th*, 1901.

PRACTICAL HINTS.*

Field Work for July.

By J. W. TUTT, F.E.S.

1.—Ova of *Leucania albipuncta* laid August 18th, 1899, hatched August 29th, fed up rapidly on grass, and by October 5th many had pupated; they were kept in a room where was a fire every day, the pupæ being left undisturbed and the surface of the earth not damped; imagines commenced to emerge October 26th.

2.—From the end of July to the middle of August the imagines of *Leucania brevilinea* are to be obtained freely at light in the Norfolk Broads, Horning being the most worked centre.

3.—At dusk in the middle of August the females of *Charaeas graminis* are often to be taken in numbers, both in the Norfolk Broads and the Cambridge fens, fluttering up the reeds and grass-culms, and paired couples are often to be found from 10 p.m.-11 p.m. It is remarkable that the males fly freely, and often in great numbers for about an hour in the early morning between 7.30 p.m. and 9.30 p.m., when no ♀ s are to be found.

4.—Three dozen larvæ of *Dianthoecia cucubali* were taken from the flowers of *Lychnis floscuculi* during the first week of August on Balerno Bog (Carlier).

5.—Towards the end of August and well on into September, a warm overcast afternoon will give an abundance of *Celaena haworthii* flying over the mosses on the moors, and it appears that if the atmosphere be clear and the sun shining there are few specimens on the

* Practical Hints for the Field Lepidopterist, recently published, contains 1,250 similar hints to these, distributed over every month in the year. Interleaved (for collector's own notes).—Ed.

wing, whilst if the afternoon be calm, warm, and moist, the species flies pretty freely; the imagines may also be taken at night on the blossoms of *Calluna vulgaris* (Finlay).

6.—Heather blossom is exceedingly attractive in August to *Noctua glareosa* and *N. dahlii*; the latter species is very uncertain in its appearance, but sometimes swarms in its well known haunts—Aberdeen, Sutton Park, Sherwood, Morpeth, &c.

7.—Towards the middle of August ragwort blossom begins to be exceedingly productive in Scotland; *Hydroecia lucens*, almost everywhere, and, near Perth, a fine local form of *Agrotis obelisca* (var. *hastifera*) abound thereon.

8.—On the coast sandhills in August, the imagines of *Agrotis vestigialis* and *Actebia praecox* are to be obtained by shaking the overhanging roots of the sand-rush (Robertson).

9.—To find the larvæ of *Agrotis ripae* in August and September, dig round the prickly saltwort, found so plentifully at many places on the coast; at Hunstanton I found them very common, not less than 260 in four hours, I have at other places dug five hours for 50 (Farren).

10.—Imagines of *Agrotis agathina* are out from about August 18th, they only fly for about three-quarters of an hour just at dusk, and are then not difficult to net with the aid of a lantern, as they do not fly fast and are very quiet in the net.

11.—*Mellinia gilvago* comes freely to light in August (Cambridge, Reading, &c.), and is sometimes taken from the lamps in and near towns in large numbers, probably though only where avenues of elms exist in the suburbs of the towns.

12.—In late August and September an occasional imago of *Tiliacea aurago* falls to the beating-stick, but the great majority appear to hide in the herbage and leaves below; at dusk they will be found to have come to the top of the grasses and other plants, or feeding on the blackberries; they take flight at once on some evenings, although sugared twigs will generally stop them.

13.—*Triphaena interjecta* is peculiar in its habits on Wicken Fen; instead of flying late in the afternoon at blossom, as it usually does in wooded districts, it comes freely to sugar in mid-August, several dozens sometimes being shaken out of the sugared "knots" in one evening.

14.—In the Morpeth district *Polia chi* ab. *olivacea* prefers to rest on the trunks of ash-trees in August.

15.—The occasional autumnal female imagines of *Demas coryli* lay eggs in August that hatch in early September; the larvæ can be started on beech, but the leaves are usually all off before they are full-fed; finish feeding on nut.

16.—Breeders of *Stauropus fagi* should always look out for autumnal emergences, individual examples frequently occur from September to October, especially when fairly large numbers are being reared.

17.—The larvæ of *Cerura bicuspis* may be beaten from alders during September and October; the cocoons are made in the depression of the trunk usually low down (from about six feet up the trunk to the surface of the ground) and are most difficult to discover.

18.—In August the imagines of *Hepialus sylvinus* are abundant in the Monkswood section of Epping flying over heather. *Eupithecia* *minutata* and *E. nanata* are also usually taken in abundance at the same time and in the same place.

19.—In early August larvæ of *Emmelesia alchemillata* are common in flowers and seedheads of *Galeopsis tetrahit* wherever these are to be found; they are rarely to be found wild on *G. ladanum*, although they eat it freely in confinement.

20.—Young larvæ, from eggs of *Zonosoma orbicularia* hatching in beginning of August, can be sleeved on sallow, and, in about a fortnight, will possibly pupate if the weather be really warm; autumnal emergences are very frequent in confinement, and pupæ want watching closely in early September.

21.—In August the seedheads of *Galium verum* should be most carefully searched for the larvæ of *Anticlea sinuata*—Tuddenham, Bury St. Edmunds, &c.

22.—In early August hunt in woods and beside hedges and ditches for the larvæ of the *Stachys*-feeding plumes. Both red and green larvæ are to be found, the former generally smaller and to be met with before the purplish-red corolla has fallen off, the latter larger and on plants which are seeding. The larvæ of *Amblyptilia acanthodactyla* (*cosmodactyla*) and *A. cosmodactyla* (*acanthodactyla*) occur on the plant at the same time (Riding).

23.—In the first week of August the grassy parts of Chippenham Fen, give an abundance of *Crambus selasellus* which are disturbed readily during the daytime and fly freely at dusk.

24.—In the second week of August *Crambus myellus* is on the wing during the evening; several in the neighbourhood of Monymusk (Mutch).

25.—At the end of August and in September the nests of *Bombus agrorum*, *Vespa vulgaris*, &c., should be collected for larvæ of *Aphomia sociella*. The larvæ spin the nest into a hard mass about the size of a cricket-ball and pupate therein, the imagines appearing in early June. The larvæ are scarcely ever found in underground nests of bees or wasps.

26.—*Poecilia nivea* sits in the crevices of the bark of oak-trees in August, and great skill is required to capture the species, as the imagines are exceedingly active, and when a pill-box is brought near them they either fly away or dodge over the hand of the would-be captor.

27.—In August the terminal shoots of *Myrica gale* are done up in balloon-like bundles by the larvæ of *Penthina dimidiana*.

28.—The imagines of *Phoxopteryx siculana* fly in great abundance in August at dusk among the buckthorn bushes on Wicken Fen, by collecting on the edge of a large clump formed by these bushes a very long series was obtained. *Phoxopteryx inornatana* was taken among sallow in smaller numbers at the same time.

29.—The larvæ of the autumnal brood of *Chauliodus chaerophyllellus* appear to straggle over a long period on *Pastinaca sativa*, full-fed larvæ being found from the last week of August to the end of September, the moths emerging from early October.

NOTES ON COLLECTING, Etc.

Early spring lepidoptera.—The early spring insects have been very backward. *Cyaniris argiolus* was fairly common at Box Hill on May 10th, when *Syrichthus malvae* was making its appearance, *Gonep-*

teryx rhamni also was exceedingly abundant. It is very astonishing what excellent condition some examples maintain throughout their hybernation, some looking as if freshly-emerged. The larvæ of *Eupithecia sobrinata* were at the time very small, although normally they should be almost full-fed.—A. J. Croker, 277, Cambridge Road, London, E. *May* 17*th*, 1901.

In this district, cold frosty nights and bright days with sharp east winds have rendered collecting unsatisfactory. *Cyaniris argiolus* has been fairly plentiful, and *Eugonia polychloros* has been especially abundant, although an insect I have hardly seen here for years; I trust this presages an abundance in August and September. Sweeping heath for larvæ of *Agrotis agathina* has been almost hopeless, and there have been but few of the usually common Geometrid larvæ, such as those of *Boarmia repandata* and *Crocallis elinguaria*. The light-traps were useless till a few nights ago, when *Notodonta trepida*, *Drymonia chaonia* and *Lithosia sororcula* appeared, but a return of the east wind has rendered the traps useless again. Two days' beating gave only five *Zephyrus quercûs* larvæ, and even those of *Cheimatobia brumata* are scarce and backward.—E. F. C. Studd, M.A., Oxton, Exeter. *May* 20*th*, 1901.

I have only to record the abundance of imagines of *Eugonia polychloros* and *Vanessa io*, and larvæ of *Triphaena fimbria*. Everything seems to be retarded by the cold nights, although *Hemaris fuciformis* on the 18th inst. is not much behind time.—B. W. Adkin, Brandon House, Morden Hill, Lewisham, S.E. *May* 22*nd*, 1901.

In the New Forest yesterday I took several interesting species—*Lithosia aureola*, *Erastria fasciana* (*fuscula*), *Bupalus piniaria*, *Brenthis euphrosyne*, *Syrichthus malvae*, &c. I saw *Hemaris bombyliformis*, and beat larvæ of *Lymantria monacha*, *Nola strigula*, *Hylophila quercana*, *Catocala promissa*, *C. sponsa*, *Ennistis quadra*, &c., whilst the previous week I captured *Nemeobius lucina*, *Eupithecia pusillata*, &c.—(Major) R. B. Robertson, Boscombe. *May* 24*th*, 1901.

I was tempted out on April 9th and then found the sallows at Sandburn not fully out, whilst on this and successive nights I found moths scarce, and only noted *Taeniocampa gothica*, *T. stabilis*, *T. pulverulenta*, *Scopelosoma satellitia* and *Anticlea badiata*. The evening of April 17th appeared an ideal one for collecting; I found at Bishop Wood the sallow-bloom well advanced, and whilst it was still light, the following species were shaken on the sheets spread under the large bush on the Hambleton side—*Taeniocampa munda*, common, but rather worn, several being ab. *immaculata*; *T. pulverulenta*, scarce, *T. gothica*, *T. incerta*, *T. gracilis*, a greater number on this and subsequent nights than I have met with before in this wood, of this species; *Pachnobia rubricosa* and *P. leucographa*, 19 males of the latter species being all I saw. Rain spoiled the 18th, but the 19th was again favourable, and resulted in a really good bag. *T. gracilis* in great variety, one with a black reniform, two tinged with rosy, another powdered with dark scales and darker nervures; *Panolis piniperda*, one only seen, but as it was an almost green aberration, it was a valuable capture, *T. populeti*, going over, but *Pachnobia leucographa* was in great force, and in perfect condition, and was decidedly in the majority, every shake of the bushes bringing down many specimens, until the time arrived for leaving the wood, in order to catch the train home. The following night, with

Messrs. Porter and Russell, of Hull, another visit was paid to the wood, when the success of the preceding night was practically repeated, *Pachnobia leucographa* still coming in great numbers and in fine condition. A few hours at Sandburn Wood on May 27th, produced *Euchloë cardamines*, *Nisoniades tages*, *Brenthis selene*, *Chrysophanus phlaeas*, *Macrothylacia rubi*, abundant, *Saturnia pavonia*, *Eurymene dolabraria*, *Odontopera bidentata*, *Panagra petraria*, common, *Hypsipetes impluviata*, *Tephrosia punctulata*, *T. crepuscularia* (*biundularia*), *Eupithecia indigata*, larvæ of *Asphalia flavicornis*, *Cleoceris viminalis*, and *Hypsipetes elutata*. On May 28th, at Bishop Wood I found *Cerura furcula* at rest, and larvæ of *Taeniocampa populeti* and *Tethea subtusa* commonly on the poplars.—S. Walker, Queen Anne's Road, York. *June* 1*st*, 1901.

A few *Eriocrania purpurella* were taken in a wood near here on April 21st and *Incurvaria pectinea* on April 28th. In the same wood on May 5th a larva of *Geometra papilionaria* was found on birch, and *Depressaria assimilella* was flying freely at dusk among broom; whilst at the same place, on May 29th, *Phoxopteryx siculana* was netted. Two or three *E. brizella* have appeared from *Statice*, plenty of thrift, however, grows among the *Statice*. Gregarious larvæ are abundant here, those of *Malacosoma castrensis* in greater abundance than ever.—F. G. Whittle, 3, Marine Avenue, Southend. *June 5th*, 1901.

Since the second week in May the season has been especially good for sugar. *Macaria notata* has again been plentiful, and *Zonosoma punctaria* and *Z. pendularia* more so than usual, neither being common here. *Z. pendularia* usually sits on a birch-stem anywhere under 5 feet from the ground, and I found the best plan on a hot day was to tap the stems sharply with a stick and net them as they flew off, which they did instantly; they will hardly ever allow you to box them sitting, except towards evening when it gets cold or on a very cold day; they often rise even before you strike the stem. When *Cidaria corylata* began to appear, the difficulty of catching them was increased as, though the colour and flight are very different, it was difficult to keep the eye from following the *C. corylata*, which sometimes rose three or four at a time. I also bred two or three from larvæ last August, but one cannot get many ova from captive ♀s, only one ♀ giving a small batch. *Abraxas sylvata* is not so numerous this year as last. I have from last year's pupæ bred *Leiocampa dictaeoides* and *Acronycta leporina*. —F. C. Woodforde, F.E.S., Market Drayton. *June* 17*th*, 1901.

Colias hyale in Northamptonshire and Buckinghamshire.—On June 5th I had sent me from Brackley a specimen of *Colias hyale*, taken on the above date whilst flying along a railway bank. The insect is in perfect condition, and does not wear at all the appearance of an immigrant, or hybernated specimen. *C. hyale* was not rare at Brackley last year. On June 9th my brother saw the same species in a clover field at St. Leonards, Bucks, but having no net with him failed to secure it.—A. T. Goodson, Tring.

Note on hybernating Xylina semibrunnea.—It may interest you to hear that a ♀ *Xylina semibrunnea* I took last November lived till the second week in June, the ♂ dying about six weeks earlier. I had them in a breeding-cage till early spring, when I sleeved them on a small ash growing in a pot. I never saw them *in cop.* nor have I seen any ova or larvæ from them. I took a ♀ at sallow but she had deposited all her ova except five, which were infertile.—E. H. Thornhill, Boxworth, Cambs. *June* 2*nd*, 1901.

Colias hyale in Cambridgeshire.—I saw *Colias hyale* on June 24th, and my wife saw one on June 16th, so I hope we may see some again later on.—Ibid.

Colias hyale in Kent.—In the last week in May I met with three specimens of *Colias hyale* near here. One, which I saw close, was a female in perfectly fresh condition, suggesting recent emergence, and not immigration or hybernation. The species was common here last summer, together with *C. edusa*. A late brood of the latter appeared in September, but no late specimens of *C. hyale* were seen by me, although it was the commoner of the two in July.—C. W. Watts, Binbury, near Maidstone.

On the 14th inst. I took a perfectly fresh specimen of *Colias hyale* in this neighbourhood. From its appearance I am satisfied that it could not have hybernated as an imago, and it is extremely unlikely for the same reason that it is an immigrant from the continent. I should judge that it could only have emerged from the pupal state a few hours previously to my capturing it. It is worthy of notice that I have now taken *C. hyale* in this neighbourhood three years in succession. I took four specimens in 1899 (last year it was very common), and now this specimen. I have never, however, taken it earlier than August in previous seasons.—H. Huggins, Jnr., 13, Clarence Place, Gravesend. *June 25th*, 1901.

Colias hyale at Folkestone.—When at Folkestone, June 15th, I was pleased to see *Colias hyale* again. Of two specimens (males) seen one was taken. Both were in good condition.—C. P. Pickett, F.E.S., 99, Dawlish Road, Leyton, Essex.

COLEOPTERA.

Note on Cryptocephalus 6-punctatus, L.—On June 1st last I swept a solitary specimen of this rare species in a drive, cut through a wood in this district. Close by was a moderate-sized nest of *Formica rufa*, and, for the moment, after bottling the insect, it struck me that after all it might only be a *Clythra*. This resemblance made me consider whether the beetle might not in some way be connected with the ants' nest, especially as a long search failed to reveal a second specimen. I did not, however, get an opportunity of examining the ants' nest which (judging at least from the habit of *Clythra*) would probably have had to be turned over to its lowest depths for any good to come of the examination. The pupa of *Cryptocephalus* is said to be enclosed in a case not unlike that of *Clythra*. There is certainly something very peculiar in the distribution and appearance of the species of the genus, with the exception perhaps of *labiatus*, L., which seems to be common and generally distributed in most localities in which I have collected.—A. J. Chitty, M.A., F.E.S., Huntingfield, Faversham. *July 17th*, 1901. [Father Wasmann writes (*Myr. u. Ter. Aut.*, p. 159) : "From some short notes by Weise, it is probable that all the species of *Cryptocephalus* change to pupæ in ants' nests." It is well known that the larvæ of species of *Cryptocephalus* make cases, which, in the event of their living in the nests of the ants, would protect them from the ants as is the case with *Clythra*.—H.J.D.]

Homalota divisa var. blatchii, var. nov.—I cannot find that this variety has been described, although it figures in Sharp and Fowler's

List of British Coleoptera of 1893, as *H. divisa* var. *angulata*, Blatch. This variety was discovered by the late Mr. W. F. Blatch in dead moles and hedgehogs at Knowle, Warwickshire, and a small number of both sexes were taken by him, some of which I believe he gave away, whilst two further specimens I have presented to my friends, and the remainder, which I have selected as types, are in the Blatch collection which is now in my possession. I have since taken it in dead moles. The new variety may be characterised as follows:—

Homalota divisa var. *blatchii*, var. nov.—A very distinct form differing from the type in that the base of the thorax is much wider than the elytra owing to the strongly developed posterior angles.

Mr. Blatch in his correspondence on this insect expressed himself quite satisfied that it was only a variety of *H. divisa*, and from my own observations I am able to share this opinion. I have selected the above name in order to perpetually link the name of Blatch with this variety. The discovery forms part of the large amount of work he bestowed on Midland insects, the publication of which he unfortunately was not able to undertake.—H. Willoughby Ellis, F.E.S., Birmingham. *July* 6*th*, 1901.

A successful hunt for Lytta vesicatoria, L.—Having determined for some years past to try and find the "blister beetle" in Cambridgeshire, I gladly accepted Mr. Verrall's kind invitation to stay with him at Newmarket in July, 1900, especially as a living specimen had been brought to him about that time in 1899. Mr. Verrall thought he knew where the beetle would occur, as there are a number of old ash trees near the spot where the insect which was brought to him was taken. I was not, however, fortunate enough to find the beetle, and came to the conclusion that it was too late, and as, also, the July races were on, I spent the rest of my very pleasant visit racing. This year, Mr. Verrall having again kindly asked me to come up and stay with him, and once more try my luck, I determined to run the beetle down if possible. I had made and took down with me a 36ft. pole and a large dust sheet. Mr. Verrall's locality again drew blank, so it was decided to go further afield and beat every ash tree in the county till I got it. On June 21st, accompanied by Mr. Collin, having ridden some fifteen miles, and tramped about five, and beaten every ash tree we could find, without success, we began to think that we were engaged in a wild goose chase. We determined, however, to try a few more trees before giving in, and, having reached some fairly young trees, I was delighted to see four specimens seated on a low bough. I shouted to Mr. Collin, who had gone on ahead, that I had got the creature, and after mutual congratulations we set to work with the pole and sheet on all the ash trees near, and with his assistance I was fortunate enough to take eleven specimens. It is nearly thirty years since the beetle was taken, with the exception of one or two single chance specimens.—Horace Donisthorpe, F.Z.S., F.E.S., 58, Kensington Mansions. *July* 11*th*, 1901.

CURRENT NOTES.

Mr. G. Meade-Waldo records (*Entom.*, p. 207) a "hybernated" *Charaxes jasius* in Tangier, on April 8th, and further states that "the fresh ones come out in August." Surely this species passes the winter as a larva as in the Esterel, although the imagines possibly appear earlier in the spring and the species becomes double-brooded further south. The record of *Colias edusa* in Tangier, during the first fortnight of January, is interesting from the point of view of its continued-broodedness in the more southern part of its range.

The South London Entomological Society has recently published its volume* for the year 1900, and it contains a number of first-class papers:—"On the pupation of *Cossus ligniperda*," R. Adkin; "Desultory days at Dawlish," H. J. Turner; "On some wing-structures in Lepidoptera," Dr. T. A. Chapman; "On the ova of Lepidoptera," by F. Noad Clark. There are, besides, full reports of the various field meetings at Banstead, Horsley, Paul's Cray Common, Oxshott, as well as an excellent presidential address by Mr. W. J. Lucas. The Abstract of Proceedings contains many first-class details of entomological work, relating especially to Orthoptera, Odonata and Lepidoptera. The important paper of the *Proceedings* is undoubtedly Dr. Chapman's "On some wing-structures in Lepidoptera," an advanced treatment of many difficult points from the practical standpoint. This paper and that of Mr. Clark are both illustrated with some exceedingly well-produced micro-photographs taken by the latter gentleman, which add a great deal of value to these useful contributions to our knowledge of the subjects treated. One notes, too, the generosity of Messrs. Warne, A. Harrison, and S. Edwards in matters relating to the library. There are one or two matters of detail that ought not to have slipped the editorial eye, *e.g.*, "Mr. Tutt exhibited a long and varied series of *Epunda lutulenta* taken by Rev. E. Burroughs at Mucking, Essex." After this rendering of the name of the Rev. C. R. N. Burrows we shall soon wonder whether any of our lepidopterists are known to those responsible for the report. Again, "Mr. Tutt said that it (*M. fluctuata*) was a species which readily responded to its environment, and referred to the well-known var. *neapolisata* of South Europe, and to a somewhat similar form found at Pitcaple." If our memory be not at fault, Mr. Tutt referred to the dark Pitcaple form, and stated that he believed Millière named and figured the male of the var. *neapolisata* from a Naples example, but, curiously enough, figured the female from Pitcaple examples. In spite of these little slips, the volume is certainly one that ought to be carefully read by all entomologists. On p. 15 is a remark that "The larvæ of *Botys urticalis* were unusually abundant on nettle on July 7th." Is this species, in spite of its name, really closely attached to nettle, and is the larva to be found on July 7th? We have repeatedly bred it from garden mint and wild labiates, but never from *Urtica*, which, of course, is no evidence at all that larvæ were not found commonly on the latter plant, and we have often beaten the imago from beds of stinging-nettles. We would still urge the leading members of this society to insist on printing their *Proceedings* in two half-yearly parts up to date. The expense is practically identical, and the advantage of publishing as early as possible is so great that it more than compensates the want of satisfaction at showing a smaller balance at the end of the financial year.

* "Proceedings of the South London Entomological and Natural History Society," 1900, pp. 117 and xvi, one chart and four plates. Price 2s. 6d. [Published at the Society's rooms, Hibernia Chambers, London Bridge, S.E.]

The Yorkshire Naturalists' Union met on Saturday, June 22nd, to investigate Yedmandale, Beedale and Sawdondale, running from the vale of Pickering into the high moorlands, which form the northern boundary of the vale. Beedale particularly abounded in insect life. The members all met at Wykeham in the evening, and held their usual meeting under the chairmanship of Mr. G. T. Porritt, when the reports of the various sections were read.

The third volume of *British Lepidoptera* has been placed in the printer's hands. This volume will refer entirely to the Macro-Lepidoptera, and the exhaustive treatment of some of the groups of our largest moths should ensure it an even greater measure of success than its predecessors. The leading super-families discussed are the Lachneides (Lasiocampides), Dimorphides (Endromides), Attacides (Saturniides), Sphingides. The summarising of the large amount of material relating to these super-families that has been already published has been exceptionally difficult, and the variety of information available, especially relating to hybridity and gynandromorphism, will make these subjects leading features in the volume, in addition to those headings treated in detail in former volumes.

SCIENTIFIC NOTES AND OBSERVATIONS.

Experiments in rearing Lymantria monacha and Clostera curtula in moist atmosphere.—Some time ago I had the pleasure of reading Mr. Tutt's *Melanism and Melanochroism*, and the contents having suggested to me certain experiments, I thought the results thereof might possibly interest your readers. My experiments were directed to show the effect of moisture on lepidoptera in the larval state. For the purpose I used a breeding-cage of the ordinary "safe" kinds, with the exception that there is no perforated zinc at the sides, and that it is practically air-tight. My object was to create a moist atmosphere by means of two vaporising tins sunk to the level of the earth. On the top of the tins was fine perforated zinc, and the tins were filled with hot water twice daily (at 9 a.m. and 5 p.m.) by means of a cork and emptied by a valve. Inside the cage was a hygrometer, the reading of which was noted twice daily, as also that of a hygrometer kept in the open air. As I thought it probable some ventilation might be necessary, two ventilators were placed, one high up the other low down, in the cage, but these were never used, as the larvæ did not appear to need it. The dimensions of the cage were 14″ wide × 8″ deep × 18″ high. I have kept a fairly accurate register of the hygrometric readings, but they may be summarised briefly by stating that the *wet* bulb (inside the cage) registered on an average throughout the experiments, one-half a degree higher than the dry. (1) I happened to have some ova of *Lymantria monacha*, and these formed the first subject of my experiments. The ova hatched on the 23rd and 24th of April, 1900, when about 48 larvæ emerged. They were at first fed on birch, but as the leaves were then hardly showing, the catkins had to be substituted. At first the little larvæ were very restless, but after a day or two settled down to feeding. On May 3rd some apple was put in with the birch, and, as the larvæ seemed to prefer it, eventually nothing but apple was given to them. The first change of skin took place on May 10th, the second on the

19th of that month, and the third on the 31st. By June 27th all that remained (about 24) had spun up. On July 3rd a ♀ emerged, and on the 11th five more ♀ s and one ♂ ; on the 14th nine ♂ s and one ♀ , and on the 16th two ♂ s. Of the imagines which emerged, the males were very dark, entirely suffused with smoke-colour. The females, however, although they varied, did not show the darkening to the same extent. One of the females had the right antenna ♂ and the left ♀ . (2). The next subject of my experiments were ova of *Clostera curtula*, obtained from insects which were bred from larvæ I had found on poplars here the previous summer. The ova hatched on June 12th, and were fed on poplar. I was absent a good deal of the time, so did not note the changes of skin. By July 20th all the larvæ (about 30) had spun up. On July 28th two imagines emerged, and subsequently three or four others, but the remainder did not emerge, and remained in the pupal stage all the winter. Of those which emerged I did not perceive any variation in the colour. I paired a ♂ and ♀ in the cage, and ova were deposited, but did not hatch. I think this due to the fact that the ova were deposited in a small card-board box, and the box (from the moisture) became mouldy, and that the eggs were thus affected, and I may add that I subsequently paired a ♂ and ♀ of *Cerura vinula* in the cage, and that the ova also did not hatch. It may be, therefore, that the moist atmosphere had a deleterious effect upon the ova. I secured a nice lot of ova from the *L. monacha*, which had resulted from the imagines produced from the larvæ on which I had made my first experiments, and with these I hope to continue my investigations. From the foregoing, two facts seem to strike me, *viz.* :—

(1) That the males seem to be chiefly affected by the conditions under which they were reared.*

(2) That in the case of *C. curtula* the second or summer brood is suppressed.

There is, perhaps, nothing new in what I have set forth above, but I thought possibly the results might be of some interest as confirming (or otherwise) the experiments of more experienced entomologists than myself. I shall be very pleased to continue my investigations in any line that any more experienced experimenter may suggest.—Arthur Hope Rydon, Awbrook, Lindfield, Sussex.

* This fact seems to correspond with the temperature experiments conducted by Professor Standfuss (*vide*, *Entomologist*, 1900, p. 283).

VARIATION.

Aberration of Dilina (Smerinthus) tiliae.—On May 22nd I bred an aberration of *D. tiliae*, which seems worth noting. The ground-colour of the forewings is rather lighter than usual, and the dark-green fascia is totally absent, being represented by a small dark-green spot in the centre of the wing just interior to the junction of the upper and middle median nervules. The moth, which, by the way, is a male, was from a larva found at Streatham, S.W., in September, 1900. Having no proper place to keep the pupa on board ship, I had simply placed it in a tin box on cotton wadding and had kept it in a very dry and warm place; the heat and drought may very possibly have caused the aberration.—T. B. Fletcher, R.N., F.E.S., H.M.S. *Gladiator*, Mediterranean Station. *June 15th*, 1901. [This is apparently referable to ab. *centripuncta*, Clark, *Ent. Rec.*, i., p. 329, pl. A, fig. 7.—Ed.]

E.C. Knight ad nat. del. West Newman chromo

Peronea cristana

Entom. Record. etc. 1901.

Migration and Dispersal of Insects: Lepidoptera.

By J. W. TUTT, F.E.S.

From the cold polar altitudes where *Eugonia californica* is fighting its way over the summit of Mount Shasta, we will transfer ourselves to the hot Mississippi valley on the same continent and look at the incredible abundance and subsequent dispersal of one of the well-known Hackberry butterflies, *Chlorippe* (*Apatura*) *celtis*. In a report which comes from Arkansas, Webster states (*Insect Life*, i., p. 29) that on May 14th and 15th, 1888, for a distance of about thirty miles along the St. Francis river, " the shores were literally lined with the butterflies. On stumps they would be packed so thickly, that, with wings erect, they completely covered the surface. The sides of the small steamer on which I was travelling were covered, and I counted seventeen on the back of a deck-hand as he was going about his work. When a landing was made, and I got off to examine the brush-wood, they would rise up in clouds about me and get into my eyes and mouth, so that I had to beat about with a bush to protect myself. The engineer of the boat said he had been running on the river for fifteen years, but never saw so many before. The inhabitants along the river were as surprised as myself." Holzgang records (*loc. cit.*, p. 29) that on May 19th he was passing along the west side of the Mississippi valley, near Memphis, up the Arkansas, when he observed a swarm of millions of the same species flying along the road in a southerly direction. The species just referred to (*Chlorippe celtis*) is an Apaturid, but another species, called popularly a " Celtis " butterfly, although belonging to an entirely different group, the Libythæids, is recorded (*loc. cit.*, vii., p. 357) by Knight (*teste* Riley) as migrating in vast numbers in Texas in 1895. Towards the end of August, *Hypatus bachmani* was observed at San Marcos, Texas, flying eastward in vast numbers, and from enquiries that were instituted it was ascertained that, at this time, swarms of the butterflies were observed flying in a general eastward direction over a territory almost one hundred miles square. Riley notes the species as belonging to the Carolinian fauna, but taken occasionally as far north as Ontario, and he supposed that the wet and hot weather of August, which followed a period of drought extending over June and July, must have favoured the simultaneous emergence of an unusually large number of these butterflies from their chrysalids and brought about the primary condition under which the migratory instinct is made active in certain insects.

Tait records (*Entom.*, xxvii., p. 133) that whilst at Santos (in 1893) the local newspapers reported that an immense swarm of "borboletas" had invaded S. Vicente, a seaside village near Santos. The insects had arrived in such immense numbers that they formed a cloud which, it was reported, even obscured the sun. They invaded the village, swarming into the houses. The greater portion of the swarm was said to have passed over the village, with a strong wind which was blowing at the time off the land, and in the direction of the sea. Large numbers were reported to have fallen into the sea and to have been subsequently washed ashore. Tait found the moths strewed along the shore and to be a species closely resembling the European Puss moth (*Cerura vinula*) but they were too much damaged for actual identification. The same observer also makes some remarks as to the influence of wind on the direction of the flight of butterflies. He noticed when crossing from Rio Janeiro to the island of Paqueta, that butterflies frequently crossed the bay with, but never against, the wind, and the observation was afterwards confirmed. The insects did not go past in a swarm, but singly or two or three together, and at sufficiently frequent intervals to attract attention.

It is impossible to deal at length with the various records of migrating lepidoptera in Australia. Anderson notes (*Victorian Butterflies*, i., pp. 24-25 and p. 29) that the migratory instinct is most noticeable among the native species in *Pieris teutonia*, sometimes called "the migratory white," although this name more properly belongs to *Delias nigrina*, Fab. In certain seasons large numbers of *P. teutonia* spread themselves all over the colony, although the food-plant only occurs naturally in the northern portions. . . . . In some years great numbers may be observed steadily passing one after the other in the same direction, they never turn back, but fly on and on, urged thereto by that irresistible impulse which is so interesting and yet so perplexing to the observer. Although we, at times, have great flights distributed all over the colony, they are generally fairly broken up and scattered, and rarely, if ever, do we see those vast flights such as have been observed in Queensland passing at a great altitude from east to west . . . . Its wide distribution extends from Australia to New Guinea, the Hebrides, Fiji, and the Friendly Islands, a result that might be expected when its migratory powers are taken into account."

A report to the effect that, on June 1st, 1860, in the valley of Vigor in southern France, immense crowds of a "copper" butterfly (supposed to be *Chrysophanus hippothoe*) were observed flying in a northerly direction in more or less numerous bands from 10 a.m. until evening, is quoted by Scudder (*Butts. of New England*, vol. ii., p. 1086) on the authority of Werneburg. The report further adds that all these specimens were males. There appears to be no other record of an European Chrysophanid exhibiting any migrating tendency.

We have now given instances, and quoted records of butterflies and moths which have been seen in the act of migrating from one place to another, in various parts of the world. These are, of course, only a very small portion of the total number of observations that have been made and recorded, but appear to be sufficient to show that the migration of butterflies and moths is an actual and well-ascertained fact.

On some races of Lasiocampa quercûs.

By J. C. WARBURG.

(*Continued from p.* 240.)

Not having been able to observe the imagines in the wild state and note their times of appearance, &c., I give the following data, kindly supplied by M. Constant, who, until his recent decease, lived at Cannes and had, therefore, opportunity of observing the insects, although he has never specially studied the *L. quercûs* forms: "The young larvæ of both forms appear at the same time, towards the middle of the autumn. In their early age they are practically alike and not always very easy to distinguish. It is not till after the third moult, I think, that *L.* var. *viburni* takes its brownish-red colour, which it never loses, whilst *L.* var. *meridionalis* keeps its tint of silky grey. The two races are about equally numerous, neither very rare nor very common, though I am inclined to think that *L.* var. *riburni* is slightly more abundant. Both are polyphagous. One is forced to suppose those of *meridionalis* the more voracious, for they grow much faster, I have found them nearly full-grown as early as the beginning of March ; *L.* var. *riburni* grows more slowly, and the former pupates more than a month before the latter. This advance is maintained, for the perfect insect of *L.* var. *meridionalis* emerges from the middle of June, whilst that of *L.* var. *riburni* does not fly until the end of August, and continues to September 15th-30th, I even think that one may consider this peculiarity as one of the best characters which might serve to differentiate the two forms, which are so close to one another in other respects . . . . that one should consider them chiefly in the larval stage, in which the brown colour of *riburni* is permanent, and also in their epoch of emergence, which is fairly regularly 50 or 60 days later than in the form *riburni*. It is a fairly commendable character, especially when dealing with a variety only."

L. quercûs (from Paris).—Described from three bred ♀s and sixty ♂s, two ♀s wild specimens. Wings and body chocolate. ♂.—Slightly redder than *L. meridionalis*, which it closely approaches in colour, tip of abdomen light. The band on the forewings varies from a little over $\frac{1}{8}$ inch to $\frac{1}{16}$ inch in front, generally narrower on the inner margin, where it nearly always turns inward in a slightly crescentic hook. It is sharply defined inside, suffused outside, curve very variable. On the hindwings it varies much in width, sometimes extending nearly to the fringes with little brown between (as in the form from the Gironde called *guillemotii*, by Trimoulet). The band is light yellow, sometimes slightly redder on the hindwings. The margin in the forewing powdered with the band-colour with the nervures (sometimes conspicuously) darker. Median spot variable in size, generally medium, surrounded with darker. Fringe of hindwings of the same colour as the band. ♀.—Female ochreous, or ochreous-brown, without any greenish tinge, darker inside the band, which is obsolete on the hindwings, as in most of the British specimens, forming simply a boundary between the colours of the basal and marginal areas. Band of forewings obsolescent, suffused externally, bordered with slightly darker within. Its general appearance is washed-out, like some of the British specimens. It is duller than most of these, and considerably duller than the south of France forms. The larvæ were taken in the environs of Paris, and were fed by my correspondent, Dr. Vogt, on privet, on which I believe he usually found them.

L. var. *sicula*.—The only specimens of var. *sicula* at my disposal are the descendants of 24 larvæ sent me in January, 1897, by a German correspondent. These, in their turn, were the offspring of a batch of larvæ found on ivy on a garden wall in Palermo the year before, possibly all of one brood, so that all the specimens were to a considerable extent inbred, and might be expected to be very constant in marking, as, indeed, they were. All the specimens reared by my correspondent himself in 1896 were, so he wrote, very constant also, except one ♂, the last to emerge (October 22nd), which was a small specimen of the coloration of the female. None of my specimens, either in the first or second generation, show variation of this kind. The following description is based on this material :—

♂.—The male expands about two inches. The wings are a rich, dark chocolate colour, less red than most of the other *quercûs* races, from which it has a very different aspect owing to the broad ochre-yellow margin of the hindwings. The spot is conspicuous, being composed of a slightly raised tuft of white scales, margined with darker. It is never very large, often quite small, round, or approximately square, not lunate. The ochreous band on the forewings is narrow, clearly-defined within, where it is margined with a slightly darker colour than the ground of the wing. It is only very slightly, or not at all, diffused outwards, and is practically defined on both sides. It is very straight in the middle portion, the upper third or fourth being slightly, but distinctly, elbowed inwards. On the inner margin the band bends outwards and then inwards, forming a small curve with its concave side to the base. The hind margin of the forewings is somewhat lighter than the general ground colour, and dusted with a few lighter scales; the fringes are concolorous. On the hindwings the band is clearly cut inside in an almost regular curve, straightening towards the anal angle. The band is continued over the whole outer third of the wing to the margin, sometimes an even orange-yellow all over, but frequently powdered along the margin with brown, though not sufficiently so as to give the effect of a narrower band. My own specimens spent the summer and autumn in England, and the winter and spring in the south of France, emerging generally here after spending most of the pupal stage down south. They all have the broad yellow border clear and bright. On the other hand, in those which Mr. Bacot reared in London, this border is contaminated with brown (chiefly along the margin) so strongly as to quite change the appearance of the insect from a smart, brightly-coloured moth to a rather dingy-looking one, albeit quite distinct from any of the other races. From these considerations there is a strong *prima facie* case that this moth would be interesting and amenable material for temperature experiments. [There are a few specimens of this race in the British Museum collection which agree with my own. They share with *L. guillemotii*, Trimoulet, the distinction of a separate label, while the specimens of *L. quercûs*, *L.* var. *callunae*, and *L.* var. *viburni* of the most diverse forms, colours and nationalities are all jumbled higgledy-piggledy* under *L. quercûs*.]

The larva of *sicula* has a more complicated dorsal pattern than the others, which, however, only develops fully when the larva is $1\frac{1}{4}$-$1\frac{1}{2}$ inches long. It consists of darker subdorsal markings on a lighter ground. When the larva is about an inch long this consists of two dark squares on each segment, one on either side of the mediodorsal area. The squares later become hollow with two slight projections in front and open towards the middle. The newly-hatched larvæ have a conspicuous white mediodorsal line. The *long white subcostal hairs*, looking as if arranged in whorls around the legs, are very clear

* We are obliged to express our satisfaction that other workers are beginning to complain of the state in which the arrangement of most of the moths is allowed to stand. What with the nomenclature being largely different from that elsewhere obtaining, the arrangement in most groups following no recognised list, and the absence of any attempt to differentiate geographical forms and local races, it frequently happens no good use can be made of the collection to do really scientific work on modern lines.—Ed.

against the rusty red coat, and form an important character of this larva.

L. quercûs (from Dorset).—The imagines I need not describe. The larvæ were dark, rusty-brown, with short greyish-white hairs on the back and white longitudinal dashes above the white spiracles. The face, except the rusty central triangle, black (blue, Bacot). It may be interesting to note that some Scandinavian *quercus* (*callunae?*) larvæ kindly sent me by Professor Aurivillius, all of which died in London at about the third moult, were very dark, with *tufts* of whitish hair down the middle of the back*.

* Mr. Bacot notes: "Characteristic of the early (about hybernating) stage of British *L. quercûs* also, I have a specimen taken by Mr. Fuller after hybernation (I think, at Deal) which has these tufts strongly marked, although the larva is $2\frac{1}{4}''$ long, and is probably in the 5th stadium."

Observations on some new and little-known Orthoptera with biological notes*.

By J. PORTCHINSKY (translated by JACOB KOTINSKY).

(*Concluded from p.* 243.)

It is not hard to guess the purpose served by the bright colours developed upon the hind-legs. It is known that not infrequently the hind-legs of the two sexes of these insects are differently coloured; thus, for example, we have just seen by how much the colouring of the hind-legs of the male differs from that of those of the female in *Nocarodes cyanipes*. We must, therefore, look upon the coloration of these legs as a secondary sexual character, having an important significance in the lives of these animals. But now we shall see whether the colour of the hind-legs does not affect some characters peculiar to the Acridian family. Upon examining three families of these insects having most in common, *viz.*, the grasshoppers (*Acridiodea*) locusts (*Locustodea*), and crickets (*Gryllodea*), we are immediately struck with that difference which, in the general resemblance among the representatives of the three named families, is noticed in the position of the stridulating organs, on one the side in the locusts and crickets, and on the other in the grasshoppers. Thus, we know, that these organs are upon the tegmina of the first two families, and the sounds are produced by the rubbing of the tegmina against one another. This method of sound-production is especially common among insects with hard tegmina (in Coleoptera, for instance) where the sounds are produced by the rubbing of the overlapping or touching of hard parts of the body. In *Acridiidae*, however, entirely different parts of the body participate in the sound production, and it is known, that their rasping is produced by the rubbing of the femur against the raised meshwork of veinlets upon the tegmina. When one of the males begins to stridulate, he bends the tibia of the hind-leg under the femur, where it is inserted into the groove, and then draws the legs up and down like a violin bow. Graber (*Verhandl. zool.-bot. Ges. Wien.*, 1871, p. 1097) finding that the general principles of the structure of the stridulating organs are the same in all Orthoptera, tries to explain

* From *Horae Societatis Entomologicae Rossicae*, vol. xx., pp. 111-127, pl. xii., 1886.

the noticeable structural difference of these organs in the grasshoppers and locusts by the difference in the relative position of the tegmina, legs and abdomen, which we notice in representatives of the two families. But such an explanation can hardly be accepted, since it is not likely that, in the gradual perfection of the sounding organs, the parts bearing and adjacent to them did not participate. On the contrary, it seems to me, that, in order to strengthen the sound, the abdomen and tegmina should have somewhat changed their original position, and that the position of these parts in Orthoptera, as we see at the present time, is essentially the result of such an adaptation, *i.e.*, a later appearance and not preceding the formation of the stridulating organs. It is not hard to be convinced of this if we examine the wingless forms that are found in considerable numbers among the grasshoppers as well as locusts. As to the cause favouring the difference in the formation of the stridulating organs of the grasshoppers from that of the locusts, I am of opinion that the bright colouring of the hind-legs, exclusively a peculiarity of the grasshoppers, constituted the principal cause of this difference. The fact is, we know already, that insects always try to expose the bright colours of their body (especially since the bright colours constitute a secondary sexual character). We know, for example, that the beautifully coloured wings of diurnal butterflies are constantly in motion. The butterflies now raise, now lower them at varying angles, which still more enhances the beauty and brightness of the wings. We also observe almost the same motion in flies with coloured wings (*Trypetidae*, *Ortalidae*) even though they are more modestly coloured. These small flies, walking over the leaves and flowers of plants, now raise, now lower their wings. The bright colours of the hind-legs elicited similar phenomena in the grasshoppers. But here the motion of the legs had to be much stronger, since the bright colours are distributed over the concealed parts of the legs. In order to expose these parts the insects are obliged to raise their legs high and turn them in all directions. To what an extent the hind-legs of grasshoppers are movable, and what a variety of motions they perform, are easily observed in the males of the genera *Stauronotus* and *Stenobothrus*, when in captivity. Nothing of this kind is observed in locusts, neither are the hind-legs coloured. Under such constant motion of the hind-legs (when the insect is not aware of danger and is in the presence of a female) the grazing of the ends of the tegmina with the moving legs is evidently a phenomenon next in order; the sounds thus produced, even though weak, served the purpose of sexual selection, which gradually inter-fitted the sound-producing parts of the body of the insects for the strengthening of the sounds.

There is no foundation whatever for thinking that the bright colours of the hind-legs of the grasshoppers could have appeared after the formation of the rasping organs and together with them the tegmina. On the contrary, it can be absolutely asserted that the colouring of the hind-legs preceded the formation of the wings. The best proof of this is furnished us by the wingless forms, and among them the above described *Nocarodes cyanipes*, in which, notwithstanding the entire absence of even the vestiges of wings, the hind-legs are exceptionally brightly and peculiarly coloured. We should sooner look for relations between the absence of means of stridulation in the wingless forms or in the winged with brighter or variegated coloured hind-legs in the males, and the females of the same species, since with the provision to produce sounds, the males became less in need of the bright colours on the hind-legs.

Finally, the question why the hind-legs of grasshoppers only are highly coloured, while in the locusts and crickets, that are so very closely related to them, the bright colours on the hind-legs are not developed at all, is readily solved, it seems to me, by the mode of life of the representatives of the last two families. The fact is, grasshoppers are insects essentially diurnal; they become most active during the hottest part of the day; during the identical time the summoning sounds of the males are everywhere heard. The crickets, on the contrary become active only at night. These are entirely, one can say, nocturnal insects, and since bright colours are not distinguishable at night, their absence on the legs of crickets presents a readily understood phenomenon. We can say almost the same about locusts (*Locustodea*) although they cannot be considered wholly nocturnal insects, owing to our lack of information concerning their habits. Nevertheless, there is no doubt, that a considerable portion of the species becomes active principally at night. Thus we know that locusts feed almost entirely during the evening or night. It is also known that the green locust (*Locusta viridissima*), for instance, begins its love walks and serenades after sunset and continues them into the night. During the day, however, this locust positively avoids sunshine. Another species, *Locusta cantans*, the best singer among the European representatives of its family, begins its stridulation also after sunset and continues until sunrise. All these facts tell us that, if, at the present time, we are not able to consider the locusts as purely nocturnal insects, they were such most probably in the comparatively not remote past. But if they come to the most active condition only at evening and night, then the bright colours on their hind-legs could not develop for sexual purposes, and this absence of bright colours had, in its turn, a telling influence upon the mobility of the hind-legs in locusts, which appear in them only as supports in the motion of the insect and are deprived of those varied functions that are characteristic of the hind-legs of grasshoppers.

Peronea cristana, Fab., and its aberrations (*with plate*).

By J. A. CLARK, F.E.S.

(*Continued from p.* 229.)

It will be observed that most (if not all) of the forms in division A are referable to *cristana* and its vars., whilst in sect. *a* of division B, although there are some undoubted aberrations of *cristana*, the greater number of names mentioned are referable to *hastiana* and its aberrations, or to other allied but distinct species.

Desvignes, between 1840 and 1845, captured some 1900 specimens of the Peroneas in Whittlebury Forest. He expresses his doubts as to the specific values of the various forms, and groups (*Zool.*, 1845, pp. 811 *et seq.*) the Peroneas into two sections: 1. *Peronea-Spuria.* 2. *Peronea-Vera.* The latter consists of the various forms of *P. cristana*, which he subdivides and describes as follows:

A. *Peronea unicolorana.*—Var. 1, *unicolorana*, Des.—This insect has generally been understood to be the *profanana* of Fabricius, but not at all agreeing with his description, I have given it the present name, its colour being uniform dark green, with the exception of palpi, head, and thorax, being more or less dirty white, the button very small, varying from a dark to a white dot. Var. 2, *alboflammana*.—Similar to the preceding, with a white dash on the inner margin extending from the base, in some specimens with a very minute dark or white button in the centre of disk. Var. 3, *xanthovittana*, Des.—Similar, with a yellow or fulvous dash; palpi, head, and thorax of the same colour. Var. 4, *albipuncta*.—Similar to the last, with the exception of a cream-coloured tuft or button. Var. 5, *cristana*.—Similar to *alboflammana*, but has a white button. [Note.—I have two specimens with cream-coloured dash and button, also specimens of the typical insect with the spadiceous mark, and others with the *striana* markings.]

Peronea subvittana.—Distinct from the foregoing, having an abbreviated white dash from the base of inner margin not extending to the outer margin, the central tuft subject to vary from a large white or cream-coloured one, the other very minute ones of the same shades.

Peronea capucina.—Var. 1, *capucina*.—This insect was first discovered by the Rev. Mr. Johnson in the New Forest; it is entirely blotched with white, but has no white dash. Var. 2, *subcapucina*, Des.—The above insect should bear this name, not being so complete as the present one, which has the white dash, and this constitutes its difference. Var. 3, *curtisana*, Des.—Similar to the last, varying in having a very faint fulvous streak extending from the base to the button, which is of the same colour.

Peronea ruficostana.—Distinct, variable, having occasionally a small reddish button.

Peronea desfontainiana.—Var. 1, *desfontainiana*.—Well-known and described. Var. 2, *sericana*, Hüb.—The same, without a button. Var. 3, *consimilana*.—Similar, but with *striana* markings on the inner margin. Var. 4, *alborittana*.—Similar, but has a white dash. Var. 5, *fulvocristana*.—Similar, with a fulvous dash and button. Var. 6, *tolana*, Des.—Between *curtisana* and *desfontainiana*.

Peronea spadiceana.—Var. 1, *spadiceana*.—Well-known and described. Var. 2, *substriana ?*—Similar, with *striana* markings. Var. 3, *brunnea*.—Smaller than *spadiceana*, much darker, and with a very large dark button; some specimens with red shoulders and *striana* markings. [Note.—This may be a distinct species, the button being much larger than in any other of the genus, with the exception of *P. subvittana*.] Var. 4, *chantana*.—Similar to *spadiceana*, with a white dash and button; I have a specimen with a dark button.

Peronea cristalana.—Var. 1, *cristalana*.—Well known and described; variable, some being darker than others; the button varying from dark to fulvous. Var. 2, *fulvovittana*.—Similar with a yellow dash.

Peronea subcristalana.—Var. 1, *subcristalana*.—Somewhat similar to *cristalana*; differs in the usual markings not being white; scarcely variable. Var. 2, *sequana*.—Similar with a yellow dash.

Peronea striana.—Var. 1, *striana*.—Well known and described; the stria white. Var. 2, *insulana*.—I did not capture this insect. Similar with the button white or cream-coloured.' Var. 3, *fulvostriana*, Des.—Similar to *striana*, with fulvous markings on the inner margin, nearly a distinct dash.

Peronea profanana.—Var. 1, *profanana*, Fab.—Cinereous, with tuft of scales of the same colour. Var. 2, *provittana*, Des.—Similar with a yellow dash.

Peronea semiustana.—Var. 1, *semiustana*, Curt.—Somewhat similar to the last species, with the exception of a very dark or black patch above the button, and touching the base. Var. 2, *bentleyana*.—Similar, with a yellow dash. Var. 3, *semistriana*, Des. Similar to *semiustana*, with *striana* markings.

The trouble of working out the various forms of this species in order to get the accurate nomenclature, has been very great. In the 1st edition of Curtis's *British Entomology*, only one form, *ruficostana*, is described, although the forms named by Fabricius, Haworth and others, together with a large number of MSS. names of Stephens are referred to. These latter names are referred to again in Stephens' *Catalogue* and yet again in Rennie's *Conspectus*, still without descriptior. This last named author added nothing to our knowledge of the group and seems simply to have given a free translation of the forms described by Haworth, accrediting the descriptions, however, to Curtis and others, presumably to throw his contemporaries off the scent, as to their real origin. The forms represented by these MSS. names, are first described in Stephens' *Illustrations* in 1834, and are referable to this author. Wood (*Index Entom.*) comes next. The work here is moderately clear, but Humphreys and Westwood (*British Moths*) give trouble, for their work, published 1841-1845, and bearing an 1841 preface, is bound with a title-page bearing date 1851, and treated as a 2nd edition, although one suspects both editions to be identical and printed at the same time, and Stephens in his *List* gives 1844 as the date of the second volume. Curtis' *British Entomology*, 2nd ed., was published by 1839, *teste* Stainton, *Ent. Mo. Mag.*, xxiii., pp. 221-223, and reprinted in 1862, and there for the first time one finds descriptions to names that had been in current use in some instances for nearly 20 years. I simply make this explanation in order to draw attention to the possibility of errors in the synonymy, although all possible care has been taken.

I should here like to call attention to some remarkable synonymy in which Rebel has indulged in the recently published 3rd edition of the *Catalog der Lepidopteren des Palæarctischen Faunengebietes*, pt. 2, p. 79. Among other things Rebel sinks the ab. *subrittana*, Stphs., as a synonym of ab. *albipunctana*, Stphs., the ab. *alborittana*, Stphs., as a synonym of ab. *striana*, Stphs., ab. *fulvocristana*, Stphs., as a synonym of ab. *desfontainana*, Stphs., ab. *rittana*, Stphs., and ab. *brunneana*, Stphs., as synonymous with ab. *spadiceana*, Stphs., ab. *fulvorittana*, Stphs., with ab. *cristalana*, Stphs., and ab. *substriana*, Stphs., and ab. *consimilana* as synonymous with ab. *profanana*, Stphs. This is, of course, a ready way of reducing the number of aberrations in the list, but does Dr. Rebel consider this a scientific method of dealing with a confessedly difficult subject, *e.g.*, his action leads one to suppose that Stephens' descriptions of *subrittana* and *albipunctana* are identical, and Wood's figures also identical, since his synonymy reads :

ab. *albipunctana*, Stphs. 152 ; Wd. 1061 ; *subrittana*, Stphs. 152 (ab.) ; Wd. 1059—Al. ant. fuscis, puncto medio albo.

Will Rebel say that *albipunctana*, Stphs., and *subrittana*, Stphs., are identical, *i.e.*, that Stephens described the same aberration under two names, and that Wood figures the same ? If not, why sink them as synonymous ? The same argument applies to all the forms, in my opinion, sunk erroneously.

Peronea cristana, [Schiff., "Sys. Verz.," p. 129 (1775)] ; Fab., "Mantissa," &c., pp. 233-234 (1787) ; Haw., "Lep. Brit.," p. 412 (1811) ; Curtis, "Brit. Ent.," expl. pl. xvi., 1st ed. without descr. (1824) ; 2nd ed. (*ante* 1839) ; reprinted (1862) ; Tr., "Die Schmett.," viii., p. 253 (1830) ; x., p. 129, *pro parte* (1835) ; Rennie, "Conspectus," p. 175 (1832) ; Stphs., "Ill. Haust.," p. 152 (1834) ; Wood, "Ind. Ent.," 1st ed., p. 156, no. 1060 (1839) ; H. and Westd., "Brit. Moths," ii., p. 156 (? 1844) ; Desv., "Zool.," iii., pp. 810-1 (1845) ; Schlag., "Stett. Ent. Zeit.," 1854, pp. 62-67 (1854) ; Wlk., "Brit. Tort.," p. 173 (1859) ; Sta., "Man.," ii., p. 233 (1859) ; Staud. and Wocke, "Cat.," 2nd ed., p. 232 (1871) ; 3rd ed., p. 79 (1901) ; Wocke, "Bresl. Ent. Zeit.," 1874, p. 14 (1874) ; Meyrick, "Handbook," &c., p. 521 (1895). *Cristanum*, Wallgrn., "Ent. Tidsk.," ix., p. 164 (1888).—*Pyralis* alis anticis fuscis : margine interiori albo punctoque medio fasciculato elevato. (*Phalaena cristana*, "Wien. Verz.," 129, 10.) Habitat in Austria. Mus. Dom. Schieffermyller. Magna. Alæ anticæ fuscæ margine tenuiori late albo. In medio punctum album e fasciculo pilorum elevatorum fuscorum. Posticæ cinereæ. Caput et thorax albida (Fabricius).

1. ab. *nigrocristana*, n. ab. (Pl. vi., fig. 1.).—Head, thorax and palpi white. Anterior wings deep fuscous, with a large tuft of black scales in the centre ; on the inner margin is a broad white vitta tapering towards the hinder angle, posterior wings brownish, a little deeper in colour towards the anal angle. The difference

between this aberration and typical *cristana* is very marked, the former having a black button instead of a white one.

2. ab. *fulvocristana*, Stphs., "Ill. Haust.," iv., p. 151 (1834); Wood, "Ind. Ent.," fig. 1055 (1839); H. and Westd., "Brit. Moths," ii., p. 154 (? 1844); Desv., "Zool.," iii., p. 842 (1845).—Exp. alar. 9-9½ lin. Anterior wings with the costa and hinder margin fuscous-brown, the inner portion orange-brown, with a broad ochreous streak on the inner margin extending to the hinder angle; on the disc is an elevated tuft of fulvous scales; head, thorax, and palpi ochreous. New Forest (Stephens). [Curtis ("B. Ent.," 2nd ed., expl. pl. xvi., no. 16) gives this as a synonym of *desfontainiana*, Fab.]

3. ab. *chantana*, Curt., "Brit. Ent.," 2nd ed., expl. pl. xvi (*ante* 1839); H. and Westd., "Brit. Moths," ii., p. 156 (? 1844); Desv., "Zool.," iii., p. 842 (1845).—Superior wings purplish-brown, with a large lanceolate space from the base nearly to the apex of the costa ferruginous; the inner margin, a large button, and a broken line of minute dots along the posterior margin pure white, as well as the head and thorax (Curtis). Similar to ab. *spadiceana*, but with a white dash and button (Desvignes).

4. ab. *subchantana*, n. ab. (Pl. vi., fig. 2).—Head, thorax and palpi white. Anterior wings reddish-brown from the base to the centre of the marginal area, with a cream-coloured patch at the extreme base of the inner margin; a faint light streak running parallel with the inner margin to the hinder angle; the basal area and disc fuscous, with a large white button, and two or three minute white dots near the hind angle; posterior wings light brown with two slight black lines round the anal angle. The marked difference between the aberration and ab. *chantana* is the absence of the vitta.

5. ab. *prochantana*, n. ab. (Pl. vi., fig. 3).—Head, thorax and palpi white. Anterior wings brown, with a broad white vitta, and a light reddish-brown marking extending from extreme base towards the apex, on the edge of which and in the centre of the wing is a slight trace of a dark button; posterior wings light brown. This aberration differs from the two foregoing ones, in having only a trace of the button, and that dark instead of white.

6. ab. *vittana*, Stphs., "Ill. Haust.," iv., p. 150 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 8 (*ante* 1839); Wood, "Ind. Ent.," fig. 1051 (1839); H. and Westd., "Brit. Moths," ii., p. 156 (1844); Staud., "Cat.," p. 232 (1871).—Exp. alar. 9-9½ lin. Anterior wings brown, with the apex darker, the disc with an elevated tuft of black scales, and some minute black dots near the hinder angle; the inner margin with a broad ochraceous-red streak; thorax, head, and palpi of similar hue. Near London, New Forest (Stephens).

7. ab. *subvittana*, Stphs., "Ill. Haust.," iv., p. 152 (1834); Curt., "Brit. Ent.," 2nd ed., pl., xvi. expl., no 21 (*ante* 1839); Wood, "Ind. Ent.," fig. 1059 (1839); Desv., "Zool.," iii., p. 841 (1845).—Exp. alar. 10½ lin. Anterior wings fuscous, immaculate, with a very short broad whitish streak at the extreme base of the inner margin, and the central tuft of scales whitish; head, thorax, and palpi obscure white. New Forest (Stephens).

8. ab. *nigrosubvittana*, n. ab. (Pl. vi., fig. 4).—Head, thorax and palpi ashy-white. Anterior wings black, with an ashy-white patch at the extreme base of the inner margin and a large blackish button; there are also from three to five minute raised spots in the marginal area, posterior wings light brown. This aberration having a black button, and blackish colouring in the wings makes it easy to distinguish from ab. *vittana* and ab. *subvittana*.

9. ab. *punctana*, n. ab. (Pl. vi., fig. 5).—Head, thorax and palpi cream-coloured. Anterior wings dark brown, a little lighter towards the hinder angle; in the centre of the wing is a large cream-coloured button, and at the apex a cream-coloured dash and two or three minute dots, there is also a cluster of minute spots near the hinder angle, posterior wings light brown. The minute white raised dots over the wing constitute the chief difference between this aberration and ab. *subvittana*; it is also much darker in colour.

10. *albovittana*, Stphs., "Ill. Haust.," iv., p. 151 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 17 (*ante* 1839); Wood, "Ind. Ent.," fig. 1056 (1839); H. and Westd., "Brit. Moths," ii., p. 155 (1844); Desv., "Zool.," iii., p. 842 (1845).—Exp. al. 9 lin. Anterior wings, with the costa broadly fuscous-brown, the hinder margin dull brown, with an orange streak from the base to near the middle, and a broad snow-white one on the inner margin, vanishing towards the hinder margin; on the disc is an elevated fulvous tuft of scales; head, thorax and palpi snow-white. New Forest (Stephens).

11. ab. *fulvovittana*, Stphs., "Ill. Haust.," iv., p. 151 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 12 (*ante* 1839); Wood, "Ind. Ent.," fig. 1057

(1839); H. and Westd., "Brit. Moths," ii., p. 155 (1844); Desv., "Zool.," iii., p. 842 (1845); Staud., "Cat.," p. 232 (1871).—Exp. alar. 8½-9 lin. Anterior wings brown with darker and lighter clouds, a few blackish spots towards the base, then a rather distinct irregular whitish fascia, extending from the costa towards the inner margin, but vanishing before reaching the latter, and usually going off in a semicircle towards the apex of the costa, leaving a dusky costal patch; on the inner margin is a broad bright fulvous streak, and the elevated tuft of scales is very pale, or whitish, fulvous; head, thorax and palpi ashy. New Forest, Greenhithe (Stephens).

12. ab. *subfulvovittana*, n. ab. (Pl. vi., fig. 6).—Head, thorax and palpi light yellowish-brown. Anterior wings of a rich warm brown, somewhat mottled with darker, and darker towards the apex; a broad orange-coloured vitta, which extends as a fine line right to the apex of the wing; a large reddish brown button, from which a broad white marking extends up to the edge of the basal area; posterior wings light brown, deepening a little in colour towards the anal angle. The marked difference between this ab. and ab. *fulvovittana* is, that the white marking coming across the basal area finishes at the button, instead of continuing up again to the marginal area.

13. ab. *xanthovittana*, Desvignes, "Zool.," iii., p. 841 (1845).—Similar to ab. *unicolorana* and ab. *alboflammana*, but with a yellow or fulvous dash; palpi, head, and thorax of the same colour (Desvignes).

14. ab. *proxanthovittana*, n. ab. (pl. vi., fig. 7).—Head, thorax, and palpi light yellowish-brown. Anterior wings of a warm reddish-brown colour, the central area perhaps a trifle lighter, with a very faint trace of a button in the centre of wing, and a broad orange-coloured vitta from which a very fine orange line extends along the margin to the apex, posterior wings light brown. The almost complete absence of the button constitutes the marked difference between this aberration and ab. *xanthovittana*.

15. ab. *striana*, Haw., "Lep. Brit.," p. 413, no. 61 (1811); Rennie, "Conspectus," p. 175 (1832); Stphs., "Ill. Haust.," iv., p. 149 (1834); Curt., "Brit. Ent.," 2nd ed., expl. pl. xvi., no. 4 (*ante* 1839); Wood, "Ind. Ent.," fig. 1048 (1839); H. and Westd., "Brit. Moths," ii., p. 153 (1844); Desv., "Zool.," iii., p. 843 (1845); Staud., "Cat.," p. 232 (1871); 3rd ed., p. 79 (1901).—*T.* (The brown Button) alis saturate-fuscis punctulis duobus posticis costalibus niveis; altero magno medio, aliis minutis posticis elevatis, thoraceque fuscis, striâque cincreâ marginis tenuioris. Exp. alar. 10 lin. *Descriptio:* Præcedenti forte mera varietas, vel alter sexus. Caput et palpi nivea. Thorax fuscus, nec niveus. Punctum elevatum medio alarum anticarum punc-tulaque minuta transversa juxta angulum ani fusca nec nivea. Stria lata marginis tenuioris cinerea nec albissima. Cætera ut in priore (Haworth). Birchwood, Ripley, Norfolk, New Forest (Stephens).

(*To be concluded.*)

Staudinger and Rebel's Catalogue.*

(*Continued from p.* 233.)

The matter contained in the preface is of course entirely different from that of 1871. In the previous catalogue, Staudinger had to define his position with regard to the "law of priority" and its application in various critical cases; in the present one, we are simply told that that position has not materially changed, and that indeed some innovations which would have seemed desirable, to Rebel—*e.g.*, some recognition of a trinomial nomenclature—have been rendered impossible by his "strong conservatism, especially in all nomenclatorial questions;" on similar grounds Rebel was unable to obtain the introduction of any adequate generic synonymy, or of the important indication in what genus each species was first published. Varied and

* "*Catalog der Lepidopteren des palaearctischen Faunengebietes*," von Dr. Phil. O. Staudinger und Dr. Phil. H. Rebel. Dritte Auflage des "Cataloges des europäischen Faunengebietes." Berlin: R. Friedländer und Sohn. Mai, 1901. I. Theil: Fam. *Papilionidae-Hepialidae*, von Dr. O. Staudinger und Dr. H. Rebel; II. Theil: Fam. *Pyralidae-Micropterygidae*, von Dr. H. Rebel. xxxii + 411 + 368 pp. in 8vo.

interesting, on the other hand, is the matter in the new preface. Only a few points can be briefly referred to in this notice. Attention is called to the enormous advance made in the study of the Palæarctic fauna during the last 30 years, especially as regards the eastern parts of the region; the Russian empire alone, during the last decade of the nineteenth century, yielded a descriptive literature of new species which one can scarcely hope to see reached again with regard to the Palæarctic fauna. It may be here mentioned that the actual numbers of species indicated in the two catalogues are the following:

1871. Part I, 2849; Part II, 3213; total 5062.
1901. Part I, 4744; Part II, 4782; total 9526.

For various reasons, however, the above figures can only be taken as rough approximations; not only because the addenda and corrigenda have not been taken into account, but still more because various questions of specific identity or the reverse have not yet been set at rest; there are also occasional irregularities in the consecution of the numbering, *i.e.*, numbers marked "vacat," no doubt by reason of late corrections in the text.

The great geographical difficulty has been in fixing the southern boundary in the eastern part of the region, and of course a certain number of forms characteristic of other regions have to find their way into the catalogue. In general, the northern borders of Thibet proper and the lower course of the river Hoang-Ho as far as the Chingan Mountains form the southern boundaries. It was found impossible to include the whole of Japan, as first intended, the southern island containing such a large proportion of purely oriental forms. The progress made in geographical research in the region may be roughly indicated by the statement that the number of locality-abbreviations given is exactly double that given in 1871—202 as against 101.

The catalogue being intended as faunistic, purely biological literature has been largely disregarded, excepting where it throws direct light upon the determination of the species catalogued. There is no doubt much to be said for the omission of all references to varieties produced in experimental biology, to teratological literature, to hybrids which have not yet been observed in a state of nature, &c.; but it occurs to the reviewer that there are also serious objections to their omission, and that it would have been better to include them—namely, on the same grounds upon which extra-Palæarctic varieties of Palæarctic species are included, that the nomenclatorial literature may be complete for convenience of reference. If it be allowed, for example, that the varietal names proposed by Standfuss, Fischer, and others have any standing in nomenclature—and surely no one can deny it—then it is important not to suppress them in a catalogue which is sure to form the basis of future work, and to risk the creation of homonymy by subsequent describers of new varieties. Moreover, that which can be produced by the experimenter, whether in variation, hybridity, or even monstrosities, can potentially, or at least theoretically, arise under certain abnormal conditions apart from his intervention, and it may safely be denied that any sharp line of demarcation can be drawn between the divers cases. The well-known hybrid *Smerinthus ocellatus-populi* is found duly included on p. 99. Are our authors sure that that has ever been observed in a purely natural state? Of anatomical work, the investigation of the genitalia as a means of specific determination is rapidly coming to the front, and has often found recognition in the references. It is curious that Staudinger personally viewed this with so much suspicion. Rebel tells us that "his rich experience of the variability of scale-clothing and habitus in the lepidoptera, led him to extend his doubts to the constancy of characters also in all other departments"; but surely he must have had the acumen to perceive that the segregation of a species—nay, its very existence—was dependent in an infinitely greater degree upon its genital apparatus than upon its markings or its form!

Regarding the literature cited, the choice seems to be generally good, in view of the objects set forth in the preface—the ready determination and differentiation of the species. Messrs. Sherborn, Kirkaldy, and those who with them reject all names founded on figures unaccompanied by letterpress, will please take notice that the names thus founded by Clerck, Hübner, Rambur and others, are still accepted; and not only so, but Dr. Rebel tells us that, in general, *figures* are cited *by preference* because they serve in most cases for ready identification. On the other hand, a strong protest must be entered against the dropping of a good many synonyms, which appeared in the 1871 edition, such as *sinon*, Poda, to *Papilio podalirius*, L., ? *claripalpis*, Scop. to *Caradrina quadripunctata*, Fb., also of many of Kirby's—*alexis*, Scop., *thetis*, Rott., *icteritia*, Hfn., *anceps*, Goeze, &c. Everyone who has worked at all at nomenclature knows the importance of having a complete synonymy ready to hand, and even if Staudinger could not see his way to accept some of the conclusions of Werneburg, Kirby and others, he certainly ought not to have suppressed them entirely. Where, again, are the *Papilio sylvius* and *P. sylvestris* of Poda, and a lot of other names which have been identified with at least a good deal of plausibility, and which must in any case have an influence on nomenclature by precluding a second use of the same combination?

In Staudinger's part of the work, the original spelling of a name is held inviolable, excepting only where it was not latinized at all—such as *Thais cerisyi*, God., which was published as "*cerisy*." Even the worrying changes of gender to bring about agreement with changed generic names are (in theory) abjured by Staudinger, though not by his collaborator, and he gives *Lycaena minimus*, Fues., *Biston hirtaria*, Cl., &c., as the accepted forms*; but a few inconsistencies are discoverable, as, for instance, on p. 260, where Staudinger still changes the *notha* of Hübner into *Brephos nothum*, and on p. 351, where *Bupalus piniarius* is printed for *piniaria*, L.

The generic synonymy has been much improved, many of the most glaring errors having been rectified, and more attention given to the rights of priority, as is shown in the restoration of many of Hübner's least disputable generic titles.† But there still seems to be lacking any consistent principle underlying this part of work—

* The capital letters for all specific names are no doubt correct, as all proper names demand capitals; and their use prevents any grammatical objection to the non-agreement of gender between the two parts of the name.

† It is impossible to conceive, however, why some of Hübner's good monotypical or isotypical names have been rejected, such as *Panemeria* for *tenebrata*, Scop., *Operophtera* for *brumata*, L., and *boreata*, Hb., &c. They have been correctly revived by Rogenhofer, Packard, Meyrick, and others.

particularly there seems to be no recognition of Walsingham and Durrant's important rule that all revisions and corrections shall be taken in strict chronological order. Thus many restrictions of Hübner's mixed genera by Stephens, Moore, Warren, Meyrick, Rogenhofer, Hulst, &c., are disregarded, and more recent names by Stephens, Treitschke, Duponchel and others, allowed to stand. However, "festina lente" is a wise motto in connection with this subject, and there is ground for genuine congratulation on the great advance which has been made. The realisation of the necessity of type-fixations will come later, and such names as *Colias*, Fb., Latr. restr., will then get their right application. It was not anticipated that Staudinger would pay much heed to this matter, as he stated in the Hampson correspondence that he considered the "Type-Frage" quite unimportant.

A further attempt has been made to eliminate generic homonyms —and here is ground whereon every sane zoologist must be agreed; *Laria*, Schr., *Neuronia*, Stph., *Gonoptera*, Brd. and others, have been quite properly swept away, but it is inexplicable how *Phalera*, Hb. and *Acidalia*, Tr., come to have been retained, and still more how *Ephyra*, Dup., comes to have been restored. Lederer discovered the homonymy in 1853 and substituted *Zonosoma* for *Ephyra*; but it seems that he was forestalled by Gistl, who in 1848 proposed *Matella* for the same purpose (*vide*, *Ent.*, xxxiii., p. 41). Moreover, to say nothing of the *Cyclophora* of the "Tentamen," Hübner's "Verzeichniss" provides available names, either *Codonia* (used by Rogenhofer, *Lep. von Hernstein*) or *Leucopthalmia* (used by Meyrick). Rogenhofer's corrections of nomenclature (*loc. cit.*), both generic and specific, seem to have been largely ignored; this is the more curious as one would have supposed his work would be well known to Rebel, and some, at least, of his corrections need but to be known in order to be accepted—*e.g.*, the restoration of the name *fimbriata*, Schreb. (1759) for *Agrotis fimbria*, L. (1767), earlier pointed out by Brüggemann in *Abh. Nat. Ver. Bremen*, v., p. 597 (1878). Others, such as Rogenhofer's use of *Maniola* (Schr.), Meig. for *Erebia*, Dalm., &c., require more careful consideration, as they deal with mixed genera, and his conclusions do not entirely agree with those of Scudder and others.

One or two remarkable vagaries cannot be passed by in silence. On p. 279 the genus "*Sterrha*, H.-S. *nec* Hb." is allowed to pass for *sacraria*, L.! Meyrick's discovery of the utterly erroneous application of the name *Sterrha*, Hb., has therefore clearly been noticed; why, then, has his correction been ignored? The right generic name for *sacraria*, L., is of course *Rhodometra*, Meyr. (1892). Hardly less unsatisfactory is the retention on p. 153, of Lederer's erroneously restricted genus "*Pachnobia*, Gn."—with its type—species, *tecta*, Hb. (*carnea*, Tr., Gn.), removed. Perhaps *Sora*, Heinem. (*Schmett. Deutsch.*, i., p. 459, 1859) will be available for Lederer's genus *Pachnobia*, but unfortunately Walker (*Ann. Mag. Nat. Hist.* (3), iii., p. 259) in the same year (1859, April) employed the same name, *Sora* in Coleoptera, and it will be hard to prove whether Heinemann published before that date. The generic changes in the new "Catalog" are too numerous to discuss in detail, nor would any useful purpose be served by a criticism of their soundness or the reverse, until the methods upon which Dr. Rebel works are more exactly revealed. It appears evident that at present he has considered it the most satisfactory to adopt the generic nomenclature of the monographs followed—*i.e.*, to accept Watson's methods in dealing with the *Hesperiidae*, Aurivillius' with the *Lasiocampidae*, &c. But this has unfortunately resulted in several inconsistencies; as, for example, the inclusion of a few names from Hübner's "Tentamen" (*Cochlidion*, *Hipocrita*, *Diphtera*—which latter Hübner published as *Diphthera*), coincidently with the rejection of the rest, or their reference to Ochsenheimer (cfr. *Polia*, *Miselia*, &c.); the acceptance of a few (equally arbitrarily) of Billberg's ill-founded names—*Adopaea* (*Adopoea*, Billb. *sec.* Durrant *in litt.*), *Callophrys*, *Leptidia* (*Leptidea*, Billb. *sec.* Durrant) and ? *Agapetes* ("satis constituta?"), and so on.

To a similar cause are no doubt attributable some inconsistencies in citation of dates. It is very satisfactory that a date is given for every generic name (a distinct advance upon the 1871 catalogue), but the Hübnerian "Verzeichniss" dates as at present given are rather remarkable; 1816 is cited for the butterflies, 1822 for *Sphingidae*—*Saturniidae* inclusive, 1818 or 1822 at random for *Noctuidae*, 1822 for *Geometridae*, and onwards to the end of Theil I., 1818 throughout Theil II. Germar's names from Part I of his dissertation "De Bombycum Species" are sometimes given as 1810 (*e.g.*, *Arctornis*) sometimes 1811 (*e.g.*, *Seoliopteryx*); is there sufficient evidence that the work was properly published when written in 1810 (? at Halle)? Ochsenheimer's and Treitschke's names are sometimes assigned the date when they were first published, sometimes that at which generic diagnoses were first given; the former course ought to have been followed consistently, 1810 being given for the Noctuid names of Ochsenheimer's third volume, and 1825 for Treitschke's Geometrid names; they were not *nomina nuda*, for they were not only accompanied by lists of species contained, but also, in nearly all cases, by references to the sections in the Vienna Catalogue, which were duly described*. In any case, the date 1826 assigned to *Crocallis*, Tr., must be a misprint. The cross-references for the names employed by both Hübner and Ochsenheimer also require overhauling; such references as that on p. 195, "*Caradrina* (Hb., 1822), O." (and there are several of them in the *Noctuidae*) would suggest, by analogy with "*Alucita* (L., 1758), Wlsghm.," that the name was Hübner's and the restriction Ochsenheimer's—a rather absurd suggestion in view of the fact that Ochsenheimer published his last volume in 1816. Linné's subgeneric names *Tortrix*, &c., so far as used, are generally given after the method just now shown with regard to *Alucita*, and this is undoubtedly the right one; "*Geometra*, L., 1767," however, has apparently not been properly traced historically (and why "L., 1767," rather than 1758?). A consideration of these questions of dates, leads to a fresh realisation of the great importance of the work of the bibliographer; and it is to be hoped that every scrap of information relative to the dates of publication of Hübner's "Verzeichniss" will be eagerly sought after, and carefully used. In the meanwhile

* Staudinger, however, certainly believed in generic "definition by illustration" alone, for he spoke (Hampson's *Nomencl. Lep. Corresp.*, p. 297-298) in favour of the acceptance of Hübner's "Zuträge" names, and in his own 1871 "Catalog" had erected his genera *Thaleropis*, *Thaumasta*, *Oxytripia*, &c., without separate diagnoses; compare Rebel's *Oncodocnemis*, p. 354 of the new catalogue.

the rival claims of the generic names *Trichopteryx* and *Lobophora*, *Tephroclystia* and *Eupithecia*, *Eucestia* and *Chesias*, and many others must remain *sub judice;* no fixed guiding principle in the matter is discoverable in the action of Staudinger and Rebel.

(To be continued.)

Notes on the distribution of the British Coleoptera.

By W. E. SHARP.

(*Continued from p.* 205.)

We have now to consider the second of the groups into which we have, as regards their distribution, divided the British coleoptera. This comprises the majority of such of our species whose range is limited—its maximum density is in the south-east, whence it gradually thins out westward and northward, until most of its members become exceeding rare in Scotland and Ireland, and many completely absent.

This group has been called the Siberian element in our fauna, on the assumption that the original area of their specific development was Siberia, whether this is so or not, it is sufficient for our purpose that their proximate origin was the plain of central Europe, and that, at the time of their arrival here, Great Britain must have been a north-westerly extension of the continental area. That this was subsequent to the maximum severity of the glacial epoch appears probable, for if the group had existed since Tertiary times here, and survived the glacial period, it is a fair assumption that its distribution would have been, although perhaps very discontinuous, still more uniform from east to west than we now find it. The main characteristic of the group, however, is that as we proceed westward species disappear, not sporadically but finally. There is also evidence that the land connection between England and Ireland, which the limited community we find among species of the Celtic group proves to have been intact during glacial and immediately post-glacial times, was most probably interrupted during the advent of our second group. For several of its members, although they arrived at what is now the western seaboard of England, do not seem to have got to Ireland at all. It is certainly quite true that up to within recent years very little was known of the Irish coleopterous fauna, and that even now it would be absurd to consider it as at all exhaustively recorded. Still as the Irish deficiency in mammals, and still more in reptiles is certain and notorious, we may be perhaps justified in supposing that the species of coleoptera so far unrecorded there, are really wanting; and that what hindered their westward march was the fact that Ireland became an island before all of them had completed it.

In this respect the fauna of the Isle of Man becomes significant, and it is the more unfortunate that so very little is known about it. What evidence we do possess shows that its character is more Irish than English, and includes even such a peculiarly Irish form as *Silpha subrotundata*. The deduction follows that when Mona was united with Ireland (and the levels of the Irish sea bottom show that at such an era land union with Scotland and England must also and to a greater extent have existed), the Irish or Celtic group must have been dominant, also that before its insularity became perfect, many species of the eastward migration must have reached its confines. What seems probable then to our imperfect knowledge is that this migration from the east and south-east was subsequent to the maximum intensity of glacial cold, but whether it was made possible by climatic conditions or by geographical—that is to say, whether it was the gradual rise in temperature that allowed the westward and northward march over a continuous area, or whether, climatic conditions being favourable, it was due to an elevation of land which gave access from the continent to what had previously been an island or assemblage of islands, of this there appears to be no evidence. Nor does this very greatly affect the validity of the hypothesis; it is certainly more difficult to explain the different rates at which species appear to have travelled, or more accurately increased their range, for the process was probably quite imperceptible when in operation. No doubt the correspondence between a species new to any area and the environment, supply the factors which determine the rate of its progress. An instance of how dissimilar such a rate can be is furnished by a comparison between the extraordinary increase of the European rabbit in Australia, and the apparently insurmountable difficulties which attend the introduction of our common English hare into Ireland, whose native form is a distinct but closely allied species—the arctic or mountain hare—we may, I think, safely assume that no species except under exceptional and non-natural conditions, such as human interference or rearrangement of vegetation, is now increasing, or perhaps ever will increase its range, at any rate in Europe. No doubt freedom from competition either directly or indirectly, though food-plants in certain suitable areas, first fixed the lines of migration and settlement. As, however, the available land surface became more and more crowded the rate of progress would become slower, so that it seems probable that there must have been a point somewhere in the past which marked the final equilibrium of the forces of dispersal and the stress of competition, and that since this point was reached, most movement has been in the form of retrogression and due to human interference with environment.

We can thus understand that, given an original exotic immigration of an assemblage of species into any previously unoccupied area, the rate of progress initially perhaps high, would be continually decreasing till it came to a dead stop, and that no length of time elapsing since then would renew it, except by organic change in the species themselves through natural selection, and further, that the rate of advance among the species themselves would be very unequal. In nature the race is always to the swift, the battle invariably to the strong, and it is thus possible to explain why some of the species we are considering arrived as far west as Mayo while others never got to Cheshire, or arrived so late that they were cut off, or what is more probable, since there are similar deficiencies in the Scotch fauna, that their rate of progress was so slow that before they had got half this distance progress of any kind became impossible.

(*To be concluded.*)

COLEOPTERA.

The Variation and Distribution of the Genus Aphodius, Illiger. By Frank Bouskell, F.E.S., F.R.H.S. [Read before Section F. of the Leicester Literary and Philosophical Society].—

We have received a copy of the above paper, a review of which is sure to be of interest to our coleopterist readers. In it the author goes very fully into both the variation and distribution of the species belonging to this genus. He deals with the distribution of the whole genus throughout the world, and shows that many of our species have a very wide range indeed. He touches in a very interesting manner on the means of dispersal of insects, and points out that the transport of cattle has played the most important part with this genus. After some notes on the life-history of these creatures he passes on to the subject of variation. He divides the lines of variation into five classes as follows :—

1. Species which are nominally black or patchy occasionally tend to lighter shades.

2. Where the elytra, normally black, with the apex reddish, or with a red spot or markings, tend occasionally to become unicolorous at the expense of the red.

3. Where elytra normally red, become black.

4. Where elytra normally yellow with black markings, become—(*a*) nearly all black at the expense of the paler colour, (*b*) nearly all yellow without any black.

5. Where the elytra normally red, become chestnut-brown. This appears a step towards variation 4.

He says the causes are probably natural selection for protective purposes, and climatic influences, such as humidity, temperature, etc. We cannot agree with our author as to natural selection not having much to do with the fact that in some species the red form predominates and in others the black. It appears to us the only explanation can be the fact that natural selection has seized on the tendency to vary in any one species, whether to red or black, and utilized it to the best advantage for that species. He then points out that in the so-called species *A. foetens* and *A. fimetarius*, there is no real or reliable specific difference, which is undoubtedly the case. He then gives a complete list of all the British species with their synonymy, distribution, dates of occurrence, and other valuable notes, and makes a point of bringing forward all the named aberrations and varieties that have occurred, or are known to occur in Britian, a thing which has not been done heretofore. We may mention that he uses the words "variety" and "aberration" in such a manner that one knows at once what he means, and does not have to wonder if he is talking about an occasional variety, local race, or mere sport. Of the new aberrations described by him we may mention two parallel cases—

A. foetens, F., ab. 1. *hypocastaneus*, n. ab.—Elytra rich chestnut-brown almost running to black, abdomen red. New Forest, May 1896, in cow-dung (F. Bouskell).

A. fimetarius, L., ab. 1. *castaneus*, n. ab.—Elytra deep chestnut-brown ; near Leicester in numbers (J. H. Woolley).

As to the value of giving names to aberrations and varieties we are aware that many British coleopterists disagree with the practice, but we think everyone will admit that it is more convenient to have a name for a distinct aberration than to say "the chestnut-brown form of *A. foetens*," or whatever it is, as the case may be. We also deplore the inconsistency of our catalogues, in which some trifling aberrations have names to them, whilst other more distinct named forms are conspicuous by their absence. One man will perhaps admit *Apthona nonstriata*, ab. *aenescens*, Weise, which is only a colour variety, because it was brought forward as British in his favourite magazine, and ignore, say, Mr.

Bouskell's ab. *hypocastaneus*! This seems to us to be great nonsense, and we suggest that there is only one correct plan, *i.e.*, to incorporate in our British catalogues every aberration or variety that has been properly described according to the recognised laws of entomology (and Mr. Verrall in his last presidential address pointed out what these were), or brought forward as British. To conclude, we congratulate our author on his paper, and all students of British coleoptera should make it their duty to get a copy as soon as possible.—H. St. J. K. Donisthorpe, F.E.S., 58, Kensington Mansions, South Kensington.

Lina populi in the Pellice Valley.—By the side of the ditches that irrigate the meadows lying on either side of the road between Villar and Bobbie, in the Pellice Valley, willows are not infrequent. Throughout August one of the commonest species on these was *Lina populi*. I have frequently seen the species in Wicken Fen, where Mr. Donisthorpe tells me it is very abundant. What interested me about the insect was the fact that one obtained at the same time on the same bush, adult beetles, pupæ, full-grown larvæ, larvæ in the stage in which the gregarious habit is disappearing, tiny newly-hatched gregarious larvæ and batches of eggs, some newly-laid and others on the point of hatching. I was also interested in the peculiar secretion which the larvæ exude from their glandular tubercles when irritated or disturbed. My ignorance of the desiderata still required in the life-histories of the coleoptera led me to send home a supply of material to Mr. Donisthorpe but he tells me that the life-history is well known. Presumably, therefore, the structure and mechanism of these peculiar glands and the nature of the excretion is well known and what was new to me proves to be ancient history to coleopterists. The newly-emerged beetles were still ovipositing and the species evidently would go on reproducing itself until winter and the want of food killed it off in all stages except the hybernating one. How does this species hybernate?—J. W. Tutt, Westcombe Hill, S.E. *August 12th*, 1901.

Abundance of Hydrophilus piceus at electric light.—Walking across the Piazza Reale in Turin on the morning of August 23rd, I observed on the ground beneath the electric lights, among hundreds of moths that had met their doom by being attracted to the light during the preceding night, a great many large examples of this species, sometimes five or six specimens under a lamp and rarely less than three or four. Almost all the squares of the city, which were provided with lamps that were open below, were similarly bestrewn with the dead bodies of the beetles. Altogether I must have seen some 40 examples in only three or four squares so that the total number attracted in the city in one night must be enormous.—Ibid.

PRACTICAL HINTS.*

Field Work for September.

By J. W. TUTT, F.E.S.

1.—The larvæ of *Stauropus fagi* do not appear to spin up among the green leaves, but almost always, in dead leaves,

* Practical Hints for the Field Lepidopterist, recently published, contains 1,250 similar hints to these, distributed over every month in the year. Interleaved (for collector's own notes).—Ed.

with which they should be supplied when full-fed; the cocoon is very closely spun between the leaves (Newman).

2.—There is no need to keep the pupæ of *Stauropus fagi* out of doors, but a moderately damp atmosphere is necessary; if the imagines do not appear by the beginning of June, exposure to a shower of rain is often advisable. An outhouse, if the pupæ be kept on damp sand, seems to produce satisfactory results.

3.—The larvæ of *Gnophria rubricollis* begin to appear in the beating-tray in September, and are full-fed towards the end of October; they feed on the very minute lichens, mainly on oaks and beeches; when full-fed the larva retires beneath the moss on the trunks, for pupation, and, as it takes a long time to pupate, pupæ should not be searched for until late in November; the white flimsy cocoon being hardly distinguishable from the spinning of certain spiders, it is advisable to detach the moss from the top downwards, as the pupa is not among the moss, but between moss and bark, and consequently often drops, whilst, not infrequently, after moss is withdrawn, the pupa is found adhering to the trunk. Larvæ sometimes spin up low down near the ground, at others high up the trunk. Pupæ are best kept kept through winter on damp sand with a layer of moss, damp being very necessary to them.

4.—The small hybernating larvæ of *Leucoma salicis* want some rough cork or bark on which to hybernate; they will spin a silken web in September, collect into companies and remain quite immovable all winter, beginning to feed again in April as soon as the poplar, willow and sallow leaves begin to show. The cocoons of their parents are favourite hybernacula.

5.—During the first week of September, the larvæ of *Notolophus gonostigma* may be found or beaten from oak in the woods at Bexley (Newman).

6.—Captured females of *Leucania albipuncta* have no objection to laying their eggs on a growing sod of grass under a bell glass; the young larvæ appear in about eleven days make elongated holes right through the blade between two of the ribs. Kept in a warm atmosphere they will occasionally feed up quickly, and then the imagines appear the same autumn.

7.—In late September and early October, females of *Peridroma saucia* lay freely in chip boxes, each batch usually consisting of some 300-400 small ova. They hatch in rather less than three weeks, feed ravenously on dock, rape, cabbage, spinach, &c., show no inclination to hybernate, hide under the leaves by day when young, feed only by night, and bury themselves under the earth in the flower-pots in which they may be kept after they are half-grown; placed in a hothouse in November, they will pupate in December, and emerge from December to February, but in an ordinary cool room or greenhouse will continue to feed all the winter more slowly, and pupate in March or April, emerging in May.

8.—Females of *Celaena haworthii* can be swept, practically all the specimens taken on the wing in the afternoon with the net are males (Finlay).

9.—*Aporophyla australis* comes to sugar freely in September, and is said to be more abundant between 11 a.m. and midnight than earlier in the evening.

10.—The larva of *Apatela aceris* likes to get behind a loose chip of wood or bark, but will utilise a crack in soft wood where it can make use of the tiny pieces of surface material to spin amongst the silk of its cocoon which is made pretty level with the surrounding surface. In confinement it likes a mixture of wood-chips and dead leaves, and will spin up in dead leaves, moss, &c. The larvæ are to be found commonly in most parts of Kent in early September on fences, tree-trunks, &c., searching for a suitable pupating place.

11.—Larvæ of *Platypteryx harpagula* (*sicula*) are to be beaten in Leigh woods in the first half of September; difficult to obtain now as the trees on which they occur have grown so large that they are not very practicable for work.

12.—Tree-trunks must be searched in September for imagines of *Ennomos erosaria*, which are sometimes abundant on oak, birch and beech in the New Forest, Epping Forest, &c. Eggs are readily laid if a ♀ be taken, and the species is not difficult to rear.

13.—Imagines of *Ennomos autumnaria* (*alniaria*) are to be obtained from gas lamps in September and October (Deal in its chief centre—but Gosport, Chichester, &c., and other localities produce the species); eggs are freely laid in confinement.

14.—The larvæ of *Ellopia prosapiaria* pass the winter on needles of Scotch fir, commencing to feed early in the spring, and being full-fed from the middle of May to the middle of June.

15.—In the latter part of September and in October the imagines of *Eupithecia stevensata* fly close to the short turf of the downs in the neighbourhood of Dover, or visit the flowers thereon. More than thirty males were netted on one evening, attracted by a newly-emerged ♀ resting on a plant of golden-rod (Webb).

16.—Cut off sprigs of the unripe capsules of *Bartsia odontites* towards the end of September; turn these into band-boxes with muslin over top; in a few days larvæ attach themselves to muslin, when they should be removed to a cage with fresh sprays of food-plant, the bottom of the cage covered with a layer of sand; in this they make a small oval cocoon, and the pupæ often go over two years before emergence; the seedheads often require to be sprinkled with water.

17.—The dimorphic larvæ (green and putty coloured) of *Zonosoma porata* can be beaten freely from scrubby oak in September and October; they pupate in late October and emerge next spring.

18.—Eggs of *Camptogramma fluviata* laid on September 13th produced larvæ, which fed on knotgrass and dock and pupated, the imagines emerging between November 1st and 18th (Mera).

19.—In September 1892, 27 larvæ of *Cidaria reticulata* were taken in one afternoon near Windermere; the larvæ appear to feed almost exclusively on the seeds of wild balsam, entering the seed-pod about the middle; in the daytime they were to be found resting at full length along the midrib on the underside of the leaves (Moss).

20.—In Sutherland, in September, the leaves of *Arctostaphylos uva-ursi* are mined by larvæ of *Coccyx nemorivaga*, the leaf usually chosen being one of those forming the rosette terminating the shorter shoots; the affected leaf is very obvious, being divided about the middle by a slightly oblique transverse line into a basal green healthy portion and a terminal part that is red, brown or black. The mine of the larva occupies the dividing line, and often has a slender branch or two into the terminal part of the leaf; in confinement *Arbutus unedo* forms a good substitute food.

21.—The imagines of *Lithocolletis cerasicolella* are to be collected in September in the leaves of *Prunus avium*; the mine is elongate, placed between the lateral veins of the leaf, reaching from near the midrib towards the margin; the larva pale yellow, with dark brown or black head.

22.—During September working hedges, &c. will give *Peronea schalleriana* var. *latifasciana*, *P. variegana* var. *cinana*, *P. comparana*, and other interesting species; mixed hawthorn, sallow, and nut hedges preferable.

NOTES ON COLLECTING, Etc.

Habits of Lithosia complana var. sericea.—In a state of nature, the imagines of *Lithosia complana* var. *sericea*, which appear about the middle of July, hide low down among the herbage, grass, &c., where it occurs (the locality, however, seems to be very restricted), the wings wrapped very closely around the body. A few take a short flight about 4 o'clock in the afternoon, but the majority fly at early dusk. Their flight is somewhat heavy and slow, and in a direct course. They look of a creamy-yellow colour when flying and can be readily distinguished by their colour and the character of the flight from the species of Crambids that are generally on the wing at the same time. The males readily assemble to a virgin female perched on the top of a stem of grass. The larva is very lively and bright-looking, hairy-black, with two orange stripes (the description in Buckler's *Larvae*, vol. iii., p. 22, is very accurate). Larvæ hatched from ova laid by a captured female in the summer of 1899, and were kept through the following winter. They fed a little all through the winter on chickweed and grass, although when newly-hatched they fed on *Polygonum aviculare*. In the spring they seemed to prefer *Spiraea ulmaria*. Two perfect insects were reared therefrom.—G. O. Day, F.E.S. *May 23rd*, 1901.

Habits of Asthena sylvata.—On June 16th and 22nd I went for *Asthena sylvata*, which, in common with the general state of Geometrids this year, was even more numerous than last year. With rare exceptions, it is never common here, and being a very shy and retiring insect is difficult to catch. It sometimes sits on the oak-trees, but unless it is a very cold day will not allow one to get near to it, rising as soon as one approaches, and requires to be netted. Most are obtained here in an alder swamp, where the imagines sit often quite low down on the stems of the trees. When disturbed, it at first goes straight away, and, if there be a low bush near, generally flies right through it and is lost to sight; if, however, the ground be open in the line it has taken, it often doubles back and gives a chance. Very occasionally it drops down and hides in the grass. On June 22nd I saw over 100 specimens, between 50 and 60 of which were in fine condition. One specimen was quite a dwarf, hardly as large as an ordinary *A. candidata*. While hunting for it I took a fair number of *Eupisteria heparata*, an insect that flies pretty freely in the sunshine and is very easy to net, as it seldom flies for any distance.—F. C. Woodforde, F.E.S., Market Drayton. *June 17th*, 1901.

Lepidoptera in the New Forest.—I spent Whitsuntide at Lyndhurst, and found day-collecting prolific, but night work useless, the evenings being too cold. *Bapta taminata* and *Lithosia sororcula* (*aureola*) were the two commonest insects, others taken were *Nemeobius lucina*, *Tephrosia consonaria*, *Boarmia extersaria*, *Zonosoma linearia*, *Z. punctaria*, *Z. porata*, *Z. annulata*, *Eupithecia dodoneata*, *E. irriguata*, *E. pusillata*, *Epione advenaria*, *Eurymene dolabraria*, *Eupisteria heparata*, *Macaria alternata*, *M. liturata*, *Asthena candidata*, *Clostera reclusa* and *Erastria fuscula*. I had not previously seen *A. candidata* for years, although I used to consider it very common. Larva-beating produced *Zephyrus quercis*, very common, *Asphalia ridens*, very common, *Nola strigula*, *Catocala sponsa*, *C. promissa*, *Boarmia roboraria*, *Himera pennaria*, *Hylophila quercana*, and *Psilura monacha*, common.—(Major) R. B. Robertson, Forest View, Southbourne Road, Boscombe. *June 12th*, 1901.

Xylomiges conspicillaris at Castle Moreton.—One of the few insects I have taken this year worth recording is a specimen of *X. conspicillaris*, this was found in the afternoon on a stocking that had been hung out to dry in the morning, and would suggest the idea that the species must sometimes fly during the day; it was taken close to the spot where one was found a few years ago.—(Rev.) E. C. Dobrée Fox, M.A., Castle Moreton, Tewkesbury. *June 10th*, 1901.

Pharetra menyanthidis at sugar.—When at Kendal, during the first week in June, I was surprised to find that *Pharetra menyanthidis* came freely to sugar. The insect occurs sparingly in Cheshire and Lancashire, but I have never seen it at sugar before. A ♀ I kept laid eggs superficially like those of *P. rumicis*. The larvæ resulting grew very rapidly on osier and willow, and those with strength enough pupated about a week ago, but a good many of the larvæ were attacked by a kind of dysentery, a watery pink excrement coming from them, and appearing to paralyse the pair of anal claspers.—G. O. Day, F.E.S., Knutsford, Cheshire. *August 2nd*, 1901.

Food-plants of Neuronia saponariæ.—A female of *Neuronia saponariae* taken at Wicken in June last, remained in a box more than a week before she began to lay; the eggs were then laid in rows round the box. More than 100 larvæ are now feeding. They eat *Chenopodium* and broad-leaved knot-grass, but seem to prefer willow.—Ibid.

Habits of Lithosia muscerda.—*Lithosia muscerda* appears to be very local in the Broads, no doubt owing to the distribution of food; it is attached to alders and sallows whether in small patches or in thickets, and the imagines fly at dusk with a regular, directly forward, "footman" flight, but are inclined to soar out of reach. They come to light from 10 p.m.-12 p.m., and then sit on the lamp most obligingly. It is difficult to procure perfect specimens, they seem to chip and tear with the slightest provocation. Females lay freely, the eggs are round and yellow, but hitherto I have failed to rear the larvæ.—E. A. Bowles, M.A., F.E.S., Myddelton House, Waltham Cross. *June 24th*, 1901.

Acherontia atropos at Shepperton.—On August 5th, Bank Holiday, Mr. Walker, of the L.S.W.Ry., Shepperton, found a full-fed larva of *Acherontia atropos* on a patch of potatoes near the station, which he was kind enough to send over to me. Although I made a careful search I did not succeed in finding another. I understand that this larva is not nearly so abundant as last year.—S. G. C. Russell, F.E.S., Chepstow Lodge, Shepperton-on-Thames. *August 7th*, 1901.

Acherontia atropos at Doncaster.—For three consecutive years now, *A. atropos* has been common here. In 1899 and 1900 the larvæ were frequent on potato plants during September. Now they are to be found, some full-fed and others about half-grown, on *Lycium barbarum*. Early this summer an imago was brought to me (see *Naturalist*) which was caught wild. All this looks as if the species had existed here without artificial forcing for three years.—H. H. Corbett, M.R.C.S., 9, Priory Place, Doncaster. *July* 31*st*, 1901.

Argynnis adippe and Dryas paphia near Doncaster.—Both these species have appeared in the woods here this summer after an absence of nearly 25 years.—Ibid.

Actebia præcox and Crambus pinetellus near Frodingham.—While seeking neolithic flints at Frodingham, Lincs, on Sunday, the 28th inst., I took *Actebia praecox* at rest on the sandy ground. This seems worth recording, the locality being about 20 miles from the coast. At the same place *Crambus pinetellus* was abundant.—Ibid.

Papilio machaon at Mucking.—This morning a little boy named Albert Everard brought me a small and slightly deformed specimen of *Papilio machaon*, alive, which he had caught with his hat in the church yard. Last summer Mr. Page sent me some larvæ from Wicken, which were placed on the carrot bed, and duly disappeared, no trace of pupæ was ever found, and the question is whether the specimen taken was the grandchild, or one of Mr. Mathew's stock.—(Rev.) C. R. N. Burrows, Mucking Vicarage. *August* 12*th*, 1901.

Trochilium bembeciforme at Mucking.—Yesterday, about 4.45 p.m., I found a fine ♂ *Trochilium bembiciforme* on an osier leaf. There was no sun, and the insect was so perfect (scales on wings) that I should say it had never flown. I had suspected the species to occur at Mucking, owing to the number of osiers bored in the stems.—Ibid.

Larvæ of Sphinx convolvuli at Boxworth.—The capture of two larvæ of *Sphinx convolvuli* here may be worth recording. One on August 19th, the second on August 21st. They were found on bindweed growing in a field of tares, oats, &c., grown for making silage. Unluckily, the second was nearly cut in half with the scythe. The first was of a bright green colour with black spots, I did not know the larva, but made it out to be a variety of *S. convolvuli* from a description in Wilson's *Larvae of British Lepidoptera*, the second one, which was found within a few yards of the first, was of a brown colour, and agreed in every particular with the description and drawing in Barrett's *Lepidoptera*, so I have no doubt the green one is *S. convolvuli*. On August 20th I saw what I thought was the imago of *S. convolvuli* flying at tobacco plant but failed to take it, however, last night, the 22nd, I took it, a male *S. convolvuli*. This season has been an utter failure except for *Calymnia pyralina*.—E. H. Thornhill, Boxworth, Cambridge. *August* 23*rd*, 1901.

Ennomos autumnaria at Reading.—I captured a fine specimen of *Ennomos autumnaria* here, and she is depositing ova in a box. The species is quite new to our district. Is it now beginning to spread in the country?—W. Barnes, Brightwell Villas, New Road, Southern Hill, Reading. *August* 22*nd*, 1901.

Abundance of Thecla pruni and T. w-album.—*Thecla pruni* and *T. w-album* have been very plentiful at Monkswood this year, and my son is pleased at having caught a specimen of *Plusia moneta* here.—J. N. Keynes, M.D., 6, Harvey Road, Cambridge. *July* 26*th*, 1901.

Oviposition of Cosmotriche potatoria.—On Monday, July 22nd, whilst fishing on Homerton Broad, Norfolk (from a bank), a moth flew past in the dusk (about 8.30 p.m.) and settled on the rushes close by me. On going nearer I found it to be a large ♀ *Cosmotriche potatoria*, which had already laid two eggs. It instantly flew off to a more distant rush, and as it seemed restless, I boxed it. On the way home the moth laid 186 eggs. The manner of oviposition was peculiar and rapid. The moth settled on the under surface of a rush blade, and laid the ova on the upper surface, just at the junction of the stalk and leaf blade. The ovipositor was curled right round the leaf.—Hubert C. Phillips, M.R.C.S., F.E.S., 262, Gloucester Terrace, Hyde Park, W. *July 30th*, 1901.

Dilina tiliæ at Hampstead.—I found a freshly-emerged ♀ of *Dilina tiliæ* on a birch trunk about a foot from the ground (on the west side), on Hampstead Heath, on June 15th, at 5 p.m., it had evidently emerged about half-an-hour, as the wings were not properly set although developed.—Ibid.

CURRENT NOTES.

All lepidopterists who are, in ever so small a measure, something more than "mere collectors," should supply themselves with a copy of Staudinger and Rebel's new Catalogue (published by Friedländer and Son). References to it will figure largely in our magazines for some time to come, and no one who wishes to be *au fait* with his subject can afford to be without it.

British lepidopterists used sometimes to be accused of insularity, but at the present time it is doubtful whether the work of German lepidopterists does not show a greater want of knowledge of lepidopterology in its broader aspects—especially of the literature of the subject —than those of the lepidopterists of any other country. Recently it appeared necessary to offer a protest against the re-naming of various well-known forms of certain Noctuids in the *Zeitschrift für Entomologie*, and to point out instances where this had occurred. The Editor printed our corrections but apparently consigned our protest to the waste-paper basket, and so this unscientific procedure continues. In the current number of the *Societas Entomologica* (July 15th), Slevogt re-describes three Noctuid aberrations, among these the well-known and striking *Dichonia aprilina* ab. *virgata* (*Brit. Noct.*, iii., p. 62, 1892) which he calls ab. *viromelas*, and *Calocampa solidaginis* ab. *suffusa* (*Brit. Noct.*, iii., p. 110, 1892) which he calls ab. *obscura*; the third is a described form of *Hadena adusta*, for which, however, as the species is rather more obscure than the others, there may be more excuse. Staudinger's mode of dealing with the aberrations and varieties of this group in the new edition of his *Catalogue* leaves much to be desired. Almost every important and unimportant aberration described in the German magazines finds a place in the *Catalogue*, whilst the British forms, which alone have been systematically studied and described, are rarely mentioned; this cannot be because Staudinger considered them unimportant, for he has gone to the extent of re-describing many, and using later published names for others, *e.g.*, *Agrotis simulans* ab. *suffusa* (*Brit. Noct.*, ii., p. 80) is re-named ab. *obscurata*, Staud., *Cat.*, p. 143, *Agrotis cursoria* ab. *sagitta* (*Brit. Noct.*, ii., p. 41) is renamed ab.

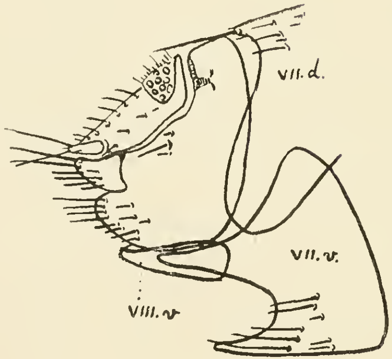
sagittata, *Cat.*, p. 148, *Aplecta tincta* ab. *suffusa* (*Brit. Noct.*, iii., p. 70) becomes ab. *obscurata*, Staudinger, *Iris*, x., p. 335, *Bryophila perla* ab. *flavescens* (*Brit. Noct.*, i., p. 8) becomes var. *perlina*, *Cat.*, p. 167. The *Phytometra viridaria* ab. *fusca*, *Brit. Noct.*, iv., p. 60 (1892), becomes ab. *modesta*, Carad., *Iris*, ix., p. 50 (1896), *Jocheaera alni* ab. *suffusa* (*Brit. Noct.*, i., p. 17, 1891) becomes ab. *steinerti*, Casp., *Soc. Ent.*, xiii., p. 3 (1898), and so on indefinitely. It will take months of close work to clear up the synonymy thus carelessly created, and it is high time that the German lepidopterists of repute, refused to allow any more duplications of this character.

It is with great regret that we have to chronicle the death of Miss Eleanor A. Ormerod, LL.D., F.E.S., which took place on July 19th last, in her 74th year. Her services to economic entomology are so well-known that it is superfluous to mention them, but the long series of "Annual Reports" shows clearly the magnitude of her work and the benefit she has conferred on a class of men who, usually ignorant of even the barest elements of entomology, were able to take advantage of her advice to their own great benefit. For her services in this direction, the University of Edinburgh, only last year, conferred on her the honorary degree of LL.D., the first lady so honoured by the University. Her difficulties and her success alike lay in the fact that she was among the pioneers in the particular branch of work on which the best years of her life were lovingly expended. It is difficult to recognise, when one looks at the mass of literature on "economic entomology" that has been turned out in America and other countries, during the last few years, that one owes it almost entirely to the loving labours of Curtis, Newman, and Miss Eleanor Ormerod.

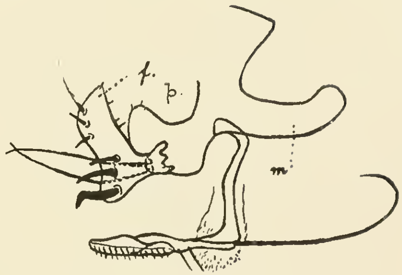
In the *Canadian Entomologist*, p. 228, Good notes that on October 27th, 1900, near Wooster, Ohio, he observed some white masses (that proved to be plant-lice, *Schizoneura tessellata*, covered with white down) on *Ilex verticillata*. Among and feeding on the plant-lice he found several larvæ of *Feniseca tarquinius*, about ·75in. in length, and these in a few days changed into the curious monkey-faced pupæ characteristic of this species. He states that he well remembers first finding the larvæ and pupæ of *Spalgis s-signata* in West Africa, and, though the larvæ found near Wooster strangely recalled to mind those of the West African species, it was not until the Ohio larvæ pupated that he felt sure of their identity.

Beutenmüller's *Monograph of the Sesiidae of America North of Mexico*, appears not yet to have been received this side of the Atlantic. It should, so far as can be judged from the American notices, be a most useful work.

Wolley-Dod (*Can. Ent.*, p. 237) records that in 1893, 1894, and 1895, he did not see *Pyrameis cardui* in Alberta; then for a year or two it was rather common, and it became more common than usual last autumn and what he supposed to be the survivors of this brood appeared in the spring. In early May these had died off, and the species was not to be seen, but before the end of the month (May 25th) the imagines were again in immense numbers. He suspects these latter to be a "flight" from the south. Females were observed ovipositing on sage. Surely if there was a flight, the early spring specimens formed it; the later ones might well be the progeny of the early ones.



2.



1.

A NEW BRITISH FLEA.

Migration and Dispersal of Insects: Coleoptera.

By J. W. TUTT, F.E.S.

Of the migration of beetles there are very few records, nor are we sufficiently conversant with the literature relating to coleoptera to feel at all certain that we have collected even the greater part of the few cases known. Darwin refers (*Voyage of Beagle*, 12th ed., p. 164) to a species of *Calosoma* coming on board the Beagle when the vessel was at some distance from the South American coast, and notes that a *Colymbetes* once flew on board the same vessel when 45 miles distant from the nearest land (*Origin of Species*, p. 345), whilst he further remarks that other instances had been recorded of the same genus of beetles having been captured far out at sea. Wallace states (*Geog. Dist. Animals*, i., p. 32) that a large Indian beetle, *Chrysochroa ocellata*, was caught in the Bay of Bengal, by Captain Payne, 273 miles from the nearest land. Walker records (*Ent. Mo. Mag.*) a fine dark-brown Longicorn, not unlike the European *Criocephalus rusticus*, that flew on board ship, when off Vancouver, during several evenings in August, 1882, but these he considered were attracted by the scent of the newly-tarred rigging. He further calls attention (*in litt.*) to the possibility of some of the larger Carabids of powerful flight, having the migrating propensity more or less developed. Thus he notes that "*Calosoma sycophanta*—which, in its early stages feeds in the nests of the gregarious larvæ of the processionary moth (*Cnethocampa*), and also appears sometimes, but rarely, to attack those of *Porthetria dispar*, the first species being unknown and the second very rare in England —has been repeatedly found in our southern counties, under circumstances which point to its having flown across the Channel. Several species of this genus, too, inhabit remote oceanic islands, as the Azores, Madeira, St. Helena, and I think the Galapagos as well, pointing to a roaming habit." As to the *Calosoma*, Hewitson writes (*Entom.*, xi., p. 176) that he obtained a specimen of *Calosoma sycophanta* from a fisherman, who stated that he took it in his net at sea, alive, between thirty and forty miles from the coast, and that several others were taken in the same way, the fishermen stating that they lived at sea upon fish. We have already noted the capture of a specimen of *Morimus asper*, 50 miles off the eastern coast of Borneo, by Captain Walker, in July, 1895, the specimen being now in the possession of Mr. Manger.

In the *Naturforscher*, xi., p. 95, Walsh records, that on August 4th, 1776, about 9 p.m., he observed the migration of myriads of *Carabus vulgaris*. He states that they passed by his house, near Halle, in Saxony, and that his attention was first attracted to them by the beetles tapping on the windows facing east and south, and resembling rain beating thereon in a strong wind. Opening a window, scarcely a minute had elapsed, before there were more than a hundred in the room. These flew towards the light, and those that were picked up in the room next day, were mostly lying on their backs and very sluggish; the flight was clearly from south to north, the greater part fairly high above the ground although some flew lower. The whole flight must have numbered many thousands. The occurrence happened during a great drought, which had continued for some time. The Editor states that this great swarm was flying towards the meadows at Löbsted, on account of the water there, the district being probably damper than the fields and vineyards over which they had come. He also notes as curious that another flight of beetles was observed at Zeitz about this time, although it was not known if it was composed of the same species.

Romanes records (*Ent.*, v., p. 98) that, towards the end of April, 1870, the Firths of Moray and Cromarty were covered with a species of small pseudo-tetramerous beetle (*Galleruca*). They appeared first on the 18th, floating by millions upon a calm sea and were afterwards thrown upon the shore in heaps by every tide. This sudden arrival of such a multitude of insects must, it would seem, be due to their migration especially as it would otherwise be difficult to account for their presence in the sea. On their arrival only a small proportion of the insects were alive, but dissection showed all to be much emaciated. Previous to their arrival there had been little or no wind. Romanes is inclined to set aside as untenable the view that they came to grief flying across the Firth, only some nine miles in width at its broadest part, since none appeared to have succeeded in reaching the opposite shore, especially when one considers how strong these beetles are on the wing; he thinks that the idea that they drifted in from the North Sea equally strange, because the nearest point from which they could have started (supposing the flight to have come in a straight line) was from the coast of Norway. De Rivaz, writing of the massing of beetles by the seashore, records (*Ent. Mo. Mag.*, iv., p. 17) that in May, 1867, he was walking along the cliff from Ramsgate to Margate, when a strong south-wester was blowing, and later descended a gully or stair to the beach below; the tide was up and he found himself on a small bay of sand, bounded landwise by perpendicular chalk cliffs. The sand to the lower part of the cliffs, was covered with thousands of beetles evidently blown down from the fields above by the wind; he counted over thirty genera, most of them represented by four or five species. The insects were mostly on their backs, and, with the exception of some *Bembidia* and a small *Cholera* (*anistomoides*), they were almost torpid; when put upon their legs they made but feeble efforts to get away, and seemed to be unable to get a footing on the fine sand. He never before saw such a quantity and variety of beetles together in so small a space (about thirty yards), to be got without the least trouble, beyond picking them up. The exact spot was between Foreness and Whiteness, the following, so far as he could recollect, being a list of the genera observed:—*Notiophilus*, *Calathus*, *Anchomenus*, *Pterostichus*, *Amara*, *Anisodactylus*, *Harpalus*, *Bembidium*, *Ilybius*, *Homalota*, *Mycetoporus*, *Philonthus*, *Xantholinus*, *Lithocaris*, *Silpha*, *Cholera*, *Sphaeridium*, *Cercyon*, *Aphodius*, *Agriotes*, *Cneorhinus*, *Sitones*, *Alophus*, *Phytonomus*, *Trachyphlaeus*, *Cryptorhynchus*, *Lema*, *Crepidodera*, *Coccinella*, *Coccidula*, &c. Another case in which large numbers of coleoptera were found near the seashore is thus described (*Ent.*, iv., pp. 142-143) by Moncreaff: "The evening of August 3rd, 1868, was very lovely, but the heat was intense (90° F.) although the sun had well-nigh set. There was not a breath of wind sufficient to ruffle the surface of the sea (which appeared like molten lead), or to bend a blade of glass. I was sauntering along the sea bank (at Southsea), enjoying the moist salty exhalation, which was beginning to arise from the water, when my attention was attracted by the curious appearance of the grass-stalks along the extreme edge of the bank ; it was as if a chimney-sweep had shaken his sootbag over it and blackened every blade, which were here and there also spotted with red. Closer examination showed me that this appearance was caused by minute insects, and a few strokes of the sweeping net brought up more than a half-pint of small coleoptera, a species of *Thyamis* and a minute *Olibrus* being the most abundant ; *Coccinella 7-punctata*, and *C. 11-punctata*, were there by hundreds, *C. mutabilis* and *C. variabilis*, *C. 12-punctata*, well represented, with many other species. I found that for more than a mile every stalk at the edge of the bank was thus tenanted, but what they were doing there I cannot imagine, and I am quite puzzled to account for the sudden appearance of such swarms of coleoptera." Of a similar swarm of *Gastrophysa polygoni*, at Whittlesford, on the days preceding September 30th, 1868, Bond records (*Ent.*, iv., p. 222) that, "within the last few days, the road, the footpath, the grass and the hedges for the distance of about three quarters of a mile must have been covered with them ; there must be bushels of them, and, although we have had showers, their numbers do not diminish."

Mapleton notes (*Ent. Mo. Mag.*, xvi., p. 18) that, on Saturday, May 3rd, 1879, "a flight of small beetles, *Galeruca capreae*, fell on the walls and banks of the Crinan Canal, at Cairn Boan, in Argyllshire. The flight extended for about a mile or perhaps rather less, up and down the canal, just opposite the Cairn Boan Hotel. The weather on the morning of this day was calm, though cold, but at 1 p.m. a whirlwind or storm suddenly arose, and at once ruffled the surface of the canal. Some persons at a distance observed a dark cloud hanging over the spot. When the storm had passed the people saw myriads of beetles on the water-banks and roads. Some of the insects were thrown with violence against the windows of a cottage and startled the inmates. The description given of the appearance on the surface of the canal was 'as if some one had strewn the water with corn,' others said 'it appeared like stones on the water, and they wondered how the stones got there, and why they did not sink.' They were swept away from the doorways and paths, and even on May 13th there are a good many left in the corners by the loch and by the edge of the canal. One man said that it would not have taken long to get a barrow full." Rye (*loc. cit.*, p. 19) drew attention to the record in Katter's *Ent. Nachrichten*, ii., p. 53, of a parallel occurrence of swarms of a *Galeruca* that occurred in northern Norway during a storm.

Bearing on this subject of flights, possibly due to atmospheric disturbances, there is an interesting article on Argentine coleoptera, by E. Steinheil, referred to in the *Trans. Ent. Soc. Lond.*, 1871, p. 179, in which it is stated that *Calosoma bonariense*, Dej., and other *Carabidae*, could be collected in numbers in the middle of November, 1865, and at about the same period, in 1866, in the streets and houses of Buenos Ayres, and that they were wafted there by the Pampéro, the stormy west wind, which brings bright weather from the neighbouring pampa, after the rain. It is stated that this was a "true rain" of insects and that the houses, cellars, terraces, rooms, &c., were swarming with the creatures. In connection with this record it seems desirable to mention that Lacordaire (*Int. à l'Entomologie*, p. 494) notices that, for two consecutive years, whilst he was in Buenos Ayres, this town was, each spring, for eight days, visited by millions of *Harpalus cupripennis*, which arrived daily at dawn, and had to be swept away every morning from the outside of the houses, where they were piled up to a height of several feet. Westwood (*Proc. Ent. Soc. Lond.*, ser. 1, v., p. 24) has recorded swarms of *Harpalus* as occurring near Dover, on August 12th, 1839.

A New British Flea (*with plate*).

By the Hon. N. C. ROTHSCHILD, B.A., F.L.S.

Ceratophyllus newsteadi, sp. nov.—In "Novitates Zoologicæ," 1900, pp. 539-543, I gave some notes on four species of *Ceratophyllus* parasitic on birds. Since the appearance of the above article I have received from Mr. Robert Newstead nine specimens of an entirely new species of the genus *Ceratophyllus*. Five of these were taken from the nest of a hawfinch (*Coccothraustes vulgaris*), found near Chester, while the others were secured near Nantyffrith, Flintshire, in the nest of the common dipper (*Cinclus aquaticus*). The present species is similar in size to *C. gallinae*, Schrank, measuring slightly over 3mm. in length, and likewise resembles that species in colour.

The number of spines in the pronotal comb appears to vary, the largest number present in any of my examples being thirty-six. The palpi are almost the same length as the rostrum in *both* sexes. The posterior edges of the seventh tergite in *both* sexes, bear on each side one very long and two very short bristles. The ratio between the lengths of these bristles is of the same in *both* sexes, a character not exhibited by the other three species of this genus, in which the outer hairs situated in this position are greatly reduced in length. The posterior segments of the abdomen of both sexes are figured on the plate drawn "from the slide" by my friend Dr. K. Jordan. The segments in question differ markedly from those of any other member of the genus *Ceratophyllus*. In the male the process "p" of the ninth sternite is somewhat rounded resembling the same part of *C. gallinae*. The movable finger "f" is boot-shaped, the sole being turned distad; it bears three very strongly chitinised spines as shown in the figure, the lowest one being peculiarly curved. The manubrium, "M," is short, obtuse, and curved dorsad, differing from the manubria of the other members of the genus *Ceratophyllus*, parasitic on birds. The posterior abdominal segments of the female are drawn on the plate in optical section. The most curious feature of these segments is the shape of the seventh sternite, "vii. v.", which is deeply sinuate at its posterior edge.

Explanation of Plate.

1. *Ceratophyllus newsteadi* ♂, ninth segment.
2. *Ceratophyllus newsteadi* ♀, posterior abdominal segments.

Condition of Lachneis lanestris during the pupal state.

By T. A. CHAPMAN, M.D., F.Z.S., F.E.S.

My note in the *Record* for July last has brought me a consignment of pupæ of the season 1899 for examination, from Mr. A. Russell, and the result is so different from my anticipation that I report it at once, and hope that several observers will follow the matter up. The cocoons received (besides conjoint ones with deceased inmates) were examined August 14th, 1901. They were 24 in number, of these, two were dead, eleven contained pupæ that were entirely undeveloped, *i.e.*, with translucent pale tissues, just as shortly after pupation, the other eleven contained pupæ more or less developed. In the case of one of these I extracted the imago from the pupa-case, and it seemed fully developed, except that the hairs on the general surface seemed sparse, but this was probably a delusive appearance due to their being wet and agglutinated. This moth was unquestionably alive, and I imagine the other ten of this group are so also. Clearly we want some more observations on this subject. Mr. Russell and myself will try to follow out the further history of these 21 cocoons, but opening the cocoons and so removing the protection they afford the pupæ, not so much against predaceous foes, mites, &c., as against excessive variations of moisture, has no doubt much prejudiced further success with them, as they will probably either dry up or mould off. Will any other undeveloped ones emerge next spring, or are the developed ones those that intend to do so, if so, why do they develop so early, whilst larvæ of the season are still feeding, and should we have found them quite undeveloped last April? When do larvæ now spinning up and meaning to emerge next March begin imaginal devolopment? These ten pupæ could obviously emerge this autumn so far as the advance they have made in development is concerned.

On September 2nd I received from Germany a consignment of cocoons of *L. lanestris*, stated to be this season's cocoons, and I see no reason to doubt that they are so. Of these, eleven were dead, being detected by their lightness. Some double cocoons contained either dead larvæ or pupæ, or pupæ deformed by pressure against the other occupant. Of the sound ordinary cocoons I opened 45, and these present 43 pupæ in which development is more or less advanced, in some only the darkening of the eyes has occurred, in others greater or less general opacity, most noticeably of the wings, is observed, whilst in some more or less coloration has already taken place, and in a few the imaginal markings are quite evident. In only two cases are the pupæ still unchanged. These pupæ are from the same source as those of last year. Those it will be remembered gave only one pupa going over to a second year out of a large number, and therefore I presume are of a race or from a climate in which "going over" is a much less common phenomenon than with the British form. As regards those I opened, it is to be noticed that I left a number of cocoons untouched, and that those I opened included nearly all those of a somewhat delicate texture. The delicate, flimsy (comparatively) texture of cocoon is probably due to a weaker constitution of the larva as a rule, but it may also have some correlation with an intention to pass as short a time as possible in the pupal state. I have already expressed a fear that opened coocons will not have a good chance of surviving to enable one to complete the observation, and I have therefore left a number unopened to be examined after the emergence next spring. As an interim conclusion, founded on Mr. Russell's cocoons and these before me now, it would seem that development of the imago within the pupa, occurs during the summer and autumn, and that the moths emerging in the spring are fully developed in their chrysalids when winter sets in. These German cocoons are obviously spun up much earlier than is usual with our English ones. The German ones, therefore, have a full autumn and a scrap even of summer in which to develop, the English ones have only, as a rule, a short autumn. This probably contains the explanation of why so many German specimens emerge the first season, and why comparatively so few English ones attempt it. When I say German, I merely mean the actual pupæ I have received this year and last, what their real habitat is I do not know.

Staudinger and Rebel's Catalogue.*

(*Continued from p.* 270.)

As a good deal of revisional work at the generic nomenclature of the butterflies has been done by Scudder, Kirby, and others, and as its results have in part been made known through various channels to British readers—of whom, moreover, there are not a few whose interest hardly extends beyond these families—space may be found to catalogue the British butterflies as they now appear: PAPILIONIDÆ.—*Papilio machaon*, L. PIERIDÆ.—*Aporia crataegi*, L.; *Pieris brassicae*, L.; *P. rapae*, L.; *P. napi*, L.; *P. daplidice*, L.; *Euchloë cardamines*, L.; *Leptidia sinapis*, L.; *Colias hyale*, L.; *C. edusa*, F.; *Gonepteryx rhamni*, L. NYMPHALIDÆ.—A. NYMPHALINÆ.—*Apatura iris*, L.; *Limenitis sibylla*, L.; *Pyrameis atalanta*, L.; *P. cardui*, L.; *Vanessa io*, L.; *V. urticae*, L.; *V. polychloros*, L.; *V. antiopa*, L.; *Polygonia c-album*, L.; *Melitaea aurinia*, Rott.; *M. cinxia*, L.; *M. athalia*, Rott.; *Argynnis selene*, Schiff.; *A. euphrosyne*, L.; *A. lathonia*, L.; *A. aglaia*, L.; *A. adippe*, L.; *A. paphia*, L. [B. DANAINÆ.—*Danais plexippus*, L.] C. SATYRINÆ.—*Melanargia galathea*, L.; *Erebia epiphron*, Kn., *E. aethiops*, Esp.; *Satyrus semele*, L.; *Pararge aegeria*, L.; *P. megera*, L.; *Aphantopus hyperantus*, L.; *Epinephele jurtina*, L. (=*ianira*, L.); *E. tithonus*, L.; *Coenonympha pamphilus*, L.; *C. tiphon*, Rott. ERYCINIDÆ.—*Nemeobius lucina*, L. LYCÆNIDÆ.—*Thecla w-album*, Kn.; *T. pruni*, L.; *Callophrys rubi*, L.; *Zephyrus quercûs*, L.; *Z. betulae*, L.; *Chrysophanus dispar*, Hw.; *C. phlaeas*, L.; [*Lampides boeticus*, L.;] *Lycaena argiades*, Pall.; *L. argus*, L. (=*aegon*, Schiff.); *L. astrarche*, Bgstr.; *L. icarus*, Rott.; *L. bellargus*, Rott.; *L. coridon*, Poda; *L. minimus*, Fuess.; *L. semiargus*, Rott.; *L. arion*, L.; *Cyaniris argiolus*, L. HESPERIIDÆ.—*Pamphila palaemon*, Pall.; *Adopaea lineola*, L.; *A. thaumas*, Hufn.; *A. acteon*, Rott.; *Augiades comma*, L.; *A. sylvanus*, Esp.; *Hesperia malvae*, L.; *Thanaos tages*, L.

Of the 68 species enumerated, only 41 bear the same generic names as in Tutt's "British Butterflies;" but 15 of the 27 differences are due to the conservation by Staudinger of the large old-fashioned genera *Vanessa*, *Argynnis*, *Erebia*, and *Lycaena*, and need not concern our more advanced British students; eight others are in the *Hesperiidae*, and the reviewer is incompetent at the moment to decide which nomenclature is right, although probably Watson's (followed by Staudinger) will prove to be so in most cases. The other four differences are the restitution of *Leptidia* (recte *Leptidea*), Billb., in place of *Leucophasia*—a change which will stand or fall according to the view taken

* "*Catalog der Lepidopteren des palaearctischen Faunengebietes*," von Dr. Phil. O. Staudinger und Dr. Phil. H. Rebel. Dritte Auflage des "Cataloges des europäischen Faunengebietes." Berlin: R. Friedländer und Sohn. Mai, 1901. I. Theil: Fam. *Papilionidae—Hepialidae*, von Dr. O. Staudinger und Dr. H. Rebel; II. Theil: Fam. *Pyralidae—Micropterygidae*, von Dr. H. Rebel. xxxii+411+368 pp. in 8vo.

of Billberg's "Enumeratio," the rejection of *Anosia*, Hb. Tent. (together with most "Tentamen" names); the use of *Satyrus* for *semele*, L., instead of *Hipparchia*, Fb., of which latter Scudder believes the type to be *hyperantus*, L.; and the resuscitation of *Aphantopus*, Wllgn., for the last-named species.

One or two obvious corrections of genera in the other families may be just briefly mentioned as safe for adoption by British authors. On p. 155 *Epineuronia*, Rbl., n. nom., is proposed for the pre-occupied *Neuronia*, Hb. (*nec* Leach). On p. 164 *Miana*, Stph., is removed from the heterogeneous *Hadena* of the 1871 catalogue; but Mr. Grote's correction of the name to *Oligia*, Hb. (*Ent. Rec.*, vi., p. 79) which is disregarded, must be accorded the priority. On p. 198 the subgenus (of *Caradrina*) *Hydrilla*, B., is rightly raised to generic rank. On p. 199 *Petilampa*, Auriv., is accepted for *arcuosa*, Haw., which is certainly not a *Caradrina*, as it appeared (though with a query) in 1871; the name *Lampetia*, Boie, used for it by some authors, was unfortunately a homonym, hence the correction. On pp. 308 and 320 some of the heterogeneous elements are removed from Lederer's unwieldy genus *Cidaria* (now called *Larentia*, Tr.*) by the recognition of the separate genera *Asthena*, Hb. and *Phibalapteryx*, Stph., but much more yet remains to be done in the same direction.

In connection with the nomenclature of the species, we know pretty well, especially from the 1871 preface, what Dr. Staudinger's principles were, and it is a good deal to his credit that he allowed them to be rigidly followed out in so many cases even where their application produced distressing changes from the nomenclature of his earlier editions. Thus we get quite correctly *jurtina*, L., in place of *janira*, L., *primulae*, Esp., for *festiva*, Hb., *fulminea*, Scop., for *paranympha*, L., *taenialis*, Hb., for *albistrigalis*, Haw., *ribeata*, Cl., for *abietaria*, Hb., *bistortata*, Goeze, and *crepuscularia*, Hb., for the "jumble" of 1871, *dilutaria*, Hb., for *holosericata*, Dup., *interjectaria* (B.), Gn.,* for *dilutaria*, Led. *nec* Hb., *denotata*, Hb., for *campanulata*, H.-S., *inturbata*, Hb., for *subciliata*, Gn., *sannio*, L. (misprinted *sanio*), for *russula*, L., *quadripunctaria*, Poda, for *hera*, L., most of the Scandinavian changes enumerated in *Ent. Rec.*, ii., p. 224, several from Tutt's "British Lepidoptera," and a few others from various sources.

* This is not a very happy change, since the type of *Larentia*, fixed by Westwood, was *chenopodiata*, L. (*limitata*, Scop.), while that of *Cidaria*, fixed by Duponchel, was *fulvata*, Forst.

* As *interjectaria*, B., was originally proposed as a purely nomenclatorial correction for *dilutaria*, Hb., *nec dilutata*, Bkh., it is much to be feared that it cannot stand for any other species than the true *dilutaria* of Hübner; *fuscovenosa*, Goeze, iii., 3, p. 478 (1781), should therefore be substituted for *interjectaria* (*vide*, *Trans. City Lond. Ent. Soc.*, x., p. 65). Goeze's name was founded upon Geoffroy's "La Nervure Brune," which Werneburg (i., p. 308) very plausibly determines for his *humiliata* (=*humiliata*, Hfn. + *interjectaria*, Gn.); and as Geoffroy describes the costa as "fuscous," not as red, we shall be following Guénée's rule (and common-sense) in adopting it for *interjectaria*.

(*To be concluded.*)

Peronea cristana, Fab., and its aberrations (*with plate*).

By J. A. CLARK, F.E.S.

(*Concluded from p.* 265.)

16. ab. *substriana*, Stphs., "Ill. Haust.," iv., p. 149, no. 3 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 5 (*ante* 1839); Wood, "Ind. Ent.," fig. 1049

(1839); H. and Westd., "Brit. Moths," ii., p. 153 (1844): Desv., "Zool.," iii., p. 842 (1845); Staud., "Cat.," p. 232 (1871).—Exp. alar. 9½ lin. Anterior wings griseous-brown, nearly immaculate, with a large tuft of elevated black scales on the disc, and an obscure ashy streak on the inner margin; thorax fuscous; head and palpi cinereous. Birch Wood, New Forest (Stephens).

17. ab. *prostriana*, n. ab. (Pl. vi., fig. 8).—Head, thorax and palpi cinereous. Anterior wings uniform, dark fuscous with a cinereous vitta and slight trace of self-coloured button, posterior wings light-brown. This aberration differs from ab. *substriana* in having only a trace of a button.

18. ab. *alboflammana*, Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 23 (*ante* 1839); ? Desv., "Zool.," iii., p. 841 (1845).—Superior wings livid-brown with a small button on the disc and an orange dot at the base; a costal spot near the apex and the middle of the cilia fox-colour; inner margin, upperside of palpi, head and thorax white (Curtis). One doubts whether Desvignes' description refers to the same form.

19. ab. *subalboflammana*, n. ab. (Pl. vi., fig. 9).—Head, thorax and palpi ashy-white. Anterior wings uniform deep brown with a broad white vitta; in the centre of the wing is a very small white button; posterior wings light brown. The button in this aberration being white instead of dark brown, makes it impossible to confuse it with ab. *alboflammana*.

20. ab. *albistriana*, Haworth, "Lep. Brit.," p. 412(1811); Stphs., "Ill. Haust.," iv., p. 155 (1834); Curt., "Brit. Ent.," expl. pl. xvi., no. 26 (*ante* 1839); Wood, "Ind. Ent.," p. 154, fig. 1069 (1839); Humph. and Westd., "Brit. Moths," ii., p. 157 (1844).—*Tortrix* (The Grey-streak) alis fuscis, costa scabro-ciliata, striaque cinerea marginis tenuioris.—Exp. alar. 10 lin. Alæ anticæ fuscæ, tincturâ obsoletissimâ purpurascente, punctis paucis scabriusculis. Posticæ pallide fuscescentes (Haworth).

21. ab. *fulvostriana*, Desvignes, "Zool.," iii., p. 843 (1845).—Similar to ab. *striana*, with fulvous markings on the inner margin, nearly a distinct dash (Desvignes).

22. ab. *insulana*, Curt., "Brit. Ent.," pl. xvi. expl., no. 20 (*ante* 1839); H. and Westd., "Brit. Moths," ii., p. 156 (1844); Desv., "Zool.," iii., p. 843 (1845).—Superior wings purplish-brown with a large white button, the inner margin white, with a long purplish-brown streak on the disc; palpi, head and thorax white (Curtis).

23. ab. *fuscana*, n. ab. (Pl. vi., fig. 10).—Head, thorax and palpi white. Anterior wings uniform brown, with a large self-coloured button, and broad white vitta; near the base and at the hinder angle are a few tiny white spots; posterior wings light brown.

24. ab. *ruficostana*, Curt., "Brit. Ent.," 1st ed., pl. xvi. (1824); 2nd ed., no. 24 (*ante* 1839); Stphs., "Ill. Haust.," iv., p. 153 (1834); Wood, "Ind. Ent.," fig. 1062 (1839); Desv., "Zool.," iii., p. 842 (1845); H.-Sch., "Sys. Bearb.," vol. iv., pl. 27 (1849); Staud., "Cat.," p. 232 (1871).—Ochreous-grey; superior wings livid brown, a deep ferruginous stripe at the base extending beyond the middle and including a small button, the lanceolate space above rich brown, inner margin white with a few dots at the anal angle; palpi, head and thorax white. Beat out of whitethorns in the New Forest, in August, September and October (Curtis).

25. ab. *alboruficostana*, n. ab. (Pl. vi., fig. 11).—Head, thorax and palpi white. Anterior wings cinereous-brown with a deep chocolate-coloured marking, extending obliquely across the wing towards the apex; in the centre of the wing is a minute reddish button; it has also a broad white vitta; posterior wings light brown. This ab. differs markedly from ab. *ruficostana* in having a small button and a white vitta, ab. *ruficostana* having a yellow vitta.

26. ab. *transversana*, n. ab. (Pl. vi., fig. 12).—Head, thorax and palpi cinereous. Anterior wings warm reddish-brown, growing lighter towards the inner margin, and so forming a rather indistinct vitta with a beautiful chocolate-coloured marking extending obliquely from base towards apex, and becoming a little lighter along the costal margin, posterior wings light brown. The absence of a white vitta constitutes the difference between this ab. and the two previous ones.

27. ab. *attaliana*, n. ab. (Pl. vi., fig. 13).—Head, thorax and palpi white. Anterior wings with marginal area fuscous, with small white raised spots dotted thereon; a rich, deep, chocolate-coloured marking extends from the base obliquely to the apex, on the edge of which and in the centre of the wing is a small yellowish button; it has a broad white vitta, posterior wings light brown, deepening in colour towards the anal angle. This is the only aberration in this lovely group of four, which has the white dots over the marginal area.

28. ab. *albipunctana*, Stphs., "Ill. Haust.," iv., p. 152, no. 15 (1834); Curt.,

"Brit. Ent.," 2nd ed., pl. xvi. expl., no. 22 (*ante* 1869); Wood, "Ind. Ent.," fig. 1061 (1839); H. and Westd., "Brit. Moths," ii., p. 156 (1844); Staud., "Cat.," p. 232 (1871). *Albipuncta*, Desv., "Zool.," p. 841 (1845).—Exp. alar. 9 lin. Anterior wings brown, immaculate, with a central tuft of white elevated scales, and a few scattered ones towards the hinder margin; on the inner margin is a broad ochraceous-white, or cream-coloured, dash; head, thorax and palpi cream-coloured. New Forest (Stephens).

29. ab. *ochreapunctana*, n. ab. (Pl. vi., fig. 14).—Head, thorax and palpi yellowish. Anterior wings a rich warm brown, with orange-coloured vitta, and cream-coloured button, also a few minute yellowish dots on the marginal area, posterior wings light brown. The distinguishing feature of this aberration is the orange vitta.

30. ab. *nigropunctana*, n. ab. (Pl. vi., fig. 15).—Head, thorax and palpi yellowish. Anterior wings an uniform warm brown, with orange vitta and large blackish button; posterior wings light brown. It is very easy to distinguish this aberration from the two foregoing ones, because it has an almost black button, and the others have very light ones.

31. ab. *capucina*, [Johnson, "Ann. Mag. Nat. Hist.," 1842, *teste* Stephens;] Desv., "Zool.," p. 841 (1845). *Capuana*, H. and Westd., "Brit. Moths," p. 162, pl. xcv., fig. 16 (1844). *Capuzina*, Stphs., "List. Br. An. Brit. Mus.," x., p. 13 (1852).—This insect . . . . is entirely blotched with white, but has no white dash, New Forest (Desvignes). Measures 8½ lines in expanse; forewings with the basal and inner margin snow-white, the former with a short abbreviated angulated fascia, and a smaller discoidal patch of dark brown, and also a few dark scales, the middle of the disc with a white tuft of scales; the extreme half of the wing brown, with a dark abbreviated dash, with two whitish patches between the centre and apical angle, and a number of smaller paler shining patches, and a few small white elevated scales; hindwings pale brown; head, palpi and thorax snow-white. In the specimen figured in the plate the white dash along the inner margin is obsolete. Found by the Rev. Mr. Johnson, in the New Forest (Humphreys and Westwood). [I am unable to find the original description in the *Annals* and *Mag.* of *Nat. History*.]

32. ab. *subcapucina*, Desv., "Zool.," iii., p. 842 (1845).—Desvignes says: "The above insect (*capucina*) should really bear this name, not being so complete as the present one, which has the white dash, and this constitutes the difference between them."

33. ab. *gumpiana*, n. ab.—Head, thorax and palpi white. The anterior wings light brown, mottled all over with white; a broad white vitta joins the white marking at the base; a faint trace of a white button. Posterior wings fawn coloured. [I have retained this name as it is that by which this rare aberration has been known among lepidopterists for 70 years, and under which it has been sold in Stevens' salerooms.]

34. ab. *curtisana*, Desv., "Zool.," iii., p. 842 (1845).—Similar to ab. *subcapucina*, varying in having a very faint fulvous streak, extending from the base to the button, which is of the same colour (Desvignes).

35. ab. *charlottana*, n. ab. (pl. vi., fig. 16).—Head, thorax and palpi cream-coloured. Anterior wings cinereous mottled with white, and with a broad white vitta, above the vitta is a red streak running from the base to the button, which is large and creamy in colour, and continuing past it up to a large white spot which is on the inner edge of the marginal disc; above the red line is a triangular shaped white one, broadest at the bottom where it ceases; above the red line in the marginal area a dark line runs obliquely from the button towards the apex; on the marginal area are also five tiny raised white spots; posterior wings light greyish-brown.

36. ab. *masoniana*, n. ab. (pl. vi., fig. 17).—Head, thorax and palpi yellowish. Anterior wings of a warm lightish brown with broad white markings extending between the base and the button which is yellowish in colour, as is also the vitta, from which a fine line, which becomes almost orange coloured, extends along the margin towards the apex. Near the hinder angle are two minute white spots, posterior wings light brown.

37. ab. *tolana*, Desv., "Zool.," iii., p. 842 (1845).—Between *curtisana* and *desfontainiana* (Desvignes).

38. ab. *cristalana*, Don., "Nat. Hist.," iii., pl. 77, figs. 1, 2 (1794); Stphs., "Ill Haust.," iv., p. 152 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 11 (*ante* 1839); Wood, "Ind. Ent.," fig. 1058 (1839); H. and Westd., "Brit.

Moths," ii., p. 155 (1844); Desv., "Zool.," iii., p. 842 (1845); Staud., "Cat.," 2nd ed., p. 232 (1871). *Cristana*, Hb., "Eur. Schmett.," fig. 176 (*post* 1800); Dup. "Hist. Nat.," ix., pl. 244, fig. 1 (1834).—Upper wings yellow-brown with dark shades; a broad irregular white mark and a tuft or button on the centre of each. Head and thorax white clouded. Lower wings pale brown. It is distinguished by the unusual form of the white markings on the upper wings, and particularly by the tuft or button which is situated in an upright position near the centre of each; these tufts appear only slightly feathered on the upper parts to the naked eye, but when one of them is examined with a microscope, or even common magnifier, it presents the appearance of a bundle of fibres enclosed within a thin membrane; narrow at the base, increasing in bulk near the middle, and expanding at the summit into a number of shoots, in the form of a crest; several other tufts are dispersed near the extremities of the upper wings, but they are not conspicuous to the naked eye. Coombe Wood in Surrey, Kent (Donovan).

39. ab. *subcristalana*, Curt., "Brit. Ent.," 2nd ed., expl. pl. xvi., no. 10 (*ante* 1839); H. and Westd., "Brit. Moths," ii., p. 155 (1844); Desv., "Zool.," iii., p. 843 (1845).—Palpi, head and collar ash-colour, superior wings beautifully variegated and similarly marked to *cristalana*, Don., but entirely brown, the broken angulated fascia at the base and the button are very dark brown, the curved semiloop on the costa is pale purplish-brown, and at the apex is a lead-coloured spot (Curtis).

40. ab. *unicolorana*, Desv., "Zool.," iii., p. 841 (1845).—This insect has generally been understood as the *profanana* of Fabricius, but not at all agreeing with his description I have given it the present name. Its colour is uniform dark green, with the exception of the palpi, head and thorax, which are more or less dirty white; the button is very small, varying from a dark to a white dot (Desvignes).

41. ab. *subunicolorana*, n. ab. (Pl. vi., fig. 18).—Head, thorax and palpi brown. Anterior wings uniform brown, with large dark brown button, posterior wings lightish brown. This aberration may easily be distinguished from *unicolorana* which has no button, or only the very faintest trace of one.

42. ab. *nigrana*, n. ab.—(Pl. vi., fig. 19).—Head, thorax and palpi blackish. Anterior wings blackish, mottled over with darker colour. Large black button, posterior wings ashy.

43. ab. *rufinigrana*, n. ab. (Pl. vi., fig. 20).—Head, thorax and palpi blackish. Anterior wings blackish, with a broad chocolate coloured marking extending over the wing from the base towards the apex, the button is black, and from it a fine black line runs along the edge of the chocolate marking towards the apex, posterior wings light brown. The chocolate coloured marking which is totally absent in ab. *nigrana* constitutes the difference between these two aberrations.

44. ab. *atrana*, n. ab. (Pl. vi., fig. 21).—Head, thorax and palpi yellowish. Anterior wings blackish, suffused with darker marking; large black button, and broad bright orange coloured vitta, posterior wings greyish-brown. The orange vitta makes it easy to distinguish this aberration from the two foregoing ones which it otherwise greatly resembles.

45. ab. *merlana*, n. ab. (Pl. vi., fig. 22).—Head, thorax and palpi ashy. Anterior wings uniform black with large button, and an ashy coloured vitta, posterior wings light brown. This aberration is much like ab. *nigrana* or ab. *rufinigrana*, and might at first glance be taken for them, the ashy vitta is its distinguishing feature.

46. ab. *sequana*, Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 13 (*ante* 1839); Desv., "Zool.," iii., p. 843 (1845).—Similar to ab. *fulvovittana*, but smaller and having no white in the superior wings, which are purplish-brown and variegated, an angulated brown space at the base spotted with black, button large and ochreous at the apex, with a short black streak beyond it, the semiloop on the costa purplish-grey, apex lead-colour, inner margin ochreous; palpi, head and centre of thorax pale ash-colour (Curtis).

47. ab. *lichenana*, Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 7 (*ante* 1839).—Superior wings purplish-brown with a large black button and a few small tufts at the anal angle; a bright ferruginous line from the button towards the apex, softened into the costa; head, thorax and a large patch at the base of the inner margin white (Curtis).

48. ab. *semiustana*, Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 2 (*ante* 1839); H. and Westd., "Brit. Moths," ii., p. 153, pl. xcii., fig. 2 (1844); Desv., "Zool.," iii., p. 843 (1845).—Superior wings dull ochreous, button brown-black,

with an obscure fascia near the base, a large oblique space of the apical portion ferruginous-ochre clouded with brown, a spot at the apex dark-brown, and a doubly curved line near the margin bearing three dark elevated dots at the inner angle, and several others round the disc. Coombe and Birch Woods, New Forest (Curtis).

49. ab. *semistriana*, Desv., "Zool.," iii., p. 843 (1845).—Similar to ab. *semiustana*, but with *striana* markings (Desvignes).

50. ab. *bentleyana*, Curt., "Brit. Ent.," 2nd, ed., pl. xvi. expl., no. 1 (*ante* 1839); H. and Westd., "Brit. Moths," ii., p. 154, pl. xcii., fig. 5 (1844); Desv., "Zool.," iii., p. 843 (1845).—Superior wings pale brown, an oblique portion from the base towards the apex blackish-brown, including the button, an indistinct fascia near the base forming a pale spot on the costa, and a brown tuft below the apex is spotted, and beneath is a large pale ring, inner margin bright ochre; palpi, head and thorax tawny (Curtis).

51. ab. *profanana*, Fab., "Ent. Syst.," iii., p. 268 (1794); Haw., "Lep. Brit.," p. 412, no. 56 (1811); Don., "Nat. Hist.," xii., pl. 377, fig. 3 (1806); Stphs., "Illus.," iv., p. 149 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 3 (*ante* 1839); Wood, "Ind. Ent.," fig. 1047 (1839); H. and Westd., "Brit. Moths," ii., p. 153 (1844); Desv., "Zool.," iii., p. 843 (1845); Staud., "Cat.," p. 232 (1871).—*Pyralis*, alis cinereis; puncto medio fusco. Habitat in Anglia Mus. Dom. Francillon. Statura sequentis. Corpus cinereum. Alæ cinereæ, nitidæ punctis aliquot sparsis, minutis, elevato pilosis et in medio puncto magno, elevato e pilis fuscis. Posticæ cinereæ, immaculatæ (Fabricius). Birch and Coombe Woods, New Forest (Stephens).

52. ab. *provittana*, Desv., "Zool.," iii., p. 843 (1845).—Similar to ab. *profanana*, but with a yellow dash (Desvignes).

53. ab. *desfontainana*, Fab., "Ent. Syst.," iii., p. 268 (1793); H. and Westd., "Brit. Moths," ii., p. 154 (1844). *Desfontaniana*, Haw., "Lep. Brit.," 413, no. 62 (1811); Stphs., "Ill. Haust.," iv., p. 141 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 16 (*ante* 1839); Wood, "Ind. Ent.," fig. 1054 (1839); Staud., "Cat.," p. 232 (1871). *Desfontainiana*, Desv., "Zool.," iii., p. 842 (1845).—*Pyralis*, alis fusco cinereis; vitta media abbreviata fulva; puncto medio elevato piloso. Habitat in Anglia Mus. Dom. Francillon. Corpus medium, niveum. Alæ anticæ obscure fuscæ vitta lata a basi ultra medium ducta fulva et in medio alæ in hac vitta punctum e pilis elevatis fulvis. Margo tenuior flavescens. Alæ posticæ cinereæ. Desfontaines Botanicus Parisiensis egregius, qui Insecta in itinere Africano lecta benevole mecum communicavit (Fabricius). Birch and Coombe Woods, New Forest.

54. ab. *ulotana*, n. ab. (Pl. vi., fig. 23).—Head, thorax and palpi ashy. Anterior wings dark slate colour, with a bright red streak which proceeds from the base to the large button which is also red, posterior wings light brown. This aberration may not be confounded with ab. *desfontainana* which it resembles because of the deep slate colour of the wings.

55. ab. *spadiceana*, Haw., "Lep. Brit.," p. 412, no. 57 (1811); Stphs., "Ill. Haust.," iv., p. 150 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 9 (*ante* 1839); Wood, "Ind. Ent.," fig. 1052 (1839); H. and Westd., "Brit. Moths," ii., p. 154 (1844); Staud., "Cat.," p. 232 (1871).—T. (The bay-shouldered Button) alis brunneo-fuscis, puncto magno medio elevato nigro externe dimidiatim oblique spadiceis. Habitat apud Coombe Wood. Imago, Jan. et forte ab Autumno, per hyemem, at rarissime. Expansio alarum 9 lin. Descriptio: Præcedenti (*profanana*) simillima, at alia; differt, alis anticis costam versus, obliquè dimidiatim rufo-spadiceis, a basi post medium (Haworth). Coombe Wood, New Forest (Stephens).

56. ab. *brunneana*, Steph., "Illus.," iv., p. 149, no. 4 (1834); Wood, "Ind. Ent.," p. 154, fig. 1050 (1839); H. and Westd., "Brit. Moths," ii., p. 154 (1844). *Cristana*, H.-Sch., "Sys. Bearb.," pl. iv., fig. 25 (1849). *Brunnea*, Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 6 (*ante* 1839); Desv., "Zool.," iii., p. 842 (1845).—Exp. alar. 9-10 lin. Anterior wings pale brown at the base, dark at the apex; the disc with a black tuft of elevated scales, and a few smaller ones near the anal angle; on the inner margin is a faint ashy streak; thorax, head and palpi ashy. Darenth Wood, New Forest (Stephens).

57. ab. *intermediana*, n. ab. (Pl. vi., fig. 24).—Anterior wings brown, with a broad transverse marking of warm light reddish-brown running across the wing from the base, on the edge of which is a large dark brown button; it has a broad cream-coloured vitta. This aberration may easily be distinguished from ab. *spadiceana* by the vitta.

58. ab. *sericana*, Hb., "Eur. Schmett.," fig. 83 (1796); Dup., "Hist. Nat.," ix.,

pl. 244, fig. 3 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 15 (*ante* 1839); Desv., "Zool.," iii., p. 842 (1845).—Forewings of a purplish-grey but with a bright orange median longitudinal line from base to beyond middle of wing, edged above with a darker line running up to apex; fringes yellowish; hindwings purplish-grey (Hübner's fig. 83).

59. ab. *consimilana*, Stphs., "Ill. Haust.," iv., p. 150, no. 7 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 14 (*ante* 1839); Wood, "Ind. Ent.," p. 155, fig. 1053 (1839); H. and Westd., "Brit. Moths," ii., p. 154 (1844); Desv., "Zool.," iii., p. 842 (1845).—Exp. alar. 9½ lin. Anterior wings fuscous-brown, the base interiorly of a tawny orange, the apex freckled with black; on the disc is an elevated red-brown tuft of scales, and on the inner margin an obscure ashy streak; head, palpi and thorax white. New Forest, Ripley (Stephens).

60. ab. *albicostana*, Sand, "Cat. Lép. Auv.," p. 133 (1879); Staud. and Reb., "Cat.," 3rd ed., p. 79 (1901).—Inédite. Tête, corps, abdomen, blancs de neige. Les ailes supèrieures blanches, depuis la côte jusqu'à la pointe apicale, et jusqu'à la moitié interne en biais, les crêtes blanches avec une lunule blanche sur ce qui reste de l'aile qui est fauve et tachée de brun. Ailes inférieures grises. Jolie aberration. Nohant (Indre). Septembre (Sand).

61. ab. *rossiana*, Fab., "Ent. Sys.," iii., 259 (1794); Staud., "Cat.," p. 232 (1871). *Lefebvriana*, Dup., "Hist. Nat.," ix., pl. 244, fig. 6 (1834); Schläg., "Ber.," p. 237 (1848); H.-Sch., "Sys. Besch.," pl. iv., fig. 26 (1849).—*Pyralis* alis brunneis; dorso communi punctoque medio piloso niveis. Habitat ad aquas Spadanas Dom. de Paykull. Magnitudo præcedentium (*populana*). Caput et thorax nivea, immaculata. Alæ anticæ a basi usque ad apicem marginis crassioris testaceæ, interne fuscæ dorso communi niveo. Punctum elevatum, pilosum, album, in medio alæ. Rossi *Patavinus Entomologiae Italicae cultor et Faunae Patavinae descriptor* (Fabricius).

62. ab. *combustana*, Dup., "Hist. Nat.," ix., p. 157, pl. 244, fig. 2 (1834); Curt., "Brit. Ent.," 2nd ed., pl. xvi. expl., no. 32 (*ante* 1839); Wood, "Ind. Meth.," p. 157, fig. 1068 (1839); H. and Westd., "Brit. Moths," ii., p. 157 (1844); Staud., "Cat.," p. 232 (1871).—Only differs from *cristana* in the absence of the white band and in the inner border being yellowish. Otherwise it has exactly the same markings, and the palpi and corselet are white. It is found with *cristana*. Dept. du Nord (Duponchel).

The following is a complete list of the various named forms of this species :—

PERONEA, Curt.
cristana, Fab.
ab. nigrocristana, Clark
ab. fulvocristana, Stphs.
ab. chantana, Curt.
ab. subchantana, Clark
ab. prochantana, Clark
ab. vittana, Stphs.
ab. subvittana, Stphs.
ab. nigrosubvittana, Clark
ab. punctana, Clark
ab. albovittana, Stphs.
ab. fulvovittana, Stphs.
ab. subfulvovittana, Clark
ab. xanthovittana, Desvignes
ab. proxanthovittana, Clark
ab. striana, Haw.
ab. substriana, Stphs.
ab. prostriana, Clark
ab. alboflammana, Curt.
ab. subalboflammana, Clark
ab. albistriana, Haw.
ab. fulvostriana, Desvignes
ab. insulana, Curt.
ab. fuscana, Clark
ab. ruficostana, Curt.
ab. alboruficostana, Clark
ab. transversana, Clark

PERONEA, Curt.
cristana, Fab.
ab. attaliana, Clark
ab. albipunctana, Stphs.
ab. ochreapunctana, Clark
ab. nigropunctana, Clark
ab. capucina, Johns.
ab. subcapucina, Desvignes
ab. gumpiana, Clark
ab. curtisana, Desvignes
ab. charlottana, Clark
ab. masoniana, Clark
ab. tolana, Desvignes
ab. cristalana, Donov.
ab. subcristalana, Curt.
ab. unicolorana, Desvignes
ab. subunicolorana, Clark
ab. nigrana, Clark
ab. rufinigrana, Clark
ab. atrana, Clark
ab. merlana, Clark
ab. sequana, Curt.
ab. lichenana, Curt.
ab. semiustana, Curt.
ab. semistriana, Desvignes
ab. bentleyana, Curt.
ab. profanana, Fab.
ab. provittana, Desvignes

PERONEA, Curt.	PERONEA, Curt.
cristana, Fab.	cristana, Fab.
ab. desfontainana, Fab.	ab. consimilana, Stphs.
ab. ulotana, Clark	ab. sericana, Hb.
ab. spadiceana, Haw.	ab. albicostana, Sand
ab. brunneana, Stphs.	ab. rossiana, Fab.
ab. intermediana, Clark	ab. combustana, Dup.

Notes on the distribution of the British Coleoptera.

By W. E. SHARP.

(*Concluded from p.* 271.)

Of course it is not to be assumed that climatic conditions even over so small an area as that of the British Islands, do not play an important part in limiting the range of a species, and possibly actual mean temperature may be less effectual in this way, than differing degrees of humidity, and this again will act more effectively, indirectly through food-plants, &c., than directly on the organism itself. But it is certain that climatic conditions have not been the only, or even the principal factors which have shaped out the range limits of any particular species. Thus *Cetonia aurata*, the common Rose Chafer, is in England quite a southern species, but in Ireland is found abundantly as far north as Antrim and also in the Isle of Man. In this second group I should also feel inclined to include most of our fen insects, as well a species with so restricted a north-eastern range as *Nebria livida*.

I have already defined this group as one having a maximum density in the south-east, and thinning out gradually north and west, but we find several species in our fauna which we can hardly include in such a definition. These are forms having a very limited southern or western range, and in some cases appearing merely as isolated detachments in quite southern localities.

All orders of insects supply examples of this group and among the Coleoptera it will be sufficient to cite as examples *Cicindela germanica*, *Dromius vectensis* or *Omophlus armeriae* in its eastern, and *Rhopalomesites tardyi* or *Exomias pyrenaeus* in its western extension.

I have called the former the third and the latter the fourth division into which I provisionally divided our coleoptera, but I am by no means sure that they differ chronologically although they may have done so in immediate origin and their separation is certainly a matter of convenience. They are often so entangled with the second group that the true allocation of many of their species seems impossible and in all must be provisional on the extent of our knowledge or rather our ignorance. Thus at Deal we find associated with the *Erodium* of the coast sandhills, *Hypera fasiculata* and *Lixus bicolor*, but as the first occurs also in similar situations at Rhyl, and the latter seems, so far as we know at present, almost restricted to the coast of Kent, I should place the *Hypera* in the second but the *Lixus* in the third group.

The advent of these forms seems to have been subsequent to the general settlement here of the second group, and its restrictions due to the competition of an already established fauna. It is probable that on the cessation of glacial conditions in Europe there was a general northerly movement over the whole of the continental area, and that, in this migration, species succeeded species as the gradual secular rise of temperatue made the advance for each possible. It is also conceivable that these few isolated species which we find restricted either to the counties south of the Thames Valley, or even quite to the littoral of the English Channel, were the rear guard of this migration, and the last arrivals which the break of land connection between England and France allowed. Had that connection continued longer it is possible that other species, not numbered in our fauna, but which are common enough in northern France and the Channel Islands, might have maintained a permanent foothold here, but of this there is no evidence and the very narrow range of many species that did arrive made the supposition doubtful. As regards the immediate origin of this group it seems obvious that northern France and Belgium furnished such species as we find now attached to restricted localities along the coast lines of Kent, Sussex and Hampshire, but as we proceed westward and especially when we consider the fauna of the south and south-west of Ireland, the hypothesis of a former vast continental land extension which once united Cornwall, Kerry, Brittany and the Iberian Peninsula, forces itself upon our attention. Such a continental area may have sustained a fauna differing in many respects from that of regions more to the east, and explaining to some extent faunistic features which we recognise in the extreme west of England and south of Ireland, and which perhaps penetrated some distance along a river valley now represented by the Bristol Channel. This is the group which I have ventured to designate as a fourth and last division of our coleoptera. It is emphasised especially in Ireland possibly more in flora than in fauna, and in the Mollusca such a species as the spotted slug of Kerry (*Geomalacus maculatus*) undoubtedly represents it.

It seems possible that even while some obstacle, such as an immense lake filling the bed of what is now the Irish Sea, cut Ireland off from England and Wales more to the north, this south-westerly land extension may have been in existence and thus explain a certain bifurcation which we seem to trace in the lines of distribution of some species such as that of *Pyropterus affinis*, which has only occurred in Nottinghamshire and in Kerry, or *Lytta vesicatoria* found occasionally, but only in the south-eastern counties of England, but which much to the surprise of entomologists was recorded a few years ago as having been taken near Roscommon in Ireland. A similar case is that of *Nebria complanata* which occurs on the coast of Wexford and of the Bristol Channel. Other species seem to have had a range more exclusively western as *Rhopalomesites tardyi* and *Carabus intricatus*, although the former has penetrated as far north as Belfast and the west of Scotland.

Otiorrhynchus auropunctatus is a more enigmatical insect as, so far as we know at present, it seems confined to the eastern coast of Ireland, but as it is unknown in Great Britain at all I should feel inclined to associate it with what is known as the Iberian element in the Irish fauna, or to what I have designated as the fourth group in these notes.

In any general consideration of this group it is obvious that the fauna of the Scilly Islands should be significant. Of their coleopterous inhabitants, however, our knowledge is meagre and even disappointing, they have certainly never been adequately explored, the few records we have being the result of a brief sojourn, at perhaps not the best time of year, by one or two coleopterists, and it is moreover, probable that these islets are far too small and too exclusively marine to have successfully maintained any lingering relics of a fauna which must have been at the time of their union with surrounding land areas quite inland in character. Hence their evidence even if far more exhaustive than it is at present might not be of much value. Enough, however, I believe remains in the south of Ireland and western extension of England, to make it clear that their present coleopterous (and other) inhabitants, could never have been derived from the east, but are probably the survivals of some last Atlantis long sunk beneath the waves of the western ocean.

In drawing these speculations to a close I must admit that perhaps the most obvious fact about them is their extremely provisional character. We really know so little about the coleoptera of these Islands, such vast areas still remain either absolutely unexplored or known only from the results of a few days spent possibly during an unpropitious season by the vagrant coleopterist.

Beetles differ much from lepidoptera in the attention they have received at the hands of entomologists and many of their species are so minute and so elusive that nothing but persistent collecting carried on for several years in any locality could hope to even approximately exhaust its coleopterous inhabitants. This is precisely what we lack. Coleopterists are few in number and principally inhabitants of large towns, and it must be confessed, often more prone to visit, for collecting purposes, localities known as likely to furnish additions to their cabinets, than to explore more virgin fields whose possibilities may be all unknown. Moreover, coleoptera share with other orders of insects a most perplexing irregularity of appearance and abundance. It is within the experience of every entomologist that species of all orders have their "years," seasons when, owing to causes probably exceedingly complex and often indirect, but which are certainly quite beyond our present knowledge, a species will abound throughout its range and often overflow its normal limits. Such a spring tide of profusion is always followed by the ebb of scarcity, and it is the mean of a long series of years which will fix the true range limit of a species. Just as the occasional occurrence of *Calosoma sycophanta* during such favourable years along our southern coast does not give that species any real right to a place in the British fauna, so a northern form may in similar times of its abundance extend southward, or a southern one northward. And of course to the casual collector such occurences are most delusive. Indeed, no single record of a species in any given locality is, I believe, sufficient to justify us in assuming that such a locality marks the extent of its true specific range, nothing but observations conducted consecutively over a long series of years are really sufficient for such a conclusion, observations which could determine whether the species was merely a chance visitor impelled by some migratory instinct to diffuse itself, or whether it was so far established as to appear in fewer or greater numbers during most years and to be resident there during all stages of its existence.

These are some of the difficulties which beset an enquiry into a subject as yet perhaps hardly ripe for discussion. Year by year, however, we are slowly adding to our stock of knowledge and of recorded facts, and I have ventured on these speculations more perhaps as indicating what may be the lines of future research into the distribution of our British coleoptera, than as propounding a theory which adequately explains it.

ORTHOPTERA.

Saga natoliæ, Serv., at Constantinople.—While riding on the moors near the Forest of Belgrade, about six or seven miles west of Therapia, on August 25th, I was lucky enough to catch sight of a green *Saga* crawling on the grass. It was too large to put into any box I had with me, and I had to bring it home alive in my handkerchief. It turned out to be a *Saga natoliae*, Serv., ♀, a typical Balkan form. Brunner has taken it at Castellastua, in Dalmatia, but I failed to find it there last year, and he records it also from Brussa and Smyrna, in Asia Minor. They are powerful carnivorous insects, capable of giving a good bite, which may even draw blood from the hard skin of the hand; they sit waiting on the top of weeds and clumps of herbage which stand higher than the surrounding grass, from which they can see and pounce upon their prey, which seem to be smaller insects of any sort. The females are far commoner than the males, and, in fact, the male of *S. serrata*, Fabr., is almost unknown, whereas the female is far from rare; it appears that they breed by parthenogenesis. My specimen, when opened, was found to contain several eggs ready for oviposition, and four or five half developed.—M. Burr, F.Z.S., Dormans Park. *September* 10*th*, 1901.

VARIATION.

Variation of Zonosoma pendularia.—The most frequent form of *Z. pendularia* obtained here is dark slaty-blue with a broad, bright red band, the edges running into the blue and being very ill-defined. The ordinary type form is rare. I think this is a very distinct case of protective coloration. On the ordinary white-barked birch the type form is hardly visible, but very few of the birches here are white-barked, only a few of the larger ones being so as a rule; the bark is usually dark brown, mottled with a little white, and coloured also by lichens; on these stems the typical form is most conspicuous, and can be seen many yards away, whereas the dark form is almost invisible and is most easily overlooked; very occasionally it sits on oak-trees in which the dark form has the same advantage of being inconspicuous, whilst the type is just the reverse.—F. C. Woodforde, F.E.S., Market Drayton. *June* 17*th*, 1901. [The banded form appears to be a quite distinct and unnamed aberration. There is a var. (et. ab.) *griseolata*, Staud., "Iris," x., p. 23, diagnosed in Staudinger's *Cat.*, 3rd ed., as: "Al. dense griseo-inspersis, minus signatis." One specimen, which I saw from Mr. Woodforde's locality, might well belong here. The extreme form with the bright red band is, however, very striking and unusual.—Ed.]

Seasonal dimorphism in Cilix glaucata.—Whilst examining my captures of the current year I was struck by the decided difference between the 1st and 2nd broods of *Cilix glaucata*, the latter being so much paler.

In the *Ent. Record*, vol. vii., p. 303, Mr. Douglas C. Bate notes, in an article on the Macro-Lepidoptera of Dulwich, that in the years 1893 and 1895 he fancied that *C. glaucata* had a partial 3rd brood. If any one has captured undoubted specimens of such a brood, or bred them, it would be interesting to know whether the specimens are dark like the first, showing that these two forms are alternate, or like the second. If the latter be so, the darker form of the 1st brood might possibly be the result of passing the winter, that is to say, a period of six months, in the pupal state, instead of a few weeks as in the case of the 2nd and partial 3rd broods.—J. F. Bird, The Lodge, Cowfold, Sussex. *August* 21*st*, 1901.

Dark aberrations of Abraxas sylvata.—This year, on the ground where the so-called "blue" aberrations of *Abraxas sylvata* have occurred during the past few years, we found even the type extremely rare, no dark aberrations and not many pale ones, while the proportion of cripples was enormous. It occurs to me that this aberration is really a diseased form. As far as my experience goes it will not breed true, and the large percentage of cripples both among the aberrations and the type seems to suggest an enfeebled race, owing probably to some purely local cause, while the fact that the species is evidently decreasing in numbers, points to a similar conclusion. I had ova last year from a dark ♀, but though sleeved out from the first on a growing tree, the larvæ did badly, and those that did produce moths yielded nothing like an aberration. I should like to see this question threshed out.—(Rev.) C. D. Ash, M.A., Skipwith Rectory, Selby. *July* 17*th*, 1901.

Dwarf Lepidoptera.—One noticeable feature of the season has been the number of undersized specimens taken wild. Several *Tephrosia crepuscularia* (*biundularia*) have been much below usual size, and a ♂ *Amphidasys betularia* ab. *doubledayaria*, at Sledmere, was a veritable dwarf. A number of *Anthrocera lonicerae* pupæ, collected at Sandburn are yielding very small specimens. Larvæ of *Thecla pruni* also, which pupated within 24 hours or so of capture, have yielded some very small specimens, and many of the *Urapteryx sambucata*, which are now swarming everywhere, are little bigger than some of the *Rumia luteolata* that we get here. Has the dry season here anything to do with this? Strange to say, during the last few days, I have netted in my garden two of the largest and brightest *Pericallia syringaria*, a species usually rare with us, that I ever saw.—Ibid.

Aberration of Smerinthus tiliæ.—I had the good fortune to breed an aberration of *Smerinthus tiliae* on May 18th last, from a larva taken the previous autumn at East Dulwich. It is very similar to fig. 7 on plate A in *Ent. Record*, vol. i., with the exception of the ground colour, which is of a darker brown, and the markings near the tip of forewing are an intense green. The band on forewing is replaced by a spot as in fig. 7.—C. W. Colthrup, 127, Barry Road, East Dulwich, S.E.

SCIENTIFIC NOTES AND OBSERVATIONS.

Gynandromorphous Epione vespertaria.—On July 13th, I bred a gynandromorphous *Epione vespertaria* from a larva swept with others in June. The sexual dimorphism of this species is so striking that the presence of both sexes in one specimen gives it a very curious appearance. The left side is ♂ and the right side ♀. The specimen is in perfect condition but somewhat undersized.—S. Walker, F.E.S., York. *July 27th*, 1901.

Hybrid Lasiocampa quercûs ♂ × Pachygastria trifolii ♀.—This hybrid was bred by Wagner (see Standfuss, *Handbuch*, &c., p. 57). We have, in vol. iii of *British Lepidoptera* named this hybrid *wagneri*, and make this announcement to prevent any duplication of names.—J. W. Tutt.

Argynnis adippe ♂ paired with A. paphia ♀.—Yesterday afternoon, July 20th, 1901, while collecting in the Helmerth wood, I came upon a ♂ *Argynnis adippe, in cop.* with a ♀ *A. paphia*; when disturbed, they settled on the lower branches of an oak only a few yards from the ground, where I had ample leisure to see both specimens over and over again. On being again disturbed by two or three ♂ *A. paphia* they left the oak-tree, and sought a fresh perch on a nut-tree close at hand. In these journeys, strange to say the ♂ did all the flying, and succeeded in carrying the ♀ *A. paphia*, though the latter was by far the larger insect. This is quite contrary to my experience, having invariably observed the ♀ carrying the ♂ when flying. Later in the afternoon, I disturbed two *A. paphia, in cop.*, and when on the wing, the ♀ did all the flying. It will be very interesting, next season, to see whether there will be any hybrids as the result.—F. B. Newnham, M.A., Church Stretton. *July 21st*, 1901.

Habits of certain butterflies when disturbed during copulation.—Whilst on the Mendelstrasse in August, 1895, I repeatedly observed the ♂ of *Dryas* (*Argynnis*) *paphia* carry the ♀ when paired, and never the opposite. During my visit to the Vaudois, July 25th-August 24th, this year, I again many times saw *Dryas paphia* flying whilst *in copulâ*. The male invariably, in my experience, carried the female, and I must have made the observation during the last month, at least a score of times, a half of these, perhaps, being a typical ♂ *paphia* paired with a ♀ var. *valesina*. It is remarkable that, however worn and battered, and apparently incapable the ♂ may be physically to accomplish such a flight, the ♀ never attempts, in my experience, to fly, either hanging motionless or slightly separating its wings as if to make itself ride more lightly. The ♂ *Argynnis niobe* also carries the ♀, and I have seen a ♂ of this species, so worn and broken as to be incapable of flying more than a yard or two at a time, paired with a large, heavy, newly-emerged ♀, make strenuous efforts to escape capture, rising and settling repeatedly, but the ♀ making no attempt to use its wings. Similarly the ♂ of *A. aglaia* always carries the ♀ and so does the male of *A. lathonia*. Observations on *A. niobe* in this direction have been almost unlimited, and at least two instances of the flight of *A. aglaia* and *A. lathonia* when paired, have occurred to me during the last three weeks. Mr. Newnham's observation (*suprà*) of a ♀ *paphia* carrying the ♂ when paired, comes as a surprise to me, I thought the habit so positively fixed. In some of the "blues" the ♂ again carries the ♀, but I believe I have somewhere recorded that, among some of the Melitæas, *e.g.*, *M. didyma*, the ♀ always carries the ♂. On the other hand, I believe the ♂ *Melanargia galathea* always carries the ♀, even when the former is worn to rags.—J. W. Tutt. *August 27th*, 1901.

Probable second pairing of Melanargia galathea.—We have begun to get accustomed to the fact that many lepidoptera pair more than once. I captured about 1.30 p.m. on August 4th last, near Torre

Pellice, a pair of *Melanargia galathea* in such thoroughly bad condition that I was certain that the ♀, at least, must have paired before. I boxed them, and they separated about 4.30 p.m. The ♂ died about an hour afterwards. In the morning I found that the ♀ had laid nine eggs, and had also died during the night. Her abdomen was quite empty, so that a previous pairing was in her case almost certain. The eggs hatched on August 24th-28th.—Ibid.

The lid of the cocoon of Lachneis lanestris.—At page 244, *anteà*, our Editor makes a quotation from Mr. Latter's paper, *Trans. Ent. Soc. London*, 1895, pp. 407-8 (not pp. 475-8 as there printed). In Mr. Latter's remarks there is nothing to correct, but some amplification is desirable. He refers to *Lasiocampa quercûs* var. *callunae*, *Lachneis lanestris* and *Cochlidion limacodes* (*testudo*), as having similar cocoons, and engineering their escape in the same way. He especially notes that *L. quercus* var. *callunae* and *Cochlidion testudo* have the head-front of the imago produced into an umbo or boss, and that *Lachneis lanestris* is similarly but less markedly endowed. He also notes that this boss hardly exists in the pupa of the Lachneids, but is more marked in the pupa of *C. testudo* than in the imago. I have not observed the emergence of *L. quercûs* var. *callunae* for many years; but I have made recent observations on *L. lanestris* and *C. testudo*. I have no doubt about them, but about *L. quercûs* var. *callunae*, my ideas are more vague. *L. quercûs* var. *callunae*, I think, breaks off a lid like they do, but more often it fractures very irregularly and often into several pieces, but it is a fracture rather than a solution, though Latter says the imago produces much alkaline liquid. In all three cases the force producing the fracture is the pressure, which the inflation of the imago enables it to exert from "within from end to end of the cocoon." The "sharply-pointed umbo" merely determines the starting point of the fracture, *i.e.*, it increases the strain immensely at one particular point, and as soon as fracture commences there it at once runs round the whole lid. Mr. Latter is quite right in supposing the lid of *C. testudo* is ruptured by the pupa, *i.e.*, by the imago within the pupa skin, since, like all Incompletæ, the unruptured pupa emerges from the cocoon. The sharp point of the pupa does not act as Mr. Latter expresses it "as an awl," but makes the pressure the whole pupa is exerting a little more strenuous at one point, tending to an angular bending of the cocoon at that point, and so beginning the fracture. When a "pupa incompleta" has to force its way through meshes of silk, &c., as in most Tortricids, *Cossus*, &c., an awl-like effect probably occurs, but in all cases of lids, as for instance in Sesiids, the process is probably the same as occurs in *C. testudo*. Most people are, I think, familiar with the effect of a very localised interference being *per se* harmless, but determining at once that a strain should produce powerful effects.—T. A. Chapman, M.D., Betula, Reigate.

Luffia lapidella larvæ in September.—Mr. Luff reports that the imagines of this insect from larvæ that have fed up on inland walls have long emerged, yet he sends from rocks near the sea living and active larvæ that are apparently full-fed. I brought last spring from Cannes a number of larvæ that I supposed to be, and that by all precedent ought to have been, *Luffia ferchaultella*, and which I reported as such (*anteà*, vol. xiii., p. 190). During my absence in July these emerged, and though on my return, almost unrecognisable, were half a dozen of each sex, and therefore certainly *L. lapidella*. M. Constant had never taken these near Cannes. A few cases of *Luffia* were taken at Arcachon, July 4th, from these a ♀ emerged about August 16th, and a ♂ August 23rd. These were from the fir-tree trunks inland, walls near the sea shore presented only empty cases, emerged probably in late May or early June. The dates, therefore, of these Arcachon *L. lapidella*, as referring to coast and inland examples, were precisely contrary to those met with by Mr. Luff, in Guernsey. In the case of Arcachon, and, I presume, probably of Guernsey also, "inland" means less than a mile from the sea. There is still much interesting material to be observed in the matter of these Luffias.—T. A. Chapman, M.D., Betula, Reigate. *September 6th*, 1901.

I found what appeared to be full-grown larvæ of *Luffia lapidella* here and there around Torre Pellice, chiefly on the walls between this town and Villar during the first ten days of August. Unfortunately my box in which they were kept has gone a missing.—J. W. Tutt.

The cocoon-cutter of Actias luna.—I have just had the opportunity of noting the use of this weapon in the emergence of *Actias luna*. I can confirm Professor Packard's observations on it in every particular, except one, and that is, that the cutter is not essentially a cutting instrument. The moth exudes abundant softening fluid, so that the threads of silk are no longer fastened together in a solid plate, but are individually separable. The cocoon-cutter, working really very noisily, as Professor Packard notes, teases these out and pulls them down from the end to the side of the cocoon. The force used is quite sufficient to frequently break an erroneously placed thread, but it probably rarely or never cuts one.—T. A. Chapman.

PRACTICAL HINTS.*

Field Work for October.

By J. W. TUTT, F.E.S.

1.—Pupæ of *Acherontia atropos* obtained first week in October, placed in a small breeding-cage and laid on about two inches of very damp moss and covered with about an inch of the same material; the cage then placed in a shady corner of a small humid plant stove, in a temperature ranging from 65°-80°F.; the moss covering the pupæ sprinkled with water every other day; imagines emerged at end of third week in splendid condition (Mason).

2. Collect larvæ of *Macrothylacia rubi* in the first or second week of October; place in a large empty wine case 30 inches long, 14 inches broad, 20 inches high at back, 15 inches in front, with space in the back for ventilation 15 inches × 5 inches covered with perforated zinc, the whole covered with a close-fitting glazed pane and made secure with hooks. Inside at each end a layer of *Sphagnum* moss about six inches deep, none in the centre where the jelly jar stands with food for larvæ so long as wanted; the latter when full-fed roll in a close ring in the *Sphagnum*, remain there till spring when they come up and

* Practical Hints for the Field Lepidopterist, recently published, contains 1,250 similar hints to these, distributed over every month in the year. Interleaved (for collector's own notes).—Ed.

spin at the top of the *Sphagnum*. The whole is kept out of doors (Finlay).

3.—The imagines of *Diloba caeruleocephala* emerge from pupa from 5-7 p.m. in the first week of October. They pair readily in confinement, but a female will sit still for several days if she be not fertilised, scarcely moving from the spot where she expanded her wings.

4.—*Tiliacea aurago* often appears at ivy in October; the females lay pretty freely in confinement on the stems of the branches of beech, especially in the axils of the leaves and shoots, and rarely scatter their eggs on the muslin or the walls of the receptacle in which they are confined.

5.—Imagines of *Dasycampa rubiginea* bred in autumn can be kept through the winter if supplied with thin syrup, on which they will occasionally feast, remaining generally quiet, however, under curled-up withered apple leaves, with which they should be supplied; they pair at the end of February and in early March, oviposit throughout March and April and on into May, the young larvæ feeding up freely on apple and dandelion. The larvæ are all usually full-fed by the commencement of June, the imagines appear throughout September, October and on into November.

6.—The larvæ of *Toxocampa pastinum* are to be obtained in much greater numbers in autumn than in spring on *Vicia cracca*. Holland notes gathering them at the rate of 150 per hour in autumn, while he could only get some 50 in two mornings on the same ground the next spring.

7.—Larvæ of *Heterogenea cruciata* must be searched for in October on beech; cannot be beaten in numbers; larvæ pupate readily on leaves or twigs; very uncertain in appearance, common in 1884 at Lyndhurst, then scarce till 1892, when it was found in great numbers, the cocoons have never been obtained in the wilds (Hewett).

8.—The larvæ of *Cryptoblabes bistriga* should be searched for on oak, from the middle till the end of October; at the same time one is sure to find the small hybernating larvæ of *Rhodophaea consociella*.

9.—The rush-feeding Coleophorids want very careful separation. We have among the insects that used to be united as *Coleophora murinipennella* and *C. caespititiella*, five species—(1) *C. sylvaticella*, larva on *Luzula sylvatica*, imago flies in May. (2) *C. alticolella*, larva on *Juncus lamprocarpus*, imago flies in July. (3) *C. murinipennella*, larva on *Luzula campestris* and *L. multiflora*, imago flies in May. (4) *C. caespititiella*, larva on many kinds of *Juncus*, flies in June. (5) *C. glaucicolella*, larva on many kinds of *Juncus*, particularly *J. glaucus*, flies in July. (6) *C. agrammella*, chiefly on *Juncus conglomeratus*, but also on *J. effusus* and *J. lamprocarpus*.

10.—Males of *Lemnatophila phryganella* fly in early November in woods, &c., especially among bracken, the semiapterous females with whitish wings and black markings, being found at rest on the tree-trunks near.

NOTES ON COLLECTING, Etc.

Lepidoptera in the New Forest.—During June and early July I have spent several days beating for larvæ in the New Forest. The abundance of larvæ of *Asphalia ridens*, *Zephyrus quercûs* and *Lymantria monacha*, was quite phenomenal, and has already been noticed, whilst those of *Amphidasys strataria*, *Cleora lichenaria*, *C. glabraria*, *Selenia tetralunaria*, *Drymonia chaonia*, and *Notodonta trepida* were also taken. Sugar is fairly good both here at Boscombe and in the New Forest, such insects as *Triphaena orbona* (*subsequa*) four, *Apatela aceris*, *Moma orion*, *Dipterygia scabriuscula*, *Hadena genistae* and *Caradrina ambigua* (very early for this), having occurred, whilst it may be well to mention how common *Erastria fasciana* (*fuscula*) has been in the Forest this year. *Dryas paphia*, *Argynnis aglaia*, *A. adippe* and *Limenitis sibylla* are also common, but I have not seen var. *valesina* yet although I heard of two being captured. Larvæ of *Leucoma salicis* has been abundant, too, at Boscombe, previously I have never taken more than three or four a year.—(Major) R. B. Robertson, Forest View, Southbourne Road, Boscombe. *July 8th*, 1901.

Lepidoptera at Chingford.—Sugar has paid exceedingly well this year at Chingford, *Dicycla oo* has occurred to the number of 10-20 per evening, and of *Cymatophora ocularis*, three were taken on one evening, whilst during the last three weeks I have taken *Dipterygia pinastri*, *Aplecta nebulosa*, *Graphiphora augur*, *Noctua plecta*, *N. triangulum*, *Agrotis suffusa*, *Triphaena orbona*, *T. fimbria*, *Caradrina blanda*, *Xylophasia lithoxylea*, *X. hepatica*, *Leucania lithargyria*, *Rusina tenebrosa*, *Gonophora derasa*, *Thyatyra batis* (ten on July 10th), *Taeniocampa gothica*, and many other species, *Miana strigilis* has been extremely abundant.—A. J. Croker, 277, Cambridge Road, Bethnal Green. *July 11th*, 1901.

Lepidoptera at Oxton.—Until recently light has paid badly this year, a few *Notodonta trepida*, *N. chaonia* and *N. trimacula* (below the average number usually thus taken) being the best captures, whilst *Lithosia sororcula* has again been fairly common. Recently, since the full moon, the traps have been full, the most striking thing being the great number of *Cledeobia angustalis* taken ; previously three examples have been the maximum for a year's take, but this year they were so abundant that on the morning of July 8th, I found from 70-100 in the traps ; there was no female among them, and they were pretty equally distributed between the three traps. Day-flying species were common in June, and have remained so to date, the most notable captures being *Eupithecia dodoneata*, *Phoxopteryx myrtillana*, *Dichrorhampha sequana*, *D. alpinana*, *Hypsipetes trifasciata*, *Eupisteria heparata* and *Nemeophila plantaginis*, commoner things were in abundance. On July 6th, a bright hot day, whilst collecting with my brother-in-law, he beat, about 4-30 p.m., a Scotch fir standing by itself in the midst of heather and bracken, and obtained from it 24 *Micropteryx aureatella*, the first record of the species from the district. We failed to find any others in the neighbourhood and subsequent visits to the tree proved unproductive. *M. seppella* has been unusually abundant this year. Recently I worked carefully last year's locality for *Nemotois minimella*, but only eight resulted from three days' work. I may also note the great abundance of larvæ of *Eupithecia tenuiata* in the sallow catkins this year; I collected many and have since bred a large number.—E. F. C. Studd, M.A., F.E.S., Oxton, near Exeter. *July 13th*, 1901.

Lepidoptera in Yorkshire.—So far the season has not been a great success. Sugar is of no use at all and probably will not be until we get rain, everything is parched. Flowers have been fairly attractive, especially *Mathiola* (night scented stock), which has been visited by crowds of *Habrostola tripartita*, *Plusia gamma*, *P. chrysitis* and *P. iota*. *Choerocampa porcellus* was common at rhododendrons from June 4th-12th, with an occasional *C. elpenor*, then no more came till July 14th, when a fine specimen visited the stocks and another emerged in one of my cages a few days earlier. *Melanippe galiata* began to emerge on June 11th, and have been coming out singly at intervals of from two days to a week ever since. The best capture in this neighbourhood has been *Acidalia straminata*, of which Mr. Bower and myself got some very fine specimens. One was taken last year by chance, so this year we worked for it. It seems excessively local.—(Rev.) C. D. Ash, M.A., Skipwith Vicarage, Selby. *July* 17*th*, 1901.

Lepidoptera in the New Forest.—At Whitsun, New Forest insects were well up to time; *Macroglossa bombyliformis* was plentiful but already *passé; Argynnis adippe* was already out fairly thickly on June 26th, and I obtained a dark specimen. The year has been a good one for *Agrotis cinerea*, *Pachetra leucophaea* and *Cidaria reticulata*.—B. W. Adkin, Brandon House, Morden Hill, Lewisham. *July* 19*th*, 1901.

Lepidoptera in Essex.—The season here has been a good one. *Apamea unanimis* was fairly common on sugared maple at the edge of a ditch near Prittlewell from June 10th. Old plants of *Statice* brought from the marshes near here, yielded between June 30th and July 18th more than 60 examples of *Goniodoma auroguttella*. *Cidaria picata*, which I had not previously found in this district, occurred July 3rd, and came to sugar in excellent condition July 23rd. The brilliant *Nemotois fasciellus* was netted, but not commonly, among *Ballota nigra* at North Shoebury, on July 7th; *Rhodophaea marmorea* flying over blackthorn at Great Wakering on July 8th; *Melanippe procellata* and *Phibalapteryx tersata* on July 9th, among clematis, at Southchurch. *Cledeobia angustalis* was somewhat common on the Hadleigh Castle slopes on July 10th; *Gonophora derasa* came to sugar at Eastwood July 12th. *Leioptilus microdactylus* occurred among *Eupatorium*, and *Aciptilia galactodactyla* near burdock, at North Shoebury, on July 15th. *Botys pandalis* was netted at Great Wakering, July 20th, but was not common. *Mamestra persicariae* came to light on July 21st and *Mania maura* to sugar on July 23rd. I have at the present time attached to the sides of a breeding-cage a number of pupæ of *Mimaeseoptilus zophodactylus* from larvæ that had crept up from plants of *Erythraea* gathered at North Shoebury.—F. G. Whittle, 3, Marine Avenue, Southend. *August* 1*st*, 1901.

Information as to keeping pupæ of Hylophila bicolorana wanted.—For several years I have beaten larvæ of *Hylophila bicolorana* from oak in June; they seem rather abundant and feed in confinement but never spin a cocoon; they pupate instead on the surface of the ground. The pupæ appear healthy and after a few days become blackish as though they were going to emerge; but this they never do, dying within a few weeks. Has any other lepidopterist had a similar experience, or can anyone suggest a cause?—W. S. Riding, M.D., F.E.S., Buckerell, Devon. *August* 6*th*, 1901.

Lepidoptera at King's Lynn.—The season here has been a good one. *Thecla w-album* larvæ have been very abundant, and could have been obtained in numbers from the elm-trees; *Zephyrus quercûs* larvæ simply swarmed. On the 23rd inst. a full-grown larva of *Sphinx convolvuli* was picked up on the road near the town and brought to me, and another on the 26th, both have since gone down. Two specimens of *Colias hyale* have also been taken here this month.—E. A. Atmore, F.E.S., King's Lynn. *August* 30*th*, 1901.

Lepidoptera in south Devon.—During the first three weeks of August, lepidoptera were not particularly abundant. I took a good series of *Callimorpha hera*, with a very large proportion of yellow and orange forms. *Bryophila muralis* was abundant and exceedingly varied; one wall, about 200 yards long, producing over 100 specimens in six days. They emerge between 5.30 and 7.30 p.m., and this is the best time of the day, I found, for looking for them, as they are far more conspicuous when stretching their wings or when at rest on the spot where they have just closed them. When they had flown and chosen a resting-place for themselves they were exceedingly hard to find, so well did they harmonise with their surroundings. Sugar at Torcross and Torquay was a great failure. Very few insects came to it, and in a fortnight we did not see more than 40 *Caradrina ambigua*. *Agrotis puta* was present in small numbers, and so were *Miana literosa* and *Miana furuncula*. The latter species was seen flying at dusk in swarms, but on no evening were more than twenty settled on the whole ground at sugar. *Lithosia caniola* had been numerous earlier in August, but they were mostly over by the time we arrived; altogether we got forty, about a half being in really good condition. On one occasion we found a specimen fluttering about a sugared flower, and on boxing it, two more were discovered to be lying in the box paired. *Leucania putrescens* was quite over; our only rarities were two *Leucania albipuncta* and two *Heliothis armigera*, one specimen of each at each of the above-mentioned places. After my experience at Torquay in 1896 and 1897, it was very disappointing.—F. G. Woodforde, F.E.S., Market Drayton. *August* 23*rd*, 1901.

Nyssia lapponaria in Perthshire.—Many of your readers may be interested to hear that last year I took two larvæ of *Nyssia lapponaria*, in Perthshire, from which one imago, a female, emerged. This July, I have again obtained larvæ in the same locality. I believe Mr. Christy is the only other entomologist who has taken this insect recently. According to Barrett he found his larvæ on hawthorn and birch, whereas mine were feeding on low plants—ling, bell-heather, and bog-myrtle.—E. A. Cockayne, 6, Tapton House Road, Sheffield.

Plusia moneta and Porthesia chrysorrhœa at Norwood.—It may interest you to know that *Plusia moneta* and *Porthesia chrysorrhoea* have occurred at Norwood. I have taken five of the former, four at Norwood, and one at Sydenham, it has also been taken at West Wickham. A few *Eutricha quercifolia* have also been taken here by others as well as myself.—A. M. Swain, 5, Kelvin Terrace, Sydenham, S.E. *August* 12*th*, 1901.

Papilio machaon and other Lepidoptera in the Esher district.—The following observations made around Esher this year may not prove uninteresting; on May 19th I saw a specimen of *Papilio machaon* on a lilac bush in Claremont Lane, but did not capture it, whilst on May 20th I found in my garden a specimen of *Sphinx ligustri*. On June 9th, when dusking, my boy beat a few stunted willows from which fell a larva of *Cerura furcula*, which pupated the next day in the chip box in which I had placed it, an imago duly emerging on August 8th. I have never before heard of *C. furcula* being double-brooded. My son, on June 23rd, captured on Arbrook Common, *Choerocampa porcellus* on the wing, flying round a blackberry bush, the first I ever saw taken on the wing, although I have found larvæ and bred imagines at Cambridge. If this one fed up in the place where it was found it must have fed on some other species of bedstraw than *Galium verum*, as this is not found on the Common. I also captured a fine specimen of *Heliothis armiger* on Oxshott Heath, on August 10th.—Harry Fleet, 7, Park Road, Esher, Surrey. *August 10th*, 1901.

Sesia andreniformis in Kent.—Whilst my son and I were engaged sembling for *Lasiocampa quercûs* near here on July 17th last, the latter took a clearwing which turns out to be a specimen of the rarest of the British Sesiids, *viz.*, *Sesia andreniformis*. It was settled on a leaf of the wild cornel or dogwood, *Cornus sanguinea*, in the stems of which the larva is believed to feed. I should have recorded it earlier, but though it perfectly corresponded with the description of *S. andreniformis*, as given in Newman's *British Moths*, I was still doubtful about it, but having now had an opportunity of submitting the same to my friend, the Rev. C. R. N. Burrows, of Mucking, the latter says there is not the least doubt as to the identity of the insect.—H. Huggins, Jun., 13, Clarence Place, Gravesend. *August 22nd*, 1901.

Sphinx ligustri full-fed in July.—On July 22nd, I took three larvæ of *Sphinx ligustri*, two being apparently almost full-fed, these two burrowed on July 28th and 29th respectively, whilst the third, which was much smaller when taken, burrowed on August 6th. Is this not very early for this species to be full-fed?—Ibid.

Colias hyale at Gravesend.—I did not take this species again, after the specimen I recorded as being taken on June 14th, until the 9th inst., when I saw and took a solitary one; since then, on the 19th, I saw two and took one, on the 20th I saw two and took one, on 21st I saw five and took two, to-day have seen eleven and have taken nine. It seems, therefore, as if this, though in a minor degree as compared with last year, is going to be a "*hyale* year." It is worthy of notice, too, that all these *C. hyale* have been taken in two lucerne fields adjoining each other. Yesterday I took a big round, visiting many spots which were very prolific of *C. hyale* last year, but, with the exception above mentioned, without result.—Ibid.

Entomological notes from Rye.—Of the insects captured at Rye during the first three weeks of August, the following are interesting:—*Leucania albipuncta* and *Calymnia affinis* at sugar, *Stauropus fagi*, larvæ, *Sphinx convolvuli*, an imago, in the High Street, at Rye. Sugaring on the whole, was poor, though *Agrotis tritici*, *A. vestigialis*, *A. puta*, and others were plentiful on the sandhills. Some 50 larvæ of *Choerocampa porcellus* were obtained, as also many of *Smerinthus populi*, and *Pyrameis atalanta*. Among the Coleoptera I may mention the capture of six *Hylesinus oleiperda* from ash-trees, an addition to the Sussex list.—J. Henderson, Birchin Lane, London. *August 21st*, 1901.

Sphinx convolvuli in Essex.—I took a specimen of *Sphinx convol-*

vuli at light on the 25th inst. and one was sent from Rainham on the 26th. This morning a larva was brought in, which quite contradicts the published descriptions. It is bright, pale green, vertical lines white, horn orange, and spiracles orange ringed with black. Anal flap, and anal prolegs yellow. Every segment transversely lined narrowly in black, corresponding with the subsegmental divisions.—(Rev.) C. R. N. Burrows, Mucking, Essex. *August 28th*, 1901.

Occurrence of Eutricha quercifolia.—I again took *Eutricha quercifolia* at Margate, in May, this year, the larvæ spun up on June 8th, 9th, and 11th, and imagines emerged on July 12th and 13th. I also took a ♂ *E. quercifolia* from a street lamp at Newport, Isle of Wight.—C. W. Colthrup, 127, Barry Road, East Dulwich, S.E. *September 10th*, 1901.

Sphinx convolvuli in East Dulwich.—On September 2nd I had brought me a specimen of *Sphinx convolvuli*, taken alive in Barry Road, East Dulwich.—Ibid.

Boletobia fuliginaria at Hale End.—On July 29th last, I was fortunate enough to take a specimen of *Boletobia fuliginaria* in my garden at Hale End. The insect was flitting round a sugared post, though I cannot say whether it was attracted by the sugar or not; it is in good condition. I had never seen the species before, but it has been identified by my friend Mr. Prout.—R. W. Robbins, 19, Woodland View, Hale End, Walthamstow. *September 11th*, 1901.

Catocala fraxini in Suffolk.—Mr. J. F. Green, of West Lodge, Blackheath, wishes me to report in the *Record*, his good fortune in capturing *Catocala fraxini*, on August 24th, this year. The specimen was taken at sugar in the grounds of Benacre Hall, Wrentham. I have seen the moth, which, with the exception of a slight blemish to the tip of the right forewing, and equally slight rubbing to the thorax, is a very fine example. Mr. Green informs me that when taken the specimen was absolutely perfect, but not anticipating seeing such a large insect he was only provided with ordinary-sized cyanide bottles, and therefore his prize had to be carried in a net into the house. Although the distance was short, and covered with the utmost despatch, it proved long enough to cause the injuries stated.—B. A. Bower, F.E.S., "Langley," Willow Grove, Chislehurst. *September 7th*, 1901.

Aporia cratægi, Pieris daplidice, etc., at Dover.—This year I have again taken *Aporia crataegi*, which makes the sixth year in succession, and there can be little doubt but that the insect has occurred continuously in this particular locality for the last fourteen or fifteen years at the least, for, from information obtained from the natives, I learn that "the big white butterfly," as they call it, always makes its appearance about midsummer, and has done so as long as they can remember, though not always as plentifully one year as another. On August 11th I had the good fortune to take two specimens of *Pieris daplidice*, and just a week later I took a third specimen. All three were taken within a short distance of one another, and, had I worked for them before, no doubt I should have been rewarded with the capture of one or two more. The third and last specimen taken is in the collection of Mr. H. Wood, of Ashford, with whom I was when I caught the first two, whilst Mr. Banks, of this town, saw me catch the last specimen. This one was rather worn, and is set showing the underside. In early July I took a single specimen of *Colias hyale* and another last month; but they are not in any numbers in this part of the country. *M. stellatarum* is now dashing about in some numbers.—H. Douglas Stockwell, 2, Albert Road, Dover. *September* 6*th*, 1901.

Mellinia ocellaris at Mucking.—I took a very nice specimen of *Mellinia ocellaris* at sugar in my garden last night. It looked quite like a pale *M. gilvago*, but puzzled me, as its behaviour was so very unlike that species. *M. gilvago* is, as a rule, very quiet when the light falls on it, but this example of *M. ocellaris* flew off and at the light, and off again, and round, and it was not until I turned the bright rays of my acetylene lamp upon the ground that I could pull it up and capture it. Has anyone noticed this peculiarity before? Is the species taken regularly anywhere in Britain?—(Rev.) C. R. N. Burrows, Mucking Vicarage. *September* 14*th*, 1901.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Eggs of Lasiocampa fasciatella var. excellens.—These are apparently scattered loosely like those of *Lasiocampa quercûs*, but are rather larger than those of the latter species. Each forms a very broad rounded oval, but varying somewhat, some almost round, but invariably flattened on the two sides and deeply depressed as well. Colour dark umber-brown; with a lens the ground-colour is seen to be pinkish or flesh-colour, much mottled and splashed with very dark umber, almost black, much like the coloration of a scarlet-runner bean only with more dark and less light, and the mottlings are finer (in relation to size) on the egg. At one end, rather the blunter of the two, there is a slightly flattened disc with a large and distinct very dark coloured spot in it. This is surrounded in some eggs by a margin or ring of the pale ground colour, making it a very distinct feature, but in other ova the ring or margin is very narrow and the spot is therefore far less conspicuous. The general colour of the egg also varies, the ground colour of some being pale brown instead of the pink described above. The micropyle is slightly depressed, the general surface of egg dead and covered with minute pitting (not enough light to distinguish structural detail). The eggs remind one on the one hand of those of the Pachygastriid group—dead surface, scattered, not attached, and somewhat in coloration—and are nearest to *Pachygastria trifolii*, on the other hand, the flattened sides and especially the plan of coloration remind one of *Poecilocampa populi*, whilst again in some eggs there are traces of double dark bands that remind one of the eggs of *Cosmotriche potatoria* and *Eutricha quercifolia*. I opened one of the eggs but it contained nothing but a turbid greenish fluid, which appeared to contain granules. The roughness or deadness of surface appears to be due to small raised points or knobs, which, so far as I can make out, in certain parts of the egg, are placed at the points of a hexagonal network. A small and roughly marked rosette of hexagonal cells is present round the micropyle.—A. Bacot. [Received from Ernst Heyne, January, 1899. The eggs unfortunately did not hatch.]

Larva of Anthrocera trifolii hybernating a second winter.—I had a brood of *Anthrocera trifolii* from a ♀ taken at Tiverton in July, 1900. After hybernation the larvæ commenced to feed again, and all but two fed up, and have now emerged. These two mentioned seemed to return almost at once to hybernation, and are still alive, but have not moved or eaten for months. Is this usual?—E. F. C. Studd, M.A., Oxton, Exeter. *July* 17*th*, 1901. [See *British Lepidoptera*, i., p. 491, for habits of the larva of this species.—Ed.]

A whole brood of *Anthrocera trifolii* that I had from ova in 1892, hybernated for two winters in the larval stage before feeding up.—(Rev.) C. D. Ash, M.A., Skipwith Vicarage, Selby. *July* 19*th*, 1901.

CURRENT NOTES.

Scudder has once more produced a comprehensive and detailed catalogue entitled "Alphabetical Index to North American Orthoptera, described in the Eighteenth and Nineteenth Centuries," published in the *Occasional papers of the Boston Natural History Society*, vi., 1901. It is not a synonymic list but an index pure and simple, giving a mass of references, a complete bibliography of North American orthopterology, and at the end a careful index to specific names. As a catalogue it is of inestimable value to students, who should indeed be grateful, especially as the author remarks in his preface "it has been forty years in the making."

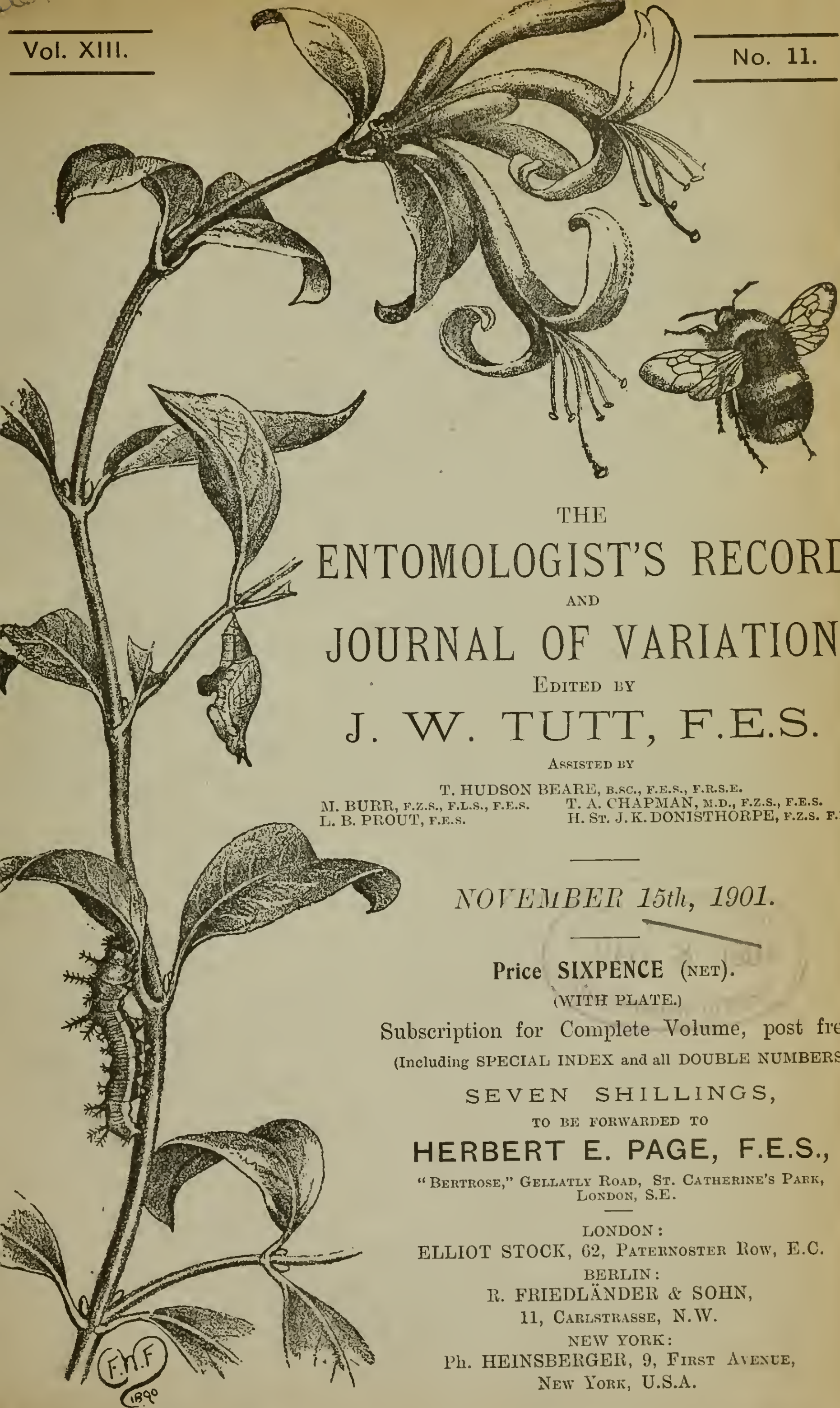
Mr. F. C. Adams records (*Ent. Mo. Mag.*) the capture of three specimens of the dipteron, *Lophosia fasciata*, Mg., in his garden, at Lyndhurst, on July 22nd, 24th, and August 1st, respectively. This is an addition to the British list.

Messrs. Cassell and Co., Ltd., have recently published a very useful book "Familiar Butterflies and Moths," by W. F. Kirby, F.L.S., F.E.S. It is excellently got up, the plates (coloured) are, as a rule, exceedingly good, and the letterpress accurate and reliable. It deals chiefly with British species, but several striking and well-known continental species are included. As a popular book it is sure to attract attention and to be favourably received, and it will undoubtedly prove of great value to any young lepidopterist in whose hands it may be placed.

After a long period of time, all too long for entomological science, the mantle of the old naturalists—Réaumur, De Geer, &c.—seems to have fallen on the shoulders of Professor Miall, to whom, and his talented assistants, we are indebted for many of the best recent contributions to entomology, considered as a branch of natural history. As supplementary to the account of the larva of *Eristalis*, in Miall's "Natural History of Aquatic Insects," Wilkinson has published a most interesting account (9 pp. and 2 plates) of "The Pharynx of the *Eristalis* larva," explaining in detail how the pharynx can be used as a strainer to separate fine organic particles, serviceable for food, from the water which passes into the beginning of the alimentary canal. We do not know whether this is obtainable from any firm of publishers, our copy having come direct from Mr. Wilkinson, Burnside, Skipton; but it might well be kept with everyone's copy of the "Natural History of Aquatic Insects" for reference.

Vol. XIII.

No. 11.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S.
T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S.
H. ST. J. K. DONISTHORPE, F.Z.S. F.E.S.

NOVEMBER 15th, 1901.

Price SIXPENCE (NET).

(WITH PLATE.)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),

SEVEN SHILLINGS,

TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

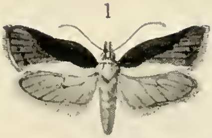
"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.

BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Copies may also be obtained from R. H. PORTER, 18, Princes Street, Cavendish Square, London, W.C.


1


2


3


4

E. C. Knight ad nat. del. West, Newman photo.

Aberrations of British Lepidoptera.

A butterfly hunt in the Cevennes.

By H. ROWLAND BROWN, M.A., F.E.S.

For some years past I have devoted some time of my entomological leisure to the butterflies of France, especially in the Alpes-Maritimes and the Riviera. This summer I found myself with my friend Mr. A. H. Jones, at the picturesque wayside station of St. Cécile d'Andorge a hundred miles south of Clermont Ferrand, on a baking day in July, and as no carriage awaited us for the drive to Florac, owing to the National Fête, we passed the night of the 15th there in an atmosphere of squibs and crackers, exploded in honour of the occasion. I had selected Florac for a prolonged stay after a careful perusal of Mr. Kane's *Handbook*, which now, as often before, had given me a delightful foretaste of joys to come. And Florac—the very name savours of flowers, and chestnut-wooded hills, long sweeps of lavender and thistles of enormous size and fierceness, among which it was not unreasonable to expect a strange and characteristic fauna. That third week in July will always remain a delightful memory. In the first place the locality was novel to me, and then the sun shone in an unclouded sky from morning till evening, to be succeeded by stars of such singular brightness as only the south can show. The long dusty journey from St. Cécile occupied the greater part of a day, and was wholly devoid of butterflies, save here and there, at first, a single *Gonepteryx cleopatra* of the second brood, and an occasional *Papilio podalirius*. In fact, it soon became clear to me that we were not to expect quantity, and we, therefore, buoyed ourselves up with visions of quality, for, although there is, I believe, no one butterfly peculiar to the Cevennes, there are forms of a few species to be met with which certainly differ from the types or varieties of them to be taken elsewhere. Our first day on the Empézon at once revealed the kind of collecting we were in for. A dusty footpath runs up sharp from the first bridge on the road to St. Enimie—the haunt of *Syrichthus carthami*, *Coenonympha dorus*, and those lesser-winged creatures which seem to love these arid regions. An occasional *Chrysophanus gordius*, a single *Thecla acaciae*, evidently the last of the brood, and *T. spini*, with innumerable *Melitaea didyma* and *Melanargia galatea*, afforded pleasant variety hunting, and the aberration *leucomelas* of the latter species was by no means rare. A little higher up, the road led into the chestnut woods, and we agreed with Robert Louis Stevenson, who passed this way some fifteen years ago with his donkey, that "to see a clan of old unconquerable chestnuts cluster 'like herded elephants' upon the spur of a mountain, is to rise to higher thoughts of the powers that are in Nature," and, as if nothing should be wanting to the fresh beauty of the scene, the trees were alive with that most splendid of the Satyrids, *Satyrus circe*, flying here, there and everywhere, with the sunlight flashing back spangles of electric reflection from its black-brown glossy wings. We could have taken hundreds had we been in the mood. Happily my companion's series was already complete, and, having secured a modest toll, I was well content to leave the others to their endless quest among the trailing sprays. It was here, also, that we first encountered *S. briseis*, or, rather, at the outskirts of the wood upon the sun-baked slopes where nothing but the berberis and boxwood flourish. Higher up we hit the first little patch of sainfoin, and then the chase began in earnest—for had we not come to find *Polyommatus dolus* whose food-plant it is. A few *Polyommatus meleager*, females for the most part, *P. hylas*, and a single *Argynnis daphne*, fell to our nets before the discovery of "a white variety of *P. damon*," motionless upon a flower stem. Of course this turned out to be the male of the species of which we were in search, and we were glad to observe that the few specimens taken that day (July 16th) were in perfect condition. The male of *P. dolus* can be mistaken on a close inspection for no other European butterfly. The delicate white-silver sheen of the upper wings, suffused with a brownish-purple flush in freshly-emerged examples, is as different from the tint of *P. corydon* as the twilight blue of the morning sky is from the fuller depths of noontide. The female on the wing, however, very closely resembles the female of *P. damon*, and the two fly together to make confusion worse confounded. On the upperside of the forewings the discoidal spot, which seems altogether wanting in some specimens of *P. damon*, is distinctly marked in *P. dolus*; in the female the hind margin of the lower wings shows a distinct row of orange-tawny ocellations (wholly absent in the female of *damon*), while the fawn colouring of the underside is deeper and richer, and the spots on the forewings more decidedly accentuated. That the larva feeds upon sainfoin only, I should think very doubtful, for, though the species was not abundant here (probably by reason of the earlier date), we found it later on in swarms in a locality where this plant appeared to be non-existent. Of aberrations there are none among the specimens which fell to my share, but the minute spots on the underside of the hindwing differ very considerably in position; in some specimens they are placed outside the characteristic white streak, in others within, and yet in others upon it. Higher up the Empézon, on the terraces of lavender, the insect occurred much more freely, and it was not altogether absent from the uplands on the opposite side of the valley, known as the Causse Méjean. It was to reach this goal that we started next morning betimes, for there is no shade on the road, which represents an hour and a half continuous collar work in the eye of the sun any time after seven o'clock. The main attraction for us was *Melanargia iapygia* var. *cleanthe*. But we were not so fortunate with it as with the preceding species. A more uninviting locality for the butterfly-hunter than these barren plateaux it is hard to conceive. Imagine a huge table-land rising in places to the dignity of unverdured ridges. Here and there a few scraggy oat-fields sustain a precarious existence; and, on the patches of roadside grass, now burnt to cinders, the long-bodied huge-eared sheep of the Noah's Ark type pretend to be satisfied with the grazing. But the all-prevailing plant of this desert is the thistle—vast, tow-headed, tough-stemmed stalks, with white rugged heads, and the blue witch-like variety, otherwise suggestive in its form of homely teasel. Then there was the usual aniline red kind, and finally that variety which, in decadence, suggests nothing so much as a sun-dried star-fish. However, it is among surroundings of this nature that *cleanthe* is to be caught, and, after cooling off in the grateful shade of a single sycamore, we were soon busy netting every *Melanargia* that came along. The result of two days' hard labour under a sweltering sun—Mr. Jones had the second day to himself—was three or four worn specimens only. We were evidently too late, and either *cleanthe* flies a very short time, or "June-July" in Kane should, I think, be confined to the earlier month. We had not seen much upon the interminable upward gradient, and the absence of Erebias was a little disappointing. *Erebia stygne*, indeed, appeared to be the sole representative, nor did I see another member of the family in this part of the Cevennes. The Empézon runs up to above 4000ft. This particular Causse could not have been less than 3000ft. so we might reasonably have expected a bigger bag of these essentially upland butterflies. Alpine insects, however, were not to the fore. We did spot occasional individuals of *Parnassius apollo*, but the Lycænids, such as were there, were ordinary lowland kinds, and never in any sort of profusion. Equally scarce were Anthrocerids, of which *Anthrocera trifolii*, *A. achilleae* and *A. fausta*, were all that I found at Florac, and there was no sign of the usually plentiful *Syntomis phegea.*

Among the box and dwarf broom, *Satyrus briseis* was more common, with specimens of *S. cordula* very much smaller than those observed by me at Digne and Susa. Indeed, the characteristic feature of the Cevennes butterflies, was their comparative smallness, though there were exceptions to the rule, among them *Papilio machaon*, of which I took one day, on the hills outside Florac, the largest example I have ever come across. At noon these same slopes were very furnaces, the heat radiated from the barren hill-side, suggesting the climate of the tropics. *P. meleager* apparently thrives under these humanly trying conditions; both males and females were flying over the rocks above the Town Infirmary, but, owing to the vertical sun, were fatiguing to pursue. Meanwhile we looked in vain for *Apatura clytie* among the willows that border the Tarnon, and, curiously enough, I do not remember to have come across *Epinephele jurtina* in this valley. *Pararge maera*, a small, light form, was scarce, but *P. megaera* and *E. tithonus* swarmed. Leaving Florac on the 21st we took boat from St. Enimie to the Château de la Caze, the charming castle-hotel isolated among the cliffs and beech-woods of the Tarn—a stream deservedly famous for its trout and *écrevisses*, and, for the greater part of the journey, forming the sole line of communication between the eastern and western limits of its celebrated gorges. From this time forward, however, the weather unhappily became unsettled, and even the fine days were so cloudy that often for hours together no butterflies ventured abroad. Notwithstanding, the valley of the Tarn, should be a good hunting-ground. We counted over sixty species flying one day on a little piece of flower-clad slope, where also, among the almond orchards, grew the aristolochia, elsewhere the food-plant of *Thais medesicaste*, and possibly also here. But it was too late for *Thais*, and we found no trace of the larva. The commonest insect was undoubtedly *Melitaea didyma*, of which I took one remarkable aberration, with the spots of the underside almost obliterated, and next to it came *Chrysophanus dorilis*, the female of a lively bright form. Here also *Satyrus statilinus* was just coming out, while *S. briseis* (males mostly) and *S. cordula* were again locally abundant. The Lycænids, however, as elsewhere (save *P. dolus*), were scarce, *P. damon* and *P. hylas* occurring sparingly. *Pieris daplidice*, *Limenitis camilla*, *Leptidia sinapis*, and *Papilio podalirius* also put in an appearance among a host of commoner things. Driving from Le Rozier to the grottoes of Dargilan, on the 26th, we traversed a very promising looking country, but, walking up the hillside to the shanties at the mouth of the great caverns, which belong to the Société Pittoresque de France, I only noticed a few *Erebia ligea* just out, the customary crowd of *Melanargia galatea*, and, at the summit, one or two *Anthrocera purpuralis* (*minos*). We had better luck at Mende, our next halting-place, though the weather most of the time was execrable, and one intended outing resulted in a whole day's incarceration in a small roadside station. The path from Mende, by the lower road following the line of railway to Balsièges, once clear of the town, traverses much first rate collecting ground. The slopes of the Causse here are steep and covered with aromatic herbs, vetches, and long grass, and there is enough spring water in the hills to keep them fresh, in pleasant contrast to the stony uplands above. All the Satyrids found elsewhere abounded, with *S. alcyone*, and ,in a gully above the village of Balsièges, *P. dolus* was flying in hundreds. *Pyrameis cardui*, very large and perfect, hovered about the lavender, and, on the stems of grass and rushes, *Hesperia actaeon* was not uncommon, though, once disturbed, difficult to detect. The protective resemblance of some of the insects we came across was most striking. In particular, I remember a specimen of *Parnassius apollo* asleep on a dwarf conifer, the red spots of the wings appearing to harmonise exactly with the centres of the pine stem, where the undeveloped cones were already showing a rosy pink. The folded wings of *S. circe*, which, like all its kind, loves to settle on tree-trunks, assimilate in a remarkable manner to the rough bark of the chestnut, and *Polygonia c-album*, perched in the same way on the pine, is almost invisible. *M. galatea* ab. *leucomelas* I also found difficult to separate from the tufted grasses and daisies. In the same way the colouring of *Hesperia actaeon* resembles closely the brown flowers of the rush, which here, at any rate, it particularly affected. Both *Colias edusa* and *C. hyale* were swarming at the lavender; *Argynnis daphne* was represented by single specimens, while *A. aglaia* and *A. niobe* were in abundance. Noctuids seemed particularly scarce everywhere in the Cevennes. Taking our dinner *al fresco* and sitting well on into the darkness, it was remarkable when the lamps were lit how few lepidoptera were attracted. The *Ephemeridae* were in great force some nights, but other orders were wanting, and, taken all round, the mountains and cañons themselves were disappointing. Perhaps we expected too much. A gully brim full of lavender, with scattered bushes of bramble and clematis recalls the mountains at the back of Digne, and *P.* var. *rippertii*, which I was rather surprised not to encounter, but this was not the only absentee, and it is apparent that the insect fauna of south-central France approximates far more to the fauna of western and northern than of southern Europe.

From the time we arrived at Mende (July 27th) onward, the weather was all against collecting, to say nothing of the localities, and this may have something to do with the too obvious fact that our bag for the last week was nil. On the 31st we drove to Le Puy, a thirteen hours' diligence drive, during which the rain never ceased, while this otherwise extremely interesting city, did not boast in its environs a single piece of collecting ground that we could find, the land being heavily cultivated with cereals and other crops right up to the summit of the hills. August 2nd found us at Clermont Ferrand, and there again butterflies were conspicuous by their absence. A walk to the famous Puy de Dôme on the 3rd gave us no better results than a single *Euvanessa antiopa* ; while the green slopes of this extinctest of volcanoes were practically devoid of insect life altogether. A few *Erebia aethiops* flitted among the bracken, and one or two *Leptidia sinapis*, and with them ended my collecting abroad for 1901. From a purely entomological point of view the expedition was not an unqualified success, though in every other respect delightful. The Cevennes, poor in forest trees and flowers, show a corresponding scarcity of lepidoptera. All the species encountered—with but few exceptions—were small and stunted, and quite unlike the splendid forms of similar Palæarctic insects occurring in the Basses-Alpes and the mountains of central Europe. The roadside banks and cuttings, prolific of life elsewhere, yielded nothing but a few Satyrids, of which the *S. statilinus* struck me as peculiarly meagre-looking insects. On the other hand *S. circe*, as I have already stated, was present in great profusion, and fully up to the normal size. Subjoined is a complete list of the Rhopalocera observed between July 16th and August 5th, inclusive, at Florac, in the gorges of the Tarn, at Mende, Balsièges and Clermont Ferrand, numbering in all seventy-four species:

Papilio podalirius (type), *P. machaon*; *Parnassius apollo*; *Aporia crataegi*, *Pieris brassicae*, *P. rapae*, *P. napi*, *P. daplidice*, *Leptidia sinapis*; *Colias hyale*, *C. edusa*, and ab. *helice*; *Gonepteryx cleopatra*, *G. rhamni* (St. Cécile only); *Thecla spini*, *T. acaciae* (Florac, one); *Chrysophanus* var. *gordius*, *C. dorilis*, *C. phlaeas*; *Plebeius aegon*, *Polyommatus baton*, *P. astrarche* var. *aestiva*, *P. icarus*, *P. escheri*, *P. bellargus*, *P. corydon*, *P. hylas*, *P. meleager*, *P. dolus*, *P. damon*, *Cyaniris argiolus*, *Cupido minima*; *Limenitis camilla*; *Polygonia c-album*, *Eugonia polychloros*, *Aglais urticae*, *Vanessa io* (very scarce), *Euvanessa antiopa* (at Royat), *Pyrameis atalanta*, *P. cardui*; *Melitaea phoebe*, *M. didyma*, *M. athalia*; *Argynnis daphne*, *A. latonia*, *A. aglaia*, *A. niobe*, *A. paphia*; *Melanargia galatea*, var. *procida*, and ab. *leucomelas*, *M. iapygia* var. *cleanthe* (Causse Méjean only) *Erebia stygne*, *E. aethiops*, *E. ligea*; *Satyrus alcyone*, *S. circe*, *S. briseis*, *S. semele*, *S. statilinus*, *S. actaea* var. *cordula*; *Pararge maera* (rare), *P. megaera*, *Epinephele jurtina*, *E. tithonus*; *Coenonympha arcania*, *C. dorus*, *C. pamphilus*; *Spilothyrus alceae*; *Syrichthus carthami*, *S. alveus*, *S. malvae*, *S. sao*; *Hesperia thaumas*, *H. actaeon* and *H. comma*.

On some races of Lasiocampa quercûs.

By J. C. WARBURG.

(*Continued from p.* 259.)

The Cross-breeds.—For convenience of reference the various races on which we worked received numbers as follows:—

(1 and 2) *L.* var. *meridionalis*, Tutt. (3 and 4) *L.* var. *viburni*, Gn. (5) Dorset *L. quercûs*. (6) *L.* var. *meridionalis* × *viburni*, with white-haired larvæ. (7) *L.* var. *meridionalis* × *viburni*, with brown-haired larvæ. (8) *L.* var. *callunae* from Aberdeen pupæ. (9) *L.* var. *sicula*, Stgr., of Sicilian parentage. (10) Paris *L. quercûs*.

The following 28 crosses were obtained, or attempted (the ♂ being first mentioned in each case):—2 × 3 (= 6 and 7), 2 × 4, 2 × 8, 3 × 5, 3 × 8, 5 × 2, 6 × 2, 6 × 3, 6 × 5, 6 × 6, 6 × 8 (did not lay), 7 × 2, 7 × 3, 7 × 8, 7 × 7, 9 × 2, 9 × 7, 9 × 10, 9 × (6 × 6), 9 × (9 × 7), (5 × 2) × (5 × 2) infertile, (6 × 6) × 9, (6 × 6) × (5 × 2) infertile, (6 × 6) × (6 × 6), (9 × 2) × 9, (9 × 2) × (6 × 6), (9 × 7) × 10, (9 × 7) × (9 × 7).

L. MERIDIONALIS × VIBURNI (= 2 × 3).—This cross produced 6 and 7. In September, 1896, I paired three or four ♂ s of *L. meridionalis* (Batch C) with three dark brown ♀ s of *L. viburni* (Batch B). I have no record of the contrary pairing and therefore take it for granted that it did not take place, and that the young larvæ of all three batches were *meridionalis* ♂ × *viburni* ♀. These larvæ, which I leave to Mr. Bacot to describe in detail, were divided into two lots, no. 6 were the white-haired ones resembling *L. meridionalis*, no. 7 the brown-haired ones resembling *L. viburni*. It is particularly noticeable that though their coloration varied slightly there were no true intermediate forms between the two types. The white-haired (no. 6) had the silky white hairs of *L. meridionalis*, often just sufficiently tinged with brown to make it possible to distinguish them from pure *L. meridionalis*. The brown-haired (no. 7) were perhaps a little more distinct from *L. viburni* than was the case in the other batch, that is to say, the influence of the *L. meridionalis* father was slightly more marked than that of the *L. viburni* mother, the red-brown fur being somewhat more greyish than in pure *L. viburni*. Whether these two types were present in all three families, or whether the one belonged to one batch, and the other to the other two, I cannot say. It would have been more satisfactory to have kept the three lots of larvæ separate, but, to minimise the trouble of keeping so many young families of larvæ, I reared them all together, a course which I now regret having followed. The imagines from both 6 and 7 were fairly constant in marking. The males had the white dot of a medium size, and the bands were continuous on fore- and hindwings (both *L. meridionalis* attributes); the specimens in my possession (I have not examined this feature in Mr. Bacot's) have light fringes to the hindwings in the case of no. 6 in 11 ♂ s and brown in 2, in the case of no. 7 something under half have the fringes more or less tinged with brown. In both, there is a tendency in nearly all to have the nervures outside the band on the hindwings slightly dusted with the ground colour. There is, as far as I can see, no difference between 6 and 7 except that the band of 6 is slightly whiter (less reddish) than in 7, a difference to some extent noticeable in *L. meridionalis* as compared with *L. viburni*. To sum up then, the larvæ follow one or other parent more or less exactly, the male parent (*L. meridionalis*) having, however, a slight predominance. This predominance is more marked in the imagines. I have left out of consideration the ♀ s of which, it should be noticed, there were very few, the total numbers being :

No 6.	14 ♂ s, 5 ♀ s.—Warburg.	No 7.	31 ♂ s, 2 ♀ s.—Warburg.
	3 ♂ s, 1 ♀ .—Bacot.		5 ♂ s .—Bacot.
	17 ♂ s, 6 ♀ s.—Total.		36 ♂ s, 2 ♀ s.—Total.

L. (MERIDIONALIS × VIBURNI) × L. MERIDIONALIS AND L. (MERIDIONALIS × VIBURNI) × L. VIBURNI, &c.—I will now briefly consider the crossings of *L. meridionalis* × *viburni* with itself or either parent.

(1) *L.* (*meridionalis* × *viburni*) ♂ × *L. meridionalis* ♀ (= 6 ♂ × 2 ♀). —This pairing obtained by Mr. Bacot (July 19th, 1897, labelled D) produced very white larvæ.

(2) *L.* (*meridionalis* × *viburni*) ♂ × *L. viburni* ♀ (= 6 ♂ × 3 ♀).—Ova obtained by Mr. Bacot (July 19th, 1897, labelled C). The only note I have of the larvæ is that two of them were brown with the long hairs white, Mr. Bacot reared three ♀ s.

(3) *L.* (*meridionalis* × *viburni*) ♂ × *L.* (*meridionalis* × *viburni*) ♀ (=6 ♂ × 6 ♀).—Two batches secured by Mr. Bacot (I. July 28th, 1897, and August 3rd, 1897). The larvæ like either pure race, except that the *viburni*-like ones often have more long white hairs than *L. viburni*, especially on the sides and in a mediodorsal ridge, or on the last few segments. My 30 larvæ had nearly all pupated by April 20th, 1898, and produced (between June 7th, 1898, and August 21st, 1898) 11 ♂ s and 8 ♀ s. The insects were much like nos. 6 and 7 but a little smaller. They were fertile as I proved by crossing two of the moths on August 4th, 1898. The larvæ hatched August 26th, 1898, but were not kept. They were (6 × 6) × (6 × 6) that is the third generation of *L. meridionalis* × *viburni*. I refrain from writing the pedigree in full.

(4) Turning now to the derivations of the brown-haired cross no. 7.—*L.* (*meridionalis* × *viburni*) ♂ × *L. meridionalis* ♀ (=7 ♂ × 2 ♀).—Two batches of ova obtained by Mr. Bacot (B. July 19th, 1891, and N. August 7th, 1897). From these larvæ he reared no imagines, but out of some five pupæ which I obtained from larvæ which he gave me, I reared one ♀ on June 10th, 1898. It is an undersized and rather malformed specimen with the markings rather indistinct. Larvæ like pure *meridionalis* or *viburni*, or somewhat intermediate, with the short dorsal hairs (which are white in *meridionalis*) reddish-white or yellowish.

(5) *L.* (*meridionalis* × *viburni*) ♂ × *viburni* ♀ (=7 ♂ × 3 ♀).—Two broods by Mr. Bacot (G. July 25th, 1897, and S. August 12th, 1897), the first only gave larvæ. No imagines seem to have been reared.

(6) *L.* (*meridionalis* × *viburni*) ♂ × *L.* (*meridionalis* × *viburni*) ♀ (=7 ♂ × 6 ♀).—Ova August 3rd, 1897, lot M, by Mr. Bacot, who reared one male. The larvæ I had were white-haired like *meridionalis*.

(7) *L.* (*meridionalis* × *viburni*) ♂ × *L.* (*meridionalis* × *viburni*) ♀ (=7 ♂ × 7 ♀).—Ova (P), August 9th, 1897, of Mr. Bacot produced larvæ, no imagines reared.

This completes the cross-breeds of *meridionalis* and *viburni* among themselves. They all seem to be fertile with one another, and though no imagines resulted in many cases, this is not to be put down to any lack of fertility due to cross-breeding, but to accidental causes inseparable from rearing large numbers of larvæ *ab ovo*.

It must be supposed that, in nature, owing to the two epochs of emergence being separated by an interval of two months, cross-pairing of *L. meridionalis* and *L. viburni* is rare. Should it occur no doubt the strain would gradually approximate to and get merged with one or other type.

The derivations of *L. meridionalis* × *L. viburni* otherwise than *inter se* or with the parent races will be noticed in their places.

VARIOUS CROSSES.—(1) *L. meridionalis* ♂ × *L. callunae* ♀ (=2 ♂ × 8 ♀).—Paired end of June, 1897, by my brother, Oscar E. Warburg. Mr. Bacot reared one cripple from the larvæ he had. The following are particulars of mine. Three larvæ were described when $2\frac{1}{4}$ inches long. They were of two types:

α*. Back dull unicolorous black. Only the subdorsal tufts of the "*quercûs* pattern" with slightly longer greyish-white hairs. Face as in English *L. quercûs*.

*α and β with conspicuous white spiracles and dashes. α is perhaps like typical *L. callunae*. I do not know the larva. Mr. Bacot has since confirmed this opinion.

β*. Much as English *L. quercûs*, with the yellowish-grey hairs on the back slightly lighter. Subdorsal hairs fairly long, white.

The first spun up on December 12th, 1897, all three were spun by January 10th, 1898. A male emerged on April 20th, 1898. One pupa got mixed with others and one remains apparently dead.

This specimen is similar to my *L. callunae*, but the *L. meridionalis* strain has modified it in the following way. The epaulette is absent, the colour a little redder (both ground colour and band) the space beyond band little powdered with yellow, and the nervures less conspicuous, so that, though the general facies, owing to the large spot and general colour, is that of *L. callunae*, yet the honours are fairly divided in the case of the imago if not slightly in favour of *L. meridionalis*. In the larva the contrary is the case.

(2) *L. viburni* ♂ × *L. quercûs* (Dorset) ♀ (=3 ♂ × 5 ♀).—Mr. Bacot obtained larvæ from ova (laid July 10th, 1897), but no imagines.

(3) *L. viburni* ♂ × *L. callunae* ♀ (=3 ♂ × 8 ♀).—The ♀ *L. callunae* was placed by Mr. Bacot with a ♂ No 6(=*meridionalis* × *viburni*) but did not lay, it was then paired as above and began to lay at once. From these ova (laid July 20th, 1897) larvæ emerged of which none survived. My only note referring to them is that they were "very brown."

(4) *L. quercûs* (Dorset) ♂ × *meridionalis* ♀ (=5 ♂ × 2 ♀).—Paired by Mr. Bacot (J. July 28th, 1897), Mr. Bacot reared 3 ♂ and 4 ♀ imagines. My larvæ, described when three inches long were similar to "pure Dorset," the spiracles and dashes very white; the face dull black (as in English) or somewhat rusty (*L. meridionalis* has a rusty-red face). My imagines 4 ♂ s and 8 ♀ s emerged April 20th-June 4th, 1898. They are handsome moths. The males, which are larger than their father (a very undersized specimen), are considerably browner (less red) in colour than *L. meridionalis*. The band is also more diffused externally. Except that the band is less sharply curved than in the father, they may be considered to follow his type almost exactly in colour and markings. The females follow their mother except in two points. They have the usual more variegated look of *L. meridionalis* ♀ with the base of hindwings brown (in one specimen almost as brown as the male parent) in fact they are several of them more contrasted in colouring than the ♀ parent which was of the fairly uniform reddish-brown type with lines and dots not prominent. They range in colour from the ochre of the Dorset ♀ type to the one before mentioned, but they are all *yellow* in general effect, and *not reddish* like the ♀ parent. The nervures are distinctly lighter than the wing, and thus become in the darker ones conspicuous. This is derived from the father's family as the mother has the nervures practically unicolorous. These females may, therefore, be considered good intermediate forms. A peculiarity of this hybrid, which was not noticed in any of the others, was that the ova, produced in the only cases in which pairing was attempted, were sterile. These were the following :—

(1) *L.* (*quercûs* (Dorset) × *meridionalis*) ♂ × *L.* (*quercûs* (Dorset) × *meridionalis*) ♀ (= ♂ (5 × 2) × ♀ (5 × 2)).

---

*α and β with conspicuous white spiracles and dashes; α is perhaps like typical *L. callunae*. I do not know the larva. Mr. Bacot has since confirmed this opinion.

(2) *L.* [(*meridionalis* × *viburni*) × (*meridionalis* × *viburni*)] ♂ × *L.* [*quercûs* (Dorset) × *meridionalis*] ♀ [= ♂ (6 × 6) × ♀ (5 × 2)].

Of this last about 30 ova were deposited, all sterile. The above facts, while showing the sterility of the ♀ s, does not, of course, prove that the ♂ s would be unable to fertilise other females. Whether the sterility is due to the malformation of the female sexual organs, or to some other cause I cannot say. All the ♀ specimens of this cross seem, as far as one can judge externally, well developed.

There is a possible cause of infertility which I do not remember ever to have seen suggested which might be worth investigating by an expert, though I have no evidence to show that it occurs. It was suggested to me by the fact that the ova of the Paris *quercûs* were particularly large, though the moths themselves were, if anything, small. If the differences in the ova extend to construction as well as to size merely, it may be that (taking first the case of different species) the particular shape of the orifices in the unimpregnated ovum, offer some obstacle to the passage of the spermatozoa. In the case of cross-breeds this might occur also on the hypothesis that, though the ovum of either pure bred parent was permeable by the spermatozoa of the ♂ parent, yet the combination ovum of the hybrid failed to possess the essential characters of either. Take a rough illustration to make my meaning clear. Suppose species A with a straight narrow orifice, B with a bent wide orifice, either of which are permeable. The resulting A × B might have an orifice both bent and narrow, which would form an obstacle to entrance. This hypothesis is not put forward otherwise than argumentatively, and I should be sorry to hold the opinion, without any proof, but the subject of the sterility of hybrids being still obscure, it is possible that the suggestion may be of use.

(5) The only remaining cross into which *sicula* does not enter is :—*L.* (*meridionalis* × *viburni*) ♂ × *quercûs* (Dorset) ♀ (= 6 × 5).—Larvæ of this were obtained by Mr. Bacot from ova laid July 10th, 1897. No moths were reared.

(*To be concluded.*)

Migration and Dispersal of Insects: Coleoptera.

By J. W. TUTT, F.E.S.

In 1867 the Melbourne papers reported enormous swarms of beetles of a dark bronze colour, as occurring in Victoria. In the early part of January, a swarm was noticed near Ararat, Victoria, flying in a column about 20 yards broad, and keeping in compact order. They cast a dark shadow on the ground, and they were about an hour in passing the spot from which they were seen. At a certain point they turned off at right angles. The Eucalyptus trees in the neighbourhood of these insects had been stripped of every particle of foliage. Great numbers of the beetles fell to the ground during the flight. The noise they made while flying was said to be like that of a hurricane playing in the rigging of a ship (*Yorkshire Post*, March 30th, 1867). A remarkable flight of *Lachnosterna tristis* is recorded by Linton (*Insect Life*, i., p. 17), as passing from north to south over Burrows, in Indiana, on the evening of May 7th, 1887; they flew in swarms or droves about one to every 18 inches square, and from 5ft. to 12ft. or 15ft. above the ground, the swarm being some one and a half miles wide; when first seen, they were thought to be a swarm of bees, but their true character was soon discovered. They commenced their flight just as the sun was hidden and continued to fly until it was quite dark. Riley adds that this species often occurs in the United States, in great numbers, but that a twilight swarming of the nature described was hitherto unknown and he thinks that the beetles must have been in search of a proper locality in which to lay their eggs. In another interesting note (*loc. cit.*, iii., pp. 176-177), Ragsdale states that, on September 9th and 10th, 1890, a flight of crickets, accompanied by a beetle, recognised by Riley as *Harpalus gravis*, appeared at Gainesville, Texas, appearing to drift in an easterly direction, and showing themselves abundantly on the west walls of buildings. Riley further states that he had received the beetle from Fort Worth, where it had appeared in the Septembers of 1886 and 1887, in immense numbers. He says that the occurrence of the *Harpalus* remains as great a mystery as the swarming of *Platynus maculicollis* in California, an account of which is published in the *American Naturalist*, 1882, p. 681. In July 1888, the rose-beetle, *Macrodactylus subspinosus*, is recorded (*Insect Life*, i., p. 91), as having suddenly appeared in swarms at the rural grounds, New York, causing a great deal of damage to grapes, roses and magnolias. The sudden appearance of this species, possibly due, however, to local conditions and not to immigration, is further commented on by Riley (*loc. cit.*, ii., p. 297), who also discusses its spread in recent years into districts where it was previously unknown.

Another interesting side of the dispersal of beetles relates to the distribution of aquatic forms. Darwin observes (*Origin of Species*, p. 343) that the wide-ranging power of freshwater productions can, in most cases, be explained by their having become fitted in a manner highly useful to them, for short and frequent migrations from pond to pond, or from stream to stream within their own countries, and that liability to wide dispersal would follow from this capacity as an almost necessary consequence. This is particularly true of beetles, and Darwin relates (*Voyage of Beagle*, pp. 114, 115) that numbers of living beetles, some aquatic and some terrestrial, were caught in the open sea, off Cape Corrientes, seventeen miles from the coast of South America, and these did not appear to be injured by the salt water. These belonged to the genera *Colymbetes*, *Hydroporus*, *Hydrobius*, *Notaphus*, *Cynucus*, *Adimonia* and *Scarabaeus*. He considered that they had been floated out to sea by a small stream that drains a lake near Cape Corrientes. At any rate, the circumstance of beetles swimming in the open ocean seventeen miles from the nearest land is interesting from the point of view of their distribution, and the possibility of their dispersal by this means. The ability of certain coleoptera, normally living in fresh water, to exist in a marine habitat, has several times been noted. Donovan notes (*Ent. Mo. Mag.*, xxii., p. 13) that, on May 10th, 1885, he captured a ♀ of *Dytiscus marginalis*, swimming in the sea at Glandore, the individual being quite at home in its salt-water element. Wood records (*loc. cit.*, p. 44) how he kept several species of *Hydradephaga* and *Palpicornia*, including the species *Haliplus ruficollis*, *Hydroporus planus*, *Agabus bipustulatus* and *Helophorus aquaticus* in a vessel of sea-water, and that they lived therein in perfect health, the three last named seeming perfectly at ease throughout, although the *Haliplus* found difficulty in diving and remained almost entirely at the surface. Walker states (*loc. cit.*, p. 15) that the only *Cybister roeselii* he ever saw alive was taken about an hour before sunset one very warm evening in August, 1876, when waiting on the pier at Besika Bay; the beetle, a fine ♂, was on the wing and flew deliberately into the sea, close enough to the pier to be caught by hand; there was no freshwater stream within a mile of the spot. He further notes that at Kavala, Turkey, a large living specimen of *Hydrophilus piceus* was caught in the sea at a "seining party," actually in the the net among the fish. The distribution of certain aquatic coleoptera is, indeed, very remarkable, but perhaps one of the most marvellous instances of wide distribution among our water beetles is that of *Rhantus pulverosus*, which extends from the south of England, eastward through central and southern Europe, North Africa, Mesopotamia, China, Japan, and Java to Australia, New Caledonia, New Zealand and Tongatábu, in the centre of the tropical part of the Pacific Ocean.

As bearing only indirectly on the question of dispersal, Lewis records (*Ent. Mo. Mag.*, xviii., pp. 138-139, 213) some very interesting observations made in July, 1880, whilst ascending a volcano in South Yezo. Whilst sitting on the ridge of the crater he noticed a most refreshing mountain draught ascending the sides of the mountain. He also observed a number of *Elateridae* and a few *Silphidae* dead and dying, lying on the sand around him, and watched those that arrived fresh and vigorous from the forest below, drop on the ridge, and, in three hours, join the army of dead that was there. The conclusion at which he arrived was that the beetles were carried up by the air-currents, involuntarily, from the forest below, and that life was destroyed by the abstraction of the fluids of the body, due to the great heat of the sand forming the ridge around the crater. His further suggestions as to why, of all the many species in the forest, the *Elateridae* and *Silphidae* alone are carried up to perish on the dry, heated lava, are exceedingly interesting, but so far outside the question that we are discussing that we can only say that he considers it due to the fact that the elytra of these groups, when raised to the angle necessary to allow the membranous wings to be put into action for flight, are just in that position to catch the full force of the upward current, and that these species with ample elytra meet their death by being mechanically lifted up into the arid region of sand. No Elaters were found in the crater, as, at the ridge, the direction of the air-current changed and they fell to the earth. The interesting general remarks and the light which these observations throw on the shortened wing-cases of certain coleoptera, *e.g.*, *Brachelytra*, &c., must be here omitted. Nor are the observations of Bruce and Thornley (*Ann. Scottish Nat. Hist.*, 1895, pp. 28-37), on a collection of coleoptera made by the former on the summit of Ben Nevis, without considerable interest. The latter gentleman was requisitioned by entomological friends to collect such insects as he might meet with at the summit, and, accordingly, during May and June, 1895, he captured a large number on that part of the mountain which is above 4350ft. in altitude, the Ordnance Cairn, at 4406ft., marking the extreme elevation; the ground from which the insects were obtained consisted of an elongated plateau more than one-third of a mile in length, and averaging about 70 yards in width; altogether it is nearly eleven acres in extent. Bruce says that the greatest number of insects seen during the summer was probably on June 6th. Taking squares of the snow measuring 2×2 feet, he calculated that there must have been many hundreds of living insects on each such square, and adds: "On May 23rd, I marked out nine such squares and counted all the insects within them. There was an average of 29 in each, six of which were dead, and only one of which was not an aphis, therefore, there must have been about 400,000 aphides upon the summit on that day. On that day a small hand basin of water, which had been standing outside near the observatory for not more than 36 hours, contained at least 300 flies, &c. The mountain top was buzzing with life . . . . All these insects are not indigenous to the mountain top, but must be carried up by warm currents. It is in the neighbourhood of the first and second gorges that insects are most plentiful, and they are doubtless swept up by the strong draughts peculiar to these gullies . . . . Careful examination was made, on a few occasions, of the *débris* upon remaining patches of snow, when it was found to be composed almost entirely of insect remains. The snow has sometimes been quite blackened by such *débris* as if covered with soot, but, although soot may partly account for the blackness, yet, on the few occasions I made an examination, it proved to be quite a minor factor. On the morning of May 24th I made a round of the squares marked out on the 23rd, and found that 93 per cent. of the insects had perished. The surface of the snow was then crisply frozen. This great slaughter takes place in the night, for, in the daytime, the cold does not appear to have any great effect upon them. Many of these insects are very active on the snow and often appear to be as lively upon it as upon a window-pane."

Staudinger and Rebel's Catalogue.*

(*Continued from p.* 287.)

Of the changes just referred to, all those given in *Ent. Rec.*, ii., are accepted with the following exceptions—*ypsilon-graecum*, Goeze, *populi*, Ström, *vespertaria*, Thnb., *corculata*, Hfn., *nebulata*, Thnb., and *flavicata*, Thnb. Of those accepted, nearly all are unquestionably sound, and writers can now adopt them without risking a charge of eccentricity; the only one which the reviewer has not checked personally is the much-controverted *vespiformis*, L. (now determined as = *cynipiformis*, Esp.). Of the six which are rejected, *ypsilon-graecum* is founded on De Geer's immortal "Mémoires," and the identity of the species with the *or* of Fabricius can hardly be doubtful enough to justify Staudinger's query against it; but when Schiffermüller's names are reinstated, as they will probably have to be, it will be permissible to resume the use of the name *or* Schiff. (*teste* Fb.).* It is equally difficult to understand why Staudinger has

* "*Catalog der Lepidopteren des palaearctischen Faunengebietes*," von Dr. Phil. O. Staudinger und Dr. Phil. H. Rebel. Dritte Auflage des "Cataloges des europäischen Faunengebietes." Berlin: R. Friedländer und Sohn. Mai, 1901. I. Theil: Fam. *Papilionidae—Hepialidae*, von Dr. O. Staudinger und Dr. H. Rebel; II. Theil: Fam. *Pyralidae—Micropterygidae*, von Dr. H. Rebel. xxxii + 411 + 368 pp. in 8vo.

* Unless, indeed, the view of Haworth, Guénée, Wallengren, and Aurivillius be accepted, *i.e.*, that this is the true *flavicornis* of Linné, in which case *flavicornis*, Auctt., will appear as *cinerea*, Goeze. In any event, to give the two species as *flavicornis*, L. and *flavicornis*, Esp., as Garbowski has done, is a gross violation of the laws of homonymy.

queried the *populi* of Ström, which was well described and recognisably figured; but as a matter of fact the name *populeti* turns out to be the right one to adopt, the rejection of Fabricius (*cfr.* Stgr. Cat., ed. ii., p. 113) being unwarranted. The earliest literature of this species has been somewhat overlooked, but was as follows. Fabricius in his "Reise nach Norwegen," p. 328 (1779) diagnosed and described it from Ström's collection (more fully than in his later systematic works) as *Bombyx populi*, supplying details as to the larva from information furnished by Ström; the name, however, was a homonym (*Bombyx populi*, L. = *Poecilocampa populi*, Auctt.), and this Fabricius discovered in 1781 (*Spec. Ins.*, ii., p. 201) consequently substituting the name of *Bombyx populeti*, with a reference to his "Reise." In 1783, Ström, apparently not yet acquainted with the "Species Insectorum," published his own account under the name of *Noctua populi;* had this been *earlier* than Fabricius' correction, it would have saved the name of *populi*, as it escaped the homonymy (cfr. Stgr. Cat., ed. ii., p. xx., on *Argynnis aglaia*, L.).

Vespertaria, Thnb., is rejected as a synonym of *paralellaria*, Schiff., which is sufficiently diagnosed, but *vespertaria* is originally a Linnean name, and there seems more probability that Thunberg has correctly determined it than that Schiffermüller (who uses the name for another species) has done so; indeed Fabricius and Illiger both agree with Thunberg, and it would probably be best to use *vespertaria*, L., for the *Epione* (as has been done in England for so long), and to substitute *parallelo-lineata*, Retz., p. 42, for (*Larentia*) *vespertaria*, (Schiff.), Bkh. *Corculata*, Hfn., is only cited with a query to *unidentaria*, Haw., as is also *ferrugata*, L.—to which latter reference the query is not warranted; *ferrugata*, Cl., is accepted, after Zeller and Lampa, as the *spadicearia* of Schiffermüller. *Nebulata*, Thnb. (for *dilutata*, Bkh.) is rightly rejected, as it is a preoccupied name, Scopoli's *nebulata* having been certainly a different species. *Flavicata*, Thnb., is with equal right sunk before *luteata*, Schiff.

Concerning the changes made in Tutt's "British Lepidoptera," so far as at present published, its author has brought together his evidence so fully that it is unnecessary to discuss them in any detail; suffice it to say that Staudinger and Rebel have accepted the evidence as sufficient in the case of *Zygaena purpuralis*, Brünn., *Narycia monilifera*, Geoff., *Solenobia lichenella*, L., *Taleporia tubulosa*, Retz., and *Epichnopterix* (*Whittleia*) *retiella*, Newm., but have rejected it in the case of *Cochlidion avellana*, Wernb. (*limacodes*, Hfn.), *Heterogenea cruciata*, Kn. (*asellus*, Schiff., is prior), *Anthrocera viciae* ? Schr. (*meliloti*, Esp.), *Diplodoma herminata* ? Geoff. (*marginepunctella*, Stph.), and *Solenobia cembrella* ? L. (*pineti*, Z.); the reviewer agrees with their verdict in the case of the first two species, but thinks the rest should have been accepted in the absence of evidence against them.

It may be here remarked that not infrequently no reason is shown for the acceptance of a particular name, and the lack of the "Merton" signs for homonyms, &c., is often seriously felt; for instance, when on p. 230 one finds *bankiana*, Fb. (1781) sunk as a synonym of *argentula*, Hb. (1787), how is one to understand the justice of the case, unless it is indicated that *bankiana*, Fb. (1781) is a homonym?

On this important question of homonymy in specific nomenclature, Staudinger's opinions expressed in 1871 have still been adhered to—

i.e., in few words, a binomial combination published a second time, for a different species, is invalid, except only if the first combination was a synonym, and even then not if it was a synonym with another species in the same (Staudingerian) genus. The rule itself cannot be impugned, but the exception—to say nothing of the *exception to the exception*—gives rise to constant trouble and ought to be utterly swept away; whether a binomial combination has ever been published is a matter of *fact*, but whether it was, is, or ever will be, a synonym is often a matter of *opinion*, and it is quite wrong to build nomenclature on such a shifting foundation. It is not surprising to find that Staudinger, with all his care, has found it impossible to be logical in the application of his exceptions. For example, in *Caradrina* he rejects the older *blanda*, Hb. for *C. superstes*, Tr., because *C. blanda*, Schiff., was another species (though sunk in the synonymy of *taraxaci*, Hb.); but in *Larentia* he accepts *luctuata*, Hb. *nec* Schiff., and *sociata*, Bkh. *nec* Fb., under precisely parallel conditions. Examples might be multiplied were it necessary; but the law without exceptions is now obtaining such general currency that there can be little doubt that it will be better applied in future editions, or future catalogues, *Lithosia deplana*, Esp., *nec* Linn., will then be called *depressa*, Esp., the Emerald moths will be revised as already shown in *Ent. Rec.*, xii., p. 180, and several other similar corrections will doubtless be found necessary.

One other matter in which the Staudinger-Rebel *Catalog* is just as inconsistent as its predecessor is in the treatment of the "Vienna Catalogue" of Schiffermüller and Denis. If the names are to be sometimes accepted and sometimes rejected, according to the exact value of the descriptive matter, nomenclature will for ever remain in confusion, as the view taken of its value in individual cases will constantly vary according to what Mr. Tutt calls the "personal equation;" and as none of Schiffermüller's names are absolute "nomina nuda," while some are excellently defined, it seems that the only logical course is to accept all that are recognisable from any source, as is done by Werneburg, Rogenhofer, and others. It must be remembered that Fabricius saw the Schiffermüller collection, and it is no more unreasonable to accept the Vienna Catalogue names *teste* Fb., than to accept those of Thunberg *teste* Lampa, as Staudinger is already doing*. That there is at present an entire lack of method, one or two examples will show. *Lasiocampa trifolii*, Schiff., is still treated as a "catalogue name" although a citation from Réaumur, as well as the generic characters, the name, and the traditional interpretation all elucidate the meaning; but *Ortholitha bipunctaria*, Schiff., is allowed currency, although quite similarly founded. *Larentia montanata*, Schiff., was regarded as a "catalogue name" in 1871, but is now allowed to be a properly-founded one, solely, no doubt, to avoid the necessity of supplanting the name by *implicata*, Vill. (*vide*, *Ent. Rec.*, vii., p. 249).

* Mr. J. Hartley Durrant has strongly urged upon the present writer the necessity of this course of work, and has thoroughly convinced him that it is the only practicable one. Traditional interpretations, and the like, should only be rejected if they unmistakably *contradict* the original description—in which case some accidental change of type-specimens or misunderstanding of a contemporary's statements may be assumed to have occurred.

Aurivillius' recent determinations of some Fabrician types (*Ent. Tids.*, xviii., p. 139) seem to have been altogether overlooked.

With the matter and the manner of citations there is in general little fault to find, if we except the occasional omission of important synonyms, already criticised. In a very few instances, however, the *original* reference is not given for a name, doubtless in most cases by oversight; thus in Theil I., p. 287, the name *sexalata* should be referred to Retzius, p. 50 (1783), and, therefore, has priority; on p. 401 under *spheciformis*, and in some other places, reference to the "S.V." is omitted; on p. 322, if *diversata*, Schiff., be a "catalogue name," then *diversata*, Gerning, *Frankf. Btr.*, ii., p. 457, cum fig. (1780) should stand as earliest reference, and should no doubt supplant the *pulverata* of Thunberg (1784); in Theil II. (which this review does not profess to cover), on p. 9, no. 157, it is noticed that the original reference for the name *cyrilli* (Costa, *Dizion. di Agric.*, ? 1840) is dropped altogether; it is there described as a new species, hence presumably the *cirilellus* of the *Fauna* is subsequent thereto.

There is occasional ambiguity through the citation of un-named figures in such a way that it would be assumed that the name last indicated was there applied; *e.g.*, *Smerinthus* hybr. *hybridus* is named by Staudinger, but the reference reads as though it were by Westwood; such confusion could have been avoided if "sine nomine" had always been quoted after such figures, as is done, for instance, on p. 314 under var. *curzoni*, Gregs.

Instances are noticed here and there of a citation under the wrong name in the synonymy; one example taken at random is under *Cilix glaucata*, Scop., where Barrett's "British Lepidoptera" is cited to this name instead of to *spinula*. But such cases are by no means frequent, and are, of course, due merely to inadvertence in arranging the order of the references; on the whole, this part of the work has been very carefully done.

The actual author of a name also occasionally fails to obtain his rightful recognition through another cause—the publication of his work under the editorship of another person. Thus while *Libythea celtis* is correctly referred to "Laicharting, in Fuessl. Arch.," *Chesias spartiata* is given as by Fuessly; is it not "Herbst, in Fuessl. Arch."?

In only very few cases has the law of priority been deliberately disregarded, but this cannot be too strongly deprecated, as it would, if allowed to go unchallenged, vitiate the whole principle of which Staudinger professed himself so zealous an advocate. On p. 19 *edusa*, F. Mant. is given the preference over *croceus*, Fourcr. (1785)*; the date of the "Mantissa" is prudently left unquoted, but everybody knows that it is 1787. On p. 172 *Hadena maillardi*, Hb.-G. (=*Crymodes exulis*, Lef.), is dealt with in a topsy-turvy manner; it is not dated, but certainly cannot be prior to Hübner's death in 1826, yet *difflua*, Hb. Zutr. (1823) is given as a variety of it, instead of as the original (literary) type! Unfortunately this is not quite an unique case; on p. 303 a similar performance with regard to *lugubrata*,

* Whether this species be, as Aurivillius considers, a variety of the South African *electo*, L. (nom. vetustius) is perhaps as yet "not proven," and it is better to write of the European species as *croceus* (Geoff.) Fourcr.

Stgr. Cat., 1871, and its var. (!) *obductata*, Mösch. (1860) is still left uncorrected. On p. 312, *callunae*, Spr. (1867) is referred as a synonym to *goossensiata*, Mab. (1869)=*minutata*, Gn. *nec* Hb.; *callunae*, Spr., is a little puzzling, on account of its large size (more than twice as large as the English specimen of *goossensiata* with which he compared it), and if it had been cited in the synonymy with a *query*, there would have been no fault to find, but if Herr Bohatsch* has satisfied himself that the forms are really co-specific, why did he not restore the older name? Have the larvæ, and particularly the pupæ (*cfr*. Sheldon in *Ent. Rec.*, vii., p. 197) yet been carefully compared side by side? On p. 364, if it were intended to unite *Spilosoma lubricipeda* ab. *eboraci*, Tugwell, with ab. *intermedia*, Stndf., the former should have had priority, the dates being 1894 and 1896 respectively.

Citations of dates for the specific names, so important for correct results in nomenclature, seem generally very accurate so far as information is available; but Mr. Sherborn's recent paper on Esper's dates (*Ann. Mag. Nat. Hist.* (7) vii., p. 137) evidently appeared too late to be used.

Varieties and aberrations are treated in accordance with the same general methods as in the earlier edition. Dr. Rebel is careful to mention in his preface that the diagnoses—which are only added to the varieties and the more important recurrent aberrations—are intended merely for the elucidation of the forms named, and cannot in all cases obviate the necessity of consulting the literature cited; it is much to be wished that those who use the "Catalog" would remember this.

The general tendency has been to minimise the number of separately erected aberrations as far as possible, and to merely cite, without diagnosing, the less striking or more casual ones; in dealing with the *Noctuidae*, it has in many cases sufficed to cite Mr. Tutt's "British Noctuæ," and space has been saved by not even recording all the varietal (or rather aberrational) names which are there employed. But in other cases, where there is no such standard work to appeal to, the references are pretty comprehensive, and show a wide acquaintance with current literature. It is not to be expected, however, that in every detail this part of the work will give general satisfaction, and certainly a few of the synonymic combinations among the references to varieties and aberrations do not appear to be tenable, although the great majority are well judged in consideration of the object in view; the minutiæ of variation must needs be studied elsewhere. A few omissions, in any case, seem sufficiently important to be worthy of mention; some could hardly have occurred had the authors been acquainted with the very striking deviation from type.

Tephroclystia (*Eupithecia*) *pulchellata* var. *hebudium*, Sheldon, *Ent. Rec.*, xi., p. 344 (1899).—This is important, being a local variety, not a mere aberration.

Hemerophila abruptaria abs. *brunneata*, *fuscata* and *unicolor*, Tutt, *Ent. Rec.*, x., p. 172 (1898).—One, at least, of these should have been recorded and diagnosed, as these melanic *abruptaria* are just as striking as the corresponding aberrations in the Boarmias, Hybernias, &c.

Larentia (*Thera*) *variata* ab. *nigrofasciata*, Gppgb., *Syst. Geom.*, iv., p. 8 [*Nova Acta*, &c., liv., p. 440] (1890).—This, and other aberrations from the same work, should at least be *quoted*, for the sake of completeness.

* It is understood that this excellent lepidopterist is mainly responsible for the *Eupitheciae*, as well as for much other useful revision in the *Geometridae*.

Dianthoecia luteago vars. *lowei* and *ficklini*, Tutt, *Ent. Rec.*, x., p. 150 (1898). —These are apparently well-defined local races, and therefore important.

Ephyra annulata abs. *obsoleta* and *biobsoleta*, Riding, *Ent. Rec.*, x., p. 239 (1898).—These are at least as worthy of recognition as some of the forms of the allied species which are duly registered.

(*To be concluded.*)

A Faunistic Island—Orthoptera at Oberweiden.

By MALCOLM BURR, F.Z.S., F.L.S., F.E.S.

In Moravia, not far from Marchegg, near the Hungarian frontier, is one of those remarkable faunistic oases, with which all practical entomologists are familiar. At Oberweiden, the "island" in question, the collector finds himself suddenly transported, as it were, from Central Europe to the region of the Volga; in a small patch of ground there is an abrupt change of fauna, most noticeable in the stationary forms of life, and in this small patch there is found what appears to be the original fauna of the neighbourhood, unmodified by centuries of cultivation.

It is a desolate, sandy spot, between eighty and a hundred kilomètres from Vienna. To reach it, the traveller alights at a small wayside station, Oberweiden. He is at once struck by the poverty of the surrounding country, and the barrenness of the soil. About twenty minutes' walk from the station, over flat, sandy, treeless country, brings us to a row of small sandy hillocks; this is the oasis. All around is flat, dry and barren, a little coarse grass in the sand forming the only vegetation. Just beyond the hillocks, there are a few stunted shrubs, and the ground becomes quite flat; this is the second part of the "island." Barren, dry, and desolate, it is a melancholy spot, a fit home for the last survivors of a dying race. Years ago, at the end of the hillocks, was a dead tree, used as a perch by a few bird-catchers, who were the only frequenters of this desert; by the tree was a little hut, where they took refuge from the weather, and kept their decoy owl; now the tree is gone, and the "buhuhütte" has disappeared. In this hut many famous entomologists had taken their frugal luncheon, and Brunner and Krauss had carved up a list of the Orthoptera which they had taken there. Civilisation has found a use even for this desert, for we saw peasants watering a track for racehorses, and the bird-catchers have given place to jockeys and trainers.

More than twenty years ago, Brunner had been surprised to receive a specimen of *Gomphocerus antennatus*, Fieb., labelled "Marchegg." This little grasshopper had hitherto only been known from Sarepta, on the Volga, and he resolved to discover the exact spot where it had been taken. After many attempts, he discovered it in numbers near the "buhuhütte," and from that time orthopterists, dipterists, and many others frequented the new happy hunting-ground. At the end of September, 1900, he accompanied me to show me *G. antennatus* in its own home.

In the flat ground, before reaching the hillocks, there is nothing. A few straggling specimens of *Stenobothrus bicolor*, Charp., were all we could find. Once among the hillocks, *Gomphocerus maculatus*, Thunb., occurred in swarms; both these, however, are common everywhere; the first form characteristic of the spot was *Oedaleus nigrofasciatus*, de Geer, which betrayed itself by flying across the hollows between the hillocks. It is a strong and active insect, and many of its congeners appear to swarm, like its near ally, *Pachytylus danicus*, L., but yet it does not occur on the plain around, and, to find it elsewhere, the collector must travel many miles south, where he will find it on the banks of the Mediterranean. These northern specimens, I noticed, were considerably smaller than the southern ones. In the same hollows, we took *Celes variabilis*, Pall., which occurred at a similar, but less characteristic, oasis at Felixdorf, still nearer Vienna, long since destroyed and even built over; it is an exceedingly variable and very locally distributed species; the bluish form taken here by Brunner, has been captured, according to him, at only one other locality, namely, Sarepta; the white form I have taken near Budapest, and it is not uncommon in Transsylvania and the Balkans; a few isolated spots in Hungary, at Felixdorf and Oberweiden, are the most northern known points of its distribution.

Sweeping in the thin rank grass, we took *Platycleis montana*, Kollar, which occurred also at Felixdorf. It is a widely distributed but very local form, having been taken also near Berlin, Glogau, Frankfurt, near Pest, and on the Volga. We were too late in the season to find all the characteristic species, but Brunner had previously taken *Platycleis affinis*, Fieb., a meridional form closely allied to the abundant *P. grisea*, Fabr. This is the only spot where it has been discovered north of the Alps; on the Mediterranean littoral it is common. Another grasshopper, occurring very rarely north of the Alps, but not uncommon here, is *Sphingonotus caerulans*, L., as also *Stethophyma flavicosta*, Fisch., a form with an erratic distribution. *Stenobothrus nigromaculatus*, Herr.-Sch. (a southern form), and *S. biguttulus*, Charp., occurred too. But the two most striking species taken at Oberweiden are *Stauronotus brevicollis*, Eversm., and *Gomphocerus antennatus*, Fieb. The former is less rare, it has been taken at Bazias on the Danube, in Servia, Epirus, and at Sarepta; its occurrence in Moravia is, therefore, quite remarkable. The latter is only known from three localities, namely, Oberweiden, a similar spot near Budapest, and at Sarepta. It is a small and delicate insect, very like *G. maculatus*, Thunb., but its long and graceful antennæ, very strongly clubbed at the apex, are most noticeable. I took but a single specimen, but earlier in the season it is abundant among the stunted trees beyond the hillocks.

One more form with an erratic distribution occurring here is *Gampsocleis glabra*, Herbst. It is found in isolated localities in different parts of northern Europe. In Thüringen, near Berlin, Frankfurt in Silesia, Bohemia, a few localities in Hungary, in Servia, abundant in the steppes of the Volga and of the Urals, and quite recently it has been discovered in Belgium.

In a short essay upon this interesting collecting ground ("Ueber die autochthone Orthopteren-Fauna Oesterreichs," *Verh. k. k. Zool.-bot. Ges. Wien.*, 1881, p. 215), Brunner suggests that these remarkable forms represent the original fauna of Europe, long since driven by cultivation and civilisation to a few scattered desolate spots, where they still maintain their existence, and hold their own against sturdier forms, which have adapted themselves to less favourable conditions. Altogether no less than eighty species have been taken at Oberweiden, of which twelve are quite remarkable.

In the twenty years which have elapsed since the appearance of Brunner's short paper, Felixdorf has disappeared, from an entomological point of view; at Oberweiden the leafless lightning-struck tree has gone; big stables have been built near the railway station, and a training ground has been made through the stronghold of *Gomphocerus antennatus*. But the ground is so poor, and the whole region so desolate, that little use can be made of it, and these dying forms may hold their own for many years, perhaps for ever.

Peronea cristana, Fab., and its aberrations (*with plate*).

By J. A. CLARK, F.E.S.

(*Concluded from p.* 293.)

A recent visit to the New Forest has given me a further supply of aberrations of this interesting species, two of which, taken on September 27th, are so exceedingly specialised that there can be no doubt that they should be described in detail. In order that the whole of the various described forms may be kept together I publish at once descriptions of them.

63. ab. *nigrocostana*, n. ab. (Pl. viii., fig. 1).—Head, thorax and palpi white; anterior wings black, with a beautiful velvety-black marking, running transversely across the wing from the base towards the apex, and a broad white vitta; posterior wings light brown, deepening in colour round the anal angle. This aberration closely resembles ab. *alboruficostana* in the form of its markings, but is slightly grey-black instead of brown, and the costal streak is black instead of chocolate colour.

64. ab. *albonigrana*, n. ab. (Pl. viii., fig. 2).—Head and palpi black; thorax white; anterior wings uniform black with a large black button, and a broad white vitta; posterior wings light brown, much deeper in colour round the anal angle. The broad white vitta distinguishes this aberration from ab. *nigrana*.

SCIENTIFIC NOTES AND OBSERVATIONS.

New names among the Lachneids.—In order to prevent the duplication of names that I have already used in *British Lepidoptera*, vol. iii., I wish to notify some of the more important of them: (1) *Pachygastria trifolii* ab. *flava*, n. ab.—The pale yellow form of the species taken between Rye and Lydd. *P.* ab. *flava-obsoleta*, n.ab.—Like the last but without any markings. *P.* ab. *cerrina*, n.ab.—The reddish-grey form with transverse markings. *P.* ab. *cerrina-obsoleta*, n. ab.—The reddish-grey form without markings. *P.* ab. *rufa*, n. ab.—Bright foxy red-brown, with transverse markings. *P.* ab. *rufa-obsoleta*, n. ab.—Bright foxy red-brown without markings. [Each of the forms with contracted median band is known as ab. *contracta*.] (2) *Lasiocampa quercûs* ab. *marginata*, n. ab.—With the yellow transverse bands extending on both fore- and hindwings to outer margin. *L.* ab. *semimarginata*, n. ab.—With narrow (or normal) transverse band to forewings, but band on hindwings extending to outer margin. *L.* ab. *purpurascens*, n. ab.—♂ with ground colour of a deep purplish- or chocolate-brown. *L.* ab. *brunnea*, n. ab.—♂ with ground colour russet-red, and normal transverse bands. *L.* ab. *ochracea*, n. ab.—♀ with ground colour dull ochreous. *L.* ab. *rufescens*, n. ab.—♀ with ground colour faint reddish-ochreous. *L.* ab. *brunnea*, n. ab.—♀ with ground colour brown. *L.* ab. *olivacea*, n. ab.—The ground colour entirely suffused with green, the latter tint not simply confined to the transverse bands as in ab. *olivaceo-fasciata*. (3) *L.* hybr. *bacoti* (=*meridionalis* × *viburni*).

L. hybr. *warburgi* (=*quercûs* × *meridionalis*). *L.* hybr. *intermedia* (=*sicula* × *meridionalis*). *L.* hybr. *prouti* (=*sicula* × *quercûs*). *L.* hybr. *complexa* [=*sicula* × (*meridionalis* × *viburni*)]. *L.* hybr. *inversa* [=(*meridionalis* × *viburni*) × *sicula*]. *L.* hybr. *complicata* [= ♂ (*sicula* × *meridionalis*) × ♀ [(*meridionalis* × *viburni*) × (*meridionalis* × *viburni*)]].

Cross-pairings between Lasiocampa quercûs and its vars. callunæ, Palm., viburni, Gn., meridionalis, Tutt, and sicula, Staud.—On referring to Mr. Warburg's and my own papers on this subject in the present volume of *The Record*, I find that I have written that the original cross-pairing which Mr. Warburg obtained in 1896 (*anteà*, pp. 114, 237) was *viburni* × *meridionalis* which gives the impression that the male parent was *viburni*, whereas it will be seen from Mr. Warburg's paper that the male parents were *meridionalis*. I was unaware when writing out my notes that Mr. Warburg had any record as to which of the varieties the respective sexes belonged to. I ought, of course, to have clearly stated this in my paper at the time, but instead I wrote the names in the same order as I had used through my notes, leaving my doubts about the sexes to be inferred from the fact that in referring to the other crosses I had used the ♂ and ♀ signs respectively, and had not done so in regard to this one.—A. Bacot, Bow House, 154, Clapton Road, N.E.

Pairing of Dimorpha versicolora.—On April 17th, 1901, I took two ♀ *Dimorpha versicolora* and placed them without covering on a birch bush (at 3.15 p.m.), one commenced calling at once, and, in ten minutes, a ♂ was paired with her; he came up against the wind, and hunted the next bush all round, in a very excited way, but could not find her, he then went back about 30 yards, and came up against the wind in almost a direct line for the ♀ and paired directly, the other ♀ did not commence to call until 4.50 p.m., when another ♂ came up in the same way as the previous one, and paired directly. I cut the branches off and put them into muslin bags, and carried them home about seven miles on my bicycle, and they remained paired until about 8.30 a.m. the next morning, I then placed the males into a cage with fresh females, and they both paired again in less than fifteen minutes. I may add that I saw several *Macrothylacia rubi* flying at Bournemouth, on June 6th, and on July 7th I saw *Cosmotriche potatoria* at light, at Reading. —W. E. Butler, Hayling House, Oxford Road, Reading. *September 19th*, 1901.

Habits of certain butterflies when disturbed during copulation.—I was interested in Mr. Tutt's note *re* male carrying female *Dryas paphia*. As bearing on the subject the following will perhaps be of interest. I find in my note-book, under date September 18th, 1900, "Saw a number of *Pieris rapae*, and also *Polyommatus icarus*, flying *in cop*. In both cases the male carried the female when disturbed."—C. W. Colthrup, 127, Barry Road, East Dulwich. *October 19th*, 1901.

COLEOPTERA.

Coleopterous notes for the autumn of 1900.—Pressure of work and unfavourable weather made my collecting in the autumn of 1900 very poor in results, but a few notes of the more interesting captures may be worth putting on record. In Richmond Park, during September and October, I obtained *Litodactylus leucogaster*, Marsh., *Notiophilus rufipes*, Curt., and *Deinopsis erosa*, Steph., at the edge of ponds, and *Hypophloeus bicolor*, Ol., under beech bark, while in a rubbish heap in my garden, *Quedius cruentus*, Ol., was common. An afternoon near Reigate in mid-October produced *Aphodius obliteratus*, Pz., and *Homalium striatum*, Gr., both in plenty out of sheep dung. On October 20th I paid a visit to Walton-on-Thames, where, out of dry dung, I obtained *Cilea silphoides*, L., and shortly afterwards came across (near the river bank) a large dead beech tree, the bark of which I was able to tear off easily in dry sheets; this proved very prolific in beetles, my captures included—*Tetratoma fungorum*, F., *Rhinosimus ruficollis*, L., *Bembidium rufescens*, Guer., *Mycetophagus multipunctatus*, Hell., *M. 4-pustulatus*, L., *Litargus bifasciatus*, F., *Homalium iopterum*, Steph., and others. Early in November, business took me over to Belfast, and one afternoon I got an hour on the shores of Lough Neagh, near the town of Antrim, but I was much too late in the season for any of the specialities of that spot and rain set in soon after I got to the lake—the following is a list of all the beetles I took—*Notiophilus substriatus*, Wat., *Leistus fulvibarbis*, Dj., *Trechus minutus* var. *obtusus*, Er., *Pterostichus minor*, Gyll., *Cercyon lateralis*, Marsh., *Quedius fuliginosus*, Gr., *Stenus bimaculatus*, Gyll., *Hypera polygoni*, L., *Parnus auriculatus*, Ill., and *Homalium laeviusculum*, Gyll. The last insect is usually considered a purely sea-coast one, and Canon Fowler says it has not been taken in Ireland but that it probably occurs; its capture, therefore, under rubbish on the shore of this, the largest fresh-water, lake in the United Kingdom, is interesting.—T. Hudson Beare, F.E.S., 2, Heriot Row, Edinburgh.

New Forest notes in 1901.—Having spent a week in July and the whole of August in the New Forest I was fortunate enough to add to my collection some of the most interesting beetles found there. In July my friend Mr. Bouskell was with me, and we took a nice series each of the lovely *Anthaxia nitidula*. This insect takes to wing very readily in the bright sunshine, but drops to the ground at the least sign of danger. Several specimens, after having been captured, were allowed to escape, when they flew to the nearest hawthorn bush and settling on the underside of a leaf, remained stationary for some time. One of my specimens is of a rich bluish colour. We had the satisfaction of leaving a fair number unmolested. Perhaps our most interesting find consisted of a few specimens of *Agrilus sinuatus*. This rare species, which has not been taken by coleopterists for many years, is also exceedingly quick on the wing, several specimens making good their escape; the species occurred on old hawthorn bushes. The next best capture was *Plegaderus dissectus*, some 30 specimens of which were taken under bark of beech. Mr. Bouskell took two specimens of the fine *Athous rhombeus*, not, however, in the same locality where I took my series in 1899. He also obtained a nice series of *Helops caeruleus* under bark of oaks at Lymington. In August, the perfect insect was over, but another brood was on the way, as Mr. Morley and I dug out a number of pupæ from a similar place, some of which have been successfully reared since. Mr. Bouskell took a specimen of *Colydium elongatum* in the burrows of *Dryocetes villosus*. I took another specimen of this rarity in August in the burrows of *Scolytus intricatus*. It is said to be parasitic on *Platypus cylindrus*, but I believe it is not confined to any one wood borer, as I took my 1895 specimen in the burrows of *Melasis buprestoides*. The other two best things I took were *Platydema violaceum* and *Velleius dilatatus*. On the capture of the latter I give a separate note. The former I took in company with my friend Mr. Gorham, seven specimens in all being taken. On August 10th I was removing the bark from an old felled oak, when I obtained a beetle, which I at once recognised to be *Platydema*, and I shouted the fact to Mr. Gorham, who was close at hand; we then set to work with the result before mentioned, that seven specimens were captured. It must be some forty years since any number of the beetle was taken. The last record we can find is by Mr. J. G. Marsh, who records two specimens as being taken by James Allen in the New Forest in 1871 (*Ent. Mo. Mag.*, viii., 248). It was one of the things old Turner used to find, and nearly all the specimens extant are from that source. In the Power collection there is only one specimen (labelled "Turner"). It has only occurred in the New Forest in Britain. I was also pleased to take a nice series of *Agrilus viridis*. They occurred on sallow bushes and I netted them as they flew and settled on the leaves in the sun. I took them on August 9th, and think they must have been a second brood; some of the ♀s are very large. Of other species taken by my friends and myself, Mr. Morley took a specimen of *Strangalia quadrifasciata* on *Angelica* (this is its first record I can find for the Forest) and *Mesosa nubila* in a fallen bough at the end of August, a very late capture; the specimen would probably have hybernated. I took a ♀ *Lucanus cervus* on August 23rd, also a very late capture. *Leptura scutellata* and *Tomoxia biguttata* were not uncommon on beech logs in July; *Staphylinus erythropterus* was picked up on the road; *Pocadius ferrugineus*, *Dacne humeralis*, and *Thymalus limbatus* occurred in white *Boleti*; *Nitidula rufipes* was abundant on old bones; *Elater pomonae* (*miniatus*, Gorham) under oak bark, and *E. lythropterus* in a fallen bough of birch; *Aromia moschata* was taken in July by Mr. Bouskell on sallow, in August by Messrs. Gorham and Morley on *Angelica*, and by myself on ragwort and *Angelica*. It is the first time I have seen this longicorne in the Forest, and its capture makes a total of 25 species of longicornes I have taken there now. *Phyllobrotica 4-maculata* was taken freely on the skull-cap. *Orchestes iota* was swept sparingly off bog-myrtle by Messrs. Beare, Morley, and myself. *Mordellistena humeralis* was common on dog-rose blossoms and *M. brunnea* on *Angelica*. *Phloeotrya rufipes* occurred in July and August under bark of beech and oak and on beech logs, and the little *Clinocara undulata* was very common under beech bark. *Bembidium decorum* which is considered rare in the south of England was found in plenty by Beare, Morley, and myself on the stretches of pebbles in the Lymington River.—H. St. J. K. Donisthorpe, F.Z.S., F.E.S., 58, Kensington Mansions, South Kensington.

Tracing *Velleius dilatatus*, F., to its haunts.—My chief object in going to the New Forest in August was to try and find the interesting *Velleius dilatatus*. I am pleased to record that I was very successful, taking in all twelve specimens of this rarity. The first thing I set myself to do was to find a hornets' nest, and this I succeeded in doing after several days' search. I found a strong nest in a hollow birch tree, the hornets entering the tree at a hole about twelve feet from the ground. Sugaring at night proved unsuccessful, though with the aid of my lantern I actually saw a *Velleius* high up on the tree, but not on the sugar. It appeared to be seeking the nest, and flew off on my turning the light on to it. I now thought out and constructed a trap which enabled me to do without night work, and to visit it in the daytime, feeling safe that any beetles which had got in at night would be waiting for me next day. I visited the spot nearly every day, and out of this one trap I took in all ten specimens. Later on I found some other hornets' nests, but they did not prove nearly so prolific, as I only took one *Velleius* each out of two of the other nests, making up my total of twelve specimens. One of my specimens is a gigantic ♂. Fowler (*Col. Brit. Isles*, ii., p. 226) points out that the species varies very considerably in size and says the largest specimens reach 25mm. My large ♂ measures 32mm.! -Ibid.

Sphærites glabratus, F., in Cumberland.—Records of this species for the British Isles appear to be confined to the Tweed, Tay and Dee districts of Scotland, with the exception of a single specimen taken by Hardy, at Wooler, in Northumberland. It will, therefore, be of interest to put on record the capture of two fine specimens on June 23rd last by Mr. H. Britten and myself near the village of Great Salkeld, in Cumberland. They occurred to us from a dead crow lying on the ground in a fir plantation, and though Mr. Britten has had that particular carcase (and others near it) under constant observation ever since, no more *Sphaerites* has turned up. Canon Fowler (*Col. Brit. Isles*, vol. iii., p. 72) mentions that it occurs " under bark of dead trees, in decaying fungi, and at oozing sap, also in dung."—Frank H. Day, F.E.S., 6, Currock Terrace, Carlisle. *September* 18*th*, 1901.

Coleoptera at Colchester.—Not having been able to devote much time to coleoptera during the past season, my list of captures is short and few species new to the district have been met with. Small ponds in a gravel pit produced a series of *Berosus affinis*, some *Pelobius tardus*, and single specimens of *Dytiscus marginalis* and *Cnemidotus impressus*, and by pulling up weeds in a swift narrow current of the river we found *Deronectes depressus*, *D.* 12-*pustulatus* and *Brychius elevatus*, the moss on some flood-gates near producing a few *Dianous caerulescens*. Among the captures on the sea-coast were *Brachinus crepitans* (including some very small examples), *Telephorus oralis*, *Dasytes plumbeus* and *Harpalus puncticollis*. By working manure-heaps and stack-bottoms during May we obtained *Microglossa suturalis*, *Heterothops dissimilis*, *Crytophagus bicolor*, *Eumicrus tarsatus*, *Aphodius lividus*, *Stilicus orbiculatus* and other species, while *Sunius intermedius*, *Bryaxis haematica*, and *B. fossulata* were found under dead leaves earlier in the year. A visit to Ipswich produced *Harpalus discoideus* and other species under stones, *Aphodius* 4-*maculatus* (3), *A. inquinatus* and *Geotrupes vernalis*. Two or three *Crepidodera nitidula*, and a number of *Phytodecta rufipes* were obtained by sweeping young aspens in a wood near Bures, and in the same locality a ♀ of *Mordellistena abdominalis*. *Rhynchites aeneovirens*, *R. betuleti*, *R. populi*, *R. pubescens*, *Cryptocephalus lineola* and *C. sexpunctatus* occurred sparingly in woods, and a specimen of *Scaphidium* 4-*maculatum* was found under a log. *Orsodacna lineola* was very scarce, three specimens being taken by beating oak-trees, which also produced *Toxotus meridianus*, *Leiopus nebulosus* and *Conopalpus testaceus*. Among the other species taken were *Harpalus punctatulus*, *H. sabulicola* (on flowers), *Rhynchites conicus*, *Ocypus compressus*, *Tribolium confusum* and other species.—B. Harwood, Colchester.

ORTHOPTERA.

Duplication of the auditory organs in Thamnotrizon cinereus, L.—Whilst collecting on waste ground near Wimbledon, last August, I took a few specimens of *Thamnotrizon cinereus*, Linn. One of the males proved to be of considerable teratological interest. In addition to the normal pair of auditory organs, which are situated at the proximal extremity of the anterior tibiæ, this individual possesses a pair on the intermediate tibiæ as well ; and since their position and external appearance is perfectly normal one is perhaps justified in assuming that they are also functional. Unfortunately I had killed it before the abnormality had been observed, otherwise I might have been able to test its capacity for responding to sound, since the other males continually appeared to answer to each other's chirping.—F. W. Terry, 51, Trinity Road, Wimbledon, S.W. *September 30th*, 1901. [We have never before seen or heard of such a phenomenon occurring in Orthoptera. The auditory organs are a useful generic character in the Locustodea, especially in the Gryllodea, but we know of no record of such a monstrosity.—M. B.].

Periplaneta australasiæ at Liverpool.—I received a pair of this fine cockroach from Wavertree during August. Mr. Oulton Harrison, to whom I am considerably indebted for them, informs me that the species occurs not uncommonly in a friend's hothouse where they are thought to do some damage by nibbling the roots of orchids, &c.—E. J. Burgess Sopp, F.R.M.S., F.E.S., Saxholme, Hoylake. *October 2nd*, 1901.

NOTES ON COLLECTING, Etc.

Nonagria neurica at Lincoln.—May I report the occurrence of this moth at Lincoln, a locality I believe not before recorded, apparently for the want of systematic searching, as the Fens are practically continuous from here to Cambridge (a known locality), thus tending to show its distribution over the whole area of the Fens of the eastern counties? It is a species likely to be overlooked by anyone not knowing its habits ; it seems to have an appearance of about three weeks, *i.e.*, the better part of the month of August, commencing flight soon after 8 p.m., threading its way rapidly low down amongst the reeds. I find the best way to net it is to stand by with a good lamp shining on the reeds, when the specimens can be easily taken on coming into the radius of light. Sugar does not seem a very seductive bait, two or three an evening being the largest take, and light is entirely ignored. Locally there does not appear much range in variation, although some are paler than others and there is a difference in size, but all may be referred to var. *arundineta*, Schmidt.—J. F. Musham, Blenheim House, South Park, Lincoln. *October 5th*, 1901.

Leucania l-album at Sandown.—I have much pleasure in recording the capture, at Sandown (Isle of Wight), on September 8th, of a specimen of *Leucania l-album* ; the insect, which came to sugar, is in excellent condition. So far as I can discover previous records of the capture of this insect in the British Isles have been of more than doubtful origin ; in the present instance, however, the insect certainly has no "past," and I trust that it will rank as the first authentic record of the species for this country.—S. J. Bell, St. Aubins, Sternhold Avenue, Streatham Hill, S.W. *October 4th*, 1901.

Catocala fraxini at Norwood.—It may be interesting to record the capture of a specimen of *Catocala fraxini* at light, at Norwood, on September 10th, 1901. It was captured by Dr. J. C. Bates.—A. M. Swain, 5, Kelvin Terrace, Sydenham, London, S.E. *September 23rd*, 1901.

Cyaniris argiolus and Plusia moneta in Middlesex.—I am glad to say that the little colony of *C. argiolus*, which appeared in the garden here last year, has thriven, and, in the spring months, both males and females were commonly to be seen flying over the flowers of the holly, and sunning themselves upon a neighbouring ilex. *Eugonia polychloros* has also occurred again on Grims Dyke, where I had not seen it for many years. But my most interesting visitor has been *Plusia moneta*. In May I was informed that the gardener had succeeded in destroying a number of caterpillars on a patch of monkshood, and my suspicions were at once aroused as to their identity. A diligent search only yielded two, spun up in the flower-heads, so well had the man done his work, but there was no mistaking them, and I afterwards took another nearly full-fed on a delphinium a few yards off. In captivity all appeared to eat either plant indiscriminately, and the three eventually pupated and hatched out during my absence abroad, in the cages of Mr. P. J. Burraud. I found traces also of the larva at Simon Hill, and one minute specimen which unfortunately was mislaid. *Pyrameis atalanta*, which, with *Chrysophanus phlaeas*, is still flying in the garden, is also reported as being plentiful. It was already out before I went away from England on July 12th.—H. Rowland-Brown, M.A., Oxhey Grove, Harrow Weald. *September 30th*, 1901.

Lepidoptera in county Dublin.—The following lepidoptera were taken in this neighbourhood at gas-lamps in September: *Hydroecia micacea*, common; *Noctua glareosa*, *N. xanthographa*, *Anchocelis pistacina*, common; *A. lunosa*, various forms; *Mellinia circellaris*, *Cirrhoedia xerampelina*, two; *Ortholitha cervinata*, *Thera variata*, *Acidalia promutata*, *Ennomos quercinaria*, some nice forms; and *E. tiliaria*. One *Sphinx convolvuli* was taken here at the flowers of *Nicotiana affinis*, on September 14th, and another seen on September 18th.—T. Greer, 30, Waltham Terrace, Blackrock, County Dublin.

Lepidoptera at Minehead.—I spent a few days at Minehead, in Somersetshire, in September. In four days, at *Nicotiana affinis*, I took 14 *Sphinx convolvuli*, they were all captured between 6.15 and 7.0 o'clock in the evening on the following dates:—September 24th, 3; 25th, 5 and missed 1; 26th, 4 and missed 2; 27th, 2. All were in fairly good condition. At sugar I also took the following insects:—*Hadena protea*, *Brotolomia meticulosa*, *Epunda nigra*, *E. lichenea*, *Citria cerago*, *Leucania pallens*, *Triphaena orbona*, *Amphipyra pyramidea*, *Anchocelis rufina*, *A. pistacina*, *A. litura*, *Orrhodia vaccinii*, *Xylophasia polyodon*, *Peridroma suffusa*, *P. saucia*, *Noctua glareosa*, *N. xanthographa*, and *Mellinia circellaris*.—John Cotton, M.R.C.S., 126, Prescot Road, St. Helens, Lancs. *October 9th*, 1901.

Notes on collecting in the Isle of Man.—The entomological season of 1901 has not been up to the average. The rarer species of our insular Noctuids were scarce. Very few *Dianthoecia caesia* and *Polia xanthomista* (*nigrocincta*) were taken. *Cirrhoedia xerampelina*, however, occurred in some numbers during August, and several specimens of *Sphinx convolvuli* were captured during September. Some fine aberrations of *Anthrocera trifolii* occurred in the Ballaugh Curraghs, during the first three weeks of July, many of them being particularly striking both in form and markings. Sugar proved attractive during the latter end of June, and *Setina irrorella* larvæ were plentiful on the coast during the early part of the season, two specimens of the "ivi" variety (=ab. *signata*) being bred by me.—H. SHORTRIDGE CLARKE, F.E.S., Sulby Parsonage, Lezayre, Isle of Man. *October* 12*th*, 1901.

COLIAS HYALE AT CHICHESTER.—My brother, Mr. Frederick Anderson, captured eight specimens of this butterfly during the month of August last. The first was on the 19th of that month. None were seen after the 24th. This was probably owing to the change in the weather, which became rainy and cold for the time of the year. Only one of the insects is a female. We have not seen a single *Colias edusa* this season.—JOSEPH ANDERSON, Chichester. *October* 4*th*, 1901.

APPEARANCE OF COLIAS HYALE AT BURGESS HILL.—Three specimens were taken on August 23rd, and three on August 24th, no *C. edusa* were to be seen anywhere.—J. C. DOLLMAN.

COLIAS HYALE IN THE CROYDON DISTRICT.—*Colias hyale* appears to have been again fairly frequent in this district during the past summer, judging from my somewhat limited opportunities for observation. I was only able to be in its haunts on August 24th and 25th, but on both those days, which were bright, and fairly suitable for its flight, it was locally frequent, and I succeeded in netting 24 perfect, and some imperfect, specimens; of the former, 22 were males and only two females. The weather broke up the next day, and I did not see another specimen.—W. G. SHELDON, Croydon. *October* 26*th*, 1901.

SPILODES PALEALIS AT FOLKESTONE.—I have to record the occurrence of this insect last June in its old locality near here. I believe it has not been taken here for some years.—STUART S. HILLS, Folkestone.

ENNOMOS AUTUMNARIA AT READING.—Referring to Mr. Barnes' note (*anteà*, p. 278), of the capture of *Ennomos autumnaria*, at Reading, the following may explain the capture of the same. In 1899, my friend Mr. Hills, of Folkestone, gave me a few pupæ of the above insect, from a ♀ taken by Mr. Giles at Folkestone. I reared a fine lot last year, and, this year (early spring), turned loose a large batch of larvæ on the plumtrees in my garden, where they fed up well, and, not wanting them, I only collected a few. Several males flew into my room to light, and, as Mr. Barnes only lives about a mile and a half from my garden, it may be one of this brood that he took. I thought I had better make this explanation.—W. E. BUTLER, Reading. *September* 19*th*, 1901.

WICKEN FEN AND MR. ASPLAND.—A week ago I spent a few days at Wicken, and collected on the Fen with another entomologist. As usual Mr. Aspland wanted to charge us 1s. 6d. per. week, saying that "we could not go on the Fen without going on his land." He also threatened to prosecute. May I, on behalf of the Wisbech entomologists, ask if he can do so?—HENRY B. JOHNSTON, 8, The Crescent, Wisbech. *August* 9*th*, 1901. [Our opinion of Mr. Aspland's conduct is expressed, *anteà*, vol. iv., p. 177. The droves, in our opinion, the best collecting-grounds on the Fen, are surely public rights-of-way, and everyone has right of usage. We always fixed our sheet on the main drove when we collected there, and risked Mr. Aspland's threats. Lepidopterists, to whom 1s. 6d. per week is nothing, have made it harder for their poorer brethren of the net, by paying this imposition without thinking of the principle involved therein. Ed.]

Sphinx convolvuli at Chichester.—Had it not been for this moth, which appeared in some numbers in this neighbourhood, the past season would have been the worst for lepidoptera in my recollection. The first record of its appearance which I have in my diary, is on August 12th, when a worn specimen was taken in a spider's web at the museum; after which the moths were not seen till September 8th. No less than eighteen were captured by my young friend, Master John Fogden, of Apuldrum, at the flowers of petunias in their garden. Some of the insects have the cilia so perfect, and the colours so fresh, that I think they must have been bred in the locality. I heard of one collector who had obtained two larvæ, which safely pupated. The moth was noticed in our own garden hovering over the petunia flowers. It is still on the wing at the date on which I am writing (October 3rd). My friend Dr. Crallan, of Bournemouth, tells me that the moth is fond of resting on palings a short distance from the ground. This habit is doubtless protective, the colours—of the anterior wings especially—harmonising perfectly with weathered palings, like those of *Cucullia umbratica*, which has a similar habit.—J. Anderson, Alre Villa, Chichester. *October 3rd*, 1901.

Appearance of Sphinx convolvuli at Angmering, at Burgess Hill, in Sussex, and at Hammersmith, London.—I had a full-fed larva of *Sphinx convolvuli* sent me from Angmering, near Worthing, on August 23rd, it is now in pupa. At Burgess Hill, Sussex, this insect was constantly to be seen flying round the incandescent gas-lamps in the London Road, on the evenings of September 14th and 15th. A dead specimen of the same insect was picked up on September 17th, in the playground of Colet Court School, Hammersmith, by one of the scholars.—J. C. Dollman.

Sphinx convolvuli in Warwickshire.—A fine specimen was brought to me alive on the 28th inst. It had been taken at rest close to my house, and had apparently only recently emerged.—G. W. Wynn, Hampton-in-Arden, Warwickshire. *September 30th*, 1901.

Sphinx convolvuli at Stratford.—It may be interesting to the readers of the *Record* to know that *S. convolvuli* has been rather plentiful in this neighbourhood. I know, personally, of about two dozen having been taken flying round the electric lights in Stratford and Ilford. It seems that they are unusually abundant this year.—Colin Murray, 9, Bedford Gardens, Ilford. *October 6th*, 1901.

Sphinx convolvuli in London Fields.—On September 25th, 1901, I captured a specimen of *Sphinx convolvuli* flying around the electric light at the Broadway, London Fields.—Joseph Alderman, 1a, Allas Road, Mile End, E.

Sphinx convolvuli at Folkestone.—I had a fine specimen of this moth brought to me on October 1st, taken here at rest. Mr. Judge, of this town, found, in September, a larva in his garden, which produced a fine imago in due course.—Stuart S. Hills, Public Library, Folkestone. *October 6th*, 1901.

Sphinx convolvuli at Chelmsford.—Four specimens of *Sphinx* *convolvuli* were taken here last Thursday and Friday, October 3rd and 4th. Unfortunately two of them were nearly dead when brought to me, and were in very worn condition. Of the other two, one, a dark ♂, was taken from an electric street lamp on October 4th, and the other, a ♀, I captured myself, on the evening of the same day, flying at flowers of *Nicotiana affinis*.—E. Miller, The Croft, Rainsford Road, Chelmsford. *October 7th*, 1901.

VARIATION.

Some new Geometrid varieties and aberrations.—In working through the new *Catalog* of Staudinger and Rebel, together with our British literature on the *Geometrides*, I have come to the conclusion that the following more or less well-known varieties and aberrations have never yet been named.

Lobophora carpinata, ab. (et var. ?) *fasciata*, n. ab.—The central area of forewings is strongly marked with two narrow, approximate, transverse bands. These forms are frequent at Rannoch, and are well represented in all our large or moderate-sized British collections.

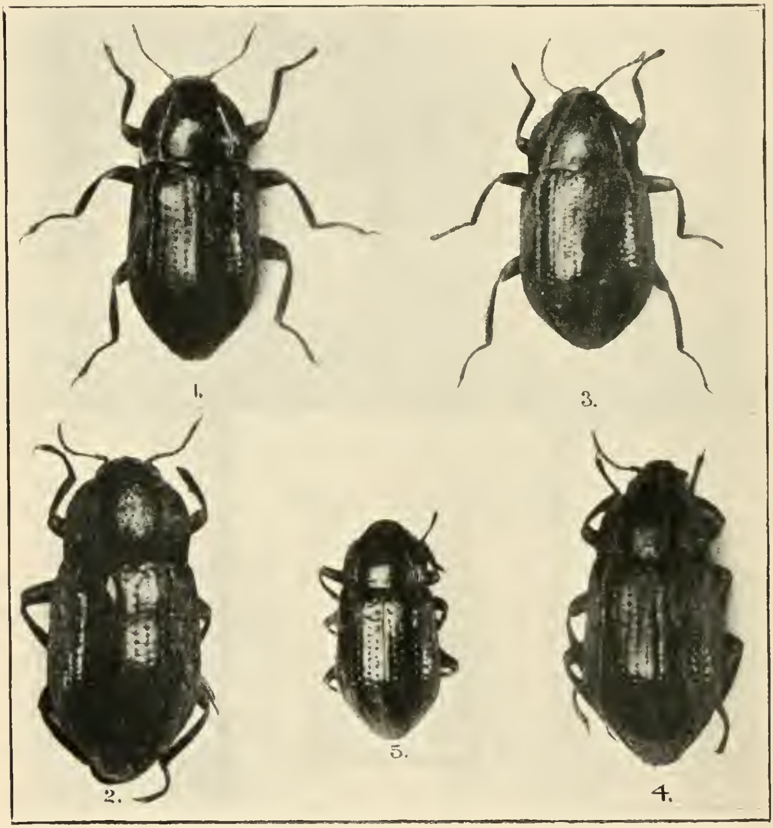
Ochyria (*Larentia*) *munitata* var. *hethlandica*, n. var.—Ground colour of forewings strongly ochreous. This fine race seems to entirely supplant the type in the Shetlands. The specimens are generally, so far as my observation extends, of rather large size and broad band, but I would not indicate these characters as absolute essentials of the variety.

Hydriomena (*Larentia*) *autumnalis* ab. *infuscata*, n. ab.—Amongst various pretty aberrations occurring with the type of this species (known to most British lepidopterists as *H. impluviata*) in the Isle of Arran, this is the most extreme, and the easiest of definition. At first glance the forewings appear to be of an almost uniform fuscous, but two narrow bands bounding the broad central area, usually also the middle part of the central area and some spots before the fringes, are really somewhat paler. It is curious that the pale bands seem to occupy the position of the (often quite dark) bluish or grey bands of the type.

Eupithecia (*Tephroclystia*) *venosata* var. (? ab.) *orcadensis*, n. var.—Ground colour of a sandy tint which is quite distinct both from the pale colour of the type and the brown-grey of var. *nubilata*, Bhtsch. (from the Shetlands). The black markings—especially the longitudinal—tend, as also in var. *nubilata*, to be less sharply expressed than in the type. Both my Orkney specimens belong to this new var., and Mr. F. J. Hanbury has others; but I am unable to say positively whether it is the sole form in the Orkneys.

Gonodontis bidentata ab. *nigra*, n. ab.—This fine form has the ground colour of a glossy black, with only the transverse lines slightly paler. It occurs in company with so many others of our melanic aberrations in some of the northern manufacturing districts—Manchester, &c.—Louis B. Prout, F.E.S., The Elms, 246, Richmond Road, Dalston, N.E.

Errata.—Page 303, line 18, for "*Cidaria*" read "*Neuronia*." Page 303, line 14, for "Lepidoptera in the New Forest" read "Lepidoptera in the New Forest, &c." By leaving out the "&c." this note reads as if *Argynnis adippe*, *Agrotis cinerea*, *Pachetra leucophaea* and *Neuronia reticulata* were captured in the New Forest. These species were not taken in the New Forest.—Ed.



British Species of Limnius.

Some Remarks on the British Species of Limnius (*with plate*).

By H. St. J. K. DONISTHORPE, F.Z.S., F.E,S.

It will be remembered that, in the April number of the *Entomologist's Monthly Magazine* of this year, Mr. Champion made some remarks on the British species of *Limnius*. He said that Mr. Edwards had sent him for examination four *Limnii* from Norfolk, apparently belonging to as many species, together with enlarged photographs of the same, taken by himself. These photographs we now reproduce, since it appears to us that the paper in question is very difficult to follow without the illustrations to study with it. We now proceed to quote some of Mr. Champion's remarks. He says (speaking of figures nos. 1-4 in the plate) : " If these specimens are to be referred to two species only, as seems probable, there must be considerable variation in the sculpture, &c., of the members of this genus, and it is, therefore, worth while calling attention to them. The chief differential characters noticed by Mr. Edwards between these four insects, which for convenience are here referred to under the numbers 1-4, are as follows :—

1. Elytra coarsely punctuate-striate on the disc (the interstices appearing convex), about two and a half times longer than the thorax; thorax shining on the disc.
2. Elytra sculptured as in no. 1, about two and a third times longer than the thorax; thorax dull and rugulose on the disc.
3. Elytra finely and somewhat shallowly punctuate-striate on the disc, the interstices flat, each with a distinct single series of punctures.
4. Elytra as in no. 3, but without a distinct single series of punctures on each interstice."

He goes on to say that M. Grouvelle has examined Mr. Edwards' insects and considers them to belong to two species only, nos. 1 and 2 being *L. dargelasi*, Latr., and nos. 3 and 4 *L. troglodytes*, Gyll. Now it seems to me that, if nos. 3 and 4 are the same species, there is absolutely nothing left to differentiate between two species. We know that size and colour go for very little in coleoptera, and what have we left—form, structure, sculpture, and punctuation, and as these two specimens differ from each other in all these the whole thing is reduced to an absurdity. We note that Mr. Champion does not express a decided opinion on the subject, and all the coleopterists to whom we have shown the photographs have expressed great doubt as to their being the same species. To make our illustration of the genus more complete we add a figure (no. 5) of *L. rivularis*, Rosenh.

Whatever views one may hold as to what constitutes specific distinction in this genus, the British forms may for the present be distinguished as follows :—

1.	(6) Disc of thorax shining.	
2.	(3) Elytra shallowly depressed on the disc.	*dargelasi*, Latr. (no. 1).
3.	(2) Elytra plain.	
4.	(5) Interstices of elytral striæ with a distinct single row of punctures.	*troglodytes*, Gyll. (no. 3).
5.	(4) Interstices of elytral striæ simple.	*rivularis*, Rosenh. (no. 5).
6.	(1) Disc of thorax dull.	
9.	(8) Thorax not narrowed until beyond the middle.	no. 2.
8.	(7) Thorax gradually narrowed from the base.	no. 4.

No. 2 may, of course, be the female of *L. dargelasi*, but if that be so then this sex must be extremely rare, since but two other specimens are recorded. Colour is lent to the assumption that the female in

Limnius has the disc of the thorax dull, by Mr. Champion's statement that nos. 3 and 4 can be matched in a series of *L. troglodytes* from Slapton in his collection, since he does not say that he has specimens intermediate between those two forms. We agree with Mr. Champion that it is worth while to call attention to these obscure insects, and hope that coleopterists will look up their specimens of this genus with the view of clearing the matter up.

Whether photo-micrography will ever take a front place in entomological illustration is doubtful, but as practised by Mr. Edwards it certainly affords a convenient means of comparing the contour and sculpture of small insects.

On some races of Lasiocampa quercûs.

By J. C. WARBURG.

(*Concluded from p.* 317.)

Sicula Derivatives.—(1) *L.* hybr. *sicula* ♂ × *meridionalis* ♀ (=9 ♂ × 2 ♀).—Mr. Bacot obtained a pairing of these two moths (U. August 24th, 1897), from which he bred 4 imagines, 3 ♂ s and 1 ♀. The same male was paired twice (if not three times). The ova given me were very green, and I anticipated that they would be sterile. They hatched, however, and the larvæ were very red-brown-haired on the dorsal area, with a very few long white hairs (derived from the ♀ parent I suppose) sprinkled over the sides, very few on the back. I obtained four pupæ (the last May 1st, 1898), and had only three emergences, all ♂ s, between July 30th and September 2nd, 1898. The specimens are more like var. *meridionalis* than var. *sicula*. The band on the forewings is much as in var. *sicula*, the spot rather larger than in either of the parent races. The predominance of var. *meridionalis* appears in the hindwing, which has the border, though a little lighter than in var. *meridionalis*, brown and not ochreous, and the band narrow. In a male which Mr. Bacot has given me of his rearing (which spent its whole life in England, while mine were in Cannes in the larval and part of the pupal stage) the dot is quite small, the only point in which it differs in the least from var. *meridionalis* being a certain intensity of colour in the narrow band of the hindwing, due to the orange-yellow coloration of the band in var. *sicula*. Two of these were paired, and the descendants are described next.

(2) *L.* hybr. ♂ (*sicula* × *meridionalis*) × ♀ [(*meridionalis* × *riburni*) × (*meridionalis* × *riburni*)] [= ♂ (9 × 2) × ♀ (6 × 6)]. —The male in this case was placed with three females. The ova, lot 3610, from one or more of these were laid about July 30th, 1898, hatched August 22nd, 1898, first moult September 3rd, second moult about September 10th, third September 25th, 1898, fourth about October 19th, 1898. The first spun up December 12th, 1898. The larvæ on hatching were dark brown with pale whitish dorsal line scarcely divided by the bluish segmental divisions. The dark brown sides of first four segments with long white hairs. Head black. After first moult bright rusty orange. The pattern on the back consists of orange lozenges with dark subdorsal Λ-marks. Head pale blue, face paler. Collar rather large, orange. First segments with long white costal hairs, sides with white hairs. Long scattered white hairs. My only two specimens

are two ♂ s, which emerged July 11th, 1900, and August 7th, 1900, after an extra year of pupal life. They are odd enough in their looks. They are of a dark mahogany-brown tint, different from any of the others, thinly scaled and partly decolorised, with small dots, a narrow sharply-defined band on the forewings, and a quite thin not very marked line on the hindwings. Their markings do not suggest their parentage, and they would hardly be taken for *quercûs* forms at all. The only other specimen they at all resemble is one of the second year [(9 × 2) × 9] batch. I still have many pupæ remaining over, possibly alive.

(3) *L.* hybr. ♂ (*sicula* × *meridionalis*) × ♀ ?*sicula* [= ♂ (9 × 2) × ♀ ? 9]. —About July 1897 I had an unfortunate accident with my pupa cage. It was knocked over by a curtain, blown by a draught in the room, and several of the pupæ were spilt out of their boxes. I sorted them out as well as I could, but there is a slight degree of doubt in some which I have marked with a ?. The female parent in this case was, however, almost certainly a *sicula*. The ova, lot 3660, obtained from the above parents on August 12th, 1898, were large, mottled with red-brown. They *all* hatched on September 3rd, 1898, and after. Before their first moult the larvæ were very similar to lots 3640 [= ♂ (9 × 2) × ♀ (6 × 6)] and 3646 [= ♂ (9 × 7) × ♀ 10], except that there seemed to be a more conspicuous black segmental division between segments 2-3 and 3-4. There were also scattered long *black* hairs. I have no further notes about them after the first moult (September 14th, 1898). The emergences extended over two years and were very erratic. So are the results. All specimens were small. The ♂ parent as before stated had large dots, the four ♂ descendants minute ones. The two males emerged in the first year (April 1899) are good intermediates both in colour (which is duller in these than in any of the others) and in markings. The whole border of the hindwing is a brown just about midway between the chestnut of var. *meridionalis* and the dark brown of var. *sicula*, just lightened up with a thin orange-yellow line inside, which is even smaller than the band in var. *meridionalis*. The ♀ of the first year is lighter than the ♀ parent, and shows the influence of both races. The two ♂ s of the second year did not appear in April, but in August 1900 and in the winter following.* The first of these was a decolorised thinly-scaled specimen, similar to the first year's, the second a washed out var. *sicula* in appearance with nothing to distinguish it from the pure race. The two second year ♀ s were darker and slightly crippled. I ought to note, as it has been shown to influence var. *sicula*, that the winter of 1898 was the last that I spent in Cannes, so that crosses obtained after that were reared entirely in England.

(4) *L.* hybr. ♂ *sicula* × ♀ (*meridionalis* × *viburni*) (= ♂ 9 × ♀ 7).—The ♂ parent was the same as in the 9 ♂ × 2 ♀ brood described, the ♀ a fairly dark nicely marked specimen. This pairing was obtained by Mr. Bacot (V, August 24th, 1897), who reared 400. My larvæ, described when $1\frac{1}{2}$in. long, closely resembled those of (7 ♂ × 2 ♀). They had the dorsal area very red-brown-haired, but more long white hairs were sprinkled over both back and sides. Face rusty-red. I obtained 17 pupæ. I am not able to say how many imagines emerged (July-September, 1898), as this box full suffered very severely in the

* No record was kept of moths, which, coming out unexpectedly, damaged themselves irreparably.

upset already alluded to. There was a good number. Four ♂ s, all alike, are good intermediates, much more so than in the ♂ 9 × ♀ 2 brood. Forewing with a band like that of var. *riburni* in breadth and in contour also, but influenced by the straight var. *sicula* character. Hindwing with a broad band suffused externally. That is to say, var. *sicula* takes the inside half and *L. meridionalis* × *riburni* the outside. Fringes yellow. These are very like the Gironde var. *guillemotii*. There is another ♂ exactly like these from a pupa which no doubt got into a wrong box. Then there are three males purporting to be this cross, with narrow bands on the hindwings, which probably are what they pretend to be; they show little *L.* var. *sicula*. Finally there is another ♂ which came out of this box which will be referred to later. The female (described from one of Mr. Bacot's) has the *sicula* hindwing.

(5) ♂ 9 × ♀ (9 × 7).—I obtained this pairing and also ♂ 9 × ♀ (6 × 6) with the same male, but nothing appears to have come of either.

(6) *L.* hybr. ♂ [(*meridionalis* × *riburni*) × (*meridionalis* × *riburni*)] × ♀ *sicula* [= ♂ (6 × 6) × ♀ 9].—This cross the reciprocal to the last was obtained by Mr. Bacot (no. 1, 1898). He and Mr. Prout* bred from it 1 ♂ and 5 ♀ s in 1899, and 2 ♂ s in 1900. The males are practically *L.* var. *riburni* but with the band more orange on the hindwings, and are very like the three 9 × 7 crosses described as doubtful (the probable correctness of which they endorse). One of the two males given me by Mr. Bacot has the band of the hindwings wavy, the only example of the kind among all the specimens. The ♀ s have the *sicula* hindwing.

We now come to three crosses which give very charming offspring.

(7) *L.* hybr. *sicula* (?) × *quercûs* (Paris) (= ♂ 9 × ♀ 10).—The male parent is one which came from a batch of var. *sicula* pupæ, and I have little doubt is such. In markings it is a typical specimen of this form. The ♀ parent is of a pale ochre with the markings obsolescent. All the ova of this batch (lot 3647), which were laid August 6th, 1898, hatched. The 1st moult took place September 14th, 1898. The moths emerged from March 28th till June, 1899, 9 ♂ s and 15 ♀ s. In the second year 2 ♀ s emerged at the end of August, which is remarkable. There are ten pupæ still left, some, I think, alive. The young larvæ before the 1st moult are like those of lot 3646 [♂ (9 × 7) × ♀ 10] but the long hairs are, many (or most) of them, black. The black spot on the 4th segment fairly conspicuous. The moths are all smaller than the parents. The males are very like *L.* var. *sicula*, but the band on the forewing is suffused externally, making the whole border pale. The border of the hindwing is either pure yellow or more or less powdered. The females all very pale yellow, paler than the mother, there is, however, more tendency to a darker base with pale border to the hindwing. The second year female is redder, thinly scaled, with markings nearly obliterated. A fertile pairing of two moths of this cross was obtained. The larvæ hatching May 23rd, 1899. These may be noted as follows:

(8) *L.* hybr. [*sicula* (?) × *quercûs*] × [*sicula* (?) × *quercûs*].—The 1st

* Mr. Bacot writes me: "Mr. Prout bred, during 1899, 4 ♂ s and 7 ♀ s, in addition I exchanged with you I think 1 ♂ and 1 ♀. One ♀ is extremely dark, not ♂ coloration, but very dark ♀ *sicula* coloration. This ♀ and another show a narrow yellow band dividing the border from ground colour of hindwing."

moult occurred June 8th, 1899. This is the only entry I have about them.

The remaining two families are particularly curious in their females. The ♂ parent of both was the same individual, but unfortunately there is doubt as to its pedigree. It was reputed to be a 9 × 7 (the batch which suffered most in the upset), but in markings it is a pure *L.* var. *sicula* with but the slightest powdering of darker on the border of the hindwing. I would not hesitate to put it down as pure *L.* var. *sicula* except that the hybrids from it and the Paris *quercûs* ♀ are considerably less *sicula*-like than the 9 × 10 lot (3647) already described. To proceed to these two families in detail:—

(9) *L.* hybr. ♂ [*sicula* × (*meridionalis* × *viburni*) or (*sicula*)] × ♀ [*sicula* × (*meridionalis* × *viburni*)]. [= ♂ (9 × 7) × ♀ (9 × 7)].—This was the first pairing of the male just mentioned. The pedigree of the ♀ is almost certainly correct. It is a large dark specimen agreeing with Mr. Bacot's 9 × 7, and has a blending of the characters without a conspicuously *L.* var. *sicula* border. The ova (lot 3644) were deposited about July 30th, 1898, only a few of them hatched (on August 22nd, 1898). Two other pairings of these hybrids (in which the ♂ s were both of the *viburni*-like type already referred to) produced, respectively, 26 and 50 sterile ova. The 1st moult of the above (lot 3644) took place September 9th, 1898. Two females emerged in May 1899, and another one is recorded in September 1900, which I cannot trace. Six pupæ lie over, possibly alive. The young larvæ resembled lot 3646 [(9 × 7) × 10] and 3640 [(9 × 2) × (6 × 6)], but with a few scattered black hairs. After the 1st moult they were like those of the foregoing two batches, and had no, or hardly any, black hairs. The ♀ moths are small but very pretty. The slightly scalloped fringe of the hindwing (slightly noticeable in *L. sicula*) is marked with grey at the tips of the nervures, which on the forewing darken when halfway across the band. This colouring is slight but enough to impart a neat look to the insect. The other markings are like *L.* var. *sicula*. The colour dull *sicula*.

(10) *L.* hybr. [*sicula* × (*meridionalis* × *viburni*) or (*sicula*)] × *quercûs* (Paris) [= (9 × 7) × 10].—This is the second pairing of the same male and, as pointed out, if it were pure *L. sicula* would be the same in descent as lot 3647 (9 × 10). The female parent fairly large, pale; dark lines marked inside band on forewings and around the dot. Bands obsolescent, whole margin pale in hindwing. The ova (lot 3646) laid about August 2nd, 1898, all hatched August 26th, 1898, and after. The moths emerged 25 ♂ s and 9 ♀ s, on March 1st, 1899, and after, and in the next year 3 ♀ s, August 19th, 1900, and after. The same curious phenomenon with regard to dates as in some of the other batches was observed. The following is the description of the various stages:— Ova very large, mottled red-brown. Larva before 1st moult: Ashy-white, very distinct dorsal line, continuous or only slightly interrupted by the segmental divisions; sides blue-black, with orange costal or subdorsal spots on black ones, the latter most marked on the 4th segment. Possibly these markings, when observed with a lens appear a little more contrasted with the ground colour than they do in lot 3640 [(9 × 2) × (6 × 6)]. Long hairs all white. After the 1st moult (beginning September 9th, 1898), rusty-orange diamonds appear on the back; the sides black with the pattern as before; head pale blue, face whitish; first two or three segments large, with long silky-white hairs,

which are also to be found scattered all over; 2nd moult took place September 20th, 1898, 3rd (?4th) moult about November 14th, 1898; the first larva pupated December 25th, 1898. The ♂ moths are larger than the father, rich in colour. They have the band diffused and the margins of the forewings consequently paler, as in lot 3647 (9 × 10). The hindwing is less markedly *sicula* than in these, and the band is powdered with darker on the outer half as in the first four (9 × 7) described. It is on account of their difference, in this respect, from lot 3647 (9 × 10) that I think it possible that the ♂ parent is not pure *sicula*. The females, too, with one exception, are brownish and not ochreous-yellow; the white dot conspicuous. Through the ♀ parent having a *sicula*-like hindwing it is not possible to say which strain they resemble in markings.

The 3 ♀s which passed an extra winter are extraordinary in appearance. They are of a dingy red-brown all over, the markings obliterated to a pale yellowish line on the forewing, obsolete in one specimen except in front. They have a slightly lighter margin on the hindwing and a very white spot on the forewings.

(11).—Five other 2nd year females with a *sicula* ♂ parent and an unknown female (*sicula* hybrid probably) also have a dingy reddish coloration and obsolescent markings.

Coleoptera on Snowdon.

By BROCKTON TOMLIN, B.A., F.E.S., and E. J. B. SOPP, F.E.S.

Collecting on Snowdon is always interesting, on account of the distinctive character of its mountain fauna. Almost before you begin to climb from Llanberis, an examination of the moss at the fall produces such species as *Stenus guynemeri*, *Quedius auricomus*, and other *Quedii*, or an occasional *Acidota crenata*, and assures the coleopterist that he is no longer on level ground. The interest was, however, much enhanced during our visit this summer by the occurrence of a phenomenon bearing upon the dispersal of insects, an account of which will, perhaps, be especially apposite, following, as it does, upon Mr. Tutt's paper in the October number.

The major part of our collecting was done on August 18th, 19th, and 20th, though a few of the species herein recorded were gathered during the subsequent three weeks. Turning over stones was not very productive, owing to the time of year, and the only interesting *Carabidae* that occurred were *Nebria gyllenhali*, *Carabus arvensis*, *Anchomenus micans*, and *Harpalus latus* var. *erythrocephalus*. This form has been considered to be merely immature, but we are strongly of opinion that it is a genuine variety. One may, perhaps, compare the red- and black-legged forms of *Pterostichus madidus*, and the tendency of some *Aphodii* to vary between red and black. One may also mention *Calathus melanocephalus*, the dark variety in this case being a mountain form, and a perfectly red variety of *Erirrhinus acridulus*, taken in September, at Ballycastle, Co. Antrim. The mountain form of *Agabus bipustulatus* is generally more or less red. This variety of *Harpalus latus* is probably widely distributed over the Welsh mountains, and one of us took it lately in Co. Antrim.

The capture of over a dozen specimens of *Chrysomela cerealis* was noteworthy, as showing that this insect, like others of the genus, lasts till late in the season. We believe that it is usually captured at least two months earlier. A very puzzling little *Longitarsus* was plentiful all over the mountain, and has been referred by different people to *ballotae* or *reichei*. Water-collecting produced a few specimens each of *Hydroporus rivalis*, *H. davisi*, *H. nigrita* and *H. melanarius*. *Agabus bipustulatus* var. *solieri* (?) was, of course, common. This variety was described by Newman as var. *snowdonius* (*Ent. Mag.*, i., 55). Miscellaneous collecting produced *Antherophagus pallens*, *Scirtes hemisphaericus*, and the variety *bicolor* of *Tachinus subterraneus*.

The moss towards the top of the mountain proved most productive, and yielded surprises of the first water amongst the Brachelytra. First and foremost comes *Ocyusa hibernica*, of which Mr. Champion took a single specimen (the type) on the top of Slieve Donard, Co. Down, twenty-five years ago. Dr. Sharp took another specimen at Braemar. Rye's name is, therefore, somewhat of a misnomer. We also took *Oxypoda rupicola*, sparingly—a mountain species which also occurred with *Ocyusa hibernica* in Ireland. *Ocyusa incrassata*, *Homalota tibialis*, *H. eremita*, occurred more or less scantily, and single specimens of *Tachinus elongatus*, *Homalota subglabra* (?), *Philonthus nigrita*, *Antherophagus alpinus*, and *Geodromicus globulicollis*. By dint of hard work we both secured nice series of *Acidota crenata*. Our experience tends to show that the moss is more productive in wet than in dry weather, in spite of the discomfort of shaking and examining it under a heavy rain.

It was a fortunate chance that impelled us on August 19th, when descending viâ Clogwyn, to turn aside for a look at the small mountain tarn known to the initiated as Llyn du'r Arddu, whose blue-black waters are a conspicuous object at the foot of the precipice of Clogwyn du'r Arddu, about 2000 feet up on the Llanberis side. We were astonished to find along the north-eastern margins of the tarn a seething mass of struggling insects, mostly beetles, though nearly all orders were represented. This mass was being constantly augmented by a steady stream of insects setting in across the surface of the water under the influence of the prevailing south-west wind, which had varied but a few points during the whole of the preceding week. Many were drowned but myriads were very much alive to the situation and crawled ashore to dry as soon as the drift gave them a chance. Nor was even the minutest particle of drift-wood untenanted; even the larger beetles and plant-bugs had willy-nilly to carry a crew, which was often piled up three or four stories high. After the first excitement of decimating these mariners was over, one naturally began to ask old Aeneas' question to the Sibyl—"Quid vult concursus ad amnem?" The preceding week had been accompanied by constant torrents of rain, and the reason first naturally presenting itself was that they had been washed down by the swollen mountain torrents and freshets. Many had undoubtedly been thus assembled, but further inspection showed that a large number of insects were of lowland origin, species attached to fir, oak, heather and other vegetation, such as only grows hundreds of feet lower down, in the valleys beneath. We have, therefore, no hesitation in adducing wind as an even more important factor than water in causing this phenomenon. The period of hot weather which had succeeded a spell of cold and rain only a day or two before our first visit would, as usual, produce a steady and somewhat strong diurnal current of air towards the sooner heated uplands, by which the insects may have voluntarily or involuntarily ascended. This fact of itself would not be adequate to explain their congregation at the tarn but for two further important considerations, firstly, the downward rush of cold air which takes place—often with boisterous force—an hour or two after sunset in all mountainous districts; secondly, the fact that, on several subsequent occasions when clouds or mist for a time obscured the sun and thus interfered with the general flux of temperature, strong gusts of wind sweeping across the south-west slope of Crib-y-Ddysgwl and Clogwyn du'r Arddu, were often observed to curl down over the precipice and occasionally even to strike the water beneath with considerable force. Pieces of paper were several times thus precipitated in the vicinity of the Llyn, their gyrations in the air not only proving the strength and direction of the atmospheric currents, but suggesting an explanation of the remarkable aggregate of forms. In this connection, we may quote Houzeau, as cited by Dr. Phipson in his "Researches on the History of the Earth's Atmosphere," with reference to hail. He says that hail is so much more frequent by day than at night, because sudden currents of air (termed in French *grains* or *coups de vent*) are more common in the daytime, and are due to the inequalities of temperature produced by the sun's rays falling on certain portions of the air whilst other portions are in the shade. In another chapter Dr. Phipson remarks, "It is now known that butterflies and other insects are occasionally transported by aërial currents from the valleys to the summits of the highest mountains and far out to sea." On one day when a south-east wind was blowing across the shoulder of the mountain and curling down as described above, large numbers of *Adimonia tanaceti* kept sailing in to the northern end of the tarn; these were, in all probability, brought up from the valley which runs from Beddgelert to Pen-y-gwryd, swept over the slopes near the summit, and precipitated by the swirling gusts into the lake. Like the majority of the beetles, they had evidently been immersed for but a short time. We append a complete list of the beetles collected in and about this tarn, some 140 species in all. The commonest was *Sitones flavescens*, which swarmed in such thousands that our lodgings were peopled for days with specimens that had settled on us and been carried home. Unfortunately the landlady was under the the impression that we had imported a novel English form of *Cimex*. Single examples occurred of the true *Philonthus nigritulus*, and of the very rare *Hydnobius punctatus* (♀), which Crotch records from North Wales. The single specimen of *Philonthus thermarum* is unicolorous black all but the elytra, which are slightly lighter. Our captures were:

Notiophilus aquaticus, *N. biguttatus*, *Elaphrus cupreus*, *Clivina collaris*, *Bradycellus similis*, *B. collaris*, *Harpalus ruficornis*, *Taphria nivalis*, *Anchomenus albipes*, *Olisthopus rotundatus*, *Bembidium tibiale*, *Tachypus flavipes*, *Trechus minutus*, *Patrobus assimilis*, *Helophorus aeneipennis*, *Sphaeridium bipustulatum* var. *marginatum*, *Cercyon obsoletus*, *C. haemorrhoidalis*, *Megasternum boletophagum*, *Cryptopleurum atomarium*, *Aleochara lanuginosa*, *Astilbus canaliculatus*, *Ocyusa incrassata*, *Homalota circellaris*, *H. vicina*, *H. tibialis*, *H. elongatula*, *H. analis*, *Encephalus complicans*, *Tachyporus chrysomelinus*, *T. humerosus*, *T. hypnorum*, *Cilea silphoides*, *Tachinus rufipes*, *T. marginellus*, *T. subterraneus*, *Megacronus analis*, *Mycetoporus angularis*, *M. lepidus*, *M. punctus*, *M. lucidus*, *Quedius molochinus*, *Q. tristis*, *Q. fuliginosus*, *Q. umbrinus*, *Q. picipes*, *Q. boops*, *Q. semiaeneus*, *Ocypus cupreus*, *Philonthus varius*, *P. sordidus*, *P. thermarum*, *P. nigritulus*, *Xantholinus glabratus*, *X. linearis*, *X. longiventris*, *Lathrobium brunnipes*, *L. fulvipenne*, *Stenus impressus*, *S. aerosus*, *S. geniculatus*, *S. declaratus*, *Leptarinus linearis*, *Othius myrmecophilus*, *Stilicus affinis*, *Platystethus arenarius*, *Oxytelus sculptus*, *O. sculpturatus*, *O. nitidulus*, *O. tetracarinatus*, *Acidota crenata*, *Homalium rivulare*, *H. excavatum*, *Agathidium laevigatum*, *Hydnobius punctatus*, *Cholera grandicollis*, *Adalia bipunctata*, *A. obliterata*, *Anatis ocellata*, *Coccinella variabilis*, *C. hieroglyphica* (type and black variety), *C. 7-punctata*, *Halyzia 14-guttata*, *Coccidula rufa*, *Rhizobius litura*, *Brachypterus pubescens*, *Meligethes aeneus*, *M. viridescens*, *M. picipes*, *Monotoma picipes*, *Enicmus minutus*, *Corticaria elongata*, *Antherophagus nigricornis*, *Atomaria fuscipes*, *A. pusilla*, *Ephistenus gyrinoides*, *Typhaea fumata*, *Byrrhus pilula*, *B. fasciatus*, *Simplocaria semistriata*, *Elmis aeneus*, *Aphodius haemorrhoidalis*, *A. ater*, *A. lapponum*, *A. fimetarius*, *A. pusillus*, *A. contaminatus*, *A. punctato-sulcatus*, *A. depressus*, *Geotrupes sylvaticus*, *Serica brunnea*, *Phyllopertha horticola*, *Corymbites aeneus*, *Chrysomela polita*, *Gastroidea polygoni*, *Phaedon armoraciae*, *Lochmaea suturalis*, *Adimonia tanaceti*, *Longitarsus jacobaeae*, *L. melanocephalus*, *L. luridus*, *L. pusillus*, *Phyllotreta undulata*, *Sphaeroderma cardui*, *Plectroscelis concinna*, *Psylliodes affinis*, *P. napi*, *Salpingus aeratus*, *Anthicus floralis*, *Apion haematoides*, *A. nigritarse*, *A. apricans*, *A. scutellare*, *Sitones hispidulus*, *S. lineatus*, *S. flavescens*, *Hypera punctata*, *H. nigrirostris*, *Dorytomus maculatus*, *Mecinus pyraster*, *Ceuthorrhynchus erysimi*, *C. contractus*, *Limnobaris T-album*, *Myelophilus piniperda*.

Staudinger and Rebel's Catalogue.*

(*Concluded from p.* 325.)

Several miscellaneous additions and corrections of detail, not given earlier in this review, and by no means professing to be exhaustive, must be very briefly given.

Müller's Lepidoptera in Allioni's "Manipulus Insectorum Taurinensium" (1766) do not seem to be quoted at all. Rogenhofer (*Lep. von Hernstein*, p. 13) gives var. *virginea*, Müll. (of *Zygaena carniolica*, Scop.) priority over *hedysari*, Hb.

Goeze's names founded on figures and descriptions in Degeer, Kleemann, Gladbach, &c., have only a very half-hearted recognition, although Staudinger expressly declared himself in favour of their validity in his 1871 preface. *Anceps*, Goeze, iii., 3, p. 207 (1781), founded on Kleemann's figure, is not even cited with a *query* in the synonymy of *trepida*, Esp. (1786), yet it ought to supplant it, as in Kirby's "Catalogue." *Bi-ren*, Goeze, iii., 3, p. 206 seems to have right of priority against (*Mamestra*) *glauca*, though the identification of Kleemann's Pl. 43, by Rogenhofer, is not the same as Werneburg's, the latter arguing for *genistae*, Bkh. One, at least, of Goeze's names

* "*Catalog der Lepidopteren des palaearctischen Faunengebietes*," von Dr. Phil. O. Staudinger und Dr. Phil. H. Rebel. Dritte Auflage des "Cataloges des europäischen Faunengebietes." Berlin: R. Friedländer und Sohn. Mai, 1901. I. Theil: Fam. *Papilionidae—Hepialidae*, von Dr. O. Staudinger und Dr. H. Rebel; II. Theil: Fam. *Pyralidae—Micropterygidae*, von Dr. H. Rebel. xxxii+411+368 pp. in 8vo.

founded on Gladbach seems also to have priority—(*Caradrina*) *octogenaria*, Goeze, iii., 3, p. 227 (1781) = *alsines*, Brahm (1791); *hermelina*, Goeze, p. 227, used by Kirby to supplant (*Cerura*) *bifida*, Brahm, and cited by Staudinger with query, needed no query, but it turns out to be a homonym, and therefore invalid, Goeze having another *Noctua hermelina* on p. 207 (= *Trichosia ludifica*, L.).

On p. 26, *Polygonia c-album*, gen. aest. *hutchinsoni*, Robson, "p. 110" should be added to the reference.

On p. 32, var. *d* of *Melitaea aurelia* should surely be called *varia*, Lampa (1885), not *norvegica*, Auriv. (1889)?

On p. 46, *glacialis*, Esp. (cir. 1805, *nec* "ante 1800"), being homonymous with *glacialis*, Schr., should be supplanted by *alecto*, Hb., which, moreover, is perhaps prior?

On p. 92, the name *flava*, Brünn., in Pontopp. Danske Atlas, i., p. 685 (1763) should supplant *thaumas*, Hfn.; the determination has never been questioned.

On p. 100, *Mimas*, Hb., should be used for *Sphinx tiliae*, L.; it seems to have been overlooked that Dalman's own selected type of his *Dilina* was *S. ocellata*, L., and that it is therefore a synonym of *Smerinthus*, Latr.

On p. 103, *Chaerocampa* is a mis-spelling of *Choerocampa*, which Duponchel published correctly with the œ diphthong.

On p. 104, *Macroglossum* is Scopoli's original spelling, and must be followed on Staudinger's own rules.

On p. 109, under *Notodonta phoebe*, Siebert, 1770 is a misprint for 1790.

On p. 131 the name *Colocasia* is wrongly attributed to Hübner; it is Ochsenheimer's, but whether traced through Hübner's restriction or through Samouelle's type-citation it became indissolubly associated with *coryli* before *Demas* was created and must of necessity replace this latter.

On p. 137, ab. *subsequa*, Hb. (of *Agrotis orbona*, Hfn.) must be transferred to *comes*, Hb.; *vide* Tutt, "Brit. Noct.," ii., pp. 93-94, 96, on *consequa*, Hb., which is the same form. Neither *subsequa* nor *consequa*, however, is the right name for it; for it is neither the *subsequa* of Schiffermüller (*teste* Ochs.) nor of Esper, and Hübner corrected the name of his var. to *interposita* (*Beiträge*, *Verbesserungen*, p. 32, 1789?) *before* he published it as *consequa* in the *Sammlung*. But, further, this name *interposita* is prior to *comes* itself, and if Snellen be not followed in giving Staudinger-Rebel's species no. 1154 as *subsequa*, Esp. (with ab. *interposita*, Hb.), then the only alternative is to give it as *interposita*, Hb., with the common form as ab. *comes*, Hb.

On p. 140, the name *xanthographa* should read *xantographa*, if it is to be attributed to Fabricius; but Schiffermüller, who originally published it, spelled it correctly with the *th*.

On p. 144, species 1273 and 1276 are wrongly-named, so far as can be made out from the evidence here adduced, for *birivia*, Hb., 42 would take precedence of *birivia*, Hb., 631, and also of *helvetina*, B.; but the name *birivia* really originated with Schiffermüller, and the complication here again shows the evil of not indicating its first source.

On p. 154, the name *Glottula*, Gn. (1837) is reinstated in place of *Brithys*, Hb., Stgr. Cat., ed. ii. This seems to be because *Glottula* was isotypical, *Brithys* heterotypical; but on a rigid historical method of procedure it is open to question, as Boisduval in 1840 restricted *Brithys* (*Brithya*) to *encausta* and *pancratii.*

On p. 162, *Dianthoecia conspersa*, Schiff., is still allowed to stand as *nana*, Rott., notwithstanding that Werneburg and Tutt have shown that it contradicts the original description of *nana* (Hufnagel's).

On p. 163, its var. *b* is misprinted *hethandica* ; fortunately it was correctly spelled *hethlandica* on its original publication in *Iris* (1892). But the name is a synonym ; var. *obliterae* [sic] Robson and Gardner, List Brit. Lep., p. 13 (cir. 1885), Tutt, Brit. Noct., iii., p. 38 (1892) is considerably older.

On p. 163, the name *bicruris*, Hfn., is rejected for *capsincola*, Schiff.; there seems no adequate reason for disputing the accepted determination, and Hufnagel's name should be given the priority.

On p. 164, the genus *Cleoceris*, B. (1840, not 1830, as printed) is wrongly rejected in favour of *Bombycia*, Stph. (*nec* Hb.), following Hampson "Moths of India," ii., p. 206 (1894).

On p. 169, we find the genus "*Luperina*" is somewhat thinned down, but is still "invalid as not containing the type of the conception*." Professor Grote long ago re-named Lederer's *Luperina*—"*Ledereria*," n. nom., but made the type *virens*, L. (*vide*, *Ent. Rec.*, viii., p. 183), which is the type of the earlier *Luceria*, Heinem. (1859) and is now correctly so given. Probably the *Luperina* of Staudinger and Rebel, as now restricted, will require a new name.

On p. 174, *hepatica*, Hb., (Text) is invalid ; the name *hepatica* is Clerck's and has been wrongly suppressed ; is it not really = *tincta*, Brahm, as Hübner (*olim*), Freyer, Herrich-Schaffer and others accepted ? If so, the *hepatica* of Hübner's text (and of our British authors, &c.) must be called by the safer name of *characterea*, Hb.

On p. 186, *paludis*, Tutt, most certainly ought not to be given as a *synonym* of *Hydroecia nictitans* (L.) Bkh. ; it is at the least a separate variety or race. ("*Acton*," in the following reference is printed in the wrong type, and looks as if it were a synonym instead of an author's name).

On p. 188, *brevilinea*, Fenn, is erroneously maintained in its position in *Nonagria*, notwithstanding the frequent corrections (Tutt, *Ent. Rec.*, xii., p. 295 ; &c.). It should be in, or at least near, the genus *Leucania*.

On p. 197, and probably in some other places, is seen the inconvenience of the circulation, often for many years, of manuscript names in Staudinger's trade-catalogues. For the central Asiatic form of *Caradrina ambigua*, Fb., there is given the new varietal name of var. *hilaris*, Stgr. ; but this form has been long distributed as "var. *dilucida*" (*cfr.* Tutt, *Brit. Noct.*, i., p. 155). Ultimately it chanced to get described under this name (*Ent. Rec.*, vi., p. 228, 1895), and it will consequently have to be known as var. *dilucida*, Prout (1895) = *hilaris*, Stgr. (1901).

On p. 205, for *subtusa*, Fb., read "*notacula*, F. Mant., 138 ; Auriv., Ent. Tidskrift, xviii., p. 159 ; *subtusa*, F. Mant., 152."

On p. 259, *ocularis*, L., has not yet been restored to its rightful place as prior to *octogesima*, Hb.; *vide* Tutt, "Brit. Noct.," i., p. 3, &c.

On p. 265, *trilineata*, Scop. (1772) is a preoccupied name, having

* The type of *Luperina*, B., was fixed by Duponchel in 1829, and is *testacea*, Hb.

been used by Hufnagel in 1767; *aureolaria* (Schiff.) Fb., is the correct name for this species.

On p. 297, for *quadrifasciaria*, Cl., read *quadrifasciata*, Cl. (*aria*, L.F.S.).

On p. 302, the species cited as *Larentia sociata*, Bkh. (a homonym) is without doubt the *alternata* of Müller, "Faun. Frid.," p. 51 (1764), as further elucidated by his citation (*Zool. Dan. Pr.*, p. 129) of Schäffer pl. 126, 2; even if Schäffer's very bad figure *might* be *mollugïnata*, Hb. or *rivata*, Hb., Müller's diagnosis could not possibly apply to any but the *blackest* (which is also the most generally common) of the group, *i.e.*, to *sociata*, Bkh. (*nec* Fb.))

On p. 304, *bifaciata* (r. *bifasciata*), Haw., "Lep. Brit.," p. 334, should supplant *unifasciata*, Haw., *l.c.*, p. 335, as even page-priority now has to be religiously observed; Snellen, "Vlinders," made this correction in 1867.

On p. 306, *furcata*, Thnb., should replace *sordidata*, Fb., instead of being merely cited with a query; surely Staudinger cannot have consulted the original or he would have seen that Werneburg's determination is quite certainly correct.

On p. 315, the sinking of *subfulvata*, Hw., as a "v.?" of *Tephroclystia succenturiata*, L., is certainly erroneous, and it is a pity that the statement "sp. div. Stgr. esse videtur" was not allowed greater weight (*cfr.* Sheldon, *Ent. Rec.*, vii., p. 197).

On p. 320, the synonymy of *debiliata* and *chloerata* does not seem perfect; if Hb. 462 is not the bilberry species, the latter, figured by Hübner at fig. 466, cannot retain the name of *debiliata* by the strict law of priority.

On p. 327, the reference for *Ennomos fuscantaria*, Haw., Prodr. Lep. Brit., ought to be bracketed off as a *nomen nudum*, being accompanied by absolutely no descriptive matter. The earliest *description* is in "Lep. Brit.," p. 295, under the erroneous name *carpinaria* (*nec* Hb.).

On p. 330, the date for *Ourapteryx*, Leach, should be 1814, not 1815 (*Zool. Miscell.*, i., p. 79).

On p. 336 (*Biston*) *strataria*, Hfn., and (*Amphidasis*) *betularia*, L., are still erroneously separated in different genera.

On p. 384, under *Zygaena filipendulae*, the *hippocrepidis* of Stephens (*nec* Hb.) is wrongly given as var. *tutti*, Rebel, n. nom.; Rebel has overlooked Dupont's prior correction of the nomenclature (*Zygènes Normand.*, p. 29, 1900—first published in 1899?, in *Bull. Soc. Sci. Nat. Elbeuf*), and *tutti*, Rebel, will have to sink as synonym of *stephensi*, Dupont.

On p. 393 (*Pachytelia*) *unicolor*, Hfn., may have to be supplanted by *hirsuta*, Poda, p. 102 (1761), or *dubia*, Scop., p. 268, no. 699 (1763); both are referred here without question by Rogenhofer (*Lep. Hernstein*, p. 15).

In connection with the vexed question of the bee-hawks, readers will be interested to learn that Mr. Kirby's corrected determination of *fuciformis*, L., for the broad-bordered species has been accepted, but that *scabiosae*, Z., has been chosen for the narrow, *tityus*, L., being only cited with a query.

The general get-up of the book is in most respects similar to that of 1871, and is on the whole very good. Those who have attempted to make corrections in ink on their copies of Hagen and Werneburg, will rejoice to find that Messrs. Friedländer have provided them with more respectable paper for the Staudinger-Rebel "Catalog," and that ink corrections will be quite feasible. A considerable number of misprints have been detected in addition to those already noticed here —*e.g.*, on p. 159, "*reticutala*" for *reticulata*, &c., and probably closer study will reveal scores—perhaps hundreds—of others. But all who have engaged in work of this kind will know how excessively difficult it is to obtain perfect accuracy in dealing with such a mass of detail, and will be prepared to be lenient toward mistakes of this kind—which are really not numerous in proportion to the 50,000 odd literature-citations which Dr. Rebel estimates the work to contain. The Index (by Dr. A. Penther) seems carefully and accurately prepared.

Of course every serious student of the Palæarctic Lepidoptera will have to possess this "Catalog," and all such are recommended to obtain it at once, and to study it for themselves.—Louis B. Prout.
June 28*th*, 1901.

On some experiments with Myrmecophilous Coleoptera, and an observation nest of Formica rufa.

By HORACE St. J. K. DONISTHORPE, F.Z.S., F.E.S.

On April 2nd I went to Oxshott to take a nest of *Formica rufa* to serve me as an observation nest. I found the ants "massing" in the sun on the sides of their hillocks. I took a fair number of specimens, some ♀ s and a portion of the nest and put them into a bag. On reaching home I placed some of the *débris* of the nest into a large oblong glass vessel filled with mould at the bottom. The vessel stood on my study table in a zinc tray, the outside of which consists of a zinc trough about an inch and a half wide, and two inches deep, filled with water The ants and the rest of the nest I placed in a wooden box connected with the glass vessel by a piece of lead piping. As soon as as many ants as I required had passed through the tube, I removed it, and examined the remaining *débris* for queen ants, beetles, &c. I found about 12 ♀ s and specimens of the following species of coleoptera—*Dinarda maerkeli*, *Notothecta flavipes*, *N. anceps*, *Thiasophila angulata*, *Oxypoda formiceticola*, *Leptacinus formicetorum*, and *Myrmetes piceus*, all of which I introduced into the nest. In a few days the ants had got all straight and built up a small hillock in one corner, to which they have steadily added ever since, as I have kept them supplied with pine-needles, &c., for that purpose. For food I gave them honey, of which they are very fond, and living insects, and kept them from getting too dry by spraying them with water when necessary.

I now proceed to give some account of the experiments I carried out, as well as of the movements of the beetles in the nest. I must first mention that all non-myrmecophilous insects introduced into the nest were at once attacked, however large, by the ants, and eventually killed and devoured. This makes their behaviour to species always found with ants, still more noticeable.

Dinarda maerkeli, Kies.—When this species meets an ant it stand still and raises the abdomen over the body, and if the ant tries to attack it (which they often do) it pokes the end of the body into the ant's face. The ant starts back and the beetle resumes its career. This is the invariable defence of the beetle (and in a great measure of the other myrmecophilous staphs), it belongs to what Father Wasmann calls "the hostile persecuted lodgers," and they, of course, all require protection. On April 6th, when examining my nest with a candle lamp at night, I observed a *Dinarda* running about. On April 18th a *Dinarda* came out of the nest and walked about. On May 3rd I introduced a specimen which I had taken from a nest of *F. rufa*, at Weybridge, it protected itself in the same way as the specimens belonging to my nest, entered one of the ants' galleries, came out again and eventually disappeared into the hillock. Specimens of *Dinarda* were observed on May 14th and 19th, June 26th, 27th, 28th and 29th. On June 30th a *Dinarda* was seen to creep underneath two ants feeding at a grain of sugar and steal a morsel. Specimens were observed every now and then till August 1st, when I went away.

Notothecta flavipes, Grav.—This beetle was observed going in and out of the galleries and walking on the hillock, &c., on April 10th and 30th, May 13th and 14th, and June 24th. It exhibited a similar defence as the *Dinarda*, but, as a rule, the ants paid no attention to it. *Notothecta anceps*, Er., was seen on April 7th running about near one of the galleries, the ants did not appear to notice it at all.

Thiasophila angulata, Er.—On April 14th a specimen of this beetle was observed eating at the dead body of a cockroach that the ants had killed. On April 23rd a *Thiasophila* was dodging about among the ants, who were very busy, and on the 24th several specimens were about, going in and out of the galleries. On April 25th a *Thiasophila* was attacked, when it showed the same means of defence as *Dinarda*. Specimens were observed on May 3rd and 13th, June 4th, 6th, 11th, 23rd, 25th, 26th, and 28th. On June 26th a specimen was again attacked by an ant, which it repulsed in the usual way.

Oxypoda formiceticola, Märk.—A specimen was observed on the hillock on May 26th. The ants paid no attention to it.

Myrmetes piceus, Payk.—On May 3rd a *Myrmetes* was walking about among the ants, and on the 4th I saw a specimen disappear down one of the galleries. On May 14th a specimen was again seen walking about, and on June 5th a specimen was found in the water-trough round the tray. The ants never seem to pay any attention to this beetle, moreover its shape and hardness protect it.

Myrmedonia humeralis, Grav.—On April 26th I introduced specimens of this beetle which I had taken from a nest of *Lasius fuliginosus* (the tree ant) at Oxshott. They ran quickly about, and when an ant came near them they exhibited the same defence as *Dinarda*. The strong smell which the species of *Myrmedonia* give off when molested (especially this species) was very noticeable. I placed several ants from my nest in tubes and small boxes with the beetles and left them together for a long time; the ants never attacked them. I next forced an ant to seize a *humeralis*, which it did by an antenna, and then dropped both ant and beetle into my nest. The ant dragged the beetle, which was tightly curled up all the time, about for a short time, but soon dropped it, when the beetle ran briskly about among the ants. On April 29th, a *humeralis* came out of the nest, and after walking about for a time went down one of the galleries. On May 8th I brought up some more specimens from Oxshott, and put several of my ants into a small box with them, the beetles were not attacked though left all day with the ants. On May 14th a specimen was walking about, and on May 26th another was seen in one of the galleries. It will be observed that this specimen had been a month in my nest, since it was introduced.

Myrmedonia funesta, Grav.—The experiments with this beetle are still more remarkable than the last, because though the specimens of *M. humeralis* already referred to, came from the nest of *Lasius fuliginosus*, still the species does occur with *F. rufa*, whereas *M. funesta* is only found with *Lasius fuliginosus*. On April 12th I brought up some specimens of this beetle from a nest of *Lasius fuliginosus* at Oxshott. I introduced several examples into my nest. An ant seized one *funesta* by the antennæ and began to drag it along, when suddenly it let go and crawled into a corner as if dazed, rubbing its head on the ground for some time. The other specimens of *funesta* when attacked used the same defence as *Dinarda* with equal success, and hid themselves in the nest. On April 13th I repeated the experiment. I introduced another *funesta*, an ant seized and closed with the beetle, and another ant joined in, also taking hold of it. The beetle was held tightly by both ants, when they suddenly let go and wandered about in the same dazed way as in the former experiment. One of the ants had a stiff antenna which remained so for some time. The beetle walked quietly away unhurt. The "Myrmedonia" smell was very noticeable at the time. On April 14th a *funesta* was running about in the nest, and when it met an ant it used the usual defence. On May 8th, having caught some more examples of *M. funesta*, I put several ants from my nest into a small box with the beetles and left them together all day. The beetles were unhurt. I think this clearly demonstrates that these beetles possess a special means of protection against even so fierce an ant as *F. rufa*. I think that this means of defence takes the form of an acid which the beetle emits as a vapour when molested, that this acid is not formic acid, and that it is very offensive to the ants. I placed a number of *Myrmedonia* in a tube with filter paper soaked with distilled water, and kept shaking them up. On removing the beetles the tube smelt strongly of the "Myrmedonia" odour, and I am endeavouring to have it analysed, though the difficulty must be great with so small a quantity.

Myrmedonia lugens, Grav., and *M. laticollis*, Märk.—I tried similar experiments with these as with the last two species. The defence is the same, though not so marked, as when an ant is forced to seize them, it does not drop them as quickly, dragging them about more.

Astilbus canaliculatus, F.—Having brought up from Portland a number of this species from the nests of *Lasius flavus* and *L. niger*, on April 23rd, I introduced several into my *rufa* nest, they ran about and entered the nest, appearing to avoid the ants by their quickness, hiding under twigs, &c. I placed two of my ants in a small box with several *Astilbus*, their mode of defence proving to be the same as in *Dinarda*. Left all day and no *Astilbus* injured. When, however, an ant is forced to seize an *Astilbus* it does not let go, as with *Myrmedonia*, but drags the beetle into the nest. On June 30th I saw an *Astilbus* come out of the nest and run quickly about, hiding itself among the pine needles.

Myrmedonia limbata, Payk.—This beetle exhibits an exactly parallel case to *Astilbus*. It will be remembered they are not so truly myrmecophilous (not invariably being found with ants) as are the other species of *Myrmedonia*.

Quedius brevis, Er.—On April 13th I introduced some specimens (from a nest of *Lasius fuliginosus* at Oxshott) into my nest. They exhibited precisely the same defence as *Dinarda* and with equal success. On April 14th a *Q. brevis* was observed biting at the body of a bee the ants had killed. On April 23rd a specimen was walking about in the midst of a number of ants. Specimens were observed on April 27th and 29th, May 3rd, 7th, 13th and 15th. *Quedius brevis* is, of course, found with *Formica rufa*, as well as with *Lasius fuliginosus*, though the specimens experimented with were taken with the latter ant.

Quedius mesomelinus, Marsh.—I introduced several specimens of this beetle (taken with *Lasius fuliginosus*, at Oxshott) into my nest. They were all at once attacked, killed and torn to pieces by the ants. Though I have taken it in numbers with *L. fuliginosus*, at Chiddingfold, and sparingly at Oxshott, it is generally not found with ants, and evidently possesses no means of defence against *Formica rufa*.

Claviger foveolatus, Müll.—On April 23rd, many ants being about, I introduced several specimens of *Claviger* (I had taken it at Portland in great numbers in the nests of *Lasius flavus* and *L. niger*) into my nest. They all buried themselves in the earth, the ants paying no attention to them. I placed an ant in a small box with several of the *Claviger*, the ant did not attack them. I forced an ant to seize a *Claviger*, but it dropped it at once. I repeated the experiment several times with other ants and always with the same result. When dropped the *Claviger* walked quietly away. On April 29th I introduced some more specimens of *Claviger* into my nest, they proceeded to enter the nest and galleries. When an ant met a *Claviger* it only touched it with its antenna and then moved on. One ant picked up a *Claviger* and carried it a short distance, on putting it down again the *Claviger* walked away quite unhurt. On May 1st, 2nd, 15th and 18th, specimens of *Claviger* were seen walking about among the ants. It has been stated that if a specimen of *Claviger* be taken out of an ant's nest and put into a strange one, even of the same species of ant, it is torn to pieces. This is not the case in my experience, we have seen that even *Formica rufa*, in the nest of which species it never occurs in nature, will not kill it. Moreover, when at Portland, I introduced specimens of *Claviger* from nests of *L. flavus* into nests of *L. niger*, and *vice versâ*, and also into nests of the same species at a distance from their own nest, and they were never attacked at all. I also introduced specimens into my observation nests of *Lasius flavus* and *L. niger*; they were received quite willingly by the ants. I noticed that the beetles generally sit on, or among, the larvæ of the ants. On May 18th a *Lasius niger* was observed to feed a *Claviger*.

Monotoma formicetorum, Thoms.—On April 24th a *Monotoma* (which on examination turned out to be this species) was seen walking on the top of the hillock. The ants paid no attention to it; it even walked over some of them. Other specimens were observed on May 27th and 29th, and June 4th. The ants never took any notice of them.

Dendrophilus pygmaeus, L.—A specimen of this beetle was seen on April 9th walking about among the ants. The ants took no notice of it whatever. It is protected in the same way as *Myrmetes*. After watching it for some time I captured it, as I required another specimen for my collection.

Amphotis marginata, Er.—On April 13th I introduced an *Amphotis* (from a nest of *Lasius fuliginosus* at Oxshott) into my nest. When it meets an ant it lies close against the ground and its flat shape and explanate elytra protect it. The ant has nothing to lay hold of, and after examining it passes on. The beetle, after walking about for a time, eventually buried itself in the ground.

Formica rufa, L.—On April 12th I brought up from Oxshott from the same nests whence my ants came, some queens and workers. They were at once recognised and received with pleasure, the ♀s immediately being cleaned and led into the nest. On April 26th I brought up a queen and some workers from another nest at Oxshott, far removed from my old nest. These also, to my surprise, were equally well received. These ants must have sprung from the same stock as my nest, since ♀s and workers from nests at Weybridge and Bournemouth were attacked, dragged about, and killed, when introduced into my nest.

Formica fusca, L. and *F. sanguinea*, Latr.—Specimens of these ants (from nests at Weybridge) when introduced were at once attacked and eventually killed by my ants.

Lasius fuliginosus, Latr.—On April 12th I brought up from Oxshott specimens of this ant and introduced them into my nest. It was very curious that, although they were attacked by many *F. rufa*, every *rufa* let go soon, whereas, as we have seen, other species of ants were stuck to and dragged about till they were killed, and then thrown out of the nest.

I hope to make further experiments in the future.

Migration and Dispersal of Insects: Coleoptera.

By J. W. TUTT, F.E.S.

Commenting on this abundance of beetles on the summit of Ben Nevis, Thornley says that the interest of Bruce's paper depends upon the fact that most of the insects recorded are widely distributed lowland forms. A singular testimony, he says, to the universal distribution of about thirty out of the fifty-two recorded species, is the fact that they can be found commonly in (or close to) his own parish, which is situated in the Trent Valley, and on the Keuper marl, whilst it is further doubtful if a single species recorded can be looked upon as a true mountain species, if, by this term, we mean a species which is only found as a straggler at low levels. Even of submountainous species there are very few. He then adds: "In this respect a mountain flora betrays much more specialisation than a mountain fauna. Bates, commenting upon the rich collection of insects brought by Whymper from the slopes and summits of the higher Andes of South America, remarks upon the altitude at which tropical lowland species were found—even as high as 9000ft.-12000ft. The difference in this case, between the upper and lower environment must be enormous, yet but little variation was perceptible. In the light of these facts we need not be surprised at the altitudes at which so many of our common insects can be found. What is much more remarkable is the presence in numbers, on the bare rocky summit, of some particular species whose ordinary mode of life would seem to be ill-adapted for such an environment. We are, therefore, obliged to have recourse to some other explanation than the presence of the struggle for existence. Such species as *Donacia discolor*, *Adimonia suturalis*, *Serica brunnea*, and several others (some of which were taken in numbers), must have been involuntarily carried to the summit through the agency of winds or strong upward currents of air. It is an admitted fact, I believe, that the steering power of beetles is not great, whilst the horny elytra act as vanes, putting the insects at the mercy of strong winds. In connection with this subject we may consider the fact that many beetles, which are winged more or less perfectly in continental areas, lose their wings or possess them only in an atrophied condition when localised at high altitudes or in oceanic islands—such a resource serving better to preserve the species in relation to those particular environments. Mr. Bruce found quantities of insects on the snow. Is it possible that the white glistening snow-cap has some power of attracting insects? Or is it simply due to the fact that insects are very clearly shown up on the sheet of snow, and numbers killed by the low temperature of the snow wind?"

The species enumerated by Thornley are as follows:—*Carabus violaceus*, *Notiophilus biguttatus*, *N. aquaticus*,* *Nebria gyllenhalii*,* *Loricera pilicornis*, *Anchomenus parumpunctatus*, *Mycetoporus lepidus*, *M. punctus*, *Tachinus elongatus*,* *T. rufipes*, *Philonthus marginatus*, *P. varius*, *P. laminatus*, *Oxytelus rugosus*, *Platystethus arenarius*, *Lestera longelytrata*,* *Acidota crenata*,* *Helophorus rugosus*, *H. aeneipennis*, *Cercyon flavipes*, *Silpha opaca*, *Coccinella hieroglyphica*, *C. 10-punctata*, *Byrrhus fasciatus*, *B. pillula*,* *B. dorsalis*,* *Cytilus varius*, *Aphodius punctatosulcatus*, *A. fimetarius*, *A. lapponum*,* *Serica brunnea*,* *Phyllopertha horticola*, *Geotrupes sylvaticus*,* *Cryptohypnus riparius*,* *Athous vittatus*, *A. haemorrhoidalis*, *Corymbites cupreus* var. *aeruginosus*,* *C. quercûs* and ab. *ochropterus*,* *Dascillus cervinus*, *Telephorus figuratus*, *T. lituratus*, *T. paludosus*,* *Ragonycha limbata*, *Donacia discolor*, *Gastroidea raphani*, *Lochmaea suturalis*, *Haltica pusilla*, *Rhagium inquisitor*, *Polydrusus cervinus*, *Hypera pollux* and *Salpingus aeratus*.

Sharp says (*in litt.*): "In this Ben Nevis list only the species marked * could in any sense be considered as natives of even the lower slopes of the mountain, so that the great majority must have been wind-carried to the top from perhaps long distances. This is curiously confirmed by some facts which have just lately come under my notice on Snowdon. I was at Llanberis for a week, in August, with my friend Mr. Burgess Sopp, of Hoylake. While I was there it rained all day, and every day, and all I did was a very little collecting at the summit, in a blinding rain, and under the most disadvantageous circumstances possible. I, however, took a *Byrrhus* in the wet moss, which I cannot specify exactly, but which I believe will turn out to be the same species as the one recorded by Mr. Thornley on Ben Nevis, and I am inclined to believe that, whatever it may be, it is native to that elevation and not wind-blown. I also took *Acidota* which is undoubtedly bred there. However, after I had returned and the weather had ameliorated, Mr. Sopp and Mr. B. Tomlin went up again and found the shores of a tarn about 2000ft. or 2500ft up, simply alive with *lowland* beetles. Mr. Tomlin has a list of, I believe, over 100 such species, and curiously enough *Salpingus aeratus*, a species recorded from Ben Nevis, and which certainly passes its larval life in the wood or bark of fir trees figured conspicuously among them. As Mr. Tomlin s, I believe, likely to publish the particulars of this occurrence, and his own observations thereon, I can only mention the circumstance as confirmatory evidence of the Ben Nevis records, and of the fact that lowland beetles are carried up by ascending currents of air, and probably travel great distances at a high elevation. This, no doubt, explains certain records we have of the sudden appearance of great numbers of some particular species in a locality where they could not have been bred, or where even they may have been previously unknown, as, for instance, *Hister 4-maculatus*, on Southsea common (see Fowler, *Coleoptera Brit. Isles*, iii., p. 201). I believe the *Coccinellidae* are often the subjects of this sort of magical appearance, and I think, although I have none that I can quote, that there are several records of their sudden visitation in swarms. I have one note which rather bears on this subject. *Mysia oblongoguttata* is a species (ladybird) attached to fir trees, which, I think, rarely flies, and which I certainly never took on the wing, but, on one occasion, my friend, Mr. R. Newstead, of Chester (being engaged on an investigation into the food of some of our common birds), shot a number of starlings as they were hawking about over a fir wood. Their crops were filled to repletion with the remains of *Mysia oblongoguttata*. This was in the evening, in spring, and it proves, as the starlings certainly took them on the wing, that some of our most sedentary beetles have their *flight times*, and, on such occasions, often rise to high altitudes, hence we can understand how they may be caught up by cyclonic or vortical air currents to very high altitudes, and be carried immense distances. Of course I should be slow to admit that all phenomenal abundance of any species of coleoptera in any particular locality is due to any sort of migration. I have seen *Phylopertha horticola* swarming in incalculable myriads for miles along the shores of Cardigan Bay, but I believe that every individual had been bred on the spot, and that the reason for their extraordinary abundance was merely a coincidence of favourable circumstances extending over, perhaps, more than one season, in fact, I should only be willing to resort to any immigration theory to explain any amount of abundance above the normal, where I was persuaded that the species could not have been bred in the locality where the imago form was in such abundance."

The interesting observations made by Tomlin and Sopp, referred to above, are detailed at length *Ent. Record*, xiii., pp. 342-345.

Harding notes (*Ent. Wk. Intell.*, iv., p. 125) that, in June, 1858, the weather being very hot, large numbers of coleoptera from the sandhills at Deal, took flight to sea. He suggests that this was due to the great heat of the sand, but gives no further details of his observations which, properly followed up, might have meant so much. Coleoptera were evidently very abundant that year at Deal, for, writing a little later, the same observer notes that on July 16th, 1858, the Deal sandhills were swarming with a little Staph. that filled the eyes and mouth of the collector.

Brown records (*Bull. U.S. Dept. Agriculture*, no. 18, n.s., p. 100) the migration of *Disonycha quinquevittata*, known as the "western willow flea-beetle," in Arizona, and, later, states (*loc. cit.*, no. 30, n.s., p. 97) that the beetles were again observed migrating, this time coming down the Gila river and going in the direction of the Colorado. They were seen, on November 3rd and 4th, 1899, moving in a belt, apparently not more than 100 yards wide, and continued doing so during the two days mentioned. When observed, they were usually flying about 4ft. above the earth, and never more than about 20ft. high.

That many insects are now much less common in the British Islands than formerly is well shown by the records of the amazing abundance of cockchafers some three hundred years ago. Thus Hollingshed writes (*Chronicles of England, Scotland, and Ireland*, iv., p. 326): "The 24th day of Februarie (1575) being the Feast of Saint Matthie, on which dai the faire was kept at Tewkesburie, a strange thing happened there. For after a floud which was not great, but such as thereby the medows neere adjoining were covered with water, and in the afternoone, there came downe the river of Seuerne great numbers of flies and beetles (*Melolontha vulgaris ?*), such as in summer evenings use to strike men in the face, in great heapes, a foot thicke above the water, so that to credible mens judgement there were seene within a paire of buts length of those flies above a hundred quarters. The mils there abouts were dammed up with them for the space of foure daies after, and then were clensed by digging them out with shovels; from whence they came is yet unknowne, but the daie was cold and a hard frost." Molyneux records (*Phil. Trans. Abridg.*, ii., pp. 781-3), in the summer of 1688, in Ireland, such vast quantities of cockchafers "that when, towards evening or sunset, they would arise, disperse, and fly about, with a strange humming noise, much like the beating of drums at some distance, they were in such vast incredible numbers, that they darkened the air for a space of two or three miles square. The grinding of leaves in the mouths of this vast multitude altogether, made a sound very much resembling the sawing of timber." Writing of the same insects, Figuier says: "Sometimes they congregate in swarms, like locusts, and migrate from one locality to another, when they lay waste everything. To present an idea of the prodigious extent to which cockchafers increase under certain circumstances, we will give a few statistics. In 1574, these insects were so abundant in England that they stopped many mills on the Severn. In 1688, in the county of Galway, in Ireland, they formed such a black cloud that the sky was darkened for the distance of a league, and the country people had great difficulty in making their hay in the places where they alighted. They destroyed the whole of the vegetation in such a way that the landscape assumed the desolate appearance of winter. In 1804 immense swarms of cockchafers, precipitated by a violent wind into the Lake of Zurich, formed on the shore a thick bank of bodies heaped up one on the other, the putrid exhalations from which poisoned the atmosphere. On May 18th, 1832, at nine o'clock in the evening, a legion of cockchafers assailed a diligence on the road from Gournay to Gisors, just as it was leaving the village of Talmontiers; the horses, blinded and terrified, refused to advance, and the driver was obliged to return as far as the village, to wait till this new sort of hail storm was over. M. Mulsant in the *Monographie des Lamellicornes de la France*, relates that, in May, 1841, clouds of cockchafers traversed the Saône, from the south-east in the direction of the north-west, and settled in the vineyards of the Mâconnais. The streets of the town of Mâcon were so full of them that they were shovelled up with spades. At certain hours one could not pass over the bridge without whirling a stick rapidly round and round, to protect oneself against their touch.

Turner notes (*Zool.*, 1864, p. 8920) that a small longicorn beetle was observed by a friend of his to fly on board a vessel 500 miles off the west coast of Africa, and settle on his person; a remarkable instance of the power of so small a creature to traverse a long distance when going with the wind.

Baird observes (*Cycl. of Nat. Sciences*) that immense swarms of ladybirds are sometimes observed in England, especially on the south-eastern coast, they have been described as extending in dense masses for miles, and the swarms are stated to consist of several species intermixed. Kirby and Spence note (*Introd.*, ii., p. 9) that, in 1807, these flights in Kent and Sussex caused no small alarm to the superstitious, who thought them the forerunners of some direful evil. They were, however, but emigrants from the neighbouring hop-grounds, where, in the larval state, they had been feasting upon the aphides. These authors again note (*loc. cit.*, 7th ed., p. 295) that the *Coccinellidae* are associated with aphides in their migrations. They see no other explanation than that of migration to account for the vast number that are sometimes, especially in the autumn, to be met with on the sea-coast or the banks of large rivers. Many years ago, they state, those of the Humber were so thickly strewn with *Coccinella septempunctata* that it was difficult to avoid treading upon them. Some years afterwards a mixture of species was observed collected in vast numbers on the sand-hills on the sea-shore at the north-west extremity of Norfolk. The Rev. Peter Lathbury made long since a similar observation at Orford, on the Suffolk coast, and about five or six years ago, the Coccinellids covered the cliffs of all the watering-places on the Kentish and Sussex coasts, whence they probably emigrated from the hop grounds. Whether the aphides and their devourers cross the sea has not been ascertained; that the *Coccinellidae* attempt to do so is evident from their alighting upon ships at sea as they themselves had witnessed. Walker writes: "I am inclined to think that the propensity to migrate is developed to some extent in the *Coccinellidae*, vast swarms of which, in some favourable years, seem to make for the coast from inland, often getting blown out to sea and perishing by millions upon millions. In 1869 a very large swarm appeared quite suddenly in the Isle of Sheppey, completely smothering the grass on the cliff-edges: these were carried out into the Thames' estuary by an off-shore breeze, and the drowned insects were afterwards washed ashore in such numbers as to form quite a bank along the beach for several miles, in places an inch or more deep, and two or three inches wide. Similar but slighter visitations of *Coccinellidae* have since occurred here" (*in litt.*). Douglas notes (*Ent. Wk. Int.*, p. 149) that, on July 31st, 1858, swarms of *Athalia centifoliae*, accompanied by hosts of ladybirds, chiefly *Coccinella 7-punctata*, were observed between Newhaven and Seaford, the flight lasting for about half-an-hour in the afternoon. In a discussion that took place on the evening of November 15th, 1869, at the Entom. Society of London, respecting the enormous numbers of Syrphids and *Coccinellidae* noticed during 1869, especially with reference to the supposed migratory powers of these latter, the general opinion of the meeting was, that there was no necessity to suppose that immigration took place, as the larvæ were extremely abundant locally in the south of England a short time before the swarms of the perfect insects. Thus Dunning observed (*Trans. Ent. Soc. London*, 1869, p. xxv) that swarms of insects of various kinds "had been reported during the autumn. He had himself encountered hosts of *Coccinellidae*, principally *Coccinella 7-punctata*, but intermixed with a considerable number of *C. bipunctata* both in Essex and in Yorkshire. Bates and McLachlan observed that, in this case, there was no need to have recourse to the hypothesis of immigration, as, previously to the appearance of the beetles, an unusual quantity of larvæ of *Coccinellidae* had been observed in the southern counties of England. The simultaneous hatching of a large number in one locality caused a scarcity of food there, and compelled them to move elsewhere ; arriving at the sea-coast the majority was stopped, whilst some, attempting to go further, fell into the sea, and were washed back with the tide. The littoral phenomena of the swarms were thus sufficiently accounted for.

VARIATION.

Aberrations of Melanargia galathea.—Two peculiar aberrations of *Melanargia galathea*, which I have had for a considerable time in my collection, are reproduced on Plate viii., figs. 3, 4, of this magazine. They were both taken whilst I was collecting at Abbott's Wood, in 1891, and their peculiarities may be described as follows :—(1) Fig. 3 is a ♂, captured at Abbott's Wood, July 12th, 1891. It is of a pale creamy colour, in fact, very similar to the ordinary ♂ as obtained in this country. It is, however, remarkable in having the central part of the pale transverse band of spots crossing the forewings, reduced, so that the two normal spots in this position resemble very strongly the Roman numeral VII. This marking is very conspicuous and fairly well exhibited in the figure. (2) Fig. 4 is also a ♂, captured at Abbott's Wood, but on July 19th, 1891. Its ground colour is white, rather of the normal ♀ coloration on the upper side. The peculiarity, as will be seen from the figure, is that the greater part of the right hindwing is deeply suffused, a strongly developed black patch occupying the greater part of the wing. This is due to a striking development of black scales that covers the ground colour. The ordinary ocellar development on the outer margin of the hindwing is here absent. The underside of this wing is, strangely enough, without any of the normal black markings, the whole area of the wing is slightly suffused, as if the black scales were spread over the general surface instead of being collected around the usual ocellated spots. There is a strong suggestion when one carefully studies this peculiarity that it has arisen from a slight failure of development, the whole wing bearing the trace of not being very fully nurtured. As a matter of fact, had it not been for this abnornal dark patch, the specimen might be considered as distinctly lighter than usual.—J. A. Clark, F.E.S., 57, Weston Park, Crouch End.

Aberration of Diloba cæruleocephala. Amongst the moths attracted into the house by light on the 17th of this month were two or three *Diloba caeruleocephala*. Not having any wild, but only bred, specimens of this moth in my collection, I kept one which in lamp-light looked like an ordinary typical male. By the way, all that have come to light have been males. When I came to set it I was pleased to find that I had taken a nice aberration, the figure-of-eight marks being yellow instead of white. I should be glad to know if this aberration has a name, and if it is of common occurrence.—J. F. Bird, "The Lodge," Cowfold, Sussex. *October 24th*, 1901.

Aberration of Anthrocera filipendulæ.—From a number of cocoons, collected at Kingly Vale, near Chichester, in July, Mr. Geo. W. Jeffery bred a beautiful aberration, which he kindly presented to me. The lower wings are yellow, suffused and streaked with carmine. The sixth spot and the primaries are of a faint yellowish-pink tint.—J. Anderson, Chichester.

Lithosia sericea, Gregs., bon. sp.—May I be permitted to enter a protest against the recording of the above-named insect (*Ent. Record*, xiii., p. 276) as a variety of *Lithosia complana*? So long ago as 1867 (*Stett. Ent. Zeit.*, xxviii., p. 125) Speyer pointed out structural differences, not only in the shape of the wings, but also in the size of the costal tuft of scales on the underside of the forewings (not to mention its colour), &c. Until his observations have been seriously challenged, or the characters in question proved inconstant, it seems to me quite unjustifiable to sink *L. sericea* as a variety. Certainly to the superficial observer the differences seem considerable enough, and one may venture to doubt whether mere varieties are ever distinguished by such a decided difference in texture and gloss.—Louis B. Prout. *October* 1*st*, 1901.

It has always been one of the greatest puzzles to me why *Lithosia sericea* should ever have been considered distinct from *L. complana*. To those who know *L. complana* over a fair part of its area of distribution, there is no need to enter into details of the great difference in size, and to a less extent in wing-shape, due probably to a somewhat fuller development accompanying the larger size, that exists in specimens of this species from various localities. Added to this one finds, as a rare aberration, occasional specimens of *L. complana* in Kent, with the superficial appearance of *sericea* very strongly developed. With regard to Speyer's differentiation of the size of the costal tuft of scales on the underside of the forewings, I know nothing, nor have I, at present, time to investigate, but the thought at once arises whether this is more than a slight specialisation, due to the same conditions of environment, that has produced what to me seems nothing more than a well-marked local race of a very widely-distributed species. Cannot a parallel examination of eggs and larvæ, both obtainable in Britain, be made for specific differences, if these exist? Is not the material available for a comparison of the genitalia? At present I am a sceptic as to the specific claims of *sericea*, but my scepticism perhaps is based on very insufficient grounds. There is, I believe, in the *Ent. Weekly Intelligencer*, a trenchant criticism of Speyer's remarks, by one of the Lancashire collectors, who took the insect freely on the mosses in the "fifties."—J. W. Tutt.

Aberration of Thymelicus thaumas.—Last June I captured in Folkestone Warren a curious aberration of *Thymelicus thaumas* (*linea*). The anterior wings are of a silvery bone-colour, while the posterior wings are shot with an iridescent green.—S. G. Hills, Public Library, Folkestone. *October* 6*th*, 1901.

Some exceptional sizes in lepidoptera.—The following insects captured this year are interesting from the point of view of size: (1) *Asthena luteata*, ·8125in. in expanse. (2) *Bryophila muralis*, ·77in. in expanse. (3) *Asthena sylvata*, ·75in. in expanse. (4) *Venusia cambricaria*, ·75in. in expanse. I also bred an example of *Amphidasys betularia* ab. *doubledayaria*, 1·1in. in expanse.—F. C. Woodforde, F.E.S., Market Drayton. *October* 21*st*, 1901.

Dwarf Lepidoptera.—Dwarf forms of *Polyommatus icarus* have been commoner than usual this year. I took one measuring only $\frac{13}{16}$ths in., in expanse. Mr Tylecote took one even smaller.—(Major) R. B. Robertson, Boscombe.

Aberrations of Bryophila muralis.—I obtained a long series of *Bryophila muralis* (*glandifera*) at Swanage, two years since, comprising all the aberrations named in *British Noctuae*, &c., vol. i., pp. 9-10). The pale form, ab. *pallida*, is the most numerous there, but, curiously enough, the only real type specimen I ever took myself (with plain black markings on a green ground) was on a wall at Littlehampton, although I have it from Folkestone (collected by Wellman), and also from Barnstaple and Ilfracombe. The green specimens with no black outline, ab. *viridis*, are found at Swanage and Rye, but they are not so numerous as the grey and brown forms.—J. Henderson, Birchin Lane, E.C.

Chrysophanus phlæas ab. schmidtii near York.—I was fortunate in taking a very fine silvery-white aberration of *C. phlaeas* whilst walking on the Thirsk and Ripon road on October 11th. The afternoon was rather dull, and this specimen must have been disturbed, as it fluttered out of the herbage on the bankside and settled close to me. This is the second record for the county.—S. Walker, Eddercliffe, York. *October 14th*, 1901.

Noctuid aberrations in Co. Dublin.—The distribution of some of the best marked forms of our variable Noctuid species is none too well known, and this leads me to note that, in Co. Dublin, among others, I have taken *Anchocelis lunosa* ab. *obsoleta*, ab. *agrotoides*, ab. *neurodes*; *Luperina testacea* ab. *nigrescens* and *Hydroecia micacea* ab. *brunnea*, and ab. *cypriaca*.—T. Greer, 30, Waltham Terrace, Blackrock, Co. Dublin. *October 24th*, 1901.

Aberration of Enodia hyperanthus.—On August 4th I captured an aberration of *E. hyperanthus* (but, unfortunately, in a very bad state), which seems worth noting. The colour is about the same as usual, but the right forewing has two spots or ringlets, while the left one has three. The capture was made in Abbott's Wood, Sussex.—G. J. C. Russell, Upper Dicker, Sussex. *November 4th*, 1901.

SCIENTIFIC NOTES AND OBSERVATIONS.

Hybrid Oporabias.—I have recently been breeding a few hybrids between *Oporabia autumnata* (Enniskillen) and *O. filigrammaria* (Bolton). The larvæ were healthy throughout, and the imagines appear to follow the *filigrammaria* form.—A. W. Mera, Capel Road, Forest Gate, E.

Inquiline Cynipidæ.—With reference to my remarks on *Synergus melanopus* and *S. reinhardi* (*anteà*, p. 126), I find by breeding these species from the galls of *Cynips kollari*, that I was in error in stating that these two *Synergi* were not parasites. After writing that paragraph I was not satisfied, seeing all the rest of the genus were parasites, consequently, in February and March, I collected one hundred *C. kollari* galls; these I kept separate and noted the contents of each gall as the flies emerged, and after emergence, I examined each gall to see what part of the gall they had occupied. The result of my breeding is as follows, *viz.*, 18 *Cynips kollari*, only one contained both the maker and inquiline; 433 *Synergus reinhardi*, 145 ♂s and 288 ♀s; 47 *Synergus melanopus*; 15 Chalcids. From five galls no flies had emerged, and on cutting them open (November 10th) I found each contained from 3 to 12 larvæ, these appeared to be healthy and as if about to pass the winter in the larval stage, and I have no doubt they are *S. reinhardi*. The larvæ of the *Synergi* occupy the centre of the gall, each forming a separate pear-shaped cell, the small end attached to the centre, and may contain from two to twelve or more cells. When the latter, or any approximate, number, the cells are so arranged that they form a round ball, the extra lodgers, if any, finding accommodation in other parts of the gall. *C. kollari* galls, in most cases, are attacked by the *Synergi* while the galls are soft and green, I submitted some to my friend Mr. Garstang who says: "The soft green gall you asked me to examine, was penetrated through and through by brown streaks, which seemed to have been caused by the passage of numerous ovipositors. In the very centre was a bunch of from twelve to twenty pedunculated eggs, exactly like those in the ovary of the ♀s I examined before" (ovary of *Cynips kollari*). From this it appears that the larva of *C. kollari* may be killed by the ovipositor of the *Synergus* coming in contact with the young larva, which at that time must be very sensitive; if not killed that way, it may be eaten or starved to death.—G. C. Bignell, F.E.S., The Ferns, Home Park Road, Saltash, Cornwall. *November* 11*th*, 1901.

On the distribution of certain British Lepidoptera.—The distribution of *Malacosoma neustria*, in Britain, offers one of the greatest puzzles to the student of the distribution of our native lepidoptera. Scarcely less puzzling is that of *Sphinx ligustri*, which practically fails beyond the midlands, whilst the distribution of *Smerinthus ocellatus* and *S. tiliae*, and that of *Eutricha quercifolia* are hardly less remarkable. The first-named of these Sphingids almost entirely fails in Yorkshire, Cumberland, Durham and Northumberland, yet a recent record received from Mr. Lofthouse shows that it is a resident in the eastern part of our largest county, and odd specimens are recorded from Hartlepool, Roxburgh, and four places in the Clyde basin. A record of the capture of this species, however, in a recent number of *The Naturalist*, in Northumberland, almost certainly refers to *S. convolvuli*, and we suspect also that the reference to *Choerocampa elpenor*, in the same note, is an error for *C. porcellus*. The distribution of *C. elpenor*, too, in the northern counties of England and the southern counties of Scotland is very puzzling; it is said to be common locally in Lancashire and Westmorland, and yet is so rare in Durham and Northumberland that only two (we believe) ancient records exist, nor can we find any for the border counties of Scotland, yet it has been recorded from as far north as Ayrshire, Perthshire and Aberdeen. What are the northern limits of this species? *C. porcellus* goes, we believe, up to Sutherland. What, too, are the northern limits of *S. ocellatus* and *S. tiliae?* It is amazing that one can get more information about a species like *Petasia nubeculosa* from Scotch lepidopterists than one can of *S. ocellatus* or *S. tiliae*. Are the species really so rare as they appear to be in Scotland? An odd record of the former species exists for Roxburgh, and one from Aberdeen, whilst there is an odd one of the latter from Cumberland and three from the Clyde basin. I should be glad to have authoritative information of the occurrence of any of these species from the northern counties of England and from any part of Scotland.—J. W. Tutt. *November 26th*, 1901.

Hybrid Smerinthus ocellatus ♂ × S. populi ♀.—On the morning of June 4th I found a fine ♂ *S. ocellatus* paired with a large ♀ *S. populi* in one of my cages, the specimens stayed *in cop.* till dusk, when I placed the ♀ *S. populi* in a large muslin-covered box. She started to lay at once, her ova were not scattered but laid in large batches all stuck together; one batch consisted of 43 eggs, and, in all, 135 ova were laid. These were watched carefully, and, on June 15th, I was delighted to see three young larvæ. All the ova were immediately sleeved on black Italian poplar, but only 45 emerged, the others did not appear to be able to break the shell; all went well, and I reared the 45 to the pupal state (at least twelve of them were sent away as full-fed larvæ, and I heard that they pupated satisfactorily). The larvæ were very variable. On looking at them in the sleeve one would have supposed there were larvæ of *S. populi* and *S. ocellatus* mixed, some were very pale green with a blue horn, while others were of a dark vivid green, exactly like *S. populi*; but what struck me particularly was that the larvæ of pale green hue were in shape precisely like those of *S. ocellatus*, and those of the dark green colour exactly like larvæ of *S. populi*. All the pupæ were alike—*S. ocellatus* in shape with the roughness of *S. populi*. I do not possess these pupæ now, but I feel sure that some of our leading collectors will describe the imagines when they emerge.—L. W. Newman, Bexley, Kent.

A new British flea.—In the *Entomologist's Record*, vol. xii., p. 19 (1900), I recorded *Typhlopsylla orientalis*, Wagner, as a British species. The insect referred to is really *Typhlopsylla bisseptemdentata*, Kol. (*cf.* Wagner, *Hor. Soc. Ent. Ross.*, t. xxxv., p. 24, 1900), also a species not previously recorded from the British Islands.—N. Charles Rothschild, B.A., F.E.S., Tring Park, Tring.

NOTES ON LIFE-HISTORIES, LARVÆ, &c.

Egg of Nepticula, sp.—While taking cases of *Coleophora hemerobiella* off a whitethorn at Putney, May 28th, 1901, about 4.30 p.m., I saw a Nepticulid alight on a whitethorn leaf. She ran over the leaf in the warm sunshine, then, suddenly stopping, she seemed to examine the leaf surface, and, as suddenly reversed her position, bringing the abdomen to the spot where the head had been. After remaining a second or two, as if ovipositing, she flew off before I could box her. I picked the leaf, and, on examining the spot where she had rested with a strong lens, found the egg. The moth was black with an uneven fascia rather beyond the centre of the wing. I fancy it was a specimen of *Nepticula atricollis*. The egg, laid on the underside of the leaf (this surface at the time being exposed to the sun's rays), was situated in the angle between the lamina and the first lateral rib, at its junction with the midrib. To the unaided eye the ovum appeared as a minute dull white bead. Under the microscope it was pale green, the surface reflecting the light but not glistening. I believe the ovum itself was really almost colourless, the green tint being due to the leaf. The ovum might be described as a globule of transparent fluid enveloped in a delicate colourless collapsible skin, in shape conforming more or less with its surroundings. In outline this one was fairly circular, very flat, the height as compared with the diameter being as one to four. Diameter about 0·2 mm. Under a strong power the surface of the ovum appeared to be covered with minute irregular depressions. The egg showed no change in appearance till May 31st, when it became more glistening. On June 2nd it exhibited a yellowish tint on one side. On June 8th it assumed a darker hue and showed no further change till June 12th when it hatched. The duration of the egg stage was therefore fifteen days. When I saw it on the 12th the larva was already mining its way to the upper surface of the leaf. The egg-shell contained the posterior half of the larva and an amount of black excrement. The head of the larva appeared green but it was difficult to see. The body was yellowish-green with a darker central line. The following day a brown fungoid (?) growth, which had previously attacked the leaf, put an end to further observation.—Alfred Sich, F.E.S., 65, Barrowgate Road, Chiswick, Middlesex. October 16th, 1901.

COLEOPTERA.

Note on the Habits of Luciola lusitanica, Charp.—At Torre Pellice, from July 31st to August 8th, a luminous beetle, which Mr. Gahan informs me is *Luciola lusitanica*, was fairly abundant; it was also common at Bobbie from August 9th-18th. This beetle flies at dark, and its habits proved most interesting to me. As soon as dark sets in, from about 9.0 p.m.-11.0 p.m., the beetles may be seen in considerable numbers, their sudden flashes of light, followed by the suppression of the light, being remarkable. One sees a bright sudden flash for less than a second, a cessation for perhaps a full second, and then another flash, and so on. The flash and its duration give one the idea that the former is due to the energy of moving the wings and becomes distinguishable each time the beetle takes a fresh sweep with its wings. The light comes from the two creamy-white ventral abdominal plates, and, in confinement, the luminosity is maintained, coming, however, only in faint pulsations with the activity of the beetle, and failing almost entirely when the beetle is quiet. As many as 30 pulsations have been noticed from one beetle before it rested, a distance of 20 yards or more being covered during this period. The beetles usually fly from 3ft. to 5ft. from the ground, although sometimes much higher, and I have seen them go up into trees to a considerable elevation and descend again. At Bobbie they appeared to be attached to willows. Two beetles caught at Torre on the evening of August 7th were seen to be dying on the morning of the 11th at Bobbie, and were then lying on their backs emitting faint luminous pulsations. After death the luminous areas become dead creamy-white, and the same colour is noticeable when the beetle is not giving forth its light. Excitement will cause a good healthy beetle to produce its light at any time.—J. W. Tutt, F.E.S.

Coleopterous notes for April and May.—At Deal, on April 11th-14th, in damp sand under small stones, I obtained *Bledius opacus*, Block., *B. tricornis*, Hbst., in moss on sandhills, *Amara lucida*, Duft, *A. curta*, Dj., *A. spreta*, Dj., *Harpalus servus*, Duft, and many others of the common sandhill species. At Horsell, on April 27th, *Bembidium nigricorne*, Gyll., and again on May 12th, on which date the following were also obtained, *Byrrhus fasciatus*, F., *Cardiophorus asellus*, Er., *Sericosomus brunneus*, L., *Apion genistae*, Kirb., *Gymnetron melanarius*, Germ., *Ceuthorrhynchus ericae*, Gyll., *C. cochleariae*, Gyll., and *Rhinoncus castor*, F., the last six by general sweeping on the heath. At Mickleham, on May 25th, by sweeping and beating in Headley Lane *Cryptocephalus ochrostoma*, Har., *Phyllotreta ochripes*, Curt., *Ceuthorrhynchus alliariae*, Bris, and others. At Wimbledon Common, on May 27th, on aspens, *Saperda populnea*, L., *Zeugophora subspinosa*, F., *Sericosomus brunneus*, L., *Dorytomus tortrix*, L., *D. maculatus*, Marsh., *Balaninus turbatus*, Gyll., with many commoner insects. On May 29th, by sweeping under hedges in a country road near Bramley station, in Hampshire, I captured *Bruchus atomarius*, L., *B. loti*, Pk., *Amalus scortillum*, Hbst., *Hylastinus obscurus*, Marsh., *Apion pomonae*, F., *Liosomus ovatulus*, Clair., *Telephorus lateralis*, L., and *Malachius aeneus*, L.—T. Hudson Beare, F.E.S., 2, Heriot Row, Edinburgh. *November 9th*, 1901.

Variation of some species of Aphodius. — Mr. Bouskell's paper on this genus suggests the following observations on some of the species: (1) *A. foetens* and *A. fimetarius*.—The sinuation of the sides of the thorax, which M. Acloque gives as the best distinction, is very clear in some specimens of *A. foetens*, but not by any means constant. Some continental authorities consider that *A. fimetarius* ♂ has a deeper impression on the front of the thorax and the central frontal tubercles more pointed than in *A. foetens*, while in the ♀ the raised line in front of the tubercles is more distinct. I believe these small differences are more marked in continental than in British specimens, but, in any case, they are hardly of specific value. On the other hand, it appears to be a misuse of terms to describe as "local" varieties, species spread over so wide an area as these, which are found in France, Germany and Austria, probably also in other parts of Europe. My own experience shows, further, that they occur in the same districts, not more than a mile apart, and yet are never found together. I note that the tibiæ of *A. foetens* are commonly red sometimes also the femora, though I have never yet found this to be so in the other species. (2) *A. ater*.—This is a very variable species as to colour. I have taken only a few purely black specimens, in sheep's dung, and these were mixed with others of every variety up to and including that with entirely red elytra. In fresh specimens the red was very bright, but became dull very soon after death. Some had the suture only black. (3) *A. granarius*. This varies much in the same way as *A. ater*, but I note that the red colour is more permanent. *A. punctatosulcatus*.—This appears to be a far more variable species than *A. prodromus*, and many of the varieties are quite unmistakable. I find the frontal tubercles are always more developed in this species in both sexes. (4) *A. rufipes*.—I have taken specimens of a red-brown form in the Ipswich district, which appears to correspond with *juvenilis*, Muls.—A. E. Elliott, F.E.S., 41, Holland Park, W. *November 14th*, 1901.

Rhyncophora, etc., in 1901.—During the past few months I have paid a good deal of attention to the Rhyncophora, and have met with, in all, about 110 species. A noticeable feature of the season 1901, in my experience, has been the comparative scarcity of Apions, and of the 25 species I took, most were common forms. None of my weevil captures are very rare, but at the same time some are decidedly local, and are, perhaps, worth mentioning. Of the genus *Trachyphloeus*, I was fortunate enough to get five species, including the very local *T. myrmecophilus* at Hastings (by the kindness of Mr. W. W. Esam), and a few each of *T. alternans*, Gyll, and *T. squamulatus*, Ol., these latter at *Helianthemum* roots on the chalk at Croydon. One of the specimens of *T. myrmecophilus* is very interesting, as it retains intact the pair of "false mandibles," by the help of which, in certain groups of the Rhyncophora, the perfect insects are supposed to "work their way through their surroundings on their emergence from the pupa state," which is passed underground. *Caenopsis waltoni*, Schön., (1) under ling in Epping Forest, September. *Omias mollinus*, Boh., a few specimens by sweeping at dusk in a grassy place on the banks of the River Lea on warm evenings at the end of May and beginning of June; it appeared to be limited to a few yards, and required a great deal of working for. *Hypera alternans*, Steph. (*pollux* var.), several observed in May in the ditch where I have previously taken it, but all I saw this year were very worn. *Pseudostyphlus pilumnus*, Gyll., a good series swept from *Matricaria* by the side of a cabbage field, at Edmonton, June. *Sibinia potentillae*, Germ. (one), in moss, Croydon. *Gymnetron villosulus*, Gyll., one, out of a dock plant at Cheshunt, in October, evidently a wanderer; I have also received a nice fresh series of this species from Yeovil, Somerset, bred by my friend Mr. C. Nicholson, from galls in the flower-heads of *Veronica anagallis*. *Cionus tuberculosus*, Scop., which in previous years I have taken freely in the Lea Valley, has been very scarce this year, only a single specimen having been captured, and the same may be said of the thistle-feeding *Tanymecus palliatus*, F., which is also usually common. *Ceuthorrhyncus melanostichus*, Marsh., one by sweeping water-mint, Cheshunt, July. *Baris lepidii*, Germ., in some numbers in June and August in marshy places here, at the roots of a plant which has been provisionally identified for me as *Barbarea praecox*; *B. picicornis*, Marsh., several at the roots of its usual food-plant on the downs near Croydon, September. *Magdalis barbicornis*, Latr., a few males from a tall dense hawthorn hedge surrounding a garden near Waltham, in June, and I also shortly afterwards took a male and female by beating, at Dorking; these captures caused me to look over my previously caught specimens of *Magdalis*, with the result that I found an undoubted ♀ of *barbicornis* placed in my collection as *M. pruni*; this I beat out of a crab-apple bush in Pymmes Park, Edmonton, in June, 1899. Of *M. cerasi*, L., I met with only a single specimen, beaten from a wild rose bush at Tottenham in June. In other groups I may mention:—*Sphodrus leucophthalmus*, L., a fine pair from a granary at Edmonton. *Homaloplia ruricola*, F., struggling on its back in a road at Dorking. *Xylophilus oculatus*, Gyll., several at Tottenham in July, by beating the sunny side of a hawthorn hedge, close to an old oak. *X. populneus*, Panz., sparingly by beating hedges at Edmonton, Tottenham, &c. *Dorcatoma flavicornis*, F., one out of an apple-tree at Tottenham. *Elater elongatulus*, Ol., a few from dead wood, and one on the wing, New Forest, where I also found a specimen of *Asemum striatum*, L., sitting on a fence, and several *Aphodius tristis*, Panz., in a sandy place; my visit was at Whitsuntide, and these were the only species I got of any interest, things being very backward.—F. B. Jennings, F.E.S., 152, Silver Street, Upper Edmonton, N. *October*, 1901.

NOTES ON COLLECTING, Etc.

Lepidopterological notes from Cornwall.—One hears so little of the entomology of Cornwall that some notes on a recent holiday spent in the north-east and western parts of the county may be interesting. The holiday was not ostensibly for collecting, but a fair amount of evening work was put in, and altogether a good number of interesting species was obtained. The short visit to the *Lycaena arion* locality was an afterthought, after the holiday had been arranged. Due to start for Carbis Bay on Monday, July 1st, and never having seen the species alive, I could not resist a run over the ground on my way, so, on the previous Friday evening, I left Paddington by the 9 o'clock night train, meaning to pay a flying visit across country from Bodmin Road, and rejoin my wife there again on her journey west on Monday afternoon. Weather, however, was against me, and by 1 p.m., Monday, I had obtained only a few indifferent specimens. In hopes of a change, I wired that I should stay one more day, and was well repaid for doing so. On Tuesday morning during an hour's sun, preceding a heavy storm, *Lycaena arion* was sufficiently plentiful for me to get a nice fresh series, and I left at midday well contented. It is undoubtedly the "common blue" of the district and seems distributed over a fairly large area. So far, at any rate, it has resisted the attacks of collectors, several of whom apparently make lengthy annual visits, working for nothing else, and taking the insects by hundreds. One visitor, I heard, this year had taken away a large number and then supplied a boy of the neighbourhood with net and boxes, and instructions to send him all he could get. I am afraid that in spite of its present abundance, it will scarcely stand working by locals as well as visitors. The weather, bad from a butterfly point of view, was ideal for treacle, and the patches were crowded. My round was a varied one, commencing with a row of posts from the sea-shore up the valley; then a dozen trees in a very small apple orchard, and finally finishing in an oak and pine wood on the hillside. A very nice lot of Noctuids occurred. *Habrosyne derasa* was present in great force, both on posts and trees, often two or three on a patch; *Thyatira batis* and *Cymatophora duplaris* were not so plentiful and confined to the wood, where *Aplecta herbida* and *A. nebulosa* were also present in fair numbers. The principal "post" species was *Agrotis corticea* which was in great variety and good condition. *Axylia putris* and *Noctua plecta* were also abundant, especially in the apple orchard, which formed a meeting-place for both the wood and "post" species. *Pharetra rumicis* was not uncommon, with occasional *Craniophora ligustri*, and single *Cossus ligniperda*, *Lithosia complana*, *Halias prasinana*, *Nola cucullatella*, *Acronycta leporina*, *Erastria fasciana*, *Neuria reticulata*, and *Mamestra anceps*. A fair number of *Apamea gemina*, *Mania maura*, *Hadena dentina*, *H. pisi*, and *H. thalassina* occurred, and lots of common Noctuids and Agrotids helped to swell a long list. Geometrids were also well represented, *Boarmia repandata* being the most plentiful and *Cleora lichenaria* the best of them. Other butterflies were abundant during the small amount of sunshine, but were altogether neglected for *Lycaena arion*. I noticed *Argynnis aglaia* not uncommonly, fine and fresh, and *Hipparchia semele*, abundant and large. Four *Leucophasia sinapis* (early brood) occurred in the lanes, still in good condition, and an abundance of *Callophrys rubi*, many to my surprise also still quite fresh. *Brenthis selene* was yet on, many in good condition. Of moths, apart from those that came to treacle, I can say little. *Eubolia plumbaria* literally swarmed, *Anaitis plagiata*, *Pseudoterpna pruinata* and *Acidalia marginepunctata* were scarce, and *Eupithecia pumilata* flew at dusk and came to treacle. The typical green form of *E. rectangulata* (so different from our black suburban insect), occurred in the apple orchard, *Eupisteria obliterata* was to be had amongst the alders and *Macroglossa stellatarum* was everywhere, apparently not in anyway requiring sun to make it active. After this short but enjoyable trip I arrived, by devious ways, at Carbis Bay, a delightful spot, two miles from St. Ives, and the home of many an artist. It is certainly an ideal place for a quiet holiday. The sea and beach are excellent, the country beautiful and full of variety, whilst good fishing and boating are to be had at St. Ives (five minutes away by train). For those who play, there is a very fine golf course at Lelant (the next station east), good tennis courts at St. Ives, and above all there are, for the entomologist, a very interesting lot of insects to be had. I had here many claims on my time besides entomology, but managed to work in some eight or nine nights' treacling, between the 3rd and 22nd, and generally had a net and a box or two about with me. Of the butterflies, *Epinephele tithonus* was quite the commonest, easily outnumbering *E. jurtina* (*janira*), and *Hipparchia semele* was appearing in the last week—quite a fortnight behind those on the "*arion*" ground. There was no sign of *Callophrys rubi* here, but *Cyaniris argiolus* was appearing commonly during the last few days. *Plebeius aegon* was locally common, but although many spots upon both the north and south coasts were apparently exactly suitable, there was no sign of *L. arion* here. *Argynnis aglaia* was everywhere and also the common Vanessids, including *Vanessa cardui*. This latter species was in almost unrecognisable condition, and shewed a fondness for high rocky points. One was seen on the very summit of Trencrom—the highest hill in the district—flying rapidly round bare serpentine rocks at 8.15 p.m. Another at seven in the evening, at the very summit of Gurnard's Head—a bare rocky headland. *Colias edusa* was the only other interesting butterfly—a fresh female at Marazion on 20th. I had noticed from the train a good treacling ground. A mile to the east of the station, sandhills commence and run along right past Lelant, round into the port of Hayle. The railway here, running along the coast between the golf course and the sea, gives two good lines of posts. These I treacled the first evening (July 3rd), a bright cold night. The first insect to turn up was *Leucania littoralis*, of which this evening I took five specimens, all in the finest possible condition ; on other evenings it was very common, usually 30 or 40 a night. *Agrotis ripae* was just over. I got two, this first evening, but no more during the visit. *A. corticea* was also on the wane, and though common and very variable, wanted picking over. *A. vestigialis*, on the other hand, was just starting. I took one only the first night, but it rapidly became common and a fine variable lot was obtained. *A. tritici* was later still, the first and only specimen occurring on my last night. A fresh *A. lunigera* turning up on July 10th induced me to treacle flowers on the cliffs in the hope of getting others, but no more were taken. It evidently must occur here, but I was probably too early for them to be well out. The great majority of the sandhill insects were of the above species, with their respective allies, *Leucania impura* and *A. exclamationis*, *Xylophasia monoglypha*, and *Triphaena pronuba*; but there was a fair sprinkling of other things. I was only in for the fag end of *Mamestra albicolon*, getting eight specimens the first week, but none afterwards. Only three of these were really fine. *Thyatira batis* and *Cymatophora duplaris* must have been wanderers from a distant wood, but *Chariclea umbra* was in its right place, as rest-harrow flourished everywhere. *Peridroma ypsilon* (*suffusa*) was another Agrotid that turned up occasionally, whilst *Noctua plecta* and *Hadena dentina* occurred sparingly. Few Geometers were attracted, but among them were *Melanippe galiata* and *Acidalia marginepunctata*, the former species being common throughout the district. There are some woods in the neighbourhood, but I did not try them, and the cliff treacling was not sufficiently remunerative to pursue it. The only other species thus obtained were *Habrosyne derasa* and *Pharetra rumicis*, and as the sandhill species were absent, I soon went back to my old ground again. All the time I had kept a sharp look out for *Sesia musciformis*, but I failed entirely with it until the 18th, when we were out for the day with a party of Marazion fishermen. Landing at Prussia Cove for lunch, and having brought a net on the off-chance of some collecting, I came across the species on thrift blossom, on a rocky headland. I took four beauties in a quarter of an hour and then had to go. Upon revisiting the spot specially, two days later, there was a strong wind blowing and I only got two more worn specimens in a sheltered corner, missing a third. *Stenia punctalis* was common here and a few *Gnophos obscurata* were found. On the rocks a few *Bryophila muralis* were at rest, and others on a wall in Marazion. They were commoner, however, on the lichen-covered serpentine rocks of Gurnard's Head, where I boxed half-a-dozen in the few minutes spent there during a drive. July 11th struck me as being an early date for them. *Cucullia umbratica* was found once at rest on a post, and every plant of *Verbascum* in the district was riddled by *Cucullia verbasci* larvæ. Although most had gone down I yet managed to get together a nice lot. At dusk and at light, without any systematic work, useful things kept turning up; *Acidalia imitaria* commonly, and an odd *A. marginepunctata* here and there; a few nice *Melanippe unangulata* one evening at dusk, and several belated *Emmelesia alchemillata*. *M. galiata* was plentiful everywhere and always came to light. A few beautifully coloured *Pseudoterpna pruinata* came in the window one night only, and other things taken by the same means, included *Cidaria pyraliata*, *C. silaceata*, *Melanthia ocellata*, *Eupithecia pumilata*, *Agrotis strigula*, *Hecatera serena*, *Nudaria mundana*, *Botys asinalis*, *Ebulea sambucalis* and quantities of *Crambus perlellus* ab. *warringtonellus*, which latter far outnumbered the type. *Lasiocampa quercus* males dashed about by day and *Macroglossa stellatarum* was everywhere, a favourite abode being inside the golf club house. Here I found them almost every day, and several times they were seen at rest in the evenings on stone walls or concrete walls of houses. Towards the end of my stay also, very young larvæ were to be found on the bedstraw. Up to July 22nd very few *Anthrocera filipendulae* had emerged, although the larvæ and pupæ were everywhere on the sandhills. I brought a great number of the latter away with me, hoping for aberrations and they are still emerging (August 9th). They are a most disappointing lot, however, one or two slightly confluent in the second and outer pairs of spots and the rest quite typical. The only interesting feature noticed about the Crambi was the very great abundance of *C. perlellus* ab. *warringtonellus* and the scarcity of the type. Otherwise nothing out of the common was seen, although it must be confessed no great attention was given to the group. The same with the Pyrales and Plumes. Besides *Stenia punctalis* and the few others mentioned previously, little else occurred except the commonest species. *Herbula cespitalis* swarmed, and *Pyrausta purpuralis* was common enough. *Nomophila noctuella* was already out, and July 20th seemed an early date for *Scopula ferrugalis*. Species might well be early, as, purely from a holiday point of view, I have never had such a spell of grand weather, the cool sea air nicely tempering a sun-heat that was probably unbearable in town. As a matter of fact, however, things were curiously mixed. *Bryophila muralis* well out, only nine days after *Callophrys rubi* was occurring in good condition ; *Argynnis aglaia* contemporary with some of the first brood of *Leucophasia sinapis*, and so on. Although the foregoing notes are the result of very casual work, I think the species taken or seen, shew this corner of England to be a rich one, and I certainly look forward with great anticipations to much more systematic work there at some future time.—Russell E. James, 18, Onslow Gardens, Highgate, N. *September 4th*, 1901.

Lepidoptera in the New Forest, Bournemouth, etc.—Till the end of July insects were pretty plentiful, there was then a decided falling off, both sugar and light proving uselsss. *Dryas* var. *valesina* was moderately common after July 15th, when my friends and myself took about 30, and Mr. Tylecote captured a beautiful khaki-coloured *D. paphia*. (On July 2nd I took *Oxygastra curtisii* and saw two others.) A trip to Swanage, on July 10th, produced a few *Thymelicus actaeon*, *Melanargia galatea*, common, *Stenia punctalis*, abundant, but worn, *Cledeobia angustalis*, common, whilst *Lithosia complana* has been more numerous than usual, also *Pachycnemia hippocastanaria*. On July 26th I captured *Leucania putrescens* on heath here, about two miles from the sea, I thought this solely a Devonshire and Glamorganshire insect. Two other species new to this district also occurred—*Spilodes palealis* and *Acontia luctuosa*. Pupæ of *Nonagria geminipuncta* have been fairly common in reed-stems, the imagines being almost black in comparison with those I took near Reading some years ago, the moorhens had taken a number by cutting the reeds as if with a knife. Larvæ of *Cyaniris argiolus* have been fairly numerous on ivy-buds. Larvæ of *Mellinia gilvago* beaten from wych-elm in Norfolk, fed well on ash and sycamore, and the imagines emerged in due course. Besides many *Sphinx convolvuli*, several pupæ and larvæ of *Acherontia atropos* have also been taken.—(Major) R. B. Robertson, Forest View, Southbourne Road, Boscombe. *September 19th*, 1901.

Lepidoptera in North Wales.—From September 12th-19th, I spent a week in North Wales, with the special object of getting *Epunda nigra*, *E. lutulenta*, and *E. lichenea*. The weather was not altogether so good as it might have been nor were insects very abundant. On the last night, September 15th, I obtained ten *E. lutulenta*, six *E. nigra*, a great number of *Anchocelis lunosa*, mostly worn, *Agrotis* *vestigialis*, some quite fresh, six *Noctua glareosa*, three *Stilbia anomala*, (one a worn ♀), two *Luperina cespitis* (at sugar), three *Peridroma saucia*, many *P. ypsilon*, and other common things. Altogether I captured some twenty *E. lutulenta*, ten *E. nigra*, and three *E. lichenea*. The first insect I took at sugar on the first night was one of the *lichenea*, and another was the last on the last night, the third came to the acetylene lamp. Light seemed to have but little attraction, and *Luperina cespitis*, which usually comes freely to light, was not even attracted, although three or four were taken from the sugar (a most unusual occurrence). On the other hand, the two ♂ *S. anomala* came to light, the ♀ was sitting on a wire near the sugar. The specimens of *E. lutulenta* were nearly, if not quite all, referable to ab. *lüneburgensis*, all were very dark, and none approached the ab. *sedi*. The *Helotropha leucostigma* captured were all of the ordinary, dull, uniform, brown type.—F. C. Woodforde, F.E.S. *October* 21*st*, 1901.

Autumnal lepidoptera at Skipwith.—The season for *Agrotis agathina*, which began this year on August 12th promised well, but was utterly ruined by the weather, only four nights proving at all favourable. Of other species usually out at the same time—*Cidaria testata* was abundant and variable, whilst of *Noctua glareosa* and *Luperina cespitis* only two of each were taken. Five specimens of *Celaena haworthii* were taken between July 30th (the first time I had taken the species here) and August 12th, and although I worked the heather bloom and the cotton-grass patches both in the afternoon and after dark, I only got one more, boxed off the *Calluna* flowers while after *A. agathina*. The only visitors to sugar recently have been a few *Anchocelis litura*, *A. pistacina*, *Orthosia lota*, *Orrhodia vaccinii* and *Scopelosoma satellitia*.—(Rev.) C. D. Ash, M.A., F.E.S., Skipwith Vicarage, Selby. *September* 26*th*, 1901.

Lepidoptera in the Scilly Isles.—I spent August in the Isles of Scilly. I sugared regularly, but found that insects would not be attracted, and flowers paid but little better. I did fairly well with *Sphinx convolvuli*, and again found a single *Oenistis quadra*, and one *Pachygastria trifolii*, the latter on August 16th, in worn condition.—B. W. Adkin, Brandon House, Morden Hill, Lewisham, S.E. *September* 20*th*, 1901.

Lepidoptera from Burnley, etc., in 1901.—I did very little indeed in the early spring, and not until the middle of May was any serious collecting attempted; generally speaking the spring was cold and backward with rather high winds. On May 2nd a few *Anticlea badiata* were flying at dusk, but very little was out, so on the 11th I ran down to Blackpool, where larvæ of *Lasiocampa quercûs* were rather plentiful, but those of *Dasychira fascelina* were scarce. On the 18th a single *Hadena glauca* suggested a further search, so on the 25th I tried the moors, and although a cold, strong wind was blowing, found about twenty, almost all of them on walls, while a few *Acronycta menyanthidis* were in similar situations; it was observed, however, that while all the *H. glauca* were low down near the base of the walls, the *A. menyanthidis* were near the top (among the bird-droppings). *Hypsipetes impluviata* was early, a dozen being found on the 27th, and they continued fairly numerous and in good condition till June 6th; fully 80% being of the dark almost unicolorous aberration. *Larentia salicata* was scarce, the only one seen occurring on May 27th. *Emmelesia affinitata* and *E. decolorata* commenced emerging on May 30th, and the former continued at intervals till July 29th, from larvæ collected in *Lychnis diurnea* capsules at Scarborough, July 30th, 1900. On June 1st, a specimen of *Habrostola tripartita* on a wall, proved an addition to the district list, while on the 8th, *H. triplasia*, in a similar situation, confirmed last season's find, I took larvæ of *Oporabia filigrammaria* for the first time, on the 1st, the yellow stripes rendering them rather conspicuous; they were feeding on the common ling. On June 8th *Emmelesia albulata* was in good condition; freshly-emerged *Melanippe galiata* and *Venusia cambricaria* were also observed—it is curious how often one or two specimens of the latter insect are noticed in early June—I did not see any more *V. Cambricaria* until July 20th; they were then found sitting on mountain-ash trunks, and were very local. June 21st was the only good night at treacle during the season; *Xylophasia rurea* was the commonest insect, about 75% being the ab. *combusta**, some of them were very dark; *Apamea unanimis* was the best of the other insects, while *E. decolorata* were common at dusk the same night. July 5th was a good night for *M. galiata*, mostly found on walls; *Hepialus velleda*, including a few ab. *gallicus*, were flying over the bracken. On the 20th, a new addition to our list occurred in *Melanthia rubiginata*, a friend further adding *Macroglossa stellatarum* and *Urapteryx sambucata* towards the end of the month. *Bryophila perla* in the centre of the town was a surprise, but I have since found it very commonly this season in localities as far apart as Scarborough and Barmouth. On August 3rd, on the moors, *Charaeas graminis* were very common, this is early for them with us, and the same may be said of *Polia chi*, August 3rd-31st, and only one in September. August 15th, on the garden wall, a fresh specimen of *Eupithecia albipunctata* also furnished an addition to our list. On the 24th, *Celaena haworthii* were fairly numerous and in good condition, but, although they continued out till September 28th, this was the only favourable afternoon, all the others having the drawback of a high and cold wind, which also operated against *Oporabia filigrammaria*, a few of which, with *Tapinostola fulva*, finished a season, that, on the whole, was a very moderate one, the prevalence all through of cool easterly breezes being the chief obstacle to success, especially with Noctuids.—W. G. Clutten, 10, Hallwell Street, Burnley.

Lepidoptera at Castle Moreton.—Sugar and light have failed here throughout the season. The first brood of *Polygonia c-album* was more abundant than usual, as were also the second broods of *Cyaniris argiolus* and *Leptidia sinapis*. I have seen a specimen of *Porthesia chrysorrhoea* taken this year in this locality. Recently I noticed a note in *The Record* bearing on the difficulty of obtaining ♀s of *Adscita geryon*, but, I believe, if lepidopterists would work for it between 4.45 p.m. and 5.45 p.m. they would obtain ♀s without difficulty.—(Rev.) E. C. Dobrée Fox, M.A., Castle Moreton Vicarage, Tewkesbury. *September 24th*, 1901.

Lepidoptera at Chislehurst, etc.—Autumnal larvæ are mostly very scarce, the only exception coming under my notice being those of *Eupithecia subnotata*, which have been extremely common. My only

* Is the form so often recorded as *combusta*, really ab. *combusta*, Haw., which, as we have previously stated (*Brit. Noctuae*, &c., i., p. 80), is a very rare form, or is it *combusta*, Hb. We suspect that the form usually called *combusta*, is not *combusta* at all, but one of the commoner named forms.—Ed.

interesting capture of late has been *Scoparia angustea* of which a fairly numerous and varied series was secured. *Calamia lutosa* has been abundant in its old haunts. Wishing to renew my series of this moth, I spent two evenings searching for it; on the first occasion when the night was cold and misty, with what little wind there was coming from the east, the moths were flying freely; but, on the second, when it was warm and clear, with a moderate westerly breeze, nearly all the specimens were resting on reeds and other plants.—B. A. Bower, F.E.S., Langley, Chislehurst, Kent. *October 4th*, 1901.

October collecting in the New Forest.—I have been much interested in several articles on collecting in the New Forest, at seasons not usually written about, whether from lack of material worthy of report or because few entomologists are on the war path at that season I cannot say, but I hope my experience may be useful to others who may intend to try for themselves. Having been unable to get away for any length of time earlier in the year, I decided to run down to the New Forest and see what was to be done there entomologically in October. I arrived at Brockenhurst on the 11th, and was very pleased to learn that insects were coming to the sweets somewhat freely. I made up my mind to start at once, and after a hurried tea made my way to Holland's Wood, where one or two entomologists were already at work. Though a little late in getting the sugar on, I found a goodly number of moths on the patches and was able to fill nearly all my boxes, not with rarities, but with species which I wanted badly for renewing. *Orthosia macilenta* was by far the commonest species, and was accompanied by a fair sprinkling of *Agriopis aprilina*, *Brotolomia meticulosa*, *Orrhodia spadicea*, *O. vaccinii*, *Scopelosoma satellitia*, *Miselia oxyacanthae*, &c. During my ten days' stay I captured about 400 insects, including 30 *Xylina rhizolitha*, 8 *X. petrificata*, 4 *Epunda nigra*, and odd specimens of *Hoporina croceago*, *Orthosia lota*, *Anchocelis rufina*, *A. lunosa*, *A. pistacina*, *Tiliacea aurago*, *Mellinia circellaris*, *Calocampa vetusta*, *Diloba caeruleocephala* (at light), *Hybernia defoliaria*, *Oporabia dilutata*, and *Cidaria psittacata*. Pupa-digging, with which I had hoped to fill up the daytime, proved a complete failure, almost every suitable tree for miles around having been already dug. A few full-fed larvæ of *Gnophria rubricollis* were beaten, these pupated almost immediately. A week spent at Freshwater Bay proved a complete failure, from an entomological point of view, as sugar both on the downs and in the wood produced nothing but a few of the commonest species, and nothing but *Brotolomia meticulosa* came in any quantity to ivy, which was well out. However, I was well pleased with my autumn outing, and hope before long to renew my acquaintance with the Forest in its autumn garb.—R. Tait, Junr., 15, Rectory Road, Crumpsall, Manchester. *November 25th*, 1901.

Lepidoptera in the Southend district.—*Cyaniris argiolus* has been very abundant this autumn, and larvæ of *Spilodes palealis* have occurred as freely as they did last year. Six *Tiliacea aurago* have visited my sugar. *Eupithecia coronata*, *Melanippe procellata*, *Phibalapteryx tersata*, *P. vitalbata*, and larvæ of *Geometra vernaria* have occurred. Clematis grows as luxuriantly in the hedges between Southchurch and Shoeburyness, far away from the chalk, as it does in the Cobham lanes on the other side of the river.—F. G. Whittle, Southend.

Leucania vitellina and L. albipuncta at Boscombe.—I captured a specimen of *L. vitellina* and also one of *L. albipuncta* (worn), at sugar, on September 17th, and my son took an example of *L. vitellina*, on the 18th.—(Major) R. B. Robertson. *September 19th*, 1901.

Leucania vitellina at St. Margaret's Bay.—A fine specimen of *L. vitellina* was taken at treacle at St. Margaret's Bay, by Mr. E. D. Green, of Plumstead.—W. Dannatt, F.E.S. *October 14th*, 1901.

Cyaniris argiolus at Blackheath.—It may be worth recording that *Cyaniris argiolus* has been plentiful in the Blackheath district this year.—Ibid.

Acidalia virgularia male, attracted by dead female.—A few days ago I had just treated a bred female *Acidalia virgularia* with oxalic acid, and the moth was lying on my setting table motionless and apparently dead, waiting to be pinned. In the meantime I had treated a few more specimens of different sorts and was about to start pinning, when a ♂ *A. virgularia* suddenly appeared flying about the room. The ♂, after circling about a little, alighted on the setting-table and made straight for the dead ♀ and was boxed without difficulty. This is surely an unusual instance of assembling by a ♀ that had been chloroformed and treated with oxalic acid.—(Rev.) C. D. Ash, B.A., Skipwith Vicarage, Selby. *September 26th*, 1901.

Abnormal length of pupal life of Agrophila trabealis.—On August 12th a specimen of *A. trabealis* emerged in the breeding-cage; this was from a batch of pupæ sent to me in 1897, the first of which emerged last year.—Ibid.

Rearing Hylophila bicolorana.—At one time I experienced some difficulty in getting the larvæ of *H. bicolorana* to spin up, but I tried keeping them shut up in the dark, with their food-plant, and met with great success. They quickly spun up on the leaves, and in due course produced fine imagines.—E. A. Atmore, F.E.S., King's Lynn.

With reference to Dr. Riding's note (*anteà*, p. 301), I have several times beaten the larvæ here in May and June from oak, but never, I believe, failed to rear them. They have been kept in cardboard boxes, have spun yellowish, boat-shaped cocoons on the sides of the boxes, not on the leaves, and emerged in due course.—E. F. C. Studd, M.A., Oxton, Exeter. *September 22nd*, 1901.

In reply to Dr. Riding's query (*Ent. Record*, *anteà*, p. 303). I may say that I have often bred *Hylophila bicolorana* from larvæ beaten out of oaks in the New Forest, and have found them easy to rear. I sleeve them out on oak and after they are once sleeved they require little attention. They invariably spin a boat-shaped cocoon on the underside of an oak leaf, of a rather yellower colour than the leaf itself, and when they pupate in that position I have never know them fail to emerge satisfactorily. No doubt their failure to emerge when pupating on the ground is the result of that abnormal and unnatural position for the pupa.—J. C. Moberly, M.A., Woodlands, Basset, Southampton. *October 22nd*, 1901.

Sphingides at Hampstead.—*Sphinx convolvuli.*—Several specimens of *Sphinx convolvuli* have been taken at Hampstead. Two only have fallen to me, one on September 6th, another on September 26th, both are males, and were taken at rest in Heath Street. *Dilina tiliae.*—Imagines have been unusually abundant, the first specimen being taken on May 19th. *Smerinthus populi.*—This is by far the commonest Sphingid and appeared, as usual, early in May, around the electric lamps, right on until the end of July. *S. ocellatus*.—I took one only, a very small male, it was whirling around on the ground at the foot of an arc lamp on Haverstock Hill, on June 20th. *Choerocampa porcellus*.—One male was taken from a lamp in Heath Street, on May 12th.—Montagu F. Hopson, L.D.S., F.E.S., 16, Rosslyn Hill, Hampstead, N.W.

Apatura iris on the Hants borders.—I had the pleasure of seeing, without the satisfaction of taking, four or five *Apatura iris*, flying high around oaks in a wood near Newbury, Berks, on Sunday, July 21st. According to the older books Newbury used to be a favoured locality for this insect, but this is the first time I have met with it, although I have known the district for many years. Newbury is a border town of Berks and Hants, and the credit so far as the county is concerned must go to the latter.—Ibid.

Capture of Eutricha quercifolia in the London district.—Is not this insect getting scarce in our metropolitan district? I have a male, taken on July 12th last, at light, in Hampstead.—Ibid.

Porthesia chrysorrhœa and Eutricha quercifolia.—On July 23rd, 1901, I boxed a fresh ♂ specimen of *Porthesia chrysorrhoea* at Hemsby Railway Station (nr. Yarmouth, Norfolk). I do not know whether this is a known locality for the species. In July (early) I found a small larva of *Eutricha quercifolia* in Ruislip Woods, which to my surprise soon went into a cocoon.—Hubert S. Phillips, F.E.S., 262, Gloucester Terrace. *October 10th*, 1901.

Note on keeping cocoons of Miselia oxyacanthæ.—The cocoons of *Miselia oxyacanthae* frequently get hard and dried up by contact with the surrounding earth. When my first moth came out, a cripple, this autumn, I dug up the rest and gave them a liberal shower bath from the greenhouse water-can. The result was, that in a few days I had 23 fine imagines emerge from the remaining pupæ. Other collectors I know have failed to rear *M. oxyacanthae*.—J. Henderson, 24, Birchin Lane, E.C. *November 4th*, 1901.

Sphinx convolvuli in Piedmont in 1901.—However abundant *Sphinx convolvuli* may have been in England this year, it was still more abundant in certain parts of Piedmont, and must have swarmed at Turin, for in the early mornings during the fourth week of August, one saw, beneath the electric lamps, what can best be described as heaps of moths. Frequently four or five examples of *Sphinx convolvuli* were under a single lamp among the smaller victims, and the early traffic had generally reduced to crushed uselessness most of the specimens. In the Vaudois mountains the species was also common, and one was very interested in seeing these fine fellows on the wing during the daytime, certainly more active, wary, and difficult of approach than at dusk when they sucked the nectar from the flowers of a large *Salvia*, common in the neighbourhood of Bobbie. On August 13th, between Bobbie and Au Pra, a fine fellow was observed feeding at 4.30 p.m. in full activity, and another on the mountains directly south of Bobbie at 12.30, noon, on August 15th, the weather being dull, whilst on the 17th, on the mountain path leading from Au Pra to the Col de la Croix, at an elevation of considerably over 6000ft., a fine male flew straight at me and was brought down with a rapid stroke that had to be executed almost before there was time to think. Its flight in the daytime was particularly bird-like, and, on the rough ground a short distance up the Pellice Valley, above Bobbie, I observed no fewer than five examples hovering at one time, well within the area of a couple of square yards, with the wings, however, repeatedly drawn up at a somewhat sharp angle over the body, and then suddenly dropped and spread forward. The insect is at all times an interesting one, but I have never been more pleased than when I have seen it in its haunts among the mountains. Larche, La Grave, Susa, and Bobbie have all given their quota.—J. W. Tutt.

Sphinx convolvuli at Boscombe.—Only a few *Sphinx convolvuli* appear to have been taken here this year, not more than 20 to 30 altogether. A pupa was brought me; its long proboscis-case, detached from the venter of the pupa, has a very extraordinary appearance.—(Major) R. B. Robertson. Boscombe.

Sphinx convolvuli at Blackheath.—A fine specimen of *Sphinx convolvuli* was taken at Morden College, and given to me, on October 4th.—W. Dannatt, F.E.S., Donnington, 75, Vanbrugh Park, Blackheath. *October* 14*th*, 1901.

Sphinx convolvuli in Shoreditch.—A specimen of *Sphinx convolvuli* was captured whilst resting on the knocker of a door in Great Eastern Street, Shoreditch.—A. J. Croker, F.E.S., 1, Connaught Road, Chingford. *September* 16*th*, 1901.

Sphinx convolvuli at Hadleigh.—A market gardener at Hadleigh sent to me, between August 20th to 29th, four larvæ and one pupa of *S. convolvuli*. All four larvæ were full-fed, and one only was of the brown form.—F. G. Whittle, 3, Marine Avenue, Southend. *October* 6*th*, 1901.

Sphinx convolvuli in York.—A specimen of *Sphinx convolvuli* that had been caught in the city was given to me alive on August 23rd.—S. Walker, Eddercliffe, York.

Sphinx convolvuli at King's Lynn.—*Sphinx convolvuli* must have been fairly common here this autumn. Two larvæ, one pupa (brought in from a potato-field about two miles from the town), and no less than 28 imagines were obtained, the first on September 27th and the last on October 9th. I have also heard of fifteen other imagines and one pupa found by other lepidopterists within the last month.—E. A. Atmore, F.E.S., King's Lynn. *October* 18*th*, 1901.

Sphinx convolvuli at Bournemouth.—*Sphinx convolvuli* has been exceedingly plentiful here this season, the record being 203 for Bournemouth, my contribution being 65, this may be of interest to the readers of the *Entom. Record*.—W. G. Hooker, Christ Church Road, Bournemouth. *November* 11*th*, 1901.

Sphinx convolvuli in Guernsey.—This species has been abundant in Guernsey. Those taken on August 17th were not in good order, but later they were in better condition and continued to haunt flowers of tobacco plant until October 9th.—(Rev.) F. E. Lowe, M.A., F.E.S., St. Stephen's, Guernsey. *November* 22*nd*, 1901.

Acherontia atropos in Guernsey.—On October 11th a fine female of *A. atropos* freshly emerged, was found in a plot of potatoes. It had climbed a shrub about two feet from the ground to dry its wings. The wings were still soft when I received it.—Ibid.

Observations on Lasiocampa quercûs, etc., in 1901.—On June 20th, ♂ s of *L. quercûs* were flying commonly in the sun at Bozen, Tirol.

On July 8th, males were also seen flying commonly in the sun at the extreme summit of Mt. Pilatus. This struck me as unexpected as also did the fairly common appearance of *Gnophria rubricollis* at the same spot. On July 17th, *L. quercûs* was common on the Joch Pass up to the top, yet, in Guernsey, several worn females were brought me as late as August 20th and 21st.—Ibid.

Plusia moneta at Bexley and neighbourhood.—During the present season *Plusia moneta* has occurred in fairly large numbers in the private gardens of this neighbourhood, and I can record about 130 captured in the larval and pupal state, and about 20 imagines netted. I also know of the capture of about 80 other larvæ in this district. The autumn brood was scarce in the larval state, and many days of hard work were quite blanks.—L. W. Newman, Bexley, Kent.

Mellinia ocellaris in North Kent.—In reply to the Rev. C. R. N. Burrows, I beg to state that I have taken *Mellinia ocellaris* in small numbers at sugar in a locality in Kent not far from Wilmington. In 1899 I took three, two ♂ s, one ♀ ; in 1900, three, and a friend who sugared with me took a pair. This year I was too busy in September to work for them, but I have no doubt the insect is firmly established here, and hope to work it up next season. *Mellinia gilrago* and *Tiliacea citrago* are usually freely taken with *M. ocellaris* in my locality. Three of these specimens are now in the collection of Mr. E. D. Bostock.—Ibid.

Deilephila livornica at Cambridge.—On June 9th last, a very hot day, as Mr. E. H. Field and myself were taking a walk in the neighbourhood of Cambridge, a specimen of *Deilephila livornica* passed us coming up from behind. Giving chase I followed the insect across the road into a cornfield, where, after an exciting chase, a lucky turn enabled me to strike the insect down with my straw hat. It clung quietly to a stalk of corn while I boxed it.—E. Crisp, 31, Union Road, Cambridge. *November 19th*, 1901.

Ennomos autumnaria at Reading.—In reference to Mr. W. Butler's note on my capture of *Ennomos autumnaria* (*anteà*, p. 334), I may state that I live quite 2¼ miles from Mr. Butler's house and have caught the insect another 2 miles beyond my house in the opposite direction, so I should hardly think my take was an "off" from Mr. Butler's. Of course, if Mr. Butler breeds to introduce new resident species, lepidopterists about here will never be sure of taking a "British" rarity.—W. Barnes, Brightwell Villas, New Road, Southern Hill, Reading. *November 19th*, 1901.

Leucania l-album reported from Tunbridge Wells.—With reference to the note of your correspondent, Mr. S. J. Bell, on the capture of *Leucania l-album*, I have in my posession a thoroughly authentic specimen which was captured near Tunbridge Wells in 1869, and was given to me by the captor.—H. W. Shepheard-Walwyn, M.A., F.E.S., Dalwhinnie, Kenley, Surrey. *November 19th*, 1901. [The properly authenticated capture of a species like *Leucania l-album*, is of the utmost importance from a scientific point of view to all students of geographical distribution. Questionable specimens, like those recorded in the *Entomologist*, vol. vi., p. 241, render the study of distribution impossible. Scarcely less harmful are specimens found here and there in cabinets throughout the country, and stated to be British, which were never critically examined at the time of capture by a competent lepidopterist, nor duly authenticated and recorded at the time. We take it that the specimen here noted has not been so recorded, and if so, we should want a very stringent definition of "thoroughly authentic" before accepting in any degree its British authenticity.—Ed.]

CURRENT NOTES.

Canon Fowler is anxious to collect any evidence as to coleoptera being eaten by birds, whether in confinement or otherwise. He would be glad to know, if possible, the generic names of any coleoptera so devoured, and the names of the birds that devoured them ; and would be very grateful for notice of remains of any beetles found in the crops of birds whilst being prepared for stuffing or cooking. There is no doubt that birds do eat coleoptera, but how far this is the case is a question, and it is still more doubtful how far they exercise discrimination between species. Any evidence as to the latter point will be much valued. We trust any of our readers who have notes or observations on this subject will promptly send them on to Canon Fowler, Rotherfield Peppard Rectory, Henley-on-Thames.

In the *Ent. Mo. Mag.*, for October, Mr. Champion records the capture of *Melandrya dubia*, Schall. (*canaliculata*, F.), by Mr. Bedwell, in the New Forest. He further states that the insect known by this name in British collections should be called *M. barbata*, F. (this, of course, includes Mr. Bedwell's specimen), and that only three other specimens have been taken of recent years, by Gulliver, in the New Forest, which are in the collections of Messrs. F. Bates and P. B. Mason. Mr. Heasler, however, took several specimens in the New Forest this year, and Mr. Gorham possesses a specimen, also taken by Gulliver.

Herr Gauckler describes an ab. *niger* of *Triphaena comes*. He seems to have overlooked ab. *nigrescens*, and ab. *rufonigrescens*, Tutt (*Brit. Noct.*, ii., p. 98) before which it falls. We still venture to hope that our German *confrères* will reduce the re-naming of well-known and already described Noctuid forms to a minimum.

A strange note, showing the want of scientific accuracy indulged in by some collectors, occurs in the *Berl. Ent. Zeits.*, xlvi., p. 10, where Herr Ziegler is reported to have exhibited an alpine aberration of the male of *Lithosia lutarella*, L., from the neighbourhood of Tarasp, in which the black of the hindwings, with the exception of a small stripe on the costa, is wanting ; also the greyish-yellow var. *pygmaeola*, Dbld., ♂ from Scotland. Three points occur to us : (1) Is not the Tarasp form the ordinary alpine form of the species ? (2) Has the var. *pygmaeola*, Dbld. (which obtains here such a remarkable literary form) ever been taken in Scotland ? (3) If not, what British lepidopterist sends out *pygmaeola* with inaccurate data to German lepidopterists ?

Mr. F. A. Lees, in *The Nat.*, p. 329, describes a butterfly taken at Wetherly as, "the Little Blue (*Chrysophanus minimus*) . . . . a living, fluttering bit of sky, as if dropt out of the azure." We should like some Yorkshire azure-blue *Cupido minima*, if any are available.

The *Ent. Mo. Mag.*, pp. 257-258, and *The Nat.*, pp. 289-290 duplicate an account of *Sphinx convolvuli* larvæ taken at Roystone, by Mr. Whitaker. This capture may be important, but we would have preferred the list of "Everingham Lepidoptera" that has been promised on the cover of *The Naturalist* so long to the duplication.

We are pleased to see that M. Lambillion is about to publish a work entitled "Histoire Naturelle et Mœurs de tous les Papillons de Belgique." The first volume will contain an account of the 103 Belgian butterflies, under the headings—Imago, Egg, Larva, Pupa, Foodplants, Time of Appearance, Localities, and Geographical Distribution. We are particularly anxious that the work should give a really complete list of all the known Belgian localities, for all except the most common species, as such a list, if sufficiently complete, would probably throw light on the distribution of some of our own more local forms. The subscription price for the volume is only six francs. (Published by Messrs. Douxfils, Namur, Belgique.)

Mr. Verrall's new edition of his "List of British Diptera" will be published in December, and will be obtainable from him price 1/-, or printed on one side only price 2/-.

We are requested to remind the Fellows of the Entomological Society of London that dinner takes place after each Council meeting and before the ordinary meeting, at Pagani's, at 7 p.m. Fellows are kindly invited and welcomed. Particulars of Mr. H. Rowland-Brown, Oxhey Grove, Harrow Weald.

Another very useful little monograph appears from the pen of M. L. Dupont, entitled "Les Procrines de la Normandie." We wish we could persuade M. Dupont to use a form of generic synonymy that is in strict accord with "the laws of priority," and thus lend his support to the attempt now being made by advanced workers to secure uniformity of nomenclature that can only be disturbed by the consideration of works not yet thoroughly studied. The contents of this brochure are in every way useful and accurate, and have a special interest to British lepidopterists owing to the similarity between the fauna of southern England and Normandy.

At the meeting of the Entom. Society of London, held on November 6th, 1901, Mr. F. B. Jennings exhibited a specimen of *Trachyphloeus myrmecophilus*, Seidl., taken at Hastings in September last, retaining intact the deciduous "false mandibles," with the aid of which the imago of the species of this and certain other genera of weevils is said to work its way to the surface after emerging from the pupa underground. These mandibles are usually shed as soon as the imago begins its life above ground, as there is no further use for them.

At the same meeting Mr. W. J. Kaye exhibited a collection of butterflies made by him in Trinidad, with several hitherto undescribed species. He said that the probable total of the rhopalocerous fauna was about 250 species, the island—about the size of Somersetshire—being thus remarkably rich in butterflies. The numbers of the species in the families exhibited were 34 *Nymphalidae*, 13 *Satyridae*, 6 *Papilionidae*, 31 *Pieridae*, 29 *Erycinidae*, 27 *Lycaenidae*, 62 *Hesperiidae*—nearly all taken within three or four miles of Port of Spain. The series of *Heliconius telchinia* and *Tithorea megara* var. *flavescens* were particularly fine, showing the yellow coloration only found in these species in Trinidad and upon the coast of Venezuela immediately opposite. A long series of *Papilio zeuxis* and *Papilio alyattus*, many of them bred from the same

♀, shows that these two are in reality identical species. The number of *Erycinidae* in Trinidad, compared with the poverty of the same family in other West Indian Islands, alone indicates the different origin of its fauna, and suggests affinity with that of the mainland of Venezuela, which, at the nearest point, is but seven miles distant.

At the same meeting Dr. Chapman exhibited specimens of *Parnassius apollo* taken last July in Castile and Aragon (Spain), as well as a number of specimens of both *P. apollo* and *P. delius*, chiefly Swiss and French, taken by himself, Mr. Tutt, Mr. A. H. Jones (at Digne), and Mr. Rowland-Brown (at Susa, N. Italy), both for comparison with the Spanish specimens and to illustrate the extent to which the races of these species approached each other in Western Europe. He noted that the Spanish specimens differed from most of the others in their great size, male specimens reaching $3\frac{5}{8}$ inches in expanse, and females $3\frac{7}{8}$. The Spanish ♂ s agree with *apollo* in the only point of distinction between that species and *delius* that makes some pretensions to absolute constancy, *viz.*, the coloration of the shaft of the antennæ. With *delius* they agree in a certain amount of creamy tinting and apparent density of the white scales, which, in nearly all races of *apollo*, are white and with a certain suggestion of transparency. They agree also with *delius* in the small amount of the dark (and semi-transparent) marginal coloration of the wings, the hindwings being as free from such markings as the most typical *delius*. They agree also with *delius* in the comparative smallness of the black marks both of fore- and hindwings, and in the tendency of these to display red nuclei. Both males and females seem to be exceedingly close to the Asiatic form of *apollo* called *hesebolus*, in general facies at any rate. These ♂ s placed between ordinary Swiss *apollo* and *delius*, obviously incline much more to the latter than the former in general tone of colour and intensity of markings. The females are very large, and vary to forms with much increased red ocelli. The paleness of the red ocelli in many specimens, especially of the males, is due to them not being in the freshest condition. Several specimens were seen with yellow or orange ocelli, but these were all in such poor condition that they were considered faded and bleached specimens rather than the well known variety with orange ocelli. It is probable, however, that some of these may really have been orange originally. Continuing Dr. Chapman said: "The specimens of *apollo* and *delius* are all labelled with localities, and I need not go over them individually. It may be observed that I do not present aberrations but specimens to illustrate the races occurring at different localities. *Delius* is apparently never a large species, but *apollo* is often as small as *delius*. The point that is perhaps most interesting is the great approach of some *delius* to the ordinary form of *apollo* in the character and extent of the black markings. A specimen from Evolena, though unquestionably *delius* by ground tint and antennæ, has the markings and general aspect of *apollo*, and another specimen from Col Torrent, practically the same locality, closely approaches this. Two specimens brought by Mr. Tutt from Larche are undoubted *delius*, but are, in general aspect, in absolute agreement with *apollo*. Three other specimens with these look exceedingly like them in size, markings, etc., but seem to be equally undoubted *apollo*. I took these five specimens unset out of Mr. Tutt's field store-box, where they formed a little group by themselves, and Mr. Tutt pointed them out to me as coming from very high ground near Larche (South Dauphiné, though actually in a northern tongue of Provence). Amongst the specimens placed with these are similar small *apollo*, that have quite equal claims to be called *delius*. They have rather short antennæ like *delius*, but have not the black rings of that species. It is interesting to note the small size of these *apollo*, exactly that of *delius*, from various localities in the Alps of the Barcelonnette region which is comparatively close to Digne, where the species attains a size equal to that of the Spanish specimens, though with a darker and more typical *apollo* coloration. What is the actual difference of *delius* from *apollo?* No one will tell me. I can find both species described, but then the descriptions do not cover all the races of each. Text-books are usually satisfied to state that everyone knows them so well that there is no need to mention the distinctions. This would unquestionably be a sound position if one had only to deal with such Swiss specimens as I have placed on either side of my Spanish specimens. The best character for *delius* is certainly the black-ringed antennæ, which are also usually proportionally shorter. The denser creamier colouring is also very characteristic, yet this would make the Aragon specimens *delius*. The pouch of the female is, to my view, identical in both species. Mr. Elwes, I think, omits to tell us whether it is so or not. The ♂ appendages have no structural difference that I have been able to observe, beyond one in size, those of *apollo* being larger and so apparently more solid. In the Spanish *apollo* this is markedly so, the differences are, however, I think, less, proportionately, than may be observed in *Erebia aethiops*, of which the appendages of continental specimens are so much larger than those of British examples."

Mr. J. A. Clark's complete illustrated account of the variation of *Peronea cristana*, Fab., might well serve as a model on which to base future accounts of the variation of more or less polymorphic species. As a rule new aberrations are described without reference to those that have already been dealt with, synonyms are thus hopelessly increased, and, unless some attempt is made by those who describe varieties and aberrations to work out their subject historically, endless confusion must result. The paper has attracted considerable attention among continental lepidopterists, and we may possibly hope before long to get some sort of general opinion formulated, that those who describe new forms should first make themselves acquainted with the literature of their subject. We hope Mr. Clark will treat other species in the same thorough manner.

We have received the exceedingly useful lists of the Macro-lepidoptera and Tenthredinidæ of the Clyde basin district, compiled by Mr. A. A. Dalglish, F.E.S., and reprinted from the British Association *Handbook*, for 1901. We know that Mr. Dalglish has had to cut down his list to meet the exigencies of space. One would have supposed, at any rate, that the British Association would not have reduced the scientific value of such a list, by considering the cost of two or three extra pages of print.

Mr. G. C. Bignell gives us, as his addition to the literature of his special subject for the year, "The Ichneumonidæ of South Devon, pt. ii., Braconidæ," a most useful little brochure, reprinted from the *Trans. Devon Assoc. for Advancement of Science*, &c., 1901.

At the meeting of the Entom. Society of London, held November 20th, 1901, Mr. G. H. Verrall, F.E.S., referring to a recent note in the *Ent. Record* (*anteà*, p. 334) dealing with the subject of the right of entomologists to collect on Wicken Fen, stated that he and other entomologists possessed plots of land in Wicken Fen, that any *bonâ fide* entomologist who applied to him might have permission to go on his land, and that this would carry a right to be on the droves in order to get on the land. He doubted whether the droves were public rights-of-way except to get on to the various plots belonging to different owners. It was stated that Mr. Aspland greatly magnified the extent of his holdings on the Fen.

Can any entomologist oblige Mr. A. Bacot, 154, Lower Clapton Road, London, N.E., with any or all of the following Lachneid species for examination:—*Eustaudingeria vandelicia*, *Paralebeda plagifera*, *Nadiasa undata* or *N. obsoleta*, *Pyrosis eximia* or *P. idiota*? If ova, larvæ, or pupæ are available they would be especially welcome. Mr. Bacot is attempting to work out a rational grouping of the Lachneid moths, and these species, which are not represented in the British Museum collection, are required badly for examination.

PRACTICAL HINTS.*

Field Work for December.

By J. W. TUTT, F.E.S.

1.—Keep larvæ of *Macrothylacia rubi* out-of-doors until December, then obtain a large bunch of heather, place in a jar of water in cage with larvæ, and remove cage near to the kitchen fire; the larvæ soon get lively, crawl about on the heather, and spin up in a week or two; emergence commences in the middle of February (Butler).

2.—The pupæ of *Gnophria rubricollis* are to be obtained in a slight cocoon, surrounded by an outer covering of spider-like web. They have been found under the "topper" of a stone wall which surrounded a fir plantation (larch, spruce, and Scotch), the larvæ feeding on the lichens on these trees and probably on the lichens on the hawthorns, which hung over the wall (Todd).

3.—The larvæ of *Hipparchia semele* hybernate small, remaining on the grass all the winter, and showing no tendency to burrow or hide; they feed a little all the winter in suitable weather, but do not grow perceptibly till spring.

4.—In November and early December *Hybernia defoliaria* and *H. aurantiaria* are both very common in Epping; the ♀s are to be found freely after dark on tree-trunks, with a lantern.

5.—The males of *Poecilocampa populi* come freely to light during November; there is then often a break in December with a fresh lot of imagines appearing towards the end of the month and during the first week in January (Mason).

6.—In December a visit to Benfleet (or any other similar coast district) will usually give an abundance of the cases of *Coleophora artemisicolella* on sea-wormwood (*Artemisia absynthium*).

* Practical Hints for the Field Lepidopterist, recently published, contains 1,250 similar hints to these, distributed over every month in the year. Interleaved (for collector's own notes).—Ed.

Erratum.—p. 305, line 6 from the bottom, for "*porcellus*" read "*elpenor*."

CONTENTS OF VOLUME XIII.

PAGE.

Coleoptera 102, 140, 182, 219, 250, 271, 328, 363
Current Notes 82, 111, 138, 166, 196, 218, 251, 279, 308, 377
Life-histories, Larvæ, etc. 137, 154, 225, 243, 307, 362
Notes on Collecting 107, 130, 164, 189, 220, 247, 276, 301, 332, 366
Obituary:—Baron Michel Edmond de Selys-Longchamps (with photograph) 79; Herbert Williams, 84; A. Constant, 218; Eleanor A. Ormerod, LL.D., F.E.S. 280
Orthoptera 153, 181, 243, 296, 332
Practical Hints:—Field work for February and March, 81; March and April, 106; April and May, 128; May, 160; June, 186; July, 215; August (July in error), 245; September, 273; October, 300; December 381
Scientific Notes and Observations .. 126, 183, 224, 253, 297, 327, 360
Variation 163, 186, 254, 296, 336, 358
Aberrations and Varieties of:—*Abraxas sylvata*, 297; *Agrotis cursoria*, 279; *Agrotis simulans*, 279; *Amphidasys betularia*, 297, 359; *Anchocelis lunosa*, 360; *Anthrocera filipendulae*, 359; *Anthrocera lonicerae*, 297; *Asthena luteata*, 359; *Asthena sylvata*, 359; *Aphodius*, 271, 364; *Aplecta tincta*, 280; *Bankesia conspurcatella*, 173; *Bryophila muralis*, 359; *B. perla*, 280; *Calocampa solidaginis*, 279; *Chrysophanus dorilis*, 119; *Chrysophanus phlaeas*, 360; *Cidaria picata*, 112; *Cilix glaucata*, 296; *Colias edusa*, 141; *Dichonia aprilina*, 279; *Dilina tiliae*, 254, 297; *Diloba caeruleocephala*, 358; *Endrosa aurita*, 139; *E. kuhlwenii*, 139; *E. irrorella*, 140; *Enodia hyperanthus*, 360; *Erebia aethiops*, 121; *E. tyndarus*, 120; *Eupithecia venosata*, 336; *Gonodontis bidentata*, 336; *Homalota divisa*, 250; *Hoporina croceago*, 186; *Hydroecia micacea*, 360; *Hydriomena autumnalis*, 336; *Jochaeara alni*, 280; *Lasiocampa quercûs*, 113, 237; *Lithosia complana*, 359; *L. lutarella*, 377; *Lobophora carpinata*, 336; *Luperina testacea*, 360; *Lymantria monacha*, 254; *Melanargia galathea*, 358; *Melanippe fluctuata*, 252; *Melitaea didyma*, 311; *Nemeophila plantaginis*, 135; *Ochyria munitata*, 336; *Ortholitha plumbaria*, 112; *Peronea cristana*, 227, 261, 287, 327; *Phytometra viridaria*, 280; *Plebeius argus*, 120; *Polyommatus icarus*, 360; *Satyrus actaea*, 206; *Smerinthus ocellatus*, 163; *Spilodes palealis*, 191; *Tephrosia (Boarmia) crepuscularia*, 112, 297; *Thecla pruni*, 297; *Thymelicus thaumus*, 359; *Urapteryx sambucata*, 297; *Venusia cambricaria*, 359; *Zonosoma pendularia* .. 296
Additions to the British List:—*Aphodius fimetarius* ab. *castaneus*, Bouskell, 272; *A. foetens* ab. *hypocastaneus*, Bouskell, 272; *Atherix crassipes*, Meig., 84; *Ceratophyllus newsteadi*, Rothschild, 284; *Chrysopa dorsalis*, Burm., *Eupithecia venosata* var. (? ab.) *orcadensis*, Prout, 336; *Gonodontis bidentata* ab. *nigra*, Prout, 336; *Homalota divisa* var. *blatchii*, Ellis, 250; *Hoporina croceago* ab. *latericolor*, Raynor, 186; *Hydriomena autumnalis* ab. *infuscata*, Prout, 336; *Lobophora carpinata* ab. *fasciata*, Prout, 336; *Lophosia fasciata*, Mg., 308; *Peronea cristana*—ab. *albonigrana*, Clark, 327; ab. *alboruficostana*, Clark, 288; ab. *atrana*, Clark, 290; ab. *attaliana*, Clark, 288; ab. *charlottana*, Clark, 289; ab. *fuscana*, Clark, 288; ab. *gumpiana*, Clark, 289; ab. *intermediana*, Clark, 291; ab. *masoniana*, Clark, 289; ab. *merlana*, Clark, 290; ab. *nigrana*, Clark, 290; ab. *nigrocostana*, Clark, 327; ab. *nigrocristana*, Clark, 263; ab. *nigropunctana*, Clark, 289; ab. *nigrosubvittana*, Clark, 264; ab. *ochreapunctana*, Clark, 289; ab. *prochantana*, Clark, 264; ab. *prostriana*, Clark, 288; ab. *proxanthovittana*, 265; ab. *punctana*, Clark, 264; ab. *rufinigrana*, Clark, 290; ab. *subalboflammana*, Clark, 288; ab. *subchantana*, Clark, 264; ab. *subfulvovittana*, Clark, 265; ab. *subunicolorana*, Clark, 290; ab. *transversana*, Clark, 288; ab. *ulotana*, Clark, 291; *Hydriomena autumnalis* ab. *infuscata*, Prout, 336; *Lasiocampa* hybr. *bacoti*, Tutt, 327; *L.* hybr. *warburgi*, Tutt, 328; *L.* hybr. *prouti*, Tutt, 328; *L.* hybr. *complexa*, Tutt, 328; *L.* hybr. *inversa*, Tutt, 328; *L.* hybr. *complicata*, Tutt, 328; *L.* hybr. *intermedia*, Tutt, 328; *Lasiocampa quercûs* ab. *brunnea*, Tutt, 327; ab. *marginata*, Tutt, 327; ab. *ochracea*, Tutt, 327; ab. *olivacea*, Tutt, 327; ab. *purpurascens*, Tutt, 327; ab. *rufescens*, Tutt, 327; ab.

semimarginata, Tutt, 327; *Ochyria munitata* var. *hethlandica*, Prout, 336; *Pachygastria trifolii* ab. *cervina*, Tutt, 327; ab. *cervina-obsoleta*, Tutt, 327; ab. *flava*, Tutt, 327; ab. *flava-obsoleta*, Tutt, 327; ab. *rufa*, Tutt, 327; ab. *rufa-obsoleta*, Tutt, 327; *Rhacochlaena toxoneura*, Lw., 84; *Ripersia tomlini*, Newstead, 167; *Stenolophus plagiatus*, Gorham, 82; *Tephritis* (*Oxyna*) *elongatula*, Lw., 84; *T. ruralis*, Lw., 84; *T. tessellata*, Lw., 84; *Tomostethus funereus*, Klg., 84; *T. gagathinus*, Klg., 84; *Typhlopsylla bisseptemdentata*, 362; *Xylophasia lateritia*, Hfn., 218; *Zonosoma pendularia* ab. *griseolata*, Staud. 296

Eggs of *Agrotis agathina*, 160; *Dendrolimus* (*Lasiocampa*) *fasciatella* var. *excellens*, 307; *Lachneis lanestris*, 225; *Lemonia dumi*, 168; Lycænids, 109; *Nepticula*, sp. 362; *Psodos trepidaria*, 137; *Trochilium apiformis*, 226

Egg-laying of *Boarmia consortaria*, 188; *Brephos notha*, 188; *B. parthenias*, *Callophrys rubi*, 160; *Colias edusa*, 187; *Cymatophora octogesima*, 154; *Drepana harpagula*, 162; *Geometra vernaria*, 188; *Gonepteryx rhamni*, 128; *Lampronia capitella*, 163; *Melitaea aurinia*, 160; *Stauropus fagi*, *Xylophasia scolopacina* 216

Habits of:—*Achroea grisella*, 189; *Acidalia ochrata*, 218; *Actebia praecox*, 246; *Adela cuprella*, 107; *Adscita geryon*, 188; *Agrotis agathina*, 246; *A. obscura*, 216; *Aleucis pictaria*, 106; *Angerona prunaria*, 188; *Anthrocera palustris*, 216; *A. stephensi*, 188; *A. trifolii*, 188; *Apamea ophiogramma*, 216; *Aporophyla australis*, 274; *Asphalia flavicornis*, 106; *Asthena sylvata*, 276; *Brephos notha*, 195, 220; *Butalis incongruella*, 130; *Calligenia miniata*, 217; *Calocampa exoleta*, 129; *C. vetusta*, 129; *Calymnia pyralina*, 217; *Celaena haworthii*, 245, 274; *Charaeas graminis*, 245; *Coccyx splendidulana*, 130; *Cupido minima*, 187; *Cymatophora ridens*, 107; *Drepana cultraria*, 162; *Endromis versicolora*, 130; *Ennomos autumnaria*, 275; *E. erosaria*, 275; *Eriocrania*, 107; *Eupithecia stevensata*, 275; *Gnophria rubricollis*, 161; *Hecatera serena*, 187; *Lemnatophila phryganella*, 301; *Leucania brevilinea*, 245; *Lithosia complana* var. *sericea*, 276; *L. muscerda*, 277; *Lophopteryx carmelita*, 106; *Luciola lusitanica*, 363; *Melampias epiphron*, 215; *Mellinia gilvago*, 246; *Moma orion*, 187; *Nascia cilialis*, 188; *Nemoria pulveraria*, 162; *N. viridata*, 188; *Nephopteryx angustella*, 129; *Nola cristulalis*, 128; *Nyssia hispidaria*, 106; *Nyssia zonaria*, 131; *Phothedes captiuncula*, 216; *Phoxopteryx siculana*, 247; *Plusia moneta*, 217; *Poecilia nivea*, 247; *Polyommatus dolus*, 310; *Retinia posticana*, 129; *Sericoris irriguana*, 217; *Sesia sphegiformis*, 187; *S. tipuliformis*, 216; *Solenobia inconspicuella*, 107; *Stauropus fagi*, 161, 162; the Drepanids, 128; *Tiliacea aurago*, 246, 301; *Triphaena interjecta*, 246; *Trochilium bembeciforme*, 188, 216; *Xylophasia* 162

Errata 109, 112, 196, 226, 336, 381

Genera, Species, Varieties, Aberrations and Hybrids new to Science:—*Actias* hybr. *mortoni*, Tutt., 183; *Antheraea* hybr. *kirbyi*, Tutt, 183; *A.* hybr. *moorei*, Tutt, 183; *Chrysophanus dorilis* var. *brunnea*, Wheeler, 120; *Eleemosia*, Prout, 183; *Eremobia grandis*, Portchinsky, 211; *Eupithecia venosata* var. (? ab.) *orcadensis*, Prout, 336; *Gonodontis bidentata* ab. *nigra*, Prout, 336; *Homalota dirisi* var. *blatchii*, Ellis, 250; *Hoporina croceago* ab. *latericolor*, Raynor, 186; *Hydriomena autumnalis* ab. *infuscata*, Prout, 336; *Lasiocampa* hybr. *bacoti*, Tutt, 327; *L.* hybr. *warburgi*, Tutt, 328; *L.* hybr. *prouti*, Tutt, 328; *L.* hybr. *complexa*, Tutt, 328; *L.* hybr. *inversa*, Tutt, 328; *L.* hybr. *complicata*, Tutt, 328; *L.* hybr. *intermedia*, Tutt, 328; *Lasiocampa quercûs* ab. *brunnea*, Tutt, 327; ab. *marginata*, Tutt, 327; ab. *ochracea*, Tutt, 327; ab. *olivacea*, Tutt, 327; ab. *purpurascens*, Tutt, 327; ab. *rufescens*, Tutt, 327; ab. *semimarginata*, Tutt, 327; *Lasiocampa* hybr. *wagneri*, Tutt, 298; *L. quercûs* var. *meridionalis*, Tutt, 113; *Leptologia*, Prout, 183; *Lobophora carpinata* ab. *fasciata*, Prout, 336; *Luffia maggiella*, Chapman, 80, 93; *Pachygastria trifolii* ab. *cervina*, Tutt, 327; ab. *cervina-obsoleta*, Tutt, 327; ab. *flava*, Tutt, 327; ab. *flava-obsoleta*, Tutt, 327; ab. *rufa*, Tutt, 327; ab. *rufa-obsoleta*, Tutt, 327; *Peronea cristana* ab. *albonigrana*, Clark, 327; ab. *alboruficostana*, Clark, 288; ab. *atrana*, Clark, 290; ab. *attaliana*, Clark, 288; ab. *charlottana*, Clark, 289; ab. *fuscana*, Clark, 288; ab, *gumpiana*, Clark, 289; ab. *intermediana*, Clark, 291; ab. *masoniana*, Clark, 289; ab. *merlana*, Clark, 290; ab. *nigrana*, Clark, 290; ab. *nigrocostana*, Clark, 327; ab. *nigrocristana*, Clark, 263; ab. *nigropunctana*, Clark, 289; ab. *nigrosubvittana*, Clark, 264; ab. *ochreapunctana*, Clark, 269; ab. *prochantana*, Clark, 264; ab. *prostriana*, Clark, 288; ab. *proxanthovittana*, Clark, 265; ab. *punctana*, Clark, 264; ab. *rufinigrana*, Clark, 290; ab. *subalboflammana*, Clark, 288; ab. *subchantana*, Clark, 264; ab. *subfulvovittana*, Clark, 265; ab. *subunicolorana*, Clark, 290; ab. *transversana*, Clark, 288; ab. *ulotana*, Clark, 291; *Platysamia* hybr. *americana*, Tutt, 183; *P.* hybr. *griffithsi*, Tutt, 183; *P.* hybr. *heyeri*, Tutt, 183; *P.* hybr. *watsoni*, Tutt, 183; *Saturnia* hybr. *complexa*, Tutt, 183; *S.* hybr. *dixeyi*, Tutt, 183; *Stenolophus plagiatus*, Gorham 82

LARVÆ:—*Acidalia emarginata*, 218; *Acidalia imitaria*, 110: *Aciptilia galactodactyla*, 129; *Agrotis agathina*, 81, 129; *Agrotis lucernea*, 81; *Amphidasys strataria*, 188; *Anticlea sinuata*, 247; *Apamea ophiogramma*, 129, 161, 187; *Apamea unanimis*, 129; *Apatela aceris*, 216, 275; *Aphomia sociella*, 247; *Argyrolepia aeneana*, 81; *Asphalia ridens*, 187; *Asteroscopus sphinx*, 81; *Boarmia cinctaria*, 188; *Bucculatrix maritima*, 163; *Camptogramma fluviata*, 275; *Cerura bicuspis*, 246; *Chauliodus chaerophyllellus*, 247; *Cidaria reticulata*, 275; *Cidaria silaceata*, 129, 189; *Cirrhoedia xerampelina*, 130, 131; *Coccyx nemorivaga*, 275; *Coleophora conspicuella*, 163; *Coleophora solitariella*, 107; *Colias edusa*, 213; *Colias hyale*, 222; *Cosmia paleacea*, 187; *Craniophora ligustri*, 216; *Cryptoblabes bistriga*, 301; *Cucullia verbasci*, 217; *Dasypolia templi*, 81; *Depressaria alstroemeriella*, 130; *Depressaria cnicella*, 130; *Dianthoecia conspersa*, 216, 217; *Dianthoecia cucubali*, 245; *Dianthoecia irregularis*, 217; *Dimorpha versicolora*, 162; *Drepana harpagula*, 162; *Dyschorista suspecta*, 161; *Ellopia prosapiaria*, 275; *Emmelesia alchemillata*, 247; *Emmelesia unifasciata*, 275; *Epunda lichenea*, 81, 106; *Eupithecia pulchellata*, 217; *Eupithecia sobrinata*, 129; *Eupithecia subciliata*, 162; *Eupithecia venosata*, 218; *Eutricha quercifolia*, 163; *Geometra papilionaria*, 128, 162; *Glyphipteryx fuscoviridella*, 107; *Gnophria rubricollis*, 274; *Gnophos obscurata*, 106; *Gonepteryx rhamni*, 187; *Hecatera serena*, 217; *Heterogenea cruciata*, 301; *Hoporina croceago*, 161; *Hylophila bicolorana* 187, 373; *Hypercallia christerniana*, 130; *Lampronia capitella*, 163; *Lasiocampa quercûs* and its varieties, 114, 142, 158; *Leucania albipuncta*, 245, 274; *L. lithargyria*, 106; *L. littoralis*, 106, 129; *L. straminea*, 131; *Leucoma salicis*, 187, 274; *Lithocolletis cerasicolella*, 276; *Lophopteryx carmelita*, 161; *Mimaeseoptilus plagiodactylus*, 129; *Nephopteryx angustella*, 129; *Noctua ditrapezium*, 129; *Notolophus gonostigma*, 274; *Pachygastria trifolii*, 163; *Peridroma saucia*, 274; *Peronea hastiana*, 189; *Platypteryx harpagula*, 275; *Plusia bractea*, 217; *P. chryson*, 161; *P. moneta*, 129, 161, 220, 222; *Polia nigrocincta*, 129; *Porthesia chrysorrhoea*, 131, 162; *Psychoides verhuella*, 107; *Pyrameis atalanta*, 160; *P. cardui*, 186; *Retinia buoliana*, 130; *Rhodophaea consociella*, 301; *Senta maritima*, 159; *Sesia culiciformis*, 128; *Sphinx convolvuli*, 278; *Taeniocampa miniosa*, 187; *Tapinostola morrisii*, 131; *Toxocampa pastinum* 301; *Zephyrus betulae*, 187; *Zonosoma orbicularia*, 247; *Z. porata* .. 275

REVIEWS AND NOTICES OF BOOKS:—*Dermatopteren und Orthopteren von Oesterreich-Ungarn und Deutschland*, Vienna, 1900, Professor Josef Redtenbacher, 82; *Victorian History of Hampshire—Coleoptera*, 102; *The Third Annual Report of the Kendal Entomological Society*, 1900, 139; *Transactions of the City of London Entomological and Natural History Society*, 140; *Das Tierreich—Libytheidae*, by Dr. A. Pagenstecher, 140; *Catálogo Sinóptico de los Ortópteros de la Fauna Iberica*, by I. Bolivar, 181; *Practical Hints for the Field Lepidopterist*, by J. W. Tutt, F.E.S., 196, 223; *Proceedings of the South London Entomological and Natural History Society*, 1900, 252; *Catalog der Lepidopteren des Palaearctischen Faunengebietes*, by Dr. O. Staudinger and Dr. H. Rebel, 230, 265, 279, 286, 320; *Familiar Butterflies and Moths*, by W. F. Kirby, F.L.S., F.E.S., 308; *Les Procrines de la Normandie*, par L. Dupont, 378; *Ichneumonidae of South Devon*, pt. 2, *Braconidae*, by G. C. Bignell, F.E.S., 380; *Hymenoptera-Tenthredinidae of the Clyde Basin*, by A. A. Dalglish, F.E.S., 380; *Macro-Lepidoptera of the Clyde Basin*, by A. A. Dalglish, F.E.S. .. 380

Aberrations of Geometrid moths .. 112
Abnormal length of pupal life of *Agrophila trabealis* .. ..

Abundance of *Hydrophilus piceus* at electric light, 273; of Lepidoptera at Grésy-sur-Aix, 88; of

PAGE.

Satyrus circe, 309; of *Thecla pruni* and *T. w-album* 278
Acherontia atropos, emergence of, 155; notes on, 155; in the Wisbech district in 1900, 156; at Shepperton, 277; at Doncaster 288
Acidalia imitaria larvæ hybernating 110
Acidalia virgularia male attracted by dead ♀ 373
Acid discharged by *Formica rufa* .. 219
Aciptilia galactodactyla larvæ in late June 195
Actebia praecox and *Crambus pinetellus* near Frodingham 278
Acquired characters, Rejection of theory of transmission of .. 46
Aculeate Hymenoptera, Century's work among 12
Anechura and *Forficula* of Russia, The 166
Anticlea sinuata at Reading .. 111
Aphodius, Variation of some species of 271, 364
Aporia crataegi at Dover 306
Apatura iris on the Hants borders 374
Apterous females of a Lachneid allied to *Macrothylacia rubi* .. 218
Argynnis adippe and *Dryas paphia* near Doncaster 278
Argynnis adippe ♂ paired with *A. paphia* ♀ 298
Assembling *Macrothylacia rubi*, 163, 224
Auguste de Bormans (with photograph) 85
Australian wood-boring Lepidoptera 219
Autumnal lepidoptera at Skipwith 370
Autumnal *Stauropus fagi* 246

Bagous cylindrus in Bedfordshire . 140
Bankesia conspurcatella, Notes on 173
Biologic entomology 1
Boers as lepidopterists 167
Boletobia fuliginaria at Hale End . 306
Brephos notha in Worcester .. 195
British Coleoptera, Literature of, for the past century 47
British Museum, Criticism of work of 43
British Rhynchota, Evolution of our knowledge of 59
Butterflies at Cannes, 189; of the Cevennes, 309; in the Lebanon (with map), 169, 205; of the Splugen, the Stelvio, and the Brenner 95; of Trinidad .. 378

Catocala fraxini at Norwood, 333; in Suffolk.. 306
Century and the Lepidopterist, The 41
Century number, Our 1
Charaxes jasius in Tangier .. 251
Chrysidae, Century's work among 14

PAGE.

Chrysopa dorsalis and *C. perla* compared 84
Classificatory position of *Lemonia* (*Crateronyx*) *dumi* 167
Clerus formicarius in the Esterels 190
Coccidae, Progress in study of .. 57
Cocoon-cutter of *Actias luna*, The 300
Cocoons of *Cerura bicuspis* 158; *Hybocampa milhauseri* 158; *Lachneis lanestris* 108, 244; *Plusia moneta* 222
Coleoptera of Glover's "History of Derbyshire," 1829 104
Coleoptera eaten by birds, Information wanted 377
Coleoptera at Colchester 331; Hampshire, 102; of the Hastings district, 103; of the London district 104
Coleopterous notes for the autumn of 1900 328
Coleopterous notes for April and May 363
Coleoptera on Snowdon 342
Colias edusa, Breeding, 213; on the wing in January, 252; Protective resting-habit of 190
Colias edusa and *C. hyale* near Croydon in 1900 109
Colias hyale at Gravesend, 305; hybernated and bred, 222; at Chichester, 334; at Burgess Hill, 334; in Croydon district, 334; in Cambridgeshire, 250; in Kent, 250; at Folkestone, 250; in Northamptonshire and Buckinghamshire, 249; Susceptible to cold 110
Collecting oak galls 81
Condition of *Lachneis lanestris* during the pupal state 284
Congress of South-eastern Union of Scientific Societies .. 84, 196
Convergence 32
Correspondence with a naturalist and educationalist desired .. 189
Cosmopolitan beetles in a London warehouse 219
Cosmotriche potatoria at sugar? .. 165
Critical note on an exhibition of *Lithosia lutarella* 377
Crosspairings between *L. quercûs* and its varieties 114, 143, 313, 328
Cry of *Acherontia atropos*, The .. 127
Cryptocephalus 6-*punctatus*, Note on 250
Cyaniris argiolus at Blackheath, 373; in Middlesex 333

Dark aberrations of *Abraxas sylvata* 297
Darwin's influence on Entomology 31, 72
Dates of appearance of *Dimorpha* (*Endromis*) *versicolora* .. 112
Deilephila livornica at Cambridge 376

PAGE.
Description of larva; a model to follow 40
Development of imago in pupa of *Lachneis lanestris* 243
Dicranura vinula emerging from cocoon 28
Dilina tiliae at Hampstead .. 279
Distribution of British Coleoptera, 147; notes on 175, 201, 270, 293; of certain British Lepidoptera, 361; the genus *Aphodius* .. 271
Dipterology of the Nineteenth Century 11
Drymonia chaonia at Bromley .. 224
Duplication of the auditory organs of *Thamnotrizon cinereus* .. 332
Duplication of entomological records 377
Dwarf Lepidoptera .. 297, 359, 360

Early appearance of *Zonosoma porata* 165
Early emergences of lepidoptera in the Isle of Man 165
Early spring lepidoptera .. 247, 248
Early stages of lepidoptera, Increase in our knowledge of 35
Embryology 36
Emergence of *Diloba caeruleocephala* 301
Endrosae, Notes on the 139
Ennomos autumnaria at Reading 278, 334, 376
Entomological butchers, exterminating *Lycaena arion* 366
Entomological Club; Mr. Verrall's dinner 83
Entomological notes from Cornwall 366; in the Southend district 372; from Rye 305
Entomological Science, Progress of, 1; Future of 3
Entomological Society in its opposition to evolution theories .. 73
Eutricha quercifolia in the London district, 374; at Rnislip woods .. 374
Experiments in rearing *Lymantria monacha* and *Clostera curtula* in a moist atmosphere 253
Experimental Entomology, 2, 26, 34
Exceptional sizes in lepidoptera .. 359
Extended duration of pupal stage 359 of *Petasia nubeculosa* 220

Faunistic Island, A 325
Fifth International Congress of Zoology 111
Food-plants of *Demas coryli*, 246; *Notodota dromedarius*, 110; *Phorodesma smaragdaria*, Fab., 197; *Neuronia saponariae* .. 277
Forcing pupæ of *Acherontia atropos* 300
Formica rufa, An observation nest of 349
Formic acid secreted by *Formica rufa*, Strength of 167

PAGE.
Generic nomenclature, Corrections in 183
Good nights for moths 107
Gynandromorphous *Epione vespertaria*, 297; *Polyommatus bellargus* 218

Habits of certain butterflies when disturbed during copulation 298, 328
Handbook of butterflies of Alps .. 138
Heather blossom attractive to moths 246
Heloptropha leucostigma at Reading 110
Hoporina croceago ab. *latericolor* .. 186
Homalota divisa var. *blatchii* at Knowle 250
Hybernia rupicapraria embedded in ice 137
Hybernating stage of *Acidalia imitaria* 164
Hybernating *Xylina semibrunnea* . 249
Hybridity 34
Hybrid *Lasiocampa quercûs* ♂ × *Pachygastria trifolii* ♀, 298; *Smerinthus ocellatus* × *populi* .. 362
Hybridity among the Sesiides .. 174
Hybrid Oporabias, 360; Saturniids, new names for 183
Hymenoptera, Phytophagous .. 18

Ichneumonidae during the nineteenth century 15
Illustrations of lepidoptera from the works of old and modern authors 66
Imaginal development of pupa of *Lachneis lanestris* 244
Influence of Darwin upon Entomology 72
Inquiline *Cynipidae* .. 126,
Insects in the Brighton district .. 164

Keeping coccons of *Miselia oxyacanthae* 374; imagines of *Dasycampa rubiginea* through the winter, 301; larvæ of *Macrothylacia rubi* through the winter, 300, 381; pupæ of *Hylophila bicolorana*, 303, 373; *Stauropus fagi* through the winter 274

Lachneids, Loan of, wanted .. 380
Larvæ of *Anthrocera trifolii* hybernating a second winter 307, 308; *Feniseca tarquinius* feeding on plant lice, 280; the *Stachys*-feeding plumes, 247; *Lasiocampa quercûs* and its varieties 114, 143
Larval description 37
Larentia viridaria double-brooded 11
Larval habits of *Senta maritima* .. 159
Larval life of *Pachytelia villosella*, Length of 221
Lasiocampa quercûs larva hybernating 158

PAGE.
Lasiocampa quercûs var. *meridionalis*, n. var. 113
Last Christmas of the Nineteenth Century, The 56
Lepidoptera at Castle Moreton, 221, 371; Chingford, 302; Chislehurst, 371; King's Lynn, 303; Knutsford, 220; Lyndhurst, 220; Oxton, 302; from Southwest Scotland, 133; Penarth district, 164; Burnley in 1901, 370; Essex, 303; Frensham district, 107; New Forest, 276, 301, 303 (erratum, 336), 369; North Wales, 369; Scilly Isles, 370; South Devon, 304; Southend district in 1900, 190, 372; Western Highlands, 135; Yorkshire 302
Lepidopterists and the council of the Entomological Society .. 83
Lepidopterists, The leading, at the end of the century 2
Lepidopterological books of century, 20; notes for the year 1900, 130; notes from Cornwall, 366; work of century.. 31
Lepidopterology in N. America, A century of 76
Leucania albipuncta at Boscombe . 372
Leucania l-album, British.. .. 376
Leucanias at Rye 164
Leucania vitellina at Boscombe, 372; at St. Margaret's Bay .. 373
Lid of the cocoon of *Lachneis lanestris* 299
Limnius, some remarks on the British species of 337
Lina populi in the Pellice Valley.. 273
Lithosia sericea, Gregs. bon. sp., 359; Is it a var. of *L. complana ?* 359
Locality for *Anthrocera exulans*, Probable new 136
Lophosia fasciata at Lyndhurst .. 308
Luffia ferchaultella at Cannes .. 190
Luffia lapidella larvæ in September 299, 300
Luciola lusitanica, Note on the habits of 363
Lytta vesicatoria, A successful hunt for 251

Macroglossa stellatarum feeding at flowers of fuchsia, 111; in March 166
Mandibles of *Trachyphloeus myrmecophilus*, The false, adherent 378
Melandrya dubia as a Britsh insect 377
Mellinia ocellaris at Mucking, 306; in North Kent 376
Migration and dispersal of insects: Lepidoptera 97, 124, 145, 193, 233, 255, Coleoptera 281, 317, 353
Mimicry 74, 218; in British Coleoptera 219
Myrmecophilous Coleoptera, Evolution of our knowledge of 51; Some experiments with.. .. 349

PAGE.
Named forms of *Peronea cristana* 292
Names for Saturnian hybrids .. 183
Naturalists among Entomologists 76
Neuration 41
New British Flea, *Ceratophyllus newsteadi*, Rothsch. (with plate), 284; *Typhlopsylla bisseptemdentata* 362
New Forest notes in 1901, Coleoptera 329
New Geometrid Varieties and Aberrations 336
New names among the Lachneids 327
Night-feeding larvæ, Searching for 221
Noctuid aberrations in Co. Dublin 360
Nomenclature of the legs of insects, On the 138
Nonagria neurica at Lincoln .. 332
Notes on collecting in the Isle of Man 333
Notes on Luffias .. 91, 143, 149, 178
Notes on *Pulex canis* and *Pulex felis* (with plate) 126
Nyssia lapponaria in Perthshire .. 307

Occurrence of *Eutricha quercifolia* 306
Odonata, Progress of our knowledge of during a century and a half 7
Odontaeus mobilicornis at Woking and Bournemouth 219
Officers of Entomological Societies for 1901 82
Orthoptera of Iberia, 181; Observations on some new and little known, 210, 240, 259; Scottish, 153; of Southern India, 83; Progress of study of during nineteenth century 3
Oviposition of *Coleophora murinipennella* 245; *Cosmotriche potatoria*, 279; *Odontopera bidentata* on *Arundo phragmites* 221

Pachytelia villosella in April, 166; (erratum), 221; length of larval life of 221
Pairing of *Dimorpha versicolora*, 328; of Psychides, A note of criticism 196
Panchlora viridis in England .. 243
Papilio machaon at Mucking, 278; in the Esher district 305
Parnassius apollo and *P. delius*, Probable specific ident ty of .. 379
Parthenogenesis, Incidental remarks on the phenomena 91, 143, 178
Peculiar Yorkshire *Cupido minima* 377
Peridroma saucia larvæ feeding up through the winter 274
Periplaneta australasiae at Liverpool 332

PAGE.

Peronea cristana and its aberrations 227, 261, 287, 327, 380
Pharetra menyanthidis at sugar .. 277
Photography and Entomology .. 42
Phylogeny 32
Physiological and Anatomical side of entomology 32
Pieris daplidice at Dover 306
Platyptilia pallidactyla, A doubtful Scotch form of 129
Plum blossom as an attraction to moths 107
Plusia moneta at Bexley, &c. .. 376
Plusia moneta at Wandsworth, 111; in Middlesex 333
Plusia moneta and *Porthesia chrysorrhoea* at Norwood .. 304
Porthesia chrysorrhoea at Yarmouth .. ..
Porthesia similis double-brooded .. 110
Position of the Luffiids among the Psychides 180
Practical Entomology 42
Probable new species of Lycænid 172
Prolegs, Larval 38
Protective resemblance in butterflies 312
Proposed list of Lepidoptera of the Cheshire, Flint, Denbigh, Carnarvon, and Anglesea districts.. 83
Proposed list of Warwickshire insects 111
Proposed new work on Belgian Lepidoptera 378
Pupation of *Apatela aceris* 275; *Gnophria rubricollis* 274, 381; *Stauropus fagi*, 274; *Sphinx ligustri*, 137; *Hemithea thymiaria* 188
Pupal condition of *Hemerophila abruptaria* during winter .. 165
Pupæ of *Thecla pruni* 160

Races of *Lasiocompa quercûs*, On some 237, 256, 313, 333
Rearing *Hylophila bicolorana* 301, 373
Rearing larvæ, 107; *Leucania albipuncta* in confinement .. 274
Renaming of aberrations of Noctuids 279, 377
Rhyncophora, etc., in 1901 .. 364
Rush-feeding Coleophorids, The .. 301

Saga natoliae at Constantinople .. 296
Sale of entomological books .. 166
Scales (sexual) in *Colias edusa* .. 141
Seasonal dimorphism in *Cilix glaucata* 296
Second pairing of *Melanargia galathea*, Probable 298
Sesia andreniformis in Kent .. 305
Sesiidae or *Ægeriidae* 122
Sesia myopaeformis in pear .. 222
Senta maritima, Winter habitat of 159
Sexual dimorphism in scaling of *Colias edusa* 141

PAGE.

Shape of galls 126
Species, Increase in number described 1
Species-naming 72
Specific claim of *Parnassius delius*, Doubtful 378
Sphaerites glabratus in Cumberland 331
Sphingides at Hampstead, 373; Classification of 62
Sphinx convolvuli at Angmering, 335; Blackheath, 375; Boscombe, 375; Bournemouth, 375; Burgess Hill, 335; Chelmsford, 335; Chichester, 335; East Dulwich, 306; Essex, 306; Folkestone, 335; Guernsey, 375; Hadleigh, 375; Hammersmith, 335; King's Lynn, 375; Shoreditch, 375; Stratford, 335; Turin, 374; Warwickshire, 335; York .. 335, 375
Sphinx ligustri full-fed in July .. 305
Spilodes palealis at Folkestone .. 304
Sporadic appearance of *Pyrameis cardui* 280
Staudinger and Rebel's Catalogue, 230, 265, 279, 286, 320, 345
Stridulation of imago of *Smerinthus populi* 164
Stridulation of ♂ of *Macrothylacia rubi* 224
Sugar, Lepidoptera at, in Warwickshire in 1900 164
Swiss butterflies, A fourth season among .. : 117
Synonymy of the Sesias 122
Systematists not generalisers .. 73

Temperature experiments on Lepidoptera 29
The "Lennon" collection of Coleoptera 82
Tortrices obtained by hedge-beating in September 276
Trimium brevicorne from Chiddingfold 182
Trochilium bembeciformis at Mucking 278
Tubercles, Larval, 39; Homology of 40

Uniformity of nomenclature .. 138

Variation of the genus *Aphodius*, 271, 364; *Zonosoma pendularia* 296
Velleius dilatatus, Tracing to its haunts 330

Wicken Fen and Mr. Aspland 334, 380
Weismannism and Entomology .. 44
Works on British Coleoptera, 47; British Rhynchota, 59; Chrysidæ, 14; Coccidæ, 57; Diptera, 11; Heredity, 45; Hymenoptera-Aculeata, 13; Ichneumonidæ, 15; Lepidoptera, 13, 20, 35, 62, 66, 73, 76; Odonata, 8; Orthoptera,

PAGE.
4, 85; Phytophagous Hymenoptera 18

Xylophasia lateritia reported as captured in Britain 218

PAGE.
Xylomiges conspicillaris at Castle Moreton 277

Yorkshire Nat. Union Field Meeting 253

LIST OF ILLUSTRATIONS, &c.

To be placed opposite PAGE.

PL. I.	Portrait of Baron Michel Edmond de Selys-Longchamps	79
PL. II.	Portrait of Auguste de Bormans	85
PL. III.	*Pulex canis*, Curt., and *Pulex felis*, Bouché	126
PL. IV.	Scales from *Colias edusa*	141
PL. V.	Butterflies in the Lebanon (Map)	169
PL. VI.	*Peronea cristana*, Fab. and its aberrations	227
PL. VII.	A New British Flea	284
PL. VIII.	Aberrations of British Lepidoptera	327
PL IX,	British Species of *Limnius*	337

LOCALITIES, ETC. :—Africa, South, 199 ; Antrim, 329 ; Argentine Republic, 283. Ben Nevis, 319 ; Bermudas, 201 ; Berlin, 158 ; Bidborough, 222 ; Bournemouth, 369 ; Bouveret, 118 ; Box Hill, 247; Branson, 118 ; Brazil, 198, 233 ; Brenner, 96 ; Brent Valley, 105 ; Brighton, 164 ; Bromley, 221 ; Burnley, 370. Cairn Boan, 283 ; Cambridgeshire, 251 ; Cannes, 95, 173, 189, 237 ; Castle Moreton, 221, 277, 371; Central America, 233 ; Cevennes, 309 ; Ceylon, 98 ; Chingford, 302 ; Colchester, 331 ; Cornwall, 366; Constantinople, 296; Cortina, 95 ; Cromarty and Moray Firths, 282 ; Croydon, 109, 333 ; Cumberland, 331. Deal, 131 ; Derbyshire, 104 ; Devon, South, 304 ; Dover, 306 ; Dublin Co., 333. East Indies, 124, 145 ; Esher, 304 ; Essex, 303. Feering Bury, 130 ; Frensham district, 107. Grésy-sur-Aix, 88. Halle, 281 ; Hampshire, 102 ; Hastings, 103 ; Headley Lane, 105. Iberia, 181 ; Isle of Man, 165, 333 . Kendal, 271 ; Kent, 250 ; Knutsford, 220 ; King's Lynn, 303. Lake Maggiore, 93 ; Lebanon, 169, 205 ; Les Plans, 118 ; Lincoln, 331 ; London district, 104 ; Lurgashall, 94 ; Lyndhurst, 220, 277. Martigny, 118 ; Minehead, 333 ; Mississippi Valley, 255 ; Mount Shasta, 236 ; Mürren, 119. New Forest, 131, 220, 248, 277, 301, 303, 329, 369, 372 ; North Wales, 369. Oxton, 248, 302 ; Oberweiden, 325 ; Pellice Valley, 273 ; Penarth, 164. Rannoch, 132 ; Reading, 109 ; Rhone Valley, 117 ; Richmond Park, 105, 130, 328 ; Rye, 164, 305. Sandburn, 248 ; Scilly Isles, 370 ; Scotland, 154, South-west of 133, Western Islands of, 135 ; Skipwith, 303, 370 ; South Yezo, 319 ; Southend, 190, 249 372 ; Splugen, The, 95 ; Stelvio, The, 95 ; Sudbury, 191. Transcaucasia, 210, 240, 259 ; Turin, 374. Val Maggia, 93 ; Val Varanno, 173 ; Vernayaz, 119 ; Veytaux, 117. Wallasey, 131 ; Warwickshire, 164 ; Wisbech, 156 ; Worcestershire 195

LIST OF CONTRIBUTORS.

Adkin, B.W. .. 248, 303, 37
Alderman, Joseph 335
Anderson, Joseph .. 334, 335, 359
Ash, (Rev.) C. D., M.A., F.E.S., 297 (twice), 303, 308, 370, 373 (twice)
Atmore, E. A., F.E.S. 304, 373, 375
Bacot, Arthur W., F.E.S. 44, 114, 142, 307, 328
Barnes, William 278, 376
Beare,(Professor) T. Hudson, B.Sc., F.R.S.E., F.E.S. 47, 329, 364
Bell, S. J. 333
Bennett, W. H., F.E.S. 104
Bignell, G. C., F.E.S. .. 127, 361
Bird, J. F. 297, 358
Bloomfield, (Rev.), E. N., M.A. F.E.S. 18, 184
Bowles, E. A., M.A., F.E.S. .. 277
Bower, B. A., F.E.S. 111, 220, 306, 372
Brown, H. Rowland, M.A., F.E.S. 95, 309, 333
Burrows, (Rev.) C. R. N. 156, 166, 197, 222, 278 (twice), 306, 307
Burr, Malcolm, F.Z.S., F.L.S., F.E.S. 3, 79, 85, 154, 181, 296, 325, 332
Butler, W. E. 110 (thrice), 111 (twice), 328, 334
Chapman, T. A., M.D., F.Z.S., F.E.S. 31, 80, 91, 128, 149, 160, 173, 178, 190, 226 (twice), 244 (twice), 284, 299, 300 (twice) .. 378
Chitty, A. J., M.A., F.E.S. .. 250
Clark, F. N... 109
Clark, J. A., F.E.S. 227, 261, 287, 327, 358
Clarke, H. Shortridge, F.E.S. 165, 334
Clutten, W. G. 195, 371
Cockayne, E. A. 304
Colthrup, C. W. 158, 165, 297, 306 (twice), 328

Corbett, H. H., M.R.C.S. 278 (thrice)
Cotton, John, M.R.C.S. 333
Cowl, (Mrs.) M.E. 111, 155, 164, 166, 221
Crisp, E. 221, 376
Croker, A. J. .. 248, 302, 375
Dadd, E. Martin, F.E.S. .. 159, 160
Dalglish, A. Adie, F.E.S. 135
Dannatt, W., F.E.S., 373 (twice), 375
Day, F. H., F.E.S... 331
Day, G. O., F.E.S. 220 (twice), 276, 277 (twice)
Dollman, J. C. .. 213, 334, 335
Donisthorpe, Horace St. J. K., F.Z.S., F.E.S. 51, 102, 182, 250, 251, 273, 330, 331
Durrant, John Hartley, F.E.S. .. 174
Dyar, Harrison G., Ph. D. .. 37
Elliott, A.E., F.E.S. 364
Ellis, H. Willoughby, F.E.S. 140, 251
Fernald, (Professor) C.H., M.A., Ph.D. 76
Fleet, Harry.. 305
Fletcher, T. B., R.N., F.E.S. .. 254
Fox, (Rev.) E. C. Dobrée, M.A. 221, 277, 371
Glenny, Fred, F.E.S. 158
Goodson, A. T. 249
Greer, T. 333, 360
Grote, (Professor) A. Radcliffe, M.A. 41
Harwood, Bernard 331
Henderson, J. 164, 305, 360, 374
Hill, H. Ainslie, F.Z.S., F.E.S. .. 165
Hills, Stuart G. .. 334, 335, 359
Hinkins, Ralph C. 165
Hooker, W.G. 375
Hopson, Montagu F., L.D.S., F.E.S... .. ..374 (thrice)
Howe, S. L... .. .. 137, 164
Huggins, H., Jun. 250, 305 (thrice)
Image, Selwyn, M.A., F.E.S. .. 56
James, Russell E. 369
Jennings, F. B., F.E.S. 365
Jenvey, Arthur J. 243
Johnston, Henry B. 334
Kaye, W. J., F.E.S. 62
Keynes, J. N., M.D. 278
Kirkaldy, G. W., F.E.S. 59
Kirby, W.F., F.L.S., F.E.S. .. 7
Kotinsky, Jacob .. 210, 240, 259
Lawrance, Alfred J. 221
Lowe, (Rev.) F. E., M.A., F.E.S. 375 (thrice)
Maddison, T., F.E.S. 220
Mera, A. W... 360
Merrifield, Frederic, F.E.S. .. 26
Miller, (Miss) Elizabeth 336
Moberly, J. C., M.A., F.E.S. 220, 373
Morice, (Rev.) F. D., M.A., F.E.S. 12, 14
Morley, Claude, F.E.S. 15
Murray, Colin 335
Musham, John F. 165, 332
Newbery, E. A. 220
Newland, C. Bingham, F.E.S. .. 109
Newman, L. W. 362, 376 (twice)
Newnham, F.B., M.A. 298
Newstead, R., F.E.S., Hon. M.R.H.S. 57
Nicholl, (Mrs.) Mary de la B., F.E.S. 169, 205
Phillips, Hubert C., M.R.C.S., F.E.S. .. .. 279 (twice), 374
Pickett, C. P., F.E.S. 250
Portchinsky, J. .. 210, 240, 259
Poulton, (Professor) Edward B., M.A., F.R.S., F.Z.S., F.L.S., F.E.S. 72
Prideaux, R.M. 141, 164, 224 (twice)
Prout, Louis B., F.E.S. 20, 112, 122, 184 (twice), 230, 265, 286, 320, 336, 359
Ransom, Edward 195
Raynor, (Rev.) G. H., M.A., F.E.S. 155, 186, 224
Reid, Percy C., F.E.S. .. 133, 221
Riding, W. S., M.D., F.E.S. .. 303
Robbins, R. W. 306
Robertson, (Major) R. B. 221, 248, 277, 302, 360, 369, 373, 375
Rothschild, (Hon.) N. C., B.A., F.Z.S., F.L.S., F.E.S. 126, 284, 362
Russell, A., F.E.S. 138
Russell, G. J. C. 360
Russell, S. G. C., F.E.S. 277
Rydon, Arthur Hope 254
Sharp, W. E., F.E.S. 104, 147, 175, 201, 270, 293
Sheldon, W. G. 110 (twice), 136, 137, 223, 334
Sich, Alfred, F.E.S. 66, 245, 363
Sopp, E. J., Burgess, F.E.S. .. 332
Stockwell, H. Douglas 307
Studd, E. F. C., M.A., B.C.L., F.E.S. .. 248, 302, 308, 373
Swain, A. M. 304, 333
Tait, R., Jun. 372
Terry, F. W. 332
Thornhill, E. H. .. 249, 250, 278
Todd, Wilfred E. L. 189
Tomlin, B., B.A., F.E.S. 104
Tutt, J. W., F.E.S. 1, 81, 82, 88, 97, 106, 111, 113, 124, 128, 137, 138, 145, 160, 164, 166. 167, 174, 183, 185, 186, 196, 198, 215, 218, 233, 244, 245, 255, 273 (thrice), 279, 281, 298 (twice), 299, 300 (twice), 308, 317, 327, 353, 359, 362, 363, 375, 377, 381
Verrall, G. H., F.E.S. .. 11, 185
Wainwright, Colbran J., F.E.S. 111
Walker, S. .. 249, 298, 360, 375
Walwyn, H. W. Shepheard-, M.A., F.E.S. 222, 376
Warburg, J. C. .. 237, 256, 313
Watts, C. W. 250
Wheeler, (Rev.) G., M.A. 117
Whittle, F. G. 192, 249, 303, 372, 375
Woodforde, F. C., F.E.S. 196, 249, 276, 296, 304, 359, 370
Wynn, G. W. 164, 335

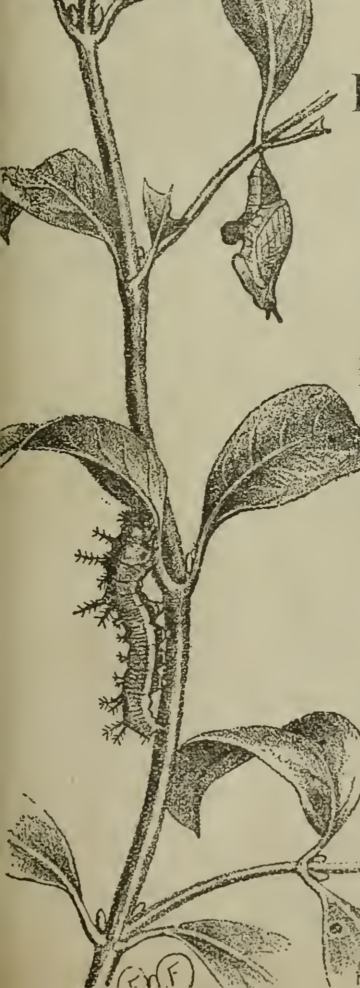
A "Special Index" containing all references to every species, genus, etc., mentioned in this volume is also published.

SUBSCRIPTIONS ARE NOW DUE.

Vol. XIII.

1901

No. 1.



THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION

Edited by

J. W. TUTT, F.E.S.

Assisted by

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S.   T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S.   H. St. J. K. DONISTHORPE, F.Z.S., F.E.S.

JANUARY 15th, 1901.

PRICE ONE SHILLING (NET).
(Century Number.)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),
SEVEN SHILLINGS,
TO BE FORWARDED TO
HERBERT E. PAGE, F.E.S.,
"Bertrose," Gellatly Road, St. Catherine's Park.
London, S.E.

LONDON:
ELLIOT STOCK, 62, Paternoster Row, E.C.

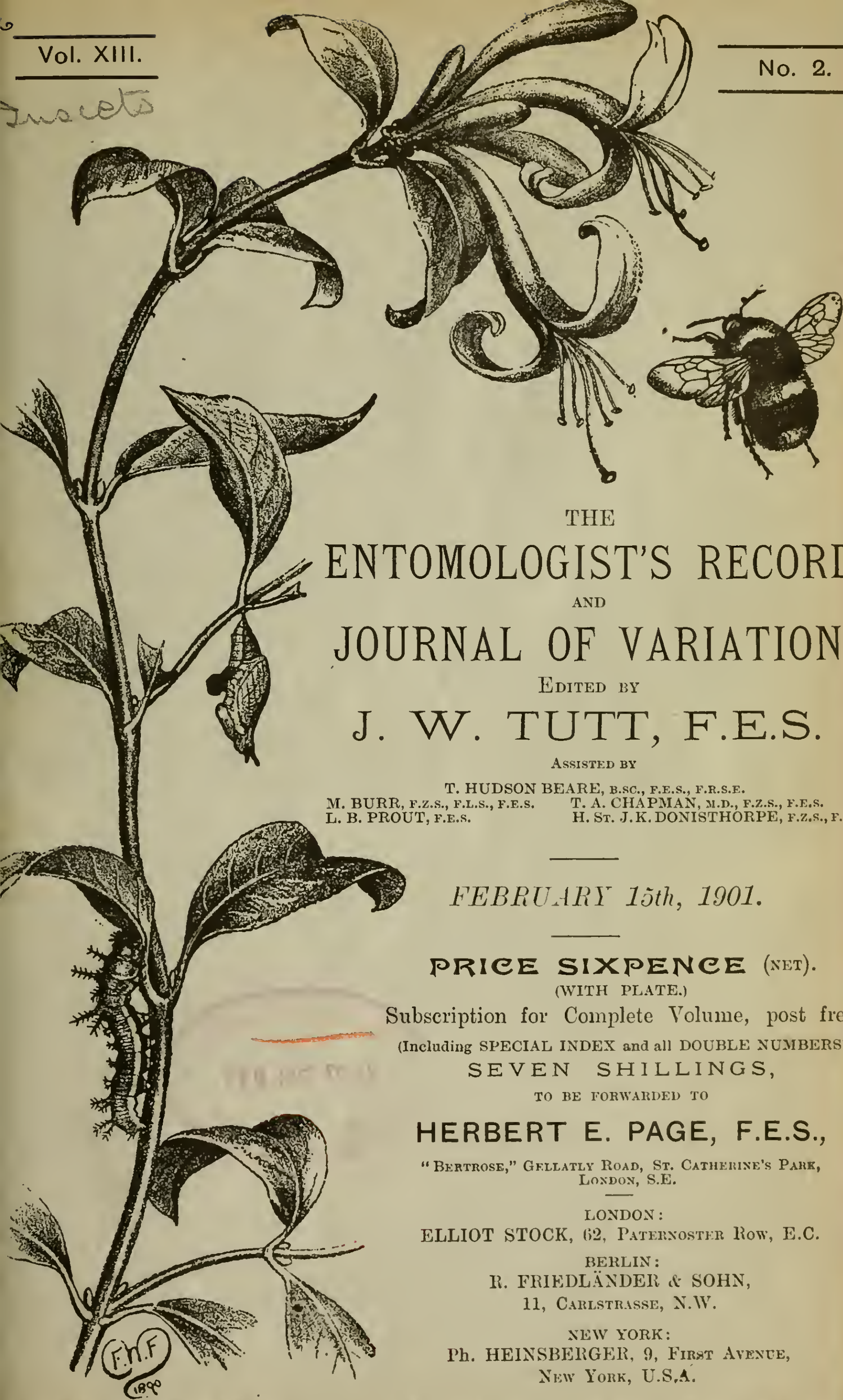
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, Carlstrasse, N.W.

NEW YORK:
Ph. HEINSBERGER, 9, First Avenue,

Vol. XIII.

No. 2.

Insects



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S. T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S. H. ST. J.K. DONISTHORPE, F.Z.S., F.E.S.

FEBRUARY 15th, 1901.

PRICE SIXPENCE (NET).
(WITH PLATE.)
Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),
SEVEN SHILLINGS,
TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Copies may also be obtained from R. H. Porter, 18, Princes Street, Cavendish Square, London, W.C.

Vol. XIII.

No. 3.

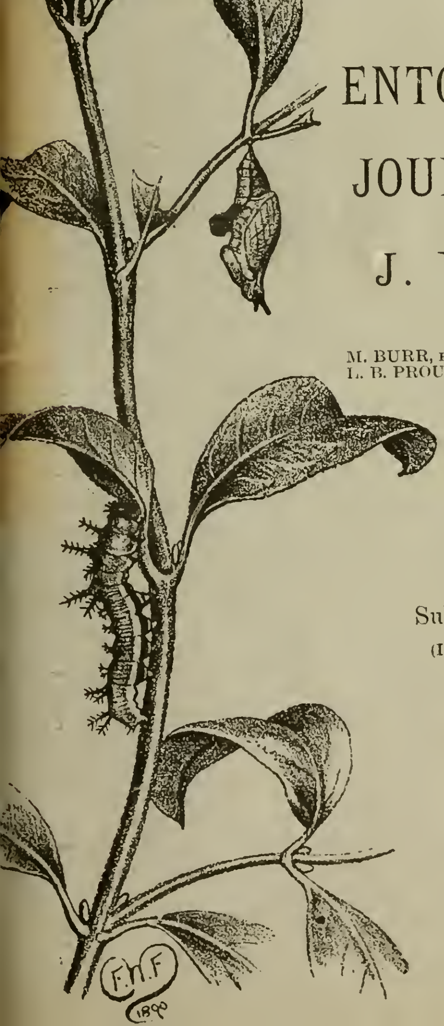
THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S. T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S. H. ST. J. K. DONISTHORPE, F.Z.S., F.E.S.



MARCH 15th, 1901.

Price SIXPENCE (NET).

(WITH PLATE.)

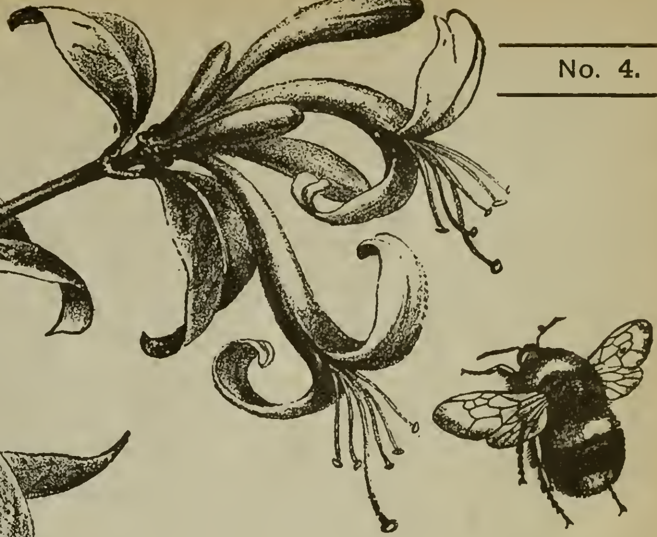
Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),
SEVEN SHILLINGS,
TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,
"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Vol. XIII.

No. 4.



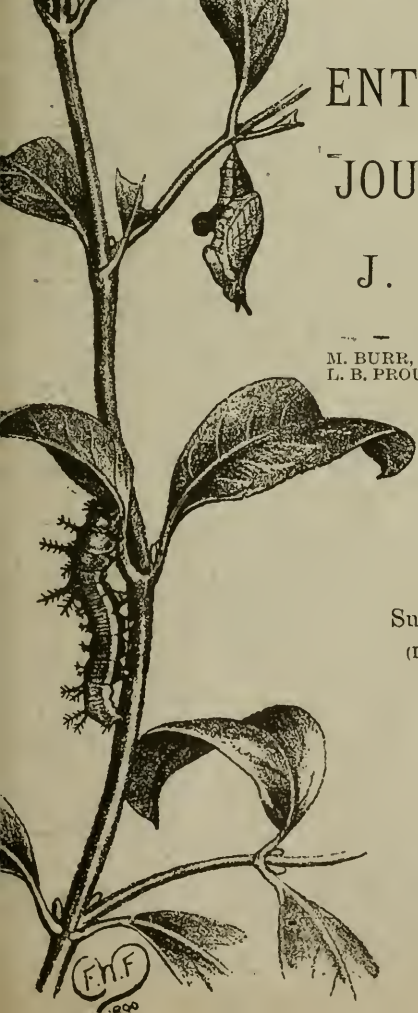
THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S. T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S. H. ST. J. K. DONISTHORPE, F.Z.S., F.E.S.



APRIL 15th, 1901.

Price SIXPENCE (NET).

(WITH PLATE.)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),
SEVEN SHILLINGS,
TO BE FORWARDED TO

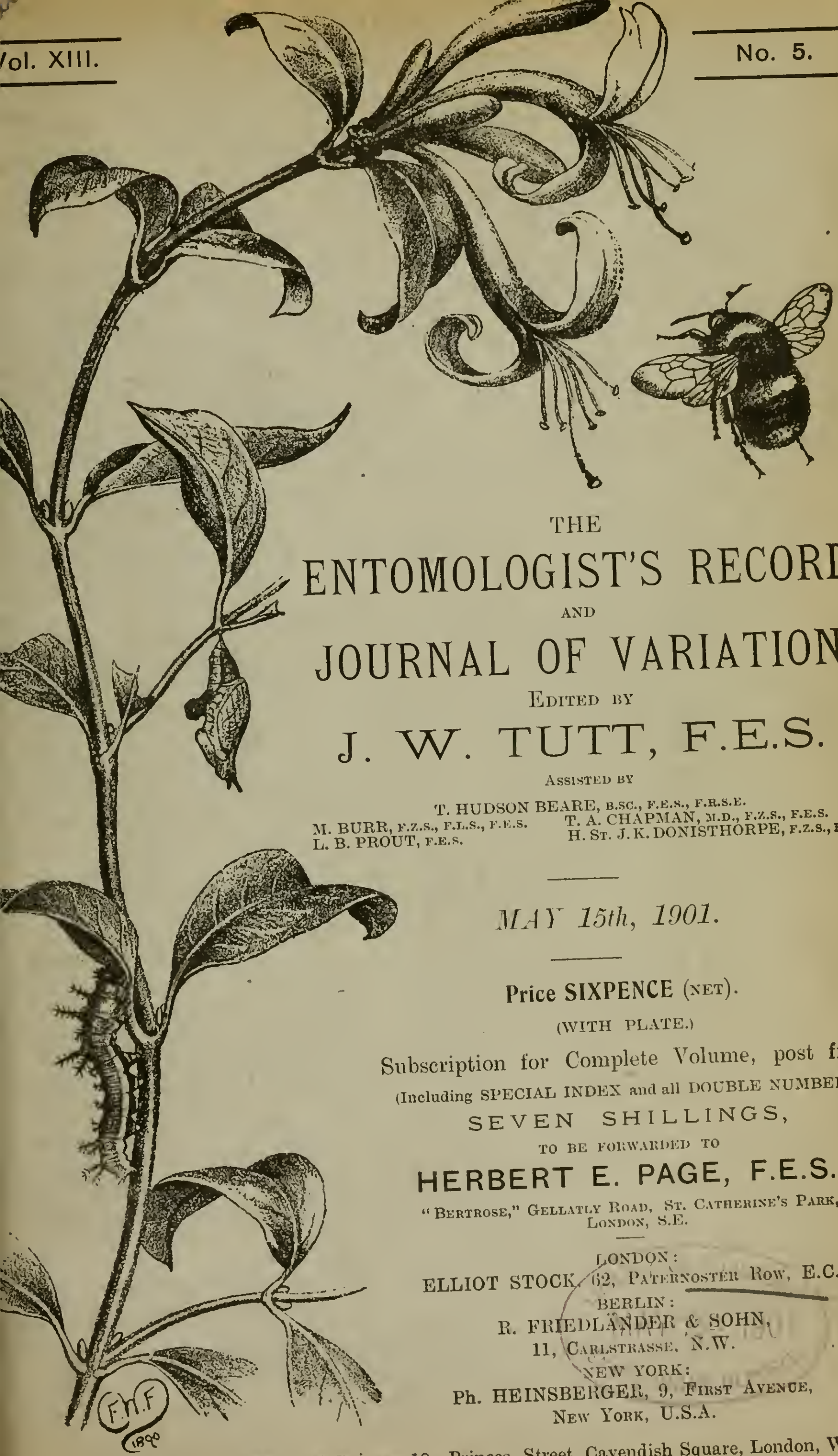
HERBERT E. PAGE, F.E.S.,

"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Vol. XIII.

No. 5.



THE

ENTOMOLOGIST'S RECORD
AND
JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S.
T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S.
H. ST. J. K. DONISTHORPE, F.Z.S., F.E.S.

MAY 15th, 1901.

Price SIXPENCE (NET).

(WITH PLATE.)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),
SEVEN SHILLINGS,
TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

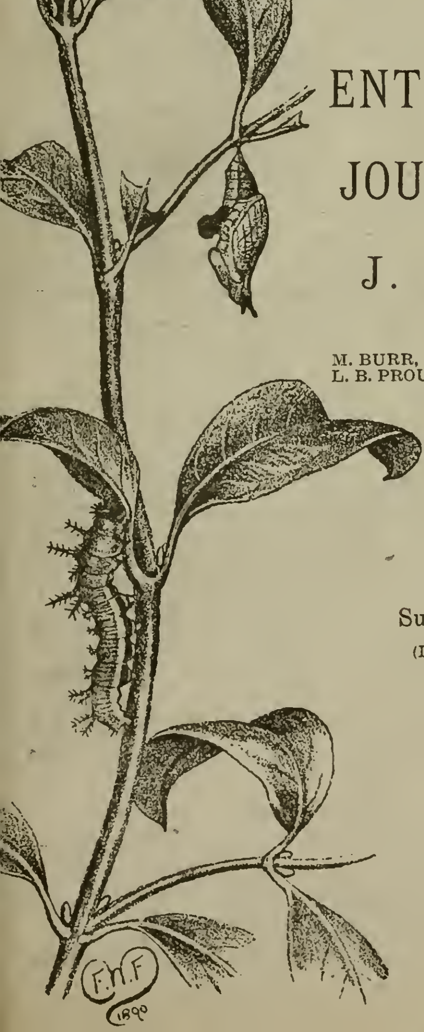
"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

obtained from R. H. PORTER, 18, Princes Street, Cavendish Square, London, W.C.

Vol. XIII.

No. 6.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S.
T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S.
H. ST. J. K. DONISTHORPE, F.Z.S., F.E.S.

JUNE 1st, 1901.

Price SIXPENCE (NET).

(WITH MAP.)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),
SEVEN SHILLINGS,
TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Vol. XIII.

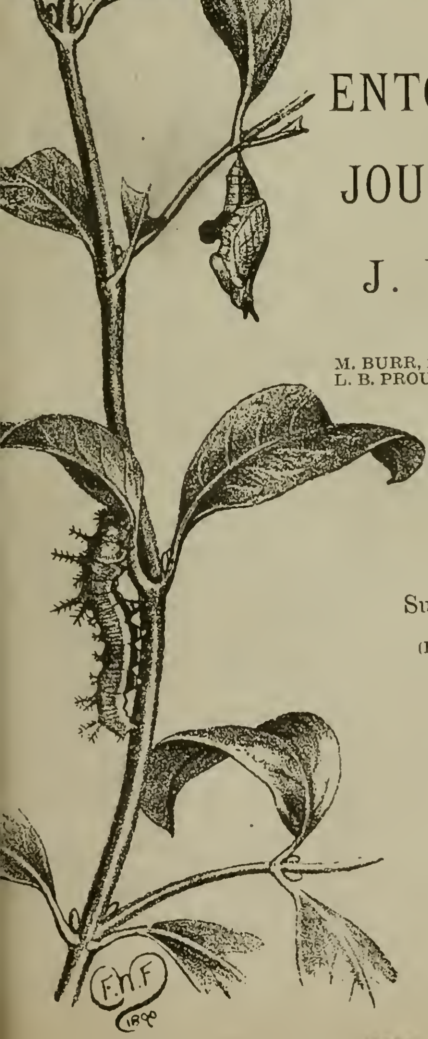
No. 7.

THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION



EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S.
T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S.
H. ST. J. K. DONISTHORPE, F.Z.S., F.E.S.

JULY 1st, 1901.

Price SIXPENCE (NET).

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),
SEVEN SHILLINGS,
TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Princes Street, Cavendish Square, London, W.C.

Vol. XIII.

No. 8.

THE

ENTOMOLOGIST'S RECORD

AND

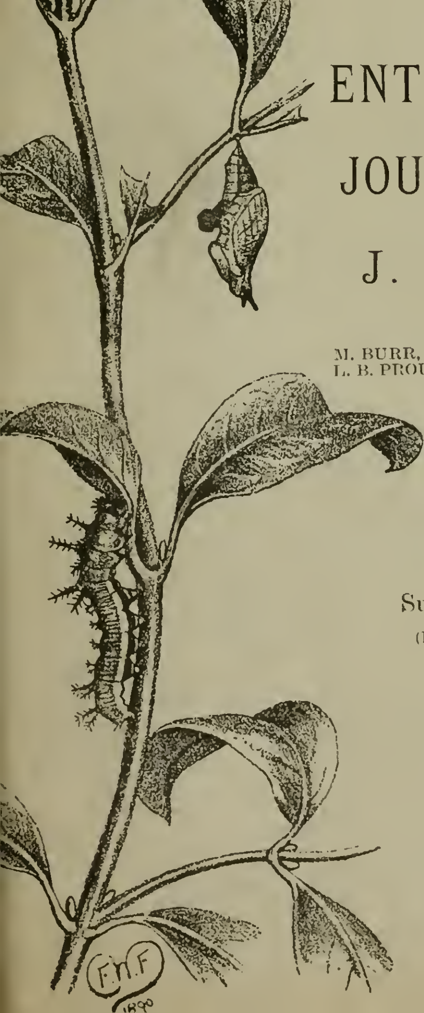
JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S.
T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S.
H. ST. J. K. DONISTHORPE, F.Z.S., F.E.S.



JULY 25th, 1901.

Price SIXPENCE (NET).

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),

SEVEN SHILLINGS,

TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE.
NEW YORK, U.S.A.

Vol. XIII.

No. 9.

THE

ENTOMOLOGIST'S RECORD

AND

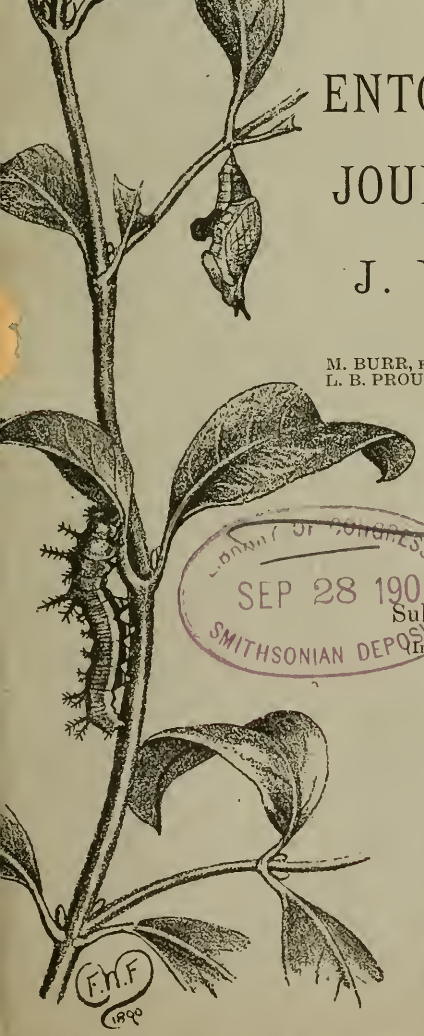
JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S.
T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S.
H. ST. J. K. DONISTHORPE, F.Z.S., F.E.S.



SEPTEMBER 15th, 1901.

Price NINEPENCE (NET).

(WITH CHROMO-LITHOGRAPH PLATE)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),

SEVEN SHILLINGS,

TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

es may also be obtained from R. H. PORTER, 18, Princes Street, Cavendish Square, London, W.C.

Vol. XIII. No. 10.

THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

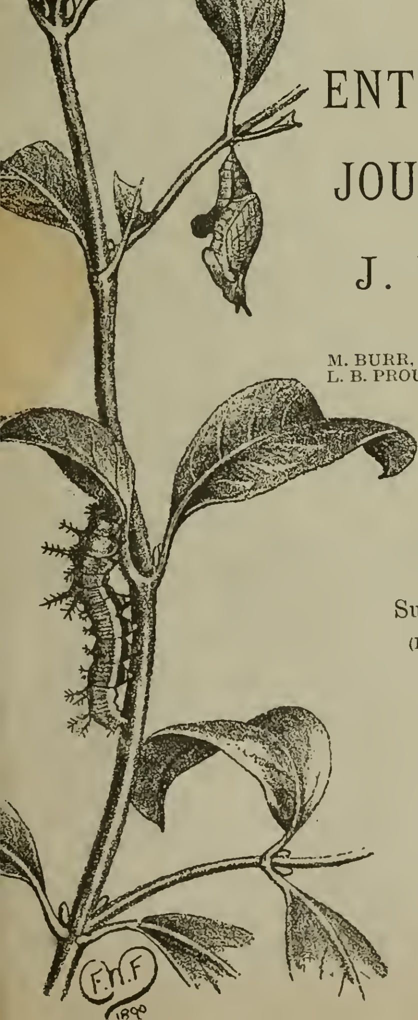
EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S. T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S. H. ST. J. K. DONISTHORPE, F.Z.S., F.E.S.

OCTOBER 15th, 1901.



Price SIXPENCE (NET).

(WITH PLATE)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),

SEVEN SHILLINGS,

TO BE FORWARDED TO

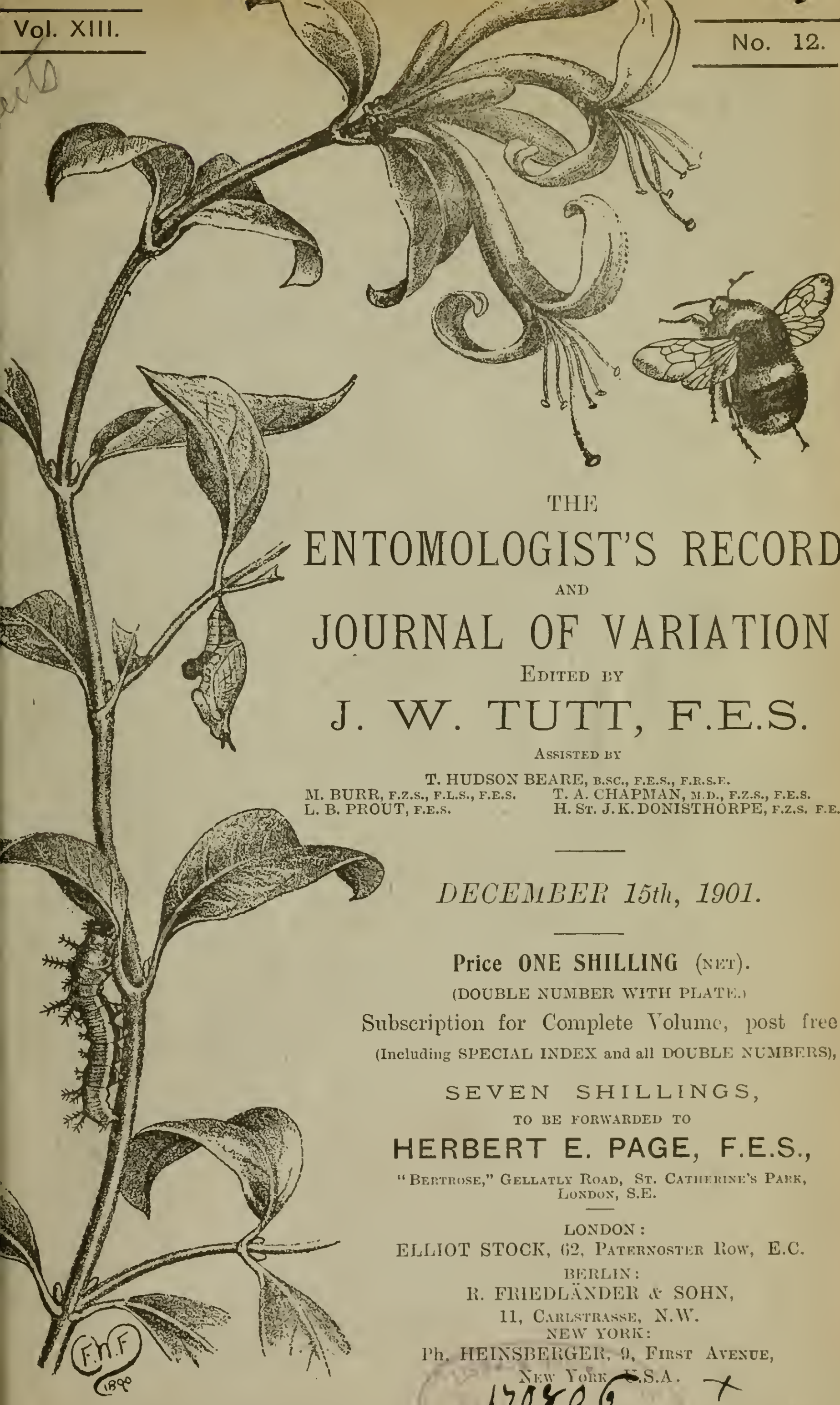
HERBERT E. PAGE, F.E.S.,

"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
Ph. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

Vol. XIII.

No. 12.



THE

ENTOMOLOGIST'S RECORD

AND

JOURNAL OF VARIATION

EDITED BY

J. W. TUTT, F.E.S.

ASSISTED BY

T. HUDSON BEARE, B.SC., F.E.S., F.R.S.E.
M. BURR, F.Z.S., F.L.S., F.E.S. T. A. CHAPMAN, M.D., F.Z.S., F.E.S.
L. B. PROUT, F.E.S. H. ST. J. K. DONISTHORPE, F.Z.S. F.E.S.

DECEMBER 15th, 1901.

Price ONE SHILLING (NET).

(DOUBLE NUMBER WITH PLATE.)

Subscription for Complete Volume, post free
(Including SPECIAL INDEX and all DOUBLE NUMBERS),

SEVEN SHILLINGS,

TO BE FORWARDED TO

HERBERT E. PAGE, F.E.S.,

"BERTROSE," GELLATLY ROAD, ST. CATHERINE'S PARK,
LONDON, S.E.

LONDON:
ELLIOT STOCK, 62, PATERNOSTER ROW, E.C.
BERLIN:
R. FRIEDLÄNDER & SOHN,
11, CARLSTRASSE, N.W.
NEW YORK:
PH. HEINSBERGER, 9, FIRST AVENUE,
NEW YORK, U.S.A.

ies may also be obtained from R. H. PORTER, 18, Princes Street, Cavendish Square, London, W.C.